



Blended Social Network to Promote Citizen Preparedness and Engagement in Sustainability

ABDULRAHMAN A ALSULIMAN

School of Engineering
Cardiff University, Cardiff, UK

Submitted in Partial Fulfilment of the Requirements of the Degree of
Doctor of Philosophy, Feb, 2015 ©

Declaration

This work has not previously been accepted in substance for any degree and is not concurrently submitted in candidature for any degree.

Signed..... (Candidate) Date.....

STATEMENT 1

This thesis is being submitted in partial fulfilment of the requirements for the degree of PhD

Signed (Candidate) Date

STATEMENT 2

This thesis is the result of my own independent work/investigation, except where otherwise stated. Other sources are acknowledged by explicit references.

Signed (Candidate) Date

STATEMENT 3

I hereby give consent for my thesis, to be available for photocopying and for interlibrary loan, and for the title and summary to be made available to outside organisations.

Signed (Candidate) Date

Acknowledgements

First and foremost, praises and thanks to Allah for allowing me to complete this research successfully.

Secondly, I would like to take this opportunity to present my deepest appreciation to all those who provide a support during the past three years of my PhD journey. I would like to express my deep and sincere gratitude to my research supervisor Prof. Yacine Rezgu, for his professional supervision during my research. I would like to thank him for continuous valued guidance, comments, and encouragement. He had been a tremendous mentor for me along my Ph.D. research journey. I would also like to thank my co-supervisor Dr. Alan Kwan for his high quality supervision and advices and I also want to thank him for their brilliant comments and suggestions. Thank you both for your time that had been dedicated for frequent academic discussions along my Ph.D. study.

Also, I want to extend my acknowledgement to my family members for their love, support, and encouragement throughout my entire academic journey. A special thanks to my mom and father. Words cannot express how grateful I am to you for all of the sacrifices that you've made on my behalf.

I want to extend my acknowledgement and express appreciation to my brothers, sisters and wife, daughters, and son, they were with me every step of the way throughout my study. Thank you so much for their support and valuable prayers. They were instrumental in keeping me on track to complete this goal while helping me laugh and see the fun and excitement in my PhD journey.

Abstract

The overall aim of this research is to devise a climate change engagement modelling with an associated platform that would contribute to successfully engage the public and prompt them to move away from anti-environmental behaviour and closer to a sustainable lifestyle. The research model relies on the creation of new types of online social networks ('Blended Social Network (BSN)'), which comprises the new type of online social network with featured ICT techniques, including: context-aware user profiling, individual social marketing, social learning, location-based services and the 'attraction modules'. The new model are able to support a bottom-up approach through adopting persuasive techniques that will likely lead to an enhanced public acceptance of environmental sustainability.

The methodology design has four main phases, which are the literature review and conceptual model development, followed by three empirical stages: the empirical field study of public perceptions survey, development of prototype platform and the testing and validation of the conceptual model of the study. The first phase undertaken: (i) to identify a gap in the research, conceptualise a research engagement model, identify the key perception constructs that are used in phase two of this research, formulate the comprehensive theoretical validation framework to check the validity of the conceptual model, and measure the influence of the model on people's intentions to change negative behaviour to be compatible with a sustainable lifestyle. In the second phase, the large survey (n=1173), was conducted to investigate public perception to provide information about public understanding towards sustainability issues and their perceptions related to components of the conceptual model in general.

The outcomes were employed to underpin the model with necessary aspects of engagement in local context and revised it to reflect the real situation. In the phase three, a new prototype 'Blended Social Network' (BSN) platform was developed to assist and enable the researcher to explain and validate all of the concepts involved in the conceptual model. The prototype platform was used to assess the capability of the BSN platform to engage people to adopt a new and sustainable lifestyle. The research hypotheses, thesis conceptual model, and its components were assessed and validated using both quantitative and qualitative approaches. The findings of the empirical study reveal that the conceptual model, is preliminarily accepted by the respondents and has potential positive effects to bridge most of the apparent barriers. For instance, the Blended Social Networks and the ICT modules proposed in this research model may assist people in overcoming most of the obstacles regarding cognition, affective and intention to change behaviour attributes including facilitating conditions and perceived behaviour control. This provides evidence of the significant role of the proposed the BSN platform and the ICT techniques in engaging people toward sustainability. The detailed validation results of this study show that the three engagement constructs considered in the model account for 71% of the dependent variable of users' preparedness to engage, relying on the use of the BSN itself, 69% for the dependent variable of users' preparedness to engage relying on Context-aware technique, 72.8% rely on Place-based technique, 51.3% rely on Social learning technique, 73.2% rely on Individual social marketing technique, 34.5% rely on Profile-sustainable-labelling technique, 69.2% rely on Participate-current-trends technique and 76.2% rely on the Permanent-incentive technique within the integrated BSN. Variance in a person's perceptions towards the overall effect of innovation on preparedness to engage was entirely explained by cognitive (ranging between 39.2% and 69.1%), affective factors (ranging between 37.9% and 72.0%) and the intention to change behaviour (ranging between 37.6% and 73.9%).

Table of Contents

DECLARATION	II
ACKNOWLEDGEMENTS	III
ABSTRACT	IV
TABLE OF CONTENTS	VII
LIST OF FIGURES	XII
LIST OF TABLES	XIV
CHAPTER 1: INTRODUCTION	1
1.1. Research Overview, Background and Motivation.....	1
1.2. Statement of the Problem.....	10
1.3. Scope and Dimensions of the Research.....	13
1.4. Development of Research Model.....	14
1.5. Research Rationale.....	19
1.6. Aim and Objectives.....	21
1.7. Research Questions.....	22
1.8. Research Approach and Methodology.....	23
1.9. Concluding Remarks.....	27
1.10. Thesis Structure.....	28
CHAPTER 2: LITERATURE REVIEW PART I: BACKGROUND INFORMATION ON ECOLOGY, ENVIRONMENTAL SUSTAINABILITY AND PEOPLE	32
2.1. Introduction.....	32
2.2. Global Warming and Climate Change.....	33
2.2.1. Possible Threats of Climate Change.....	36
2.2.2. The Volume Dangers of Greenhouse Gas Emissions Globally.....	36
2.2.3. The Earth Temperature Dilemma and Greenhouse Gas Emission.....	38
2.2.4. The Risk of Climate Change Phenomena to the Earth.....	39
2.2.5. Scientists' Efforts to Highlight the Risks of Climate Change.....	40
2.2.6. The Countries' Efforts in Tackling Climate Change.....	41
2.3. The Saudi Portion in Climate Change.....	42
2.3.1 Risk of Climate Change in Saudi Arabia.....	43
2.3.2. The Important of Promoting Individual Sustainable Lifestyle.....	45
2.3.3. Role of Group Behaviour and Collective Action in Mitigating Climate Change.....	47
2.4. Ecology, Environmental Sustainability and People.....	50
2.5. The Importance of the Role of Communities in Sustainability.....	51
2.5.1. Communities of Practice, Virtual Communities, Social Networks and Sustainability.....	51
2.6. Social Networks and Pro-environmental Action.....	55
2.7. Summary of Chapter Two.....	57
CHAPTER 3: LITERATURE REVIEW PART II: UNDERSTANDING THE LITERATURE REVIEW RELATED TO CITIZEN ENGAGEMENT IN SUSTAINABILITY	58
3.1 Introduction.....	58
3.2 Citizen Engagement in Sustainability.....	58
3.2.1 Environmental Citizenship.....	61
3.2.2 Barriers to Engagement in Two-level Individual and Social Levels.....	62
3.3 Related Aspects of Citizens Engagement in Sustainability.....	63
3.3.1 Public Opinion and Awareness.....	63
3.3.2 Demographic Variables, Education and Cognitive.....	65
3.3.3 Changing Behaviour and Engagement.....	66

3.3.4 Role of Attitudes in Behaviour Change	67
3.3.5 Role of Responsibility in Changing Behaviour	67
3.4 Strategies to Promote Sustainable Lifestyle	68
3.4.1 Motivation and Emotion	68
3.4.2 Direct Versus Indirect/External Interventions	69
3.4.3 Solutions and Availability of Products and Alternatives	71
3.4.4 Role of Local Communities and Communication.....	73
3.4.5 Role of Activities in Engagement	73
3.4.6 Social Marketing.....	75
3.5 Current Engagement Initiatives.....	76
3.6 Needs for Innovative Engagement Model	78
3.7 Summary of Chapter Three.....	81
CHAPTER 4: LITERATURE REVIEW PART III: THEORETICAL BACKGROUND FOR THE RESEARCH MODEL AND VALIDATION FRAMEWORK	83
4.1 Introduction	83
4.2 Engagement, Behavioural Theories and Models.....	83
4.2.1 Individual Level.....	84
4.2.1.1 The Deficit Model	84
4.2.1.2 Rational Choice Theory.....	85
4.2.1.3 The Theory of Planned Behaviour.....	86
4.2.1.4 Norm Activation Model	87
4.2.1.5 Values-Beliefs-Norms Theory.....	88
4.2.2 Interpersonal Level	90
4.2.2.1 Triandis' Theory of Interpersonal Behaviour	91
4.2.2.2 Social Learning Theory	91
4.2.2.3 Community or Network Level.....	92
4.2.2.4 Social Capital Theory	93
4.2.2.5 Diffusion of Innovations.....	93
4.2.3 Concluding Remarks.....	94
CHAPTER 5: THE DEVELOPMENT OF CONCEPTUAL MODEL, RESEARCH HYPOTHESES AND THEORETICAL VALIDATION FRAMEWORK.....	95
5.1 Introduction.....	95
5.2 The Development of the Conceptual Model Components Underpinned by Literature	95
5.2.1 Individuals' Engagement in Community of Sustainability.....	99
5.2.2 Social Network and the 'Blended Social Network' Approach	99
5.2.3 Proposed Enabling ICT Techniques	102
5.2.3.1 Context-Aware	102
5.2.3.2 Location-based Services	105
5.2.3.3 Social Learning.....	108
5.2.3.4 Individual Social Marketing	110
5.2.3.5 Individuals' Profiling and Sustainable Labelling	112
5.2.3.6 Proposed Innovative Hook and Attraction Module	114
5.2.4 Communities of sustainability: Characteristics and activities	119
5.3 The Development of Theoretical Validation Framework.....	123
5.3.1 Measurement of Individual Preparedness to Engage in Sustainable Lifestyle	124
5.3.1.1 Cognitive.....	124
5.3.1.2 Effective.....	127
5.3.1.3 Behaviour.....	127
5.3.2 Theoretical Framework to Measure Behaviour Change..	129
5.4 Summary of Chapter Five	132

CHAPTER 6: THE RESEARCH METHODOLOGY DESIGN	134
6.1. Introduction	134
6.2. Research Design Alternatives	135
6.3. Research Approach.....	138
6.3.1. Research Philosophy	138
6.3.2. Research Approach	141
6.3.3. Research Strategy.....	142
6.3.4. Time Horizon	145
6.3.5. Data Collection Method	145
6.4. Research Design Strategy of this Research	148
6.4.1. Phase one: Literature Review	151
6.4.2. Phase Two: Survey Instrument	152
6.4.2.1. Questionnaire Development	152
6.4.2.1.1. Structure, Operationalisation and Measures	153
6.4.2.1.2. Pilot Study.....	154
6.4.2.2. Sample Design	157
6.4.2.2.1. Targeted population.....	157
6.4.2.2.2. Sampling Frame	158
6.4.2.2.3. Specifying the survey method and distribution technique.....	158
6.4.2.2.4. Sample size	160
6.4.2.3. Data Analysis.....	160
6.4.2.3.1. Response rate	160
6.4.2.3.2. Preparation of the survey data for statistical analysis.....	160
6.4.2.3.3. Content and Construct Validity and Reliability.....	161
6.4.2.3.3.1. Reliability.....	162
6.4.2.3.3.2. Validity of the Instrument	163
6.4.3. Phase Three: Development Prototype Methodology of Blended Integrated Social Network System	166
6.4.3.1. Selecting the Development Methodology for this Study	166
6.4.3.1.1. Prototype System Development Life Cycle.....	166
6.4.3.1.2. Prototype BSN Platform Conceptualization and Domain Analysis Using Unified Modelling Language (UML).....	167
6.4.4. Phase Four: Validation of the Integrated Blended Social Network Model.....	169
6.4.4.1. Poll Survey and Focus Group Sessions.....	169
6.4.4.2. Reliability and Validity of Poll Instrument.....	1729
6.5. Ethical Considerations.....	172
6.6. Summary of Chapter Six	173
CHAPTER 7: UNDERSTANDING PUBLIC PERCEPTIONS OF CLIMATE CHANGE AND SUSTAINABLE LIFESTYLES	174
7.1. Introduction	174
7.2. Descriptive Statistical Analysis	176
7.2.1. General Characteristics of the Sample	176
7.2.1.1. Demographic Attributes of Participants.....	177
7.2.1.2. Participants' Internet-related Behaviour	178
7.2.2. General Public Understanding of Climate Change	180
7.2.2.1. Individual Engagement in Climate Change; 'noticing signs of climate change' as a Case	181
7.2.2.2. Awareness and Knowledge.....	183
7.2.2.3. Perceptions of Risk	185
7.2.2.4. Trust in Source of Information	187
7.2.2.5. Sense of Responsibility and Intention to Change Behaviour	188
7.2.2.6. Public Attitudes, Beliefs and their Perception Towards Climate Change.....	189
7.2.2.7. Perceived Effect of Climate Change on Changing Lifestyles.....	190
7.2.3. Self-report of Current Limitations and Barriers to Behaviour Change.....	191
7.2.3.1. Level of Public Engagement in Climate Change in Saudi Context	194

7.2.3.2. Discussion of Public Views Towards Environmental Sustainability; Climate Change Phenomena	195
7.2.4. Public Perception Towards the Concepts/Techniques Proposed in the Engagement Model.	201
7.2.4.1. Exploit the Role of Environmental Organizations and Social Networks	201
7.2.4.2. Ascertaining the Role of Location Loyalty and ‘Location-Based’ Technique.....	204
7.2.4.3. Ascertaining the Role of Individual Social Marketing.....	207
7.2.4.4. Ascertaining the Role of Social Learning Technique	209
7.2.4.5. Ascertaining the Role of Attraction Techniques; Local Trends, Events, and Incentives.....	213
7.3. Results of the Revision of Conceptual Model Components.....	216
7.4. Summary of Chapter Seven.....	218
CHAPTER 8: VALIDATING THE RESEARCH CONCEPTUAL MODEL; DEVELOPMENT OF PROTOTYPE PLATFORM AND DATA ANALYSIS RESULTS	219
8.1 Introduction.....	219
8.2 Part I: Development of Prototype Platform	219
8.2.1 The Implementation of Prototype BSN Platform	225
8.2.1.1 Logical Architecture and Module Components	226
8.2.1.2 Implementation specification.....	231
8.3 Part II: Data Analysis Results.....	238
8.3.1 Overview, the Empirical Work, and Data Collection Method.....	238
8.3.2 Preliminary Data Analysis Results	240
8.3.2.1 Reliability and Validity Analysis.....	242
8.3.2.1.1 Reliability Test.....	242
8.3.2.1.2 Testing the Construct Validity.....	244
8.3.2.2 Multicollinearity Analysis	248
8.3.3 Analysis Results of Validating the Model Effects on Individual Preparedness to Engagement in Sustainable lifestyle	250
8.3.3.1 Validating the Effects of the Model Components on Citizen’s Engagement Determinants with Correlations Analysis.....	250
8.3.3.1.1 The ‘Blended Social Network’.....	251
8.3.3.1.2 The ICT techniques.....	251
8.3.3.2 Validation the Effects of the Model Components on Citizen’s Engagement Determinants with Advanced Analysis	253
8.3.3.2.1 The Effects of the ‘Blended Social Network’ Platform.....	253
8.3.3.2.2 The Effects of the ICT Techniques.....	259
8.3.3.2.2.1 The Context-Aware Technique.....	261
8.3.3.2.2.2 The Location-based Technique.....	264
8.3.3.2.2.3 The Social Media Learning Technique.....	267
8.3.3.2.2.4 The Individual Social Marketing Technique.....	269
8.3.3.2.2.5 The Individual’s Profiling and Sustainable Labelling Technique.....	273
8.3.3.2.2.6 Hook and Attraction Module:.....	275
8.3.3.2.2.6.1 The Participation in Current Trends Events Technique.....	275
8.3.3.2.2.6.2 The Permanent Incentive Technique.....	278
8.3.3.3 Results of Focus Group Discussion	281
8.4 Summary of Chapter Eight.....	288
CHAPTER 9: CONCLUSION.....	290
9.1 The Thesis and Research Model Overview	290
9.2 Addressing the Research Objectives, Summary of Finding and Conclusion.....	292
9.3 Contributions to the Body of Knowledge	304
9.4 Recommendations.....	308
9.5 Directions for Future Research	310

List of Figures

Figure 1.1: Conceptual model and research dimensions	17
Figure 1.2: A summary of the research methodology	24
Figure 2.1: The thesis literature review layout, themes and chapters	33
Figure 2.2: Variation of earth's surface temperature: 100-2100, adapted from IPCC (2003).	35
Figure 4.1: Linear 'deficit' model of pro-environmental behaviour (Source: Kollmuss and Agyeman (2002)).	84
Figure 4.2: The theory of Planned Behaviour (TPB), (Source: Ajzen (1991)).	86
Figure 4.3: Value Belief Norm Theory (VBN), (Source: Stern et al. (1999)).	88
Figure 4.4: Triandis' Theory of Interpersonal Behaviour (TIB) (Source: Triandis (1977)).	91
Figure 4.5: Social learning theory (SLT), (Source: Bandura and McClelland (1977)).	92
Figure 5.1: Conceptual model components of citizen engagement in sustainability	98
Figure 5.2 Individual's attraction and motivation techniques mechanism	115
Figure 6.1: Five layers of research design and tactics adapted from (Saunders et al., 2011).	138
Figure 6.2: The design of this research methodology.	149
Figure 6.3: Phase one, literature review	151
Figure 6.4: Questionnaire Instrument Development Process; Modified from (Churchill and Iacobucci, 2009)	153
Figure 6.5: Types of Questionnaire Instrument; Modified from (Saundae et al., 2003)	158
Figure 7.1: Summary of survey sample socio-demographic characteristics	178
Figure 7.2: Sample respondents Internet previous experience	179
Figure 7.3: Sample respondents Internet usage frequency	179
Figure 7.4: Sample respondents Internet usage Purposes	180
Figure 7.5: Citizen perceived concern about environmental issues, 2012	186
Figure 7.6: Citizen perception of risks, 2012	187
Figure 7.7: Level of public acceptance of environmental groups	188
Figure 7.8: Comparison in level of trust in source of information between family and friends, scientists, government, energy supplies, environmental communities and media.	188
Figure 7.9: Measure the intention of people to change their behaviour or lifestyle to mitigate the effect of climate change.	189
Figure 7.10: Participants' attitudes and beliefs towards climate change	190
Figure 7.11: Percentage of people agree that they face barriers	192
Figure 7.12: Self-report of perceived current limitations and barriers to behaviour change.	192
Figure 7.13: Distribution of respondents answers on the role of 'social networks' on engagement deterrents	204
Figure 7.14: Distribution of respondent's answers on the role of 'individual's social marketing' on engagement deterrents	209
Figure 7.15: Distribution of respondent's answers on the role of 'social learning' on engagement deterrents	213
Figure 7.16: Distribution of respondent's answers on the role of the 'attraction techniques; local trends, events, and incentives' on engagement deterrents	216
Figure 7.17: The final conceptual model compenets for Saudi context	217
Figure 8.1: Overall package diagram of prototype BSN Platform	221
Figure 8.2: Domain analysis and knowledge representation of main prototype BSN Platform functionality using use-case diagram	224
Figure 8.3: Prototype BSN Platform system activity diagram	225
Figure 8.4: Overall logical architecture of the prototype 'Blended Social Network' (BSN) platform	227

Figure 8.5: Sample screenshots of the prototype 'BSN' platform including the associated ICT techniques functionality integrated within the platform	235
Figure 8.6: Predicted model for person's 'preparedness to engage' with the objectives of communities of sustainability relying on the integrated 'Blended Social Network' innovation.	254
Figure 8.7: Predicted model for person's 'intention to change behaviour' toward sustainable lifestyle relying on the integrated 'Blended Social Network' platform.	257
Figure 8.8: Predicted model of the theoretical validation of the effects of the ICT techniques used within the 'Blended Social Network' platform on an individual's 'preparedness to engage' with a sustainable community.	260
Figure 8.9: Predicted model of the theoretical validation illustrating the effects of the ICT techniques used within the 'Blended Social Network' model on an individual's 'intention to change behaviour' toward a sustainable lifestyle.	260

List of Tables

Table 5.1: Summary of research questions and hypotheses	133
Table 6.1: Selection criteria for system development methodology (Tegarden et al., 2013)	167
Table 6.2: Summary of methods used for data collection and outcomes of the thesis.	171
Table 7.1: The Featured Dimensions influencing overall Individual Engagement informed by literate (Social Networks (SN), Social Marketing (SM), Location-based Services (LBS), Context-aware, Social Learning, Local events and Trends, Incentives, Loyalty Awards and rewards).	175
Table 7.2: Characteristics of the survey sample.	177
Table 7.3: The volume of participant's access and use of the Internet.	180
Table 7.4: Questions measurement perceptions and intention to change behaviour toward sustainable lifestyle.	182
Table 7.5: General knowledge of respondents.	183
Table 7.6: Perceived factors that cause climate change.	184
Table 7.7: Perceived climate change more general causes	185
Table 7.8: Participants' willingness to pay to mitigate climate change.	191
Table 7.9: Participants group profile based on personal assessment of importance of climate change across with person's demographic variables. (How important is the issue of climate change to you personally?)	196
Table 7.10: Participants group profile based on personal assessment of importance of climate change across with perception's constructs (i.e. uncertainty, perceived risks, opinion and feeling, willing to change behaviour, willing to pay, take actions, the barriers) (How important is the issue of climate change to you personally?)	197
Table 7.11: The role and effect of Social Network.	202
Table 7.12: Descriptive findings for public perception of the role of 'virtual social networks' facets	202
Table 7.13: Descriptive findings for public perception to the role of 'individual social marketing'	207
Table 7.14: Descriptive findings for public perception to the role of 'social media learning technique' on respondents' engagement determinants	210
Table 7.15: Descriptive findings for public perception to the role of attraction techniques ('local trends, events and incentives') on participants' engagement determinants	214
Table 8.1: Demographic Characteristics of Survey Respondents (N=173).	241
Table 8.2: Reliability Analysis for constructs used to measure the 'Blended Social Network' (Alpha Coefficients for Factors Resulting from Factor Analysis)	242
Table 8.3: Reliability Analysis for the constructs used to measure the 'Blended Social Network' and the ICT techniques (Alpha Coefficients for Factors Resulting from Factor Analysis)	243
Table 8.4: Final Results of Exploratory Factor Analysis for effect of the 'Blended Social Network' on engagement factors	245
Table 8.5: Final results of Exploratory Factor Analysis (EFA) for effect of the ICT techniques on engagement factors	246
Table 8.6: Pearson correlation coefficients and discriminant validity test for the 'Blended Social Network' constructs (diagonal elements are a square root of the AVE)	248
Table 8.7: The Variance Inflation Factor (VIF) and correlation Matrix for integrated 'Blended Social Network' innovation	249
Table 8.8: The Variance Inflation Factor (VIF) and correlation Matrix for all the ICT techniques.	249
Table 8.9: Correlation matrix for the association between the constructs of the 'preparedness to engage' toward sustainability through the 'Blended Social Network' model'	251
Table 8.10: Correlation matrix for 'preparedness to engage' toward community of sustainability relying on the IC techniques (N=1173)	252
Table 8.11: Hypothesis testing and multiple regression coefficients predicting a person's preparedness to engagement by relying on the 'Blended Social Network' platform	254

Table 8.12: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the integrated 'Blended Social Network' platform	257
Table 8.13: Regression coefficients predicting a person's 'preparedness to engage' by relying on ICT techniques: the 'Context-aware' technique (CAT) within the integrated 'Blended Social Network' platform.	261
Table 8.14: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' relying on the 'context-aware' technique.	262
Table 8.15: Regression coefficients predicting a person's 'preparedness to engage' relying on ICT techniques: the 'location-based technique' within the integrated 'Blended Social Network' platform.	264
Table 8.16: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the 'location-based' technique.	265
Table 8.17: Regression coefficients predicting a person's 'preparedness to engage' by relying on the ICT techniques: the 'social media learning technique' (SLT) within the integrated 'Blended Social Network' platform.	267
Table 8.18: Hypothesis testing and regression coefficients predicting a person 'intention to change behaviour' by relying on the 'social media learning' technique.	268
Table 8.19: Regression coefficients predicting a person's 'preparedness to engage' by relying on ICT techniques: the 'individual's social marketing' technique (ISM) within the integrated 'Blended Social Network' platform.	270
Table 8.20: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the 'individual's social marketing' technique.	271
Table 8.21: Regression coefficients predicting a person's 'preparedness to engage' by relying on an 'individual profile, and sustainable labelling' within the 'Blended Social Network' platform.	273
Table 8.22: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the 'individual's profiling and sustainable labelling' technique.	274
Table 8.23: Regression coefficients predicting a person's 'preparedness to engage' by relying on the 'hook and attraction module (HOK) : a) 'participating in current trend's events' within the 'Blended Social Network' platform.	275
Table 8.24: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the 'participating in current trends events' technique.	277
Table 8.25: Regression coefficients predicting a person's 'preparedness to engage' by relying on using Hook and Attraction Module (HOK), in particular, the 'create permanent incentives technique' (PIT) within the 'Blended Social Network' platform.	278
Table 8.26: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the 'permanent incentives' technique.	280

CHAPTER 1: Introduction

Research Background; Statement of the Problem; Research purpose; Aim and objectives; Data collection methods; Structure of the Thesis

This chapter introduces the research background, gives an overview of the work, sets out the research purpose, highlights the importance of the study, illustrates the data-collection methods implemented to answer the research questions, and then briefly outlines the structure of the thesis and the contents of each chapter.

1.1. Research Overview, Background and Motivation

At present, sustainability is an imperative rather than an option. The burning of fossil fuels, such as coal, oil and natural gas, which are the main sources of emissions into the atmosphere of the greenhouse gas carbon dioxide (CO₂), causes environmental problems, as clearly evidenced by global warming and the consequent damage to natural ecosystems (Dawson et al., 2011). The earth's atmospheric and ocean temperatures have risen over the past century, as a result not of natural phenomena but of human behaviours and activity (Thompson, 2010, Briffa et al., 1995, Hardy, 2003). Increasingly, mankind and population growth are the cause of aggravation with regards the environmental crisis; thus, those who moderate their activities are likely to contribute to environmental protection and assist the natural resources conservation whilst minimizing their negative impacts on environment (Carpenter et al., 2012, Fransson and Gärling, 1999, Schultz and Zelezny, 1998, Halpenny, 2010). The conclusion obtained by reviewing the relevant literature emphasises that the serious depletion of natural resources of the land and the intensive exploitation of those resources has led to many contemporary environmental problems (e.g. climate change or global warming). The density of problems is due to poor organisation and lack of planning, as well as human behaviour; thus, the issue of addressing environmental problems has become vital and mandatory to the continuation of life and the ecological balance on earth. A solution to the problems would be to create permanent sustainability, providing wellbeing for current generations and the preservation of natural resources for the benefit of coming generations; it would ensure the continuation of life and prosperity in the long term. The process by which such an

objective could be realised, however, remains unclear. Many people do not see a sustainable lifestyle as one of their duties, assigning instead the responsibility of climate change and global warming mitigation to international organizations (Whitmarsh et al., 2009). Yet social and behavioural patterns have been identified in research as the crucial, main determinants in the process of serving the environment and obtaining long-term sustainability (Lutzenhiser, 1994, Schipper et al., 1989, Schipper, 1991, Stern et al., 1986, York, 2006). Leemans and Patwardhan (2009) argue the case for close integration of human activities with natural systems within the science of climate change. Individuals can collectively contribute to reducing the huge amount of greenhouse gas emissions by changing their patterns or lifestyle and transferring to a more sustainable lifestyle (Jackson, 2005, Noorman et al., 1999, Roy and Pal, 2009). It was deemed that it is essential to understand how to involve all spectrums of people to deal with environmental behaviour issues; this engagement is likely to lead to fostering pro-environmental actions among the public and sustainable communities, strengthening environment sustainability.

Successfully mitigating or adapting to global warming will require changes in the behaviour of billions of human beings who each day make individual choices that collectively have an enormous impact on the Earth's climate (Leiserowitz, 2007, 2008). At present, the engagement of individuals is not an option but a necessity. The significance of engaging people in mitigating environmental problems has been abundantly emphasised in the recent research (Moser and Dilling, 2007, Whitmarsh et al., 2011, O'Neill et al., 2013). The 'engagement principle,' as defined by Lorenzoni et al. (2007), is the involvement of individuals in environmental issues; engagement has multiple dimensions and many constraint factors, indicating why people's engagement is limited (Sutton and Tobin, 2011). Indeed, engaging people in environmental issues faces significant difficulties and barriers (Lorenzoni et al., 2007). The volume of those obstacles presents the crucial role of people's involvement. They must engage in decision-making and also their interaction, empowerment and feedback must be facilitated. Their perspective must be taken into account by creating more interactive mutual channels. More significantly, effective strategies must be implemented in order to motivate people to engage in pro-environmental action (Corner and Randall, 2011).

Social scientific research has demonstrated that risk perceptions are critical components of public and social responses to hazards (Leiserowitz, 2007, 2008). Furthermore, public feedback is essential in the evaluation of action plans and in order to drive climate change

studies towards effective adaptation and planning requirements, risk management, and sustainable development (Asrar et al., 2012). In general, the public even have a different mentality and mode of conducting their habits. Moreover, climate policies will require a degree of adoption or acceptance from those who will be affected by them if they are to be successfully implemented, taking into account the context, including multiple value preferences for characteristics and functions of natural and human systems, over short and longer time scales.

Most people relate to climate change through: (i) personal and cognitive skills (Lorenzoni and Pidgeon, 2006, Bickerstaff et al., 2006), (ii) the availability of solutions, alternatives or sustainable infrastructures (Bostrom et al., 1994, Read et al., 1994, Bord et al., 1998, Birkmann, 2011), (iii) the cost of application (Leiserowitz, 2007, 2008, Bord et al., 1998), (iv) the risks associated with the phenomenon (Lorenzoni and Pidgeon, 2006, Kirby, 2004, Poortinga et al., 2006, Poortinga and Pidgeon, 2003a), and (v) the level of trust in products, governments, media, scientists (Cvetkovich and Löfstedt, 1999, Siegrist et al., 2000, Poortinga and Pidgeon, 2003b, Poortinga and Pidgeon, 2004) and other societal actors (Ungar, 2000, Birkmann, 2011).

Notably, individuals often fail to choose the proper pro-environmental behaviours (Dunlap and Scarce, 1991, Bamberg and Möser, 2007, Howell and Laska, 1992, Tarrant and Cordell, 1997, Halpenny, 2010, Kollmuss and Agyeman, 2002). Thus, it is necessary to emphasise the role of individuals as the main actors in the implementation of climate change solutions while helping them to adapt to a sustainable lifestyle (UNEP, 2010, Uphoff, 1992, Hopkins and McKeown, 2002), by means of identification, development and support (Wolf and Moser, 2011).

Some recent research suggests that people's participation is limited at the moment and community participation is much lower, because their awareness of climate issues is limited, (Moser and Dilling, 2007, Whitmarsh et al., 2011, O'Neill et al., 2013, Leiserowitz, 2006, Sutton and Tobin, 2011). This illustrates the urgent need for shared responsibility regarding environmental issues for all social groups. Furthermore, governments need to develop various methods to help rebuild confidence with individuals and which would lead to a sharing of responsibility at all levels of society by activating the role of communities. These communities contribute to raising awareness, motivating pro-environmental action and providing space for people to discuss and suggest means of mitigating environmental problems. So, there is necessarily a need for attractive

innovations that effectively engage people in order to empower the objectives of environmental communities.

Individuals alone will not voluntarily choose to change their behaviour or lifestyle to cope with climate change unless they are enabled and supported psychologically and technically to do so and they look to the rest of society to be moving in the same direction. The key to changing public behaviour is to empower people to act and create positive perceptions of the need to take action and use targeted policies to motivate people to apply those changes (Spence and Pidgeon, 2009, American Psychological Association, 2010, Poortinga et al., 2006). Still, however, understanding how best to stimulate the masses into collaboration and adoption of a sustainable lifestyle remains a question (Crompton and Kasser, 2009). The literature review concludes that most studies into fostering sustainable lifestyles continue to be based upon traditional approaches. These approaches still commonly rely upon the analysis of large scale actions e.g. those of governments and NGOs (Owens, 2000) and often neglect the role of small scale collective actions, such as the role of individuals and local communities or small groups of people despite the poor performance of many behavioural change campaigns (Owens, 2000) that often rely on repeating the same common methods and fail to include important issues that can affect and assist people in changing anti-environmental behaviour.

According to the literature, most widely applied initiatives and well-known methods that are currently used to engage the public regards sustainability emphasis on the use of formal education to promote engagement (Hopkins and McKeown, 2002, Huckle and Sterling, 1996) by capitalising on the curriculum (Adomssent et al., 2007, Blass et al., 2010, Martin, 2012, Karatzoglou, 2013, Nejati and Nejati, 2012, Xiong et al., 2013, Gombert-Courvoisier et al., 2014), public information-intensive campaigning through different communication channels including media and television programs or the Internet (Huckle and Sterling, 1996, Rice and Atkin, 2012), creating action events and using word-of-mouth (WOM) for discussion or marketing environmentally friendly products or alternative pro-environmental solutions (Buttle, 1998, Pickett-Baker and Ozaki, 2008), attract people's attention with new innovative ideas within the context of creating an 'action event', such as, the use of action events with the aid of Human Geography action, in which Geographers not only draw from but collaborate with experts from other social science fields (Barr, 2003, Hobson, 2006, Winter, 2008), and by using a community based social marketing, (a dominant approach in the research of climate

change studies) as tools used to increase awareness and promote changes in public lifestyles (McKenzie-Mohr, 2010, McKenzie-Mohr, 2011, Kassirer, 2012); (for example, the UK's social marketing initiative to engage public in pro-environmental behaviours (Andreasen, 1995, Barr et al., 2006)). Despite the considerable research that supports such initiatives their effectiveness has been limited (Corner and Randall, 2011, McKenzie-Mohr, 2000).

The expanding use of smart phones, appliances and computers facilitates connectivity and communications between people. Today, contacting and reaching targeted people has become easier than ever; large segments of people can be reached quickly and with low or free cost. In addition, a large proportion of the public is able to access the Internet from home or work (Internet World Stats, 2013), which has drawn the attention of researchers towards the investigation of the role of the Internet in promoting lifestyle change; As a result, an increasing number of Internet intervention approaches have emerged, which suggest an improvement of existing lifestyles. Recently, Internet interventions have been widely applied with an end to refining the public's anti-environmental behaviours with increasing frequency. The interventions display superior characteristics as mentioned in the literature review; that is, the ease of accessibility, overcoming spatial and temporal barriers, and access to information 24/7 at the beneficiary's location or home. Moreover, extra features that complement the Internet can be used to enhance the effectiveness of interventions, such as those enabling interactive strategies, those that increase the fun-value, those that facilitate immediate support, e-mail, chat, Internet telephone service (IP-telephony), goal setting and tailored feedbacks. One example of technology helping people to change their lifestyle regards energy consumption is the 'smart grid' technologies that promote a change in consumption patterns through real-time feedback (Ehrhardt-Martinez et al., 2010, Sanquist et al., 2012). Some studies have attempted incorporate the ICT to build strong and powerful interventions by focusing on designing attractive interfaces or recommending regular updates for the contents of the website. However, some features are not unique and can be used by other approaches but the online interventions are likely to be more accurate and comprehensive. "The effect size comparisons in the use of Web-based interventions compared to non-Web-based interventions showed an improvement in outcomes for individuals using Web-based interventions to achieve the specified knowledge and/or behaviour change for the studied outcome variables" (Wantland et al., 2004). Wantland et al. (2004) mention in more detail the effectiveness of Web-based versus non Web-based interventions (Wantland et al., 2004).

Despite the evidence of the effectiveness of Web-based interventions via the Internet in changing behaviour, the current interventions that rely on the Internet still face criticisms and have some limitations. Furthermore, in most, the size of these operations is small (Norman et al., 2007, Van den Berg et al., 2007, Walters et al., 2006, Leslie et al., 2005); often not optimal (Webb et al., 2010, Leslie et al., 2005, Glasgow, 2007, Campbell et al., 2002); typically the engagement lessens over time (Eysenbach, 2005); some visitors tend to leave the website before finishing (Eysenbach, 2005, Danaher et al., 2005, Glasgow et al., 2007); a minority of the participants are those visiting these sites more than once (Verheijden et al., 2007, Brouwer et al., 2011); and, there is no systematic overview for the Internet interventions (Brouwer et al., 2011).

Current efforts still have not reached the optimum rate or achieve satisfactory results in attracting people. The necessity of bridging the gap in the current strategies and addressing in detail the issues related to engaging the public in pro-environmental actions (Sutton and Tobin, 2011, Whitmarsh et al., 2011, Asmar, 2009), which highlighted the necessity of new innovative approaches are acceptable to all concerned, and have the characteristics of permanence and continuity. “Designing a sustainable human future requires a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation” (Cortese, 2003, p.16).

In building such a platform, four roles of technology in promoting sustainability can be outlined: The first being that platform can be used as an intermediary for recognising the ecological impact; the second is that platform can be used as an amplifier, increasing the ability of humans in obtaining their goals; the third role of platform is that it can be used as a determinant shaping behaviour; and the fourth role of platform is its use as a promoter, influencing behavioural choices (Midden et al., 2007). In this research, each of these roles was used to design persuasive engagement platform that enable a powerful interventions in the promotion of sustainability and support of all types of initiatives (the physical and digital/online).

It has now become apparent that pro-environmental initiatives should become more personalised. Individual thinking and behaviour matter in the process of engaging in sustainability, as do knowledge, attitudes, norms, beliefs and levels of trust in sources of information. To make matters even more complex, all these issues are influenced by culture and geographic location. An effective platform then should incorporate person’s social networks and ICT techniques to address all issues. The conceptual model proposed

in this study take care in these aspects then the difference between people and all these factors will be addressed and satisfied through an effective environment that utilises social capital and person's social network and employs some ICT that motivates individuals and a variety of social groups to make a more active contribution to mitigating the level of climate change causes, such as greenhouse gas (GHG) emissions, at both local and global levels. The BSN, proposed to enhance individuals' perceptions and behaviour to lead them to be more concerned and pro-environmental. This utilises the social networks and tailored information to support people in a persuasive and acceptable manner to involve individuals and a variety of social groups and motivate people to adopt sustainable lifestyles. The BSN focuses on addressing aspects of individual characteristics and circumstances, beliefs and motivation in order to change individuals' behaviour. The behaviour change strategies rely on interactive technology and online communications, which seem to enhance the effectiveness of the solutions, perhaps in turn, promoting public engagement regarding sustainability. The proposed model of engagement platform also encourages developing and expanding the use of technology with an end to serving sustainability. Electronic devices, such as smart meters, may contribute to the success of efforts to change behaviour. Intelligent systems are also seen as facilitating the sustainable development process by supporting sustainable lifestyles when they enable the provision of regular feedback regarding the real impact of people's activities on the environment, which might affect their consumption and encourage conservation. This model also supports the expanding use and development of this type of technology by supporting and encouraging friendly environmental business sectors and firms.

In the physical world, people practice and enjoy real sensory experiences. A person touches and feels physical objects, participates in natural activities and meets people face to face. Software applications provide digital services under classifications of the virtual digital world to improve services provided to online users by proactively applying personalized assistance to satisfy users' needs over time, but those services do not have a sense of the physical world. The attempts to link the physical world with the virtual world might lead to more positive advantages in regards to users' satisfaction. The conceptual model attempts to capture future vision in stimulating people to sharing knowledge and disseminate experience in innovative ways that generate the rich sensory experience of the physical world and ensure continuity, abundance, speed and low costs of information and communication via the Internet.

This proposed conceptual model will empower people to overcome current challenges and barriers and can be seen as a new innovative models with new extra features added, drawing from different disciplines including environmental, social science, Information Systems (IS), knowledge-based systems science, computer engineering, and Information Communication Technology (ICT) domains for its inspiration. This study utilise the environmental domain by review the way of the community of sustainability applied to engage public in environmental issues including its characteristics and existing duties and activities and the process used to deploy and promote sustainable actions. The social science domain review to assist to select theories, models, practices and methods which used to change behaviour and to promote public engagement in aspects in general. The IS utilise all others domain with the knowledge management science to build integrated comprehensive technological platform with optimal information quality to the beneficiaries in appropriate way. The ICT, knowledge-based systems and computer engineering used to facilitate build a knowledge and access to the users by utilising the technology characteristics to form an effective and efficient cooperative environment to promote individuals engage in sustainability. Thus, this multi-discipline domain of research could contribute to the creation of an effective environment that may affect and attract people to willingly adopt pro-environmental actions. The focus is on utilizing the role of social networks and ICT technology in facilitating communication and integration, aiding the promotion of pro-environmental actions and assisting people in their adoption of sustainable lifestyle behaviours.

Two types of social network analysed in the literature can be used to facilitate engaging the public to change a negative lifestyle: physical face-to-face or offline social networks and virtual or online social networks. A new type of social network is created in this study and described in the conceptual model; it can be classified as linking physical and virtual social networks, and can be labelled the 'Blended Social Network' (BSN). This form of social network might have features ('Context-Aware', 'Location-based', 'Social Media Learning', 'Individual Social Marketing', 'Individual's Profiling and Sustainable Labelling', 'Hook and Attraction' techniques), that are superior to those in existing networks; thus, they are likely to overcome the cons and limitations of both online and offline social networks. This blended approach synthesises three types of social networks (i.e. virtual, cyber-physical and physical social network), with some overlapping between them, to form the 'BSN' and enable offline (physical) social networks to communicate

with it. The overlap between online and offline social networks in most cases leads to enhanced quality in these networks to serve environmental issues. The current online social networks enable distant communication via the Internet; that is, virtual or global social networks can be merged with other types of online social networks that have characteristics of physical social networks and the offline social network.

The proposed conceptual model focuses on increasing people integration, linking stockholders, by the involvement of all related partners; that is, scientists, ecologists and environmental activists, governments and non-governmental organisations, individuals and associations with local, national, and international interests, industry and business firms and ordinary people. For instance, it assists linking local to global and integrating with existing online social networks such as Twitter and Facebook to facilitate communications between people and all partners. The local and national initiatives to be linked with global initiatives and supported both technically and financially, thus, direct and online support, providing information and services in an accurate and easily accessible manner to the beneficiaries.

The semantic abstractions method using the person's information and activities (both the person's generic profile and his or her environmental profile) to generate meaningful human knowledge which leads to an integrated interpretation of situations through the context information provided to recommend appropriate contextual information and semantic searches as well as used to provide social learning and education tools that tailored to the certain user's needs and provided in a language which the user can understand in a timely manner. For example, information regarding the user's location, topics that might affect the user's desire or interests, the quality of contents fed to the user, i.e. texts, reports, the aid of resources which include learning resources, recorded audio, video, games and the locations of other users or members likely contribute to integrate the knowledge, thus enhancing the quality of services provided. This helps overcome individual barriers such as information overload, confusion over conflicting evidence, the format of information, inaccessibility posed to non-experts, a lack of knowledge, a lack of locally relevant information, scepticism, a lack of trust, information conflicts with values or norms, disempowered feelings, and perceived failure by others.

Furthermore, in addition to assist users with relevant information, services and guide them to resources nearby, it assists to suggest nearby environmental aspects, including places, people, products, services and solutions as well as the existing environmental events

located in the physical proximity of a mobile human user. This conceptual model also propose a new way of linking people with environmental products/services and friendly environmental shops/stores nearby. By relying on this method, one can achieve mutual benefits for buyers and sellers. The proposed solution can help buyers obtain needed goods immediately at a competitive cost and also help environmentally friendly businesses and firms increase their productivity.

1.2. Statement of the Problem

Human behaviours and activity have created instability in natural food cycles, reducing biodiversity and the abundance of natural resources (Carpenter et al., 2012, Guisan, 2014, Thomas et al., 2004). The dependence of humans on the natural world is highly intricate, with the earth providing all aspects of our basic needs for survival (food, shelter, water and air), and it is critical that the planet remains in a state that supports human physiology (Lovelock, 2006). However, human impact on the environment is inevitable, since we are a part of the natural system. Effective management of the environment and associated risks, engagement of the public and all stakeholders in collective action and ascription of ethical responsibilities may lead to significant reductions in the concentration of harmful emissions such as CO₂. Sustainable environmental development is being adopted by many communities and organisations concerned with environmental issues. It usually focuses on the need for co-operation and social responsibility to reduce the impact of people's actions on the environment. It has a twofold objective: to promote environmental issues so that they gain social acceptance and advocate co-operation and social responsibility in order to reduce the impact of people's actions on the environment. In a similar vein, the intent of this research is not to suggest that human activity should quickly diminish to protect the natural environment, but to advocate the development of a conceptual engagement model that supports sustainable human activity and seeks people's assistance, advice and guidance to develop best practice in order to minimise environmental degradation.

Most previous (prior) initiatives for promoting environmental sustainability, have relied on government solutions while emphasising the need for collective action and encourage individual sustainable lifestyle (Brown et al., 2010). In other words, there is overall acknowledgment that achievable practical steps to address climate change will demand some difficult political, social, cultural and individual choices (Räthzel and Uzzell, 2009, Byg and Salick, 2009, Barr et al., 2011, Adger and Kelly, 1999, Sánchez-Cortés and

Chavero, 2011). Scientific evidence suggests that the passive effects of climate change will be severe in terms of standards of living, water shortages and disease (Khan and Kelman, 2012, Dawson et al., 2011, Thompson, 2010, Oerlemans, 2005). The seriousness of global warming of a non-human nature and the seriousness of the current impact of global warming around the world are likely to encourage collective action and lead to cooperation in order to address the problem (Cole, 2007, Arrow Kenneth, 2007, Brown et al., 2010). Thus, there is a need to stimulate collective action and address the obstacles preventing this kind of action.

Climate change specialists highlight the challenges of collective action (Arrow Kenneth, 2007). The individual alone is unable to solve the problem but by the contribution of other individuals or groups members, the problems can be overcome and solved (Ki-moon, 2009). People require cooperation with others who share the same interests in, or gain, mutual benefits from a specific issue. In addition, collective action is affected by individual incentives such as reduced costs, prevention of threat, satisfaction and wellbeing, as well as securing the future in terms of mutual benefits through local education and training programs, and local activities.

While there is a need for more effective approaches to take into account the spatial and temporal dynamics (Jongman et al., 2012, Prabhakar et al., 2009), the power of volume communication through the use of media and internet campaigns should also be incorporated. Indeed, the most prominent collective problems appear with regard to global climate change, which creates the biggest dilemma to the success of collective action (Cole, 2007). The activation of collective action principles helps to determine the appropriate institutional arrangements to deal with climate change issues, including mitigation and adoption actions (Glicksman, 2011). Many benefits can be gained from such initiatives: economic, social and environmental (Hepbasli and Alsuhaibani, 2011). Still, the lack of individual response to climate change initiatives in part reflects an inability to participate and is also due to the perception and expectations of society for such programmes. In addition, the effect of (i) lack or loss of collective coordinators, (ii) lack of enabled means (platform) for sustainable behaviour, and (iii) lack of shared responsibility, form the main causes for the failure of many climate change initiatives (Lorenzoni and Pidgeon, 2006, Brown et al., 2010, Arrow Kenneth, 2007). This role must be played by government and by civil society institutions. They are responsible for laying the foundations for achieving the collective interests of society for enabling individuals

to participate and contribute (Glicksman, 2011). “Collective efforts are vital for generating greater public awareness on climate change”, said Secretary-General Ban Ki-moon in 2009 (Ki-moon, 2009). However, climate change mitigation requires coordinated actions and effective communication among stakeholders at a national and international level (Streck, 2002, Ostrom, 2009, Hirsch Hadorn et al., 2006, Brown et al., 2010, Cole, 2007, Ki-moon, 2009, Glicksman, 2011).

To address the aforementioned issues, the major emphasis of this research is to devise a novel individual engagement platform that would contribute to a successful engagement of the public and prompt them to move away from anti-environmental behaviour and closer to a pro-environmental lifestyle. The overall research objectives were to develop an effective means to encourage sustainable lifestyles and to propose a facilitating environment that would promote a positive attitude towards sustainability. Such an environment could also serve as a forum of mediation and co-operation among individuals, communities and other stakeholders who could propose, discuss and even act upon pro-environmental issues. The proposed conceptual model of online social network engagement platform, will be able to accommodate such a wide variety of agents as scientists, ecologists and environmental activists, governments and non-governmental organisations, individuals and associations with local, national, and international interests, industry and business firms, and ordinary people. This collaborative approach aims to enable direct and online support in addition to providing information in an accurate and easily accessible manner to the beneficiaries.

This research will promote individual engagement in sustainability issues in three ways: by attracting the general involvement of users with the objective of developing a community of sustainability, by encouraging active participation in pro-environmental activities intended to reduce the negative impact of existing activities on the environment, and by creating a sense of belonging in a broader sustainability community. It was identified that individual engagement is critical in creating a successful sustainable attitude towards the environment. Furthermore the benefits of such an attitude are salient, because circumstances fluctuate as conditions and situations change; that is, they continuously develop and are altered in response to existing situations, technical changes, new practices, and the varying requirements of different situations. Taking in to consideration the aforementioned multiple factors and changing conditions, therefore, constitutes a challenge for the present research.

1.3. Scope and Dimensions of the Research

The research is concerned with a development of an effective model of engagement platform that facilitates the promotion of Individuals' sustainable lifestyle. The proposed model would be used to organise, empower and regulate the contributions of all beneficiaries and others concerned (i.e. technologies and techniques, legislators and policy makers, individuals and commercial or industrial sectors and all those having a relationship directly or indirectly), leading to their participation and contribution in the process of promoting sustainable lifestyles. The function of the model is to strengthen the relationship between citizen and sustainability on the one hand and between citizen and objectives of the community of sustainability on the other. This model relies on a platform of new types of online social networks, ('Blended Social Network' (BSN)), which is able to support a bottom-up approach through the adoption persuasive techniques that will likely lead to empower the public and influence their perception, thus enhanced acceptance and promote public adopt of sustainable lifestyle as well as new environmental policies and regulations.

In this research, a general research model was developed based on a literature review, previous studies, theories and relevant models to be applicable to local Saudi context. The proposed model, however, has also been envisaged as a first step towards a future global engagement model.

The aim of this research is to investigate the validity of the proposed conceptual model in facilitating public engagement in sustainability specifically within the context of Saudi Arabia. The Saudi context was chosen for several reasons. Saudi Arabia is the largest producer of electricity in the Arab world (IndexMundi, 2012). A forecast surge in demand for electricity will necessitate expansion of the electricity grid up to twice its current size by 2023 (Obaid and Mufti, 2008). Over the last ten years, Saudi Arabia has seen significant population growth (2.3% annually, 35% from 2000 to 2010, and 70% from 1990 to 2010) (Central Department of Statistics and Information, 2012). National development plans have noted an annual average increase in domestic fossil fuel consumption of 10%, from 1.11 million barrels in 1970 to 1.02 billion barrels in 2008 (MOEP, 2012). The energy sector in Saudi Arabia relies mainly on the burning of fossil fuels, with significant effects on the environment. Measures to reduce CO₂ emissions in Saudi Arabia face a number of obstacles, including an inadequate legislative framework, restricted access to appropriate environmentally friendly technology (Rahman and

Khondaker, 2012, Darfaoui and Assiri, 2011, JCC, 2012, Almazroui, 2011, Almazroui, 2012, Al Zawad, 2008, Williams et al., 2012), and low general awareness. The daily activities primarily responsible for emissions of greenhouse gases (e.g. extensive use of air conditioning) are increasing continuously (The world bank, 2012). Climate change tends to be a greater hazard for developing countries because they are more vulnerable and less adaptable to its consequences (Lorenzoni and Pidgeon, 2006). All of these issues will continue to affect the government's ability to protect the local environment and citizens from the consequences of climate change (Darfaoui and Assiri, 2011). This research focuses on Saudi regions that are especially likely to be at risk of climate change effects, such as sea-level rise, extremes of weather and flooding (Darfaoui and Assiri, 2011, JCC, 2012, Almazroui, 2011, Almazroui, 2012, Al Zawad, 2008, Williams et al., 2012), where it can make a significant contribution in promoting individual sustainable behaviour, thereby enabling a mitigation of climate change effects.

To investigate the model's effects on individual engagement in sustainable lifestyle, the validation phase of this study, is related to its reliance on self-reported measures of individual behaviour. Self-reports of behaviour are less time-intensive and intrusive than observational measurements, but (in some instances) may not reflect actual behaviours. Nevertheless, the use of self-reports is common for predicting intention and has been adopted for this study. This issue is considered in more detail in Chapter Six.

1.4. Development of Research Model

This study proposes a novel conceptual model with an effective platform that can aid to overcome the limitations and support of environmental initiatives and encourage people to engage in pro-environmental actions. More specifically, it aspires to prompt individuals to participate in a pro-environmental community, as a common practice within their daily routine and enable their involvement with social groups that adhere to certain ideals and support sustainability.

In building the conceptual model of this research, the researcher began with a literature review which revealed that the available studies are too few and that they do not cover the field properly and all these studies are not multidisciplinary, while in fact there is an overlapping but still of scarce multidisciplinary studies in this topic. There has been little or no coordination of the subjects, collaboration between experts, or linking of stakeholders, most obviously with respect to environmental issues. Furthermore, it is

likely that many possible connections exist between disciplines that may encourage people to engage in pro-environmental acts but there is very limited research in this area. For the purpose of this research, however, the focus is on examining the link between the topic of public engagement and the academic fields of information systems and knowledge management. Could these disciplines help to formulate an engagement conceptual model which able to influence public intention to change anti-environmental behaviour and promote their preparedness to engage in sustainability? The prevailing view of knowledge management is that its main application is in storing information and retrieving it from databases. However, in this form it is not sufficient to encourage people to exchange knowledge; thus, it is not an effective method for changing negative behaviour. Instead, direct human interaction must be stimulated to achieve the change from environmentally harmful behaviour to sustainable lifestyles.

Information systems science is considered to be a hybrid of subjects from various disciplines (Galliers, 1994), an interdisciplinary domain involving fields of knowledge including sociology, psychology, communication and philosophy, which can be used to examine research problems. Furthermore, information system (IS) and software engineering draw their theoretical background from information processing and management science, as well as social studies, economics, individual demographic variables, local conditions and ICT, all working together to answer a certain question. IS research typically focuses on the “study [of] the effective design, delivery, use and impact of information technology (IT)” (Keen, 1987, p. 3) on individuals, organisations and society. ICT includes the technologies, computers, software, peripherals, Internet connections and infrastructure that are required to support data processing and run applications to deliver specific services (Leahy and Yermish, 2003). Sesan (2001) defines ICT as the convergence of micro-electronics, computing and telecommunications, which has become a global phenomenon of great importance in all spheres of human endeavour, spanning education, governance, business, labour, productivity, culture, trade, commerce and other areas (Mofleh, 2008). The last decade has witnessed a revolution in ICT, which has contributed to major changes in people’s daily lives and has had a significant impact on the characteristics of interactions, particularly between governments and their citizens (Wong and Welch, 2004). Furthermore, by removing temporal and spatial limitations, as well as organisational hierarchies, ICT serves to enhance the efficiency of public service provision.

Research on IS and ICT techniques (IPCC (2007), and other studies (Roy and Pal, 2009, Ehrhardt-Martinez et al., 2010, Sanquist et al., 2012)), reveals that an integration of information technology into people's daily routines can help mitigate climate change. Innovative approaches which rely on IS, ICT solutions and creativity, and take in account all factors in order to change individual behaviour are likely to be successful in changing the daily patterns of individuals and groups toward a sustainable lifestyle. Because of their capabilities in facilitating and promoting engagement and human interaction, IS and ICT became the environment (platform) that enabled the formulation of a conceptual model that would yield effective solutions capable to support efforts of tackling climate change. The individual's engagement in sustainability constitutes a suitable topic of IS because this discipline employs a set of principles, practices and assumptions that seek to assist and encourage all partners to do the right things, to make positive contributions and to behave well in environmental terms. Because of the multiplicity of factors affecting environmentally responsible behaviour, IS with its multidisciplinary perspective can be fruitfully employed in this research. Furthermore, information systems can be considered instruments for changing and enhancing the current engagement process, as well as a valuable asset in sustainability, considering their impact in terms of sharing knowledge, improving performance and reducing costs.

This study also employs the concept of the electronic society (e-society), which refers to the segment of society that has access to and uses the Internet regularly for social or commercial purposes. Its goal is to explore the role of online social networks and ICT and to serve society by engaging the public in addressing societal problems such as climate change. The integrated social networks of e-society enable access to people's profiles and circumstances, to provide tailored information, social marketing and social learning, and to enable semantic searches. They also provide oriented support and assistance, designed for each specific person. The integrated social network and the ICT techniques proposed in this study are context-aware, location-based, and provide individual social marketing campaigns, social learning modules and 'attraction modules'. These modules help individuals to adopt sustainable lifestyles, re-establishing users' ability to modify their behaviour in the service of the environment. A detailed discussion of these techniques is presented in Chapter Five.

Believing that the creation of new innovative platform incorporating the superior features of the online social networking paradigm, in addition of other ICT techniques can

facilitate effective public engagement in sustainability, this study started with the mission of analysing the knowledge management, IS, ICT and social capital within social networks to determine what influences people to share knowledge and experience across disciplinary boundaries or induces cooperation to achieve common goals and share responsibility for climate change. Thus, instead of choosing a narrow problem and digging into one field to solve it, this study explores a breadth of knowledge to assemble a conceptual model from various perspectives on cooperation, in order to help the public to overcome the challenges and barriers to their adoption of environmental sustainability (the components of the conceptual model of engagement platform is depicted in Figure 1.1).

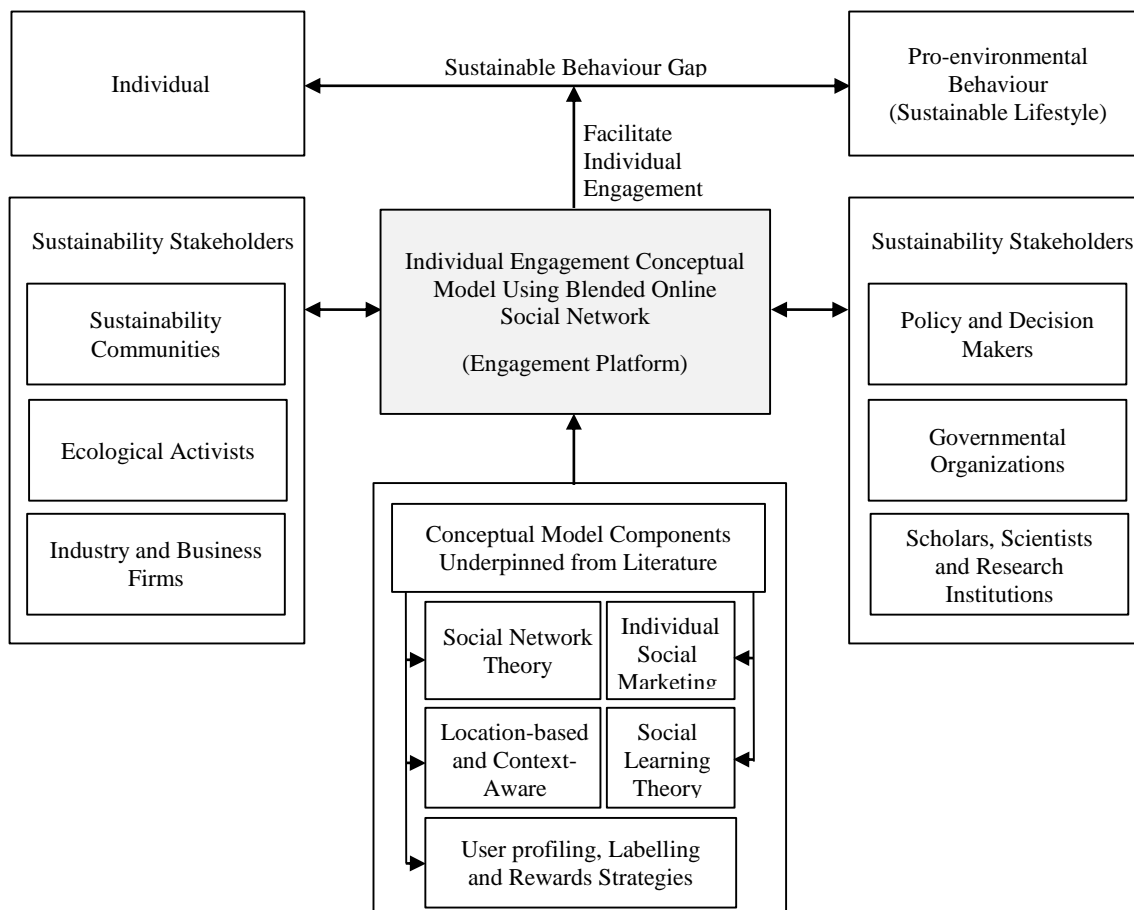


Figure 1.1: Conceptual model and research dimensions

The proposed platform with its integrated type of online social network could be effective in engaging a wide range of the members of the public with sustainability. Such a social network could serve as an interface for members of the general public, communities, governments, ecologists and activists at local, national and global levels, as well as provide an incentive for industrial and business firms to contribute to addressing climate change. Thus, this research complies with the needs of tackling these issues by building an appropriate innovative conceptual model taking into consideration the multiple dimensions and characteristics of the entities concerned, including individual and social characteristics, economic issues, technical aspects of technology use and community concerns. Moreover, to ensure that the proposed engagement platform would be persuasive, social constructs, IS, economic issues, software engineering and ICT techniques were employed in its implementation. The combination of these elements into a single model would contribute to the involvement of individuals with diverse backgrounds and social perspectives, as well as the exploitation of relationships and communication associated with these issues. In turn, this would create an interactive and cooperative environment for collective action to tackle the climate change problem, by encouraging the activation of moral and social responsibilities towards environmental issues.

The conceptual basis of this thesis is building an effective, holistic model that can link and enable organisations, governments, businesses, societies and individuals to share knowledge and exchange skills, through an efficient communication platform that is well managed and monitored. The intent is to propose an environment of interaction to deal with environmental issues. The systems approach that has been adopted for the proposed model of citizen engagement in environmental issues provides a context in which account is taken of all aspects of the participants and partners, including economic, social and environmental factors. The entire social spectrum and all organisations can participate in management and planning to protect and serve the environment. According to Mason (2005), while most of society relies on unsustainable resources (e.g. oil), it is difficult to achieve sustainable action and to apply the principles of responsibility and accountability. One objective of this study is to address this dilemma through the introduction of an active platform offering both a co-operative environment and persuasive solutions, the implementation of which relied on the capabilities of information communication technology. The working mechanism of the model firstly seeks to recognise the obstacles

and barriers that might prevent the public from adapting to a sustainable lifestyle on individual, group or societal levels, and then to specify the appropriate solutions to address these barriers and challenges.

The ultimate goal of the model is to build a foundation to systematically prepare citizens for engagement that might, in time, be able to satisfy all objectives of environmental citizenship. Environmental citizenship results when the engagement of citizens generates positive attitudes, values and beliefs for the environment. The proposed model, furthermore aims to assist policymakers to take a holistic perspective on accountability and responsibility for human action. Governments can develop environmental legislation and encourage the public to use the best practical environmental options by supporting people and facilitating usage of eco-products and services (Potoski and Prakash, 2004, Organisation for Economic and Development, 2001, BORN, 2010).

1.5. Research Rationale

While the current research literature is rife with studies of engagement, very few have reported on sustainability, and particularly rare is research into the experience of developing countries in engaging the public to adopt sustainable lifestyles (Kempton, 1997, Leiserowitz, 2006, Whitmarsh et al., 2011). In addition, a search of the literature has revealed no studies of the experience and practice of engagement in developing countries, particularly Saudi Arabia. The present study focuses on developing a holistic model that is not based on generalised areas of best practice but rather on an environmental strategy designed for specific persons, business firms, governments and ecological activists, who will support the new procedures because they are their own creation and consider the nature of their specific dynamics. Furthermore, this research relies on Internet access in its functionality. In the countries on which it focuses, most of the population have Internet access at home, at work or through their personal digital devices. For instance, more than two thirds of the citizens of Saudi Arabia have Internet access and the country has a very large number of online social network users. Throughout the geographically extensive national territory, the number of social network users has increased significantly, making social networks ideal tools for penetrating people's culture. If these networks are improved and exploited optimally, they may serve to influence people to make changes that will protect the environment.

To encourage people to minimise the negative impact of their activities on the environment, they need to understand the social, environmental and financial benefits that individuals or society will accrue by adopting a more environmentally friendly lifestyle. In building a persuasive engagement model then, the researcher has emphasised the benefits of environmentally responsible behaviour. On the other hand, if a government focuses on supplying its people with what it thinks is important, while neglecting their perceptions and actual needs, then the public will become less supportive of the government's efforts to tackle climate change and the efforts will fail. Thus, one pillar of engagement is building relationships with citizens through social networks that pay attention to and promote the trust and satisfaction of the citizens.

Most studies that address climate change issues and how to reduce emissions at the political or technological level have focused on the importance of changes in lifestyle and consumption patterns, noting that each has a crucial role in tackling climate change (Homans, 1961, Duchin, 1998, OECD, 2002, IPCC, 2007). People can help to slow climate change, or at least reduce its acceleration, by adopting eco-products and eco-services. Changes in lifestyle can contribute to lowering carbon emissions in ways which are both equitable and sustainable (Roy and Pal, 2009). Social and behavioural patterns are the main determinants of efficiency improvements in resource use; an adjustment of these patterns can serve the environment and lead to sustainability (Schipper et al., 1989). The proposed model is very much focused on enabling such adjustments. Through the model individuals are encouraged to participate in addressing climate change and to work with experts to plan processes for their creative ideas and to assess their daily activities. Developing successful initiatives that can be shared easily between members of the public is another objective of this model. Still another is to allow for partners to cooperate in creating sustainable and feasible lifestyles and action plans to protect the environment. Furthermore, the proposed model and associated platform may assist in bringing together ecologists and ordinary members of the public to cooperate in developing innovative ideas. Social networks used for climate change initiatives have the potential to provide people with an opportunity to communicate and create links with financiers, global communities, activists, governments, the United Nations, businesses, the private investment sector and people or communities interested in international climate policy.

Participants in this engagement model can use their peers' skills, environmental activities and events, workshops, lectures and individual coaching, in addition to having easy access to alternative eco-products and services and benefiting from guidance on appropriate ways to deal with the environment and natural resources. The model also facilitates the monitoring and analysis of people's activities and their behavioural reliance on the integrated online social network; this study thus analyses the role of individuals and their pro-environmental behaviour via online social networks and their potential to encourage their peers to engage in solutions. In addition, the model provides insights at the individual, environmental, organisational and societal levels to assist policymakers in building strategic plans for sustainability, as well as improving public acceptance of sustainability regulations. Beyond this, the model can be used to attract people to continuous participation and engagement in sustainability communities.

1.6. Aim and Objectives

The aim of this thesis is to explore the role of online social networks in promoting a sustainable lifestyle. To this end, this study has undertaken a critical investigation of what encourages the public to engage in adopting such a lifestyle and to engage with sustainability objectives. The findings of this investigation have been employed to formulate a conceptual model with an associated platform for engaging Saudi citizen, which was evaluated through an empirical method. To complete the above study, a series of objectives had to be identified and addressed:

Objective a: To conduct a comprehensive literature review to develop a deeper understanding related to sustainability aspects and individual engagement issues.

Objective b: To capture and explicate the public attitudes, actions and perceptions concerning environmental sustainability, as related to climate change phenomena and the core challenges influencing individuals' engagement in sustainability in Saudi Arabia, using a large survey research approach.

Objective c: To identify and investigate the factors affecting individuals' engagement in a sustainable lifestyle, including barriers to it.

Objective d: To develop a conceptual model to identify and capture the salient factors influencing individual engagement in sustainable lifestyle, and formulate the associated engagement platform using online social networks and ICT

techniques and functionality to promote individual intentions, and to offer a theoretical context to explain these factors.

Objective e: To develop a validation theoretical framework to examine the influence of proposed ‘Blended Social Networks’ platform and the associated ICT techniques on personal engagement characteristics.

Objective f: To develop the prototype engagement platform to evaluate empirically the validity of the conceptual model.

Objective g: To assess and validate the proposed conceptual model as to its ability to enable an individual’s preparedness to engage in a sustainable lifestyle.

Objective h: To develop a set of recommendations for further individual engagement in the sustainable lifestyle field.

1.7. Research Questions

The research approach emerged from a critical analysis of the literature, on sustainability and climate change. To the best of the researcher’s knowledge, no previous research has investigated the role of information system, social networks, and ICT features in effecting individuals engagement in sustainability and for mitigating the effects or consequences expected from climate change phenomena; in particular, no study has examined these issues in the Saudi context. Therefore, this study aims to exploit the role of social networks and ICT techniques in prompting sustainable human behaviour towards participation in coping with climate change. This research also attempts to identify and test the components of the conceptual model that might increase citizens’ involvement in pro-environmental actions and engagement with the objectives of the sustainability community. In this research, to address the research objectives, two main research questions and associated sub-questions related to the research scope was formulated as follows:

Main RQ1: What is the role of online social networks, i.e. the ‘Blended Social Network’, in promoting individual ‘preparedness to engage’ in a sustainable lifestyle?

Main RQ2: What factors, techniques and functionality within on-line social networks contribute to ‘encourage individual engagement’ with sustainability? This includes:

- RQ 2.1: What is the effect of using the ‘Context-Aware’ information provision and support within the BSN framework on individuals’ ‘preparedness to engage’ towards sustainability?
- RQ 2.2: Does the use of ‘individual-centric and Location-Based (Event-Based/activities, local Events participation)’ within BSN have a positive effect on individuals’ ‘willingness for engagement’ in sustainability?
- RQ 2.3: What are the roles of ‘social learning/on-line learning, including Game-Based’, to encourage people to promote ‘preparedness to engage’ towards sustainability?
- RQ 2.4: Can ‘Individual Social Marketing’ be used within the BSN to promote individuals’ ‘willingness to engage’ in a sustainable community?
- RQ 2.5: What are the roles of ‘individual profiling and sustainable labelling’ to encourage people to promote ‘preparedness to engage’ towards sustainability?
- RQ 2.6: What are the roles of adding the ‘participating in current trends and events/Event activities and trends’ technique within the ‘attraction module’ to encourage people towards ‘preparedness to engage’ towards sustainability?
- RQ 2.7: What are the roles of adding the ‘permanent incentives’ technique within the ‘attraction module’ to encourage people towards ‘preparedness to engage’ towards sustainability?

1.8. Research Approach and Methodology

This section provides a detailed description of the strategy followed to achieve the research objectives. The methodology design of this research has four main phases, which are the literature review and conceptual model development followed by three empirical stages: the empirical field study of public perceptions through a survey, the development of a prototype platform and the testing and validation phase (Figure 1.2).

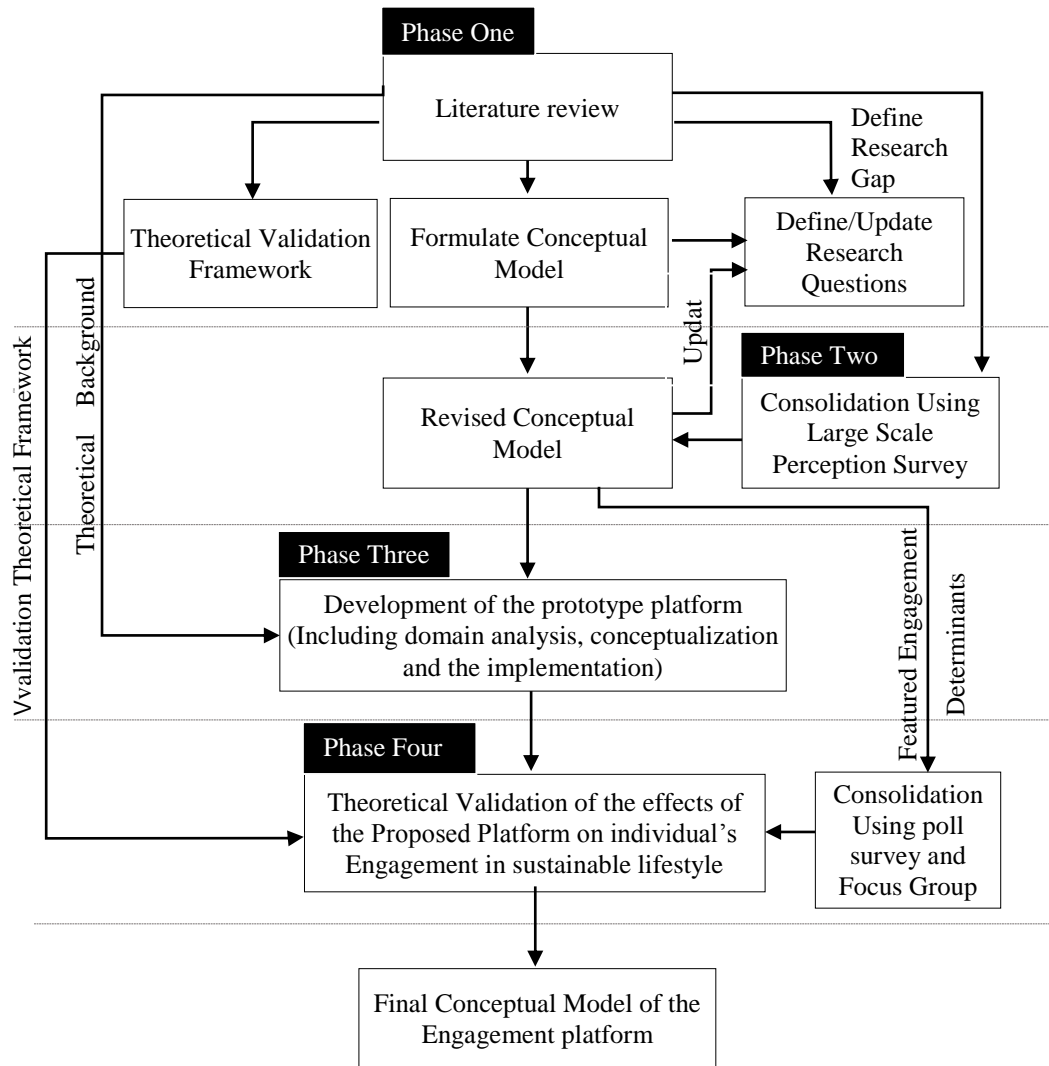


Figure 1.2: A summary of the research methodology

The details of each phase are outlined in the following sections.

Phase One: literature review and conceptual model development; in this phase, an extensive literature review of research was conducted on aspects of engagement of the public and climate change research with the intention to build a new and effective conceptual model of public engagement in sustainability. The researcher began by using a literature review to identify a gap in the research and to conceptualise a general engagement model of the public in sustainability. This involved the identification of various related concepts which had been used in previous studies to facilitate public engagement in such domains as education, commerce and politics. The preliminary conceptual model proposed in this phase combines those different concepts and elements to facilitate public engagement in sustainability issues. Afterwards, a critical literature review was conducted to identify key sustainability concepts that were used in phase two

of this research, in conjunction with the results of the field study that measured public perceptions in the Saudi context and determined the components of the proposed model.

The literature review assisted the study in three ways: (i) it identified the gap in the public engagement subject, (ii) assisted in identifying public perceptions regarding climate change as well as barriers that prevent the public from adopting a sustainable lifestyle, and (iii) it formulated a new theoretical validation framework that was employed to assess the conceptual model proposed in this research. Thus, the study involves an extensive literature review of existing research on the perceptions of climate change and engagement towards a sustainable community in Saudi citizens, in addition to the analyses of various related theories that had been used to explore human behaviour and the engagement process.

A fundamental aspect of this phase was to identify the most influential factors that affect individual intentions to change behaviour and determine the interrelationships among these factors. The data collected in this manner were used to determine the components of and formulate the conceptual model. At the same time, the information attained through the literature review was employed for validation purposes. Existing theories, models and other related views were combined with informed opinions by related academics and were used to compose a theoretical validation framework that was applied to the conceptual model after the development of the prototype platform.

Phase two: empirical field study of public perceptions: This phase of the research was carried out to identify current public perceptions about climate change and people's preparedness to engage in the process of mitigating its effects. People's perceptions are considered to be a major factor determining their willingness to accept the scientific conclusion that humans are causing global warming, on the one hand, and they strongly influence the way people respond to associated hazards, on the other (Leiserowitz, 2007, 2008, R. T. Watson and Team, 2001, Lorenzoni et al., 2005). A comprehensive understanding of public perceptions concerning climate change was, therefore, essential for this study and was achieved through a public survey. A list of variables that were obtained through the literature review were incorporated into a questionnaire which was designed to provide information about people's cognitive awareness, concerns, attitudes, vision or even risks associated with climate change phenomena. The data obtained in this manner then, informed the development of a successful revised conceptual model of engagement to help individuals and groups adopt sustainable lifestyles. Essentially the

public survey served to confirm and refine the variables that had been identified through the literature review, making them more relevant to the actual situation.

Phase three: the development of prototype platform: This phase of the research focused on the development of a prototype platform based on the findings of the revised conceptual model obtained in Phase two. The research utilizes rapid system development methodology and the component-based application development methodology using an open social network development environment ('Grou.ps' foundation services) to develop the prototype platform. This platform is used to assist and enable the researcher to explain and validate all concepts involved in the conceptual model.

The purpose of developing the prototype platform in this study is to illustrate and evaluate the proposed model, which concerns engagement of the public towards sustainability. In particular, this study is intended to assess the capability of the 'Blended Social Network' platform to engage people to adopt a new and sustainable lifestyle. It involves superior features that rely on context modelling to provide person-centric and tailored services.

The prototype platform comprises the creation of an online social network with user profiling context-aware, individual social marketing, social learning and location-based services.

The system development method that mainly applied in this part of thesis was as follows: at the beginning, the intention was to explore the functionality of the system within a social network platform and investigate the method to ensure that the online social network system achieves acceptance of a sustainable lifestyle by ordinary people in real-world practice. Based on the result, the solution statements were formulated to present the motivations with a general concept. Then, further investigation was conducted to compose a comprehensive system framework. The framework was used to identify and extract the knowledge required and then to design the platform architecture applying the prototype solution. The appropriate system engineering methods were used to design and develop platform components following the rapid 'throw-away prototyping' system development methodology. According to Pinto and Martins (2004), a 'throw-away prototyping' system development methodology is commonly used to develop a domain concept and build a semantic model. The prototype platforms were tested in a real-world situation using the poll survey and the focus groups to evaluate the proposed solution and

draw the conclusions. Details of this stage are given in the development Section of Chapter Six and Section 8.2 in Chapter Eight.

Phase four: validation of the conceptual model: The fourth phase focuses on validating the conceptual model of the study by measuring its potential to promote people engagement and its effect on their intention to change anti-environmental behaviour. The theoretical validation framework that was composed through the literature review provided the factors that be used to measure each components of the engagement platform. A poll survey and focus groups were then employed to obtain primary data concerning the potential of the components of the conceptual model to promote engagement and people intention to change behaviour. These primary data were statistically analysed and measured individual intention to change behaviour and preparedness to engage in sustainability. Finally the conceptual model was adjusted and finalised according to the results of this analysis.

1.9. Concluding Remarks

Research into engagement in climate change is in its infancy and most of the existing research in this emerging field has been concerned with the problems of implementing engagement in the developed world. Like all research into engagement in environmental matters, current research is weakened by the non-existence of a model that can be quickly and thoroughly understood. Moreover, there is scant research on climate change in the developing world and no existing study in the Saudi context. Thus, more research is required in various areas of engagement if climate change is to be addressed. The construction of a comprehensive and coherent conceptual engagement model in the present study attempts to respond to these needs and relied on a variety of engagement literature publications, case studies and sustainability literature. Saudi Arabia presents an excellent opportunity to gain insight into this area of research and to fill a gap in climate change engagement research.

Implementation and adoption of environmentally conscious practices has not been very successful in Saudi Arabia. The traditional ways of applying policies and regulations, as well as the current ones, may need re-engineering towards a persuasive method and support for certain public feelings. Decision makers and sustainability organisations need to identify the best methods and the issues that most urgently need to be addressed, taking into account people's feeling and views, including their appreciation and prioritisation of

local environmental and other issues. Such considerations might encourage the public to support and adopt sustainability and related causes. The proposed model assists in understanding what factors and issues should be the focus and whom to support, when and where. In this way, it has the capacity to enhance people's preparedness to engage, which will help the community and the targeted population alike to recognise environmental problems and achieve balance in the focus and enhancement process of engage in sustainability. Furthermore, the concepts comprising the model will inform decision makers and policy adopters, as well as sustainability organisations, so that they have more insight into appropriate strategies and plans that can be used to answer questions like how to engage the public in sustainability and what needs to be done to serve the environment. This study thus generates valuable information for the community of sustainability in the region. It also proposes a general conceptual model of engagement as a basic framework that can be tested in other countries.

The conceptual model also incorporates the relevant theoretical concepts for formulating a new innovative social network platform. This study proposes the 'Blended Social Network' platform that links virtual social networks with physical ones to facilitate and enhance social capital in environment related issues. This takes into account the role of existing online social networks and social media, as well as the effects on people of physical and face-to-face social networks. Thus, the conceptual model has led to the development of a new type of social network, which includes both kinds of social networks (virtual and physical) and which integrates with existing online social network platforms, such as Twitter, Facebook, etc.

1.10. Thesis Structure

This chapter has explained the background to the research, stated the problem that it seeks to address, set out its purpose and rationale, its aim, objectives and scope, described the contributions it makes and the questions it answers, outlined its methodology, and summarised its stages. The remainder of this thesis comprises eight interconnected chapters, each of which contributes to understanding and investigating parts of the research problem. Their contents are summarised here.

Chapter Two. This chapter is devoted to part I of the literature review, which provides the background and fundamental information about the research problem domain, including: global concern about climate change, national initiatives for tackling climate

change, climate change aspects in the Saudi context, and the relationship between ecology, environmental sustainability, and people. This is followed by a literature review of the community's roles in sustainability and effects of social networks on environmental actions. In addition, it discusses the community's roles in sustainability as one of key player in advocating a collective action for mitigating anti-environmental behaviour. This chapter ends with a review of related research into the concept of social networks and its role in enabling collective environmental actions.

Chapter Three. This chapter forms the second part of the literature review (Part II), which includes intensive review on different aspects of citizen engagement in sustainability and promoting sustainable lifestyles. This chapter shows the importance of engaging people in sustainable communities to promote sustainability practices. The literature review of engagement looks at the challenges facing people to make them more pro-environment and more active in sustainability issues. In addition, this chapter explores the related aspects/factors influencing citizen engagement in sustainable communities at both levels (i.e. individual and social). Different kinds of barriers are discussed, including: barriers related to lack of cognition, barriers related to lack of containment affective, barriers related to people's ability, and those that prevent them from changing behaviour. This chapter also reviews the most relevant aspects of promoting individuals' sustainable lifestyle. Finally, this chapter concludes with a critic's revision of current initiatives of individual engagement in sustainability.

Chapter Four. This chapter comprises the last part of literature review (part (III)). It introduces an overview of the research model in the study of individual engagement in a sustainable lifestyle and summarises notable aspects the research model. The review of the growing body of literature that covers models and theories related to 'behaviour change' and 'intentions or preparedness to engage' in changing negative behaviour were used to construct the validation theoretical framework that were used in this study.

Chapter Five. Conceptual Engagement Model: This chapter introduces the conceptual model of the study and describes the hypothesis development. First, the chapter provides a background and an overview of the model, a diagram of the model, and a detailed discussion of its components based on the literature. It presents the 'Blended Social Network' and the six overlapping 'ICT [information communication technology] techniques' included in the model. All relations and components included in the model are presented and discussed in this chapter. Finally, the chapter presents the theoretical

framework that was devised to validate the research model and explain its effects on promoting individual preparedness for a sustainable lifestyle.

Chapter Six. Research Methodology: This chapter presents an overview of the research methodology and philosophical assumptions. It discusses the research design and methodology employed in this thesis, in addition to providing a justification for the chosen methodological approach. It also describes the nature and structure of surveys and focus groups, which are the data-collection methods. The chapter discusses the process of validating the research, determining its reliability. Finally, this chapter refers to the ethical issues associated with this study.

Chapter Seven. Field Study Survey: This chapter is organised into two parts with regards to sources of primary data. The first part provides an understanding of the public side of the climate change issue by reporting the findings of the field study survey. It analyses a list of variables obtained from the study and provides more detail about the citizen profile, economics, and expected risk from future climate change involving the country. It describes and discusses each finding and result, as well as the data-gathering instrument employed in this stage. It outlines the people's current vision, attitudes and level of cognitive awareness and concern regarding climate change phenomena. Beliefs, concerns, attitudes, awareness, and role of location as incentives to affect people's behaviour and measure the level of trust in the source of information were also addressed in this part. Part of the chapter focuses on identifying current major challenges and barriers for the public in adopting a sustainable lifestyle. Research objectives (b) and (c), which ask about the current citizen profile and public perceptions, is addressed in this part. Part two provides more detail about public perceptions related to components of the conceptual model in general. This part also shows the results of revising the conceptual model to reflect the real situation. This part presents the generic engagement model for intent to adopt a sustainable lifestyle using findings from the literature review and is based on the variables obtained from the field study. In addition, this part illustrates the customization process for the engagement model based on the selected case study.

Chapter Eight. Actual Thesis Hypotheses Validation: This chapter provides the validation of a holistic model and the research hypotheses to prove the faithfulness of the conceptual model. The statistical model is introduced, which is followed by the verified engagement model. Furthermore, the quantitative and qualitative validation proves the credibility of the study model. This chapter ends with an overview of the validation

outcomes from the statistical analysis. The results of the study hypotheses are summarised in consolidated findings. The final revised conceptual model is then presented.

Chapter Nine. Conclusion and Recommendations: This final chapter summarises the main finding, and thesis contents and results. In addition, it provides direction for further research based on the findings. It also outlines the challenges in the study. Finally, the overall findings and conclusions with recommendations for practitioners and researches are presented, which is followed by a summary of the chapter.

References and Appendices. This thesis closes with a complete reference list. There are two appendices related to the work with a copy of the questionnaire.

CHAPTER 2: Literature review Part I: Background Information on Ecology, Environmental Sustainability and People

Importance of Environment Sustainability; Global Warming and Climate Change, Different Issues of Global Climate Change and Sustainability; The Saudi Position in Climate Change, Relationship of People with Sustainability; the Important of Promoting Individual Sustainable Lifestyle, the Role of Communities in Sustainability and Social Networks in Pro-environmental Actions.

2.1. Introduction

This chapter introduces background information concerning ecology, climate change, environmental sustainability and people. It highlights the importance of sustainability with a focus on the relationship between environmental sustainability and people. It aims to show the crucial impact of people on natural resources and earth atmospheres. The overview presents the topic of concern regards climate change, global climate change, possible threats and risks, the greenhouse gas emission dilemma, scientists' and the countries' efforts to tackle climate change, the importance of environmental sustainability, different issues related to sustainability and different perspectives on aspects of sustainability. This chapter lays out the case of Saudi Arabia and its position in terms of climate change as well as the risk of climate change in the country. Finally, it explores the relationship between people and sustainability, the importance of promoting individual sustainable lifestyle, the role of group behaviour and collective action in mitigating climate change and the impact of communities of practice, virtual communities and social networks on issues and practices relating to sustainability.

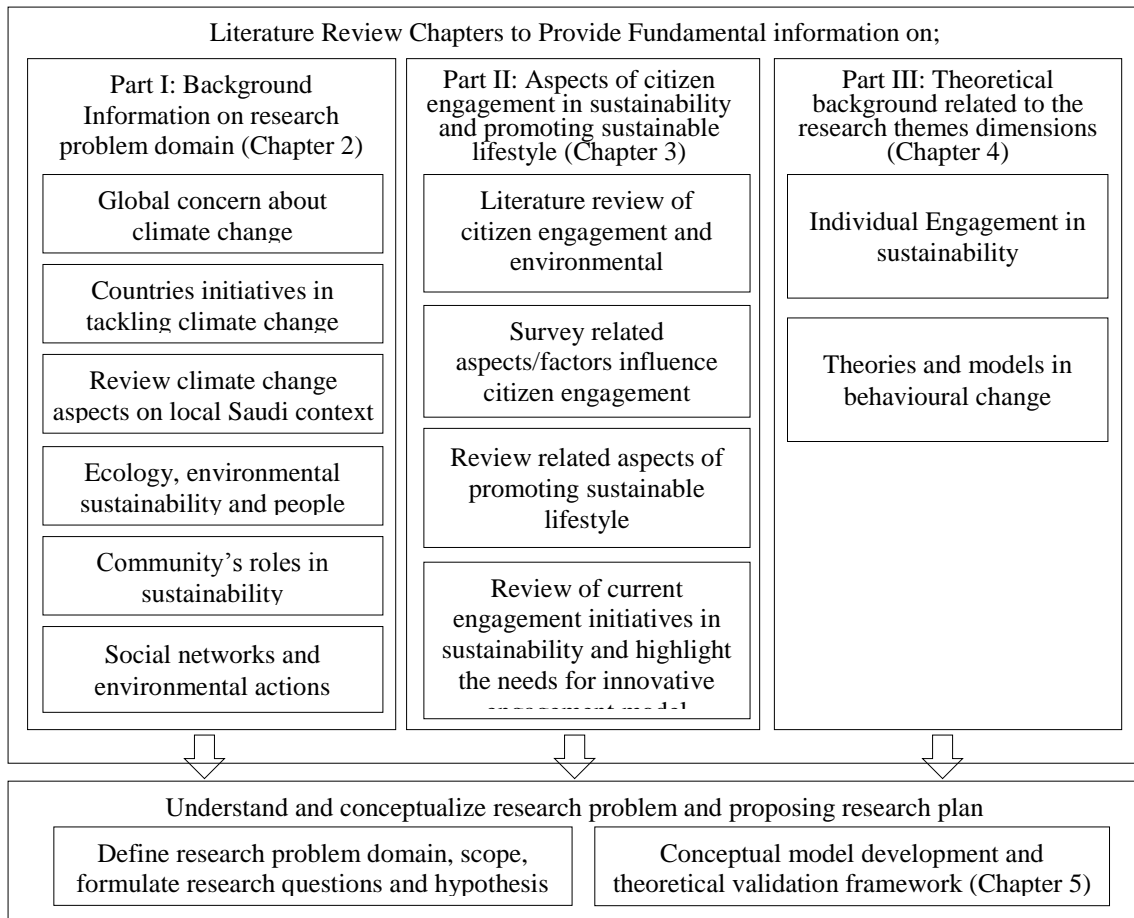


Figure 2.1: The thesis literature review layout, themes and chapters

2.2. Global Warming and Climate Change

Environmental problems, particularly from contributing pollutants, are the most important issue in the era of science and technology. They have been viewed as a result of the Industrial Revolution, the effects of which have become most apparent in the twentieth century. While this revolution resulted in huge scientific and technological advances it also had a significant negative impact on the environment, created in part and most significantly by earth pollutants. The main cause of these problems is a production process that is not accompanied by a complementary protection of the environment and natural resources. The gravity of these problems can be attributed to poor organisation, lack of planning, and human behaviour. The serious depletion of natural resources resulting from the intense exploitation of those resources has led to many contemporary environmental problems, including climate change or global warming. Such practices of resource exploitation have compromised nature's ability to recover, leading to the destruction of the soil, water, air and the biodiversity of the planet.

Addressing environmental problems is important to the continuation of life and the ecological balance of the earth, ensuring prosperity in the long term. A solution to this problem would ensure the permanent and sustainable well-being of current generations and preserve natural resources for the benefit of future ones. The most significant environmental problems that threaten life on earth come from global warming and climate change. Both the IPCC [The Intergovernmental Panel on Climate Change] and UNFCCC [United Nations Framework Convention on Climate Change] define climate change as a change that occurs as a direct or indirect result of natural fluctuations or human activities (McCarthy and IPCC II, 2001, United Nations, 1992). Thus, natural variations and human activities are the cause of climate change. Nature's variations cannot be prevented or reduced but their effects can be mitigated through the adoption of the appropriate solutions and by predicting the risks before they occur.

In the past few years, there has been a consensus among scientists regarding the direct role of human activities on climate change (Solomon et al., 2007). For example, in a poll conducted by Doran and Zimmerman (2009), it was found that 97% of scientists believed that there is a direct human role in climate change (Doran and Zimmerman, 2009). It is now clear that climate change results from the pollution that is caused by human activities. Carbon dioxide, Chlorofluorocarbon 'CFCs' and other greenhouse gases are pollutants produced by burning fossil fuels for industrial processes, the operation of cars and buildings etc. The industrial, commercial and transportation sectors, together with the nuclear energy industry and military activities are responsible for emitting dangerous gases and radiation that will have significant, negative effects on the planet for a long time.

Ordinary people are one of the causes for the climate change and global warming that we experience today (EST, 1999, Whitmarsh, 2009b). There are now nearly 40% more carbon dioxide emissions in the atmosphere than before the Industrial Revolution. Such CO₂ emission levels were not present during the last 3,000,000 years and without the irresponsible practices by humans, they would not have reached these levels in the next 800,000 years (London 2012 Sustainability Plan, 2009). Despite the consensus of scientific community, however, people are still sceptical about the facts referring to the role of human activities with regards to climate change. The widespread doubt regarding the effects of human activities on the environment further exacerbates the problem (Whitmarsh, 2009b). This public doubt and personal scepticism have serious and negative

effects on the methods, which have been suggested by scientists to mitigate the consequences of pollution and whose adoption is promoted as an effective solution regarding climate change and global warming. An effective solution depends on public acceptance and recognition that climate change/global warming is threatening their future. People must recognise that their actions contribute to this problem (Lorenzoni et al., 2007, Whitmarsh, 2009b). Scientists describe climate change as the biggest challenge facing the global community. It forms a huge risk and significant threat to both human and non-humans (IPCC, 2007). Furthermore, there is a broad consensus amongst scientists that global warming has already begun (Whitmarsh, 2009b, EST, 1999) and there is common scientific evidence that suggests that the effects of climate change are likely to be severe, and almost certainly inevitable (Black, 2006).

The earth's atmosphere and ocean temperature increase over the past century is not the result of natural phenomena but of human activity (Thompson, 2010, Briffa et al., 1995, Hardy, 2003). The burning of fossil fuels, such as coal, oil, and natural gas, which are the main sources of emissions of carbon dioxide (as a greenhouse gas) into the atmosphere, causes environmental problems, as clearly evidenced by global warming and the consequential damage to natural ecosystems (Dawson et al., 2011). Moreover, about 400 petagrams of carbon (PgC) have been added to the atmosphere, mainly through the burning of fossil fuels and changes in the use of land, (e.g., deforestation, logging) which contributed to the increased concentration of CO₂ in the atmosphere from 280 to about 380 "parts per million" (ppm) in 2004 (Sabine et al., 2004) to reach 391 ppm in 2012 (BBC News, 2012).

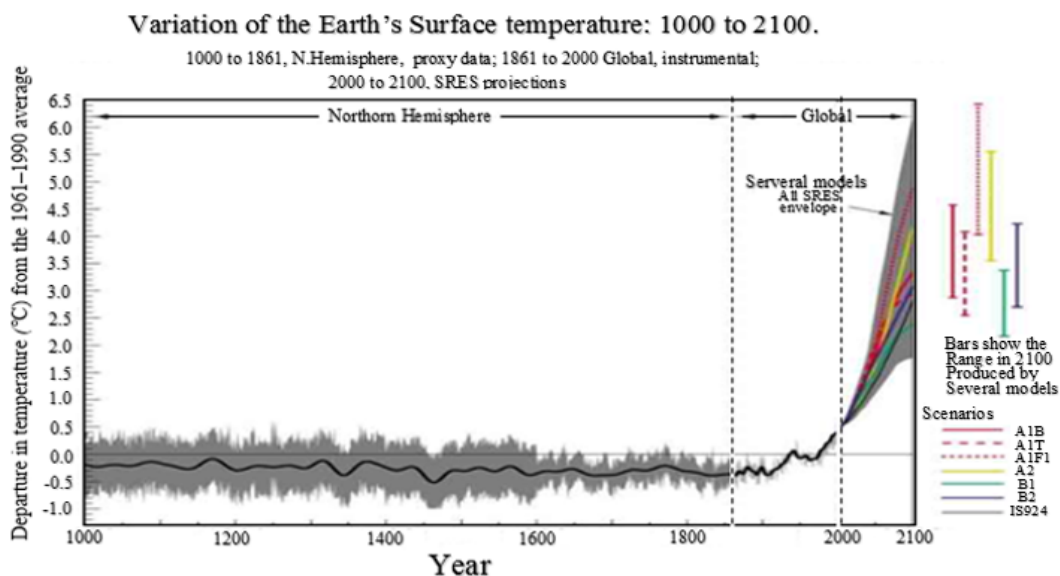


Figure 2.2: Variation of earth's surface temperature: 100-2100, adapted from IPCC (2003).

2.2.1. Possible Threats of Climate Change

Climate change threats are typically identified through assessments of the severity of current and future impacts of global climate change on human health (mortality and morbidity), the likelihood of local and global impacts on standards of living, water shortages and rates of serious disease and the seriousness of the threat of non-human nature. If uncontrolled, human influence on the climate system may generate changes that will endanger various aspects of life on Earth (Lorenzoni and Pidgeon, 2006). The precise implications of scientific claims about climate change, and the extent to which they pose a threat to various populations are being fiercely debated at many levels in relation to policy (Lorenzoni and Pidgeon, 2006).

2.2.2. The Volume of Dangers of Greenhouse Gas Emissions Globally

The warming that results from an increased greenhouse gas effect was first recognised in 1827 by the French scientist Jean-Baptiste Fourier. Then, in 1896, Svante Arrhenius, a Swedish chemist, first calculated the effect of increasing concentrations of carbon dioxide in the atmosphere and predicted that a doubling of CO₂ would lead to an increase in average global temperatures of 5-6° C (9-11° F), a result remarkably similar to current projections (Houghton, 1994:12). Figure 2.3. Nature (1979). “The release of carbon dioxide to the atmosphere by the burning of fossil fuels is conceivably the most important environmental issue in the world today” (Leiserowitz, 2007, 2008). Still, however, various aspects of environmental pollution are unclear to the general public. A survey study by climate denier Read et al. (1994) found that their respondents tended to confuse the greenhouse gas effect with ozone depletion (Read et al., 1994).

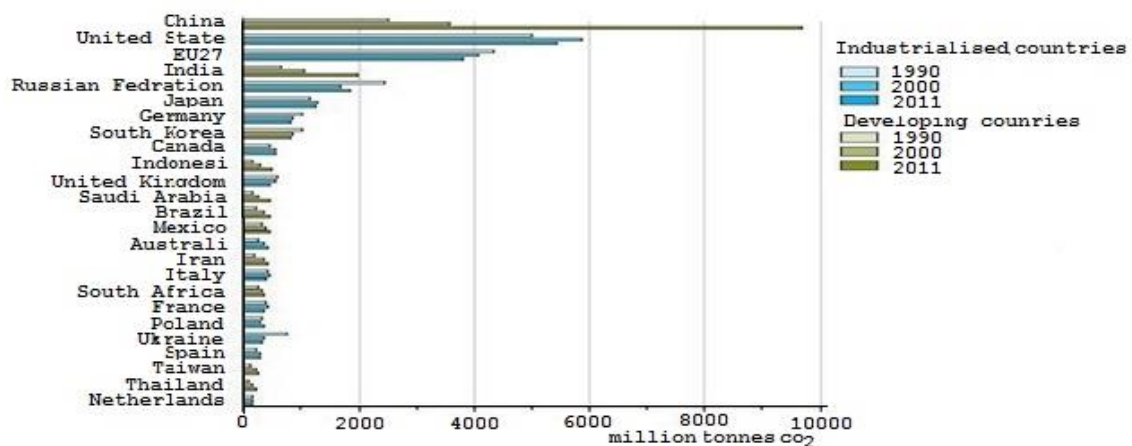


Figure 2.3: Comparison of Co₂ emissions per capita worldwide in 1990, 2000, and 2011. (Source: JRC (2011).

The earth has continued to suffer the increase in harmful emissions. Scientists highlight the volume of the risks expected from climate change with regards to future generations and a wide range of studies elaborate on the strength of the association between climate change and disaster (Khan and Kelman, 2012, Dawson et al., 2011, Thompson, 2010, Oerlemans, 2005, Thompson et al., 2009, Briffa et al., 1995, Crowley and Lowery, 2000, Moberg et al., 2005, Hardy, 2003). Environmental problems such as global warming and damage to natural ecosystems, are partly caused by ‘non-eco-friendly’ practices emitting harmful greenhouse gases (GHGs), such as carbon dioxide, into the atmosphere (Brechin, 2003, Leiserowitz, 2005, Thompson, 2010).

Moreover, an increase in GHG emissions are a consequence of (i) economic factors (Leiserowitz, 2007, 2008, Bord et al., 1998), (ii) population growth and social behaviour (Lutzenhiser, 1994, Schipper et al., 1989, Schipper, 1991, Stern et al., 1986, York, 2006) as well as (iii) the increased use of transport and manufacturing (Thompson, 2010, Oerlemans, 2005, Thompson et al., 2009, Briffa et al., 1995, Crowley and Lowery, 2000, Moberg et al., 2005, Hardy, 2003, JCC, 2012, Qader, 2009). A number of studies report strong associations between individual lifestyle, energy consumption and climate change (Cramer et al., 1984, Lutzenhiser and Hackett, 1993, Mazur and Rosa, 1974, Nader and Beckerman, 1978, Schipper et al., 1989). Moreover, a positive relationship was found between building size, individual lifestyle, and energy consumption (Lutzenhiser and Hackett, 1993). Most recent research focuses on energy consumption and the extent of its impact on climate change compared with other factors (Roy and Pal, 2009, Duchin, 1998, OECD, 2002, IPCC, 2007, Spratt and Sutton, 2008).

The use of resources that generate some of these harmful gases, such as CFCs and FCKWs, has been forbidden in most European countries. In these cases the countries in question had implemented suitable environmentally-friendly alternatives that do not impact heavily upon the cost of life or a person’s well-being, and are, therefore, easy for decision makers to implement. The use of CFCs and FCKWs in refrigerators, for example, is banned in most European countries due to recommendations of the European Parliament, that has evidence of the interaction of these gases with ozone in the upper layers of atmosphere leading to its decomposition and in turn, works to expand the depletion of the ozone and the creation of a so-called ozone hole. In 1987 the first global agreement on an environmental issue, the Montreal Protocol, banned the use of CFC elements (Palm, 2012).

However, the use of resources that generate most of the other harmful gases, such as CO₂, nitrous oxide (N₂O), methane (CH₄) and ozone (O₃) could not be prevented, necessitating further discussions, concluding with recommendations for reducing the concentration of those gases in the atmosphere by following up a series of initiatives, co-operations, participations and action plans at all levels of civil society institutions (governmental, international, organisational and individual). Everyone must share responsibility at all levels of society in reaction to the initiatives, actions and plans locally, nationally and internationally with the assistance and efforts of governments and NGOs. People must switch to a more efficient use of fossil fuels and focus on green power, using renewable energy resources and work on reducing domestic consumption of fossil fuels by adapting to a sustainable lifestyle. There are many benefits to be gained from those initiatives: economic, social and environmental (Hepbasli and Alsuhaibani, 2011).

2.2.3. The Earth Temperature Dilemma and Greenhouse Gas Emission

In 1991, Kempton's interviews with a small but diverse sample of US citizens indicated that they interpreted climate change in terms of four pre-existent categories related to the following: stratospheric ozone depletion, plant photosynthesis and respiration, air pollution and experienced temperature variations (Kempton, 1991). Most climate scientists agree that the increase in emissions of greenhouse gases in the atmosphere is causing the increase in air temperature. These increases in temperature pose a clear danger to the earth, human population distribution and abundance of animal and plant resources around the world (Thompson, 2010). The phenomenon of so-called global warming was detected in the mid-1970s (Brohan et al., 2006). The temperature has increased by 0.15°C per decade (Brohan et al., 2006). The Intergovernmental Panel on Climate Change (IPCC) expects that the global average surface temperature will increase by the end of the 21st century (2071-2100) by 3.0°C (1.5°C to 5.4°C) for scenario A2; which describes the intensification of the hydrological cycle in general, which will globally increase floods, water vapour, and evaporation (IPCC, 2001). The IPCC's B2 scenario predicted an increase in Earth's surface temperature by 2.2°C, (0.9 to 3.4°C) which would in turn lead to an expected rise in sea level of 0.11 to 0.77 metres. Meanwhile, according to the SAR based on the IS92 scenario, the rise will be up to 0.13 - 0.94 metres (IPCC, 2001).

A 2011 report published by the UN Environmental Program warns that the earth's temperature increase is about to reach or exceed 2°C, due to emissions. The analysts warn

that the delay of the developed countries to reduce emissions and the prevalence of growing emissions in major developing countries increasingly endangers life and puts the planet at risk. "We are on track to increase from 3°C to 3.5°C if they do not achieve a significant reduction by 2020" (Alden Meyer)¹. According to the United Nations Program for the Environment report Of 2011, CO₂ emissions are expected to rise to between 6 billion and 11 billion tons in 2020, unless strict policies, capable of reducing these emissions are applied (Chestney, 2012).

The energy sector contributed 90% of the total CO₂ emissions, followed by the industrial sector (8%) and agriculture (2%). Currently, we are emitting more than 29 billion metric tons of CO₂ into the atmosphere every year (Boden, 2009). Arab countries emit about 900 million tons from production and usage in the energy sector in 2001, on average per capita about 3.1 million tons/year compared with 3.87 tons/year globally (Gelil et al., 2007). However, recently, the International Energy Agency announced that the rate of carbon emissions caused by energy use reached a new record during the year 2010, an increase of up to about 5% in comparison with the average of the previous record registered in 2008. The situation has deteriorated between 2009 and 2010; the level of concentration of gas carbon dioxide reached 389 ppm in 2010; the level of concentration of gas carbon dioxide had increased by 2.3 parts per million, this is more than the average over the past decade, which is 2 ppm (Alternative and renewable energy, 2011). The agency described these increases as a "serious setback" to the efforts to mitigate the climate change that threatens life on Earth (CNN News, 2011). Carbon emissions reached 30.6 Gt in 2010; a rate only two degrees lower than that at which the world can avoid the most damaging effects of global warming. The International Energy Agency, warned that annual emissions of greenhouse gases should not be higher than 32 billion tons by the year 2020 (CNN News, 2011).

2.2.4. The Risk of Climate Change Phenomena to the Earth

Warmer weather is expected to bring more heat waves, more cases of heavy rainfall and may also cause an increase in the number and severity of storms, that will eventually force people to make unpleasant adjustments to their lifestyles (Williams et al., 2012). The IPCC made a strong statement in its Fourth Assessment, which mentions high temperatures in the oceans, as well as the average global air temperature (Treut, 2007).

¹ Director of strategy and policy for the Union of Concerned Scientists

Climate scientists agree that one of the major impacts will be rising of sea levels due to the melting of the Antarctic and Arctic ice caps (Meehl et al., 2005). IPCC (2007) expected that the sea level rise due to climate change is predicted to increase by between 0.18 metres and 1.2 metres by the year 2100 (IPCC, 2007, Rahmstorf et al., 2007). This will constitute a major threat to coastal areas and will affect ecosystems leading to predicted environmental disasters and affecting organisms in coastal areas, including shorebirds (Hughes, 2004, Baker et al., 2006, Finlayson, 2006, Fujii and Raffaelli D., 2008, Nicholls et al., 2009, Chu-Agor et al., 2011). Sea-level rise is likely to impact coastal islands and beaches, leading to increased erosion of, for example, coral reefs, with an impact on beach wildlife and the biological diversity of wetlands' salty and sandy beaches (Hughes, 2004, Baker et al., 2006, Finlayson, 2006, Fujii and Raffaelli D., 2008, Nicholls et al., 2009, Chu-Agor et al., 2011, Galbraith, 2002, Durell et al., 2006, Aiello-Lammens et al., 2011, Cantin et al., 2010).

2.2.5. Scientists' Efforts to Highlight the Risks of Climate Change

Scientists, researchers, ecologists and concerned parties have realised the complexities associated with the consequences of a breach of natural ecosystems, which led to stimulate their emotions and sense of responsibility. As a result, they intensified their efforts to prevent the massive risks by way of discourse, in order to face the danger that threatens life, both human and non-human, and to protect and secure the future of generations to come.

In 1988, the Intergovernmental Panel on Climate Change (IPCC) was established by the World Meteorological Organisation (WMO) and the United Nations Environment Program (UNEP), which was created to assist decision-makers and create public awareness in order to increase understanding of the consequences of climate change and to contribute to mitigation programs (JCC, 2012). The United Nations Framework Convention for dealing with the effects of climate change specify that all countries in the world share the responsibility to reduce emissions, but to different extents depending on their emissions and the capabilities of their country. The industrialised countries have a higher responsibility, as their emissions of greenhouse gases were and still are much higher than those of a developing country (United Nations, 1992).

The first international discussion was launched in 1992 to expose the rising risks of the global warming phenomenon at the Earth Summit in Rio de Janeiro, Brazil, with

representatives from 172 countries (JCC, 2012). It was prefaced with a binding agreement obliging member states to contribute to the mitigation of the phenomenon and to reduce harmful emissions. 20 years of debate and negotiations led to the United Nations Kyoto Protocol agreement of 1997 on the reduction of emissions (Aleqtesadah, 2011), in which the participants unanimously approved more than 150 countries in the Protocol to reduce greenhouse gas emissions and, under the present Protocol, for industrialised countries to commit to reducing the production of these gases by 5.2% (Aleqtesadah, 2011).

In late 2010, the Commission on Climate Change United Nations, during the meeting in the city of Cancun in Mexico, identified a target of reducing the earth's temperature by 2°C, or about 3.6°F (CNN News, 2011). Prior to this, the Copenhagen Summit in 2009 reached an agreement which aimed to reduce global warming to 2°C (CNN News, 2011). There were about 80 countries, collectively responsible for about 80% of the world's carbon emissions, who signed the Copenhagen Accord and pledged \$100 billion annually in aid to developing countries to combat climate change (CNN News, 2011). Although many scientists agree that the agreements reached by the Government in the city of Durban in December 2010 to reduce emissions of greenhouse gases by 2020 will contribute significantly to the reduction of losses resulting from the phenomenon (CNN News, 2011), they believe that "this plan is moving too slow to rein in global warming" (Reuters and Middle east online, 2011).

2.2.6. Countries' Efforts in Tackling Climate Change

The European Union agreed to reduce the production of carbon dioxide by 8%, the United States by 7%, while Japan, Canada and Hungary agreed to a reduction of 6%. Russia, Ukraine and New Zealand pledged not to exceed previous production levels of greenhouse gases (Hyat, 2010).

While Saudi Arabia signed the Kyoto Protocol and supported the United Nations Fund, it also committed to, and became involved with, all the various world summits to help protect the Earth (Presidency of Meteorology Environment (PME), 2005). Saudi Arabia focused on climate issues and has cooperated with the international organizations and the global initiatives to address this issues. The General Presidency of Meteorology and Environment (PME) provided the first national communication about Saudi Arabia to the Convention of Climate Change, which also contains the national greenhouse gas inventory for the year 1990 (Presidency of Meteorology Environment (PME), 2005).

2.3. The Saudi Portion in Climate Change

To date, only a few in-depth studies on public climate-change risk perceptions have been conducted and the engagement of the general public in tackling climate change is limited (Kempton, 1997, Leiserowitz, 2006, Whitmarsh et al., 2011). While most studies focus on developed countries (Shue, 1999, Gardiner, 2004, Paavola and Adger, 2006), the case of developing countries is becoming a pressing concern (Chandler et al., 2002). “Greenhouse gas emissions from developing countries will likely surpass those from developed countries within the first half of this century” (Chandler et al., 2002). Many developing countries show negative indicators of environmental effects, which highlight the importance of addressing environmental issues and the role of individual lifestyles and behaviour (Duchin, 1998, OECD, 2002, IPCC, 2007, Spratt and Sutton, 2008). In particular, very little is known about public opinion or behaviour regarding climate change in countries with large oil reserves like Saudi Arabia. In fact, climate change tends to be a higher hazard for developing countries as they are more vulnerable and less adaptable to its consequences (Lorenzoni and Pidgeon, 2006). Saudi Arabia has been chosen as a representative case study of developing countries in the region with similar demographic variables, social and cultural determinants and income per capita. According to the Saudi Arabia Energy Efficiency Report (2012): (i) “Saudi Arabia’s primary energy consumption per capita is four times higher than the world average, at 6.8 toe compared with the world average of 1.8 toe, in 2009” and (ii) “total energy consumption is growing steadily and very rapidly, at an average rate of 5.8 % / year since 1990 and has tripled between 1990 and 2009”. Furthermore, carbon emissions per capita in Saudi Arabia, according to the International Fund in 2008 was 16.6 tons placing it seventh in the world in terms of carbon emissions (The world bank, 2012).

The generation of electricity in the Gulf States, which depends mostly on oil and natural gas, leads to pressure on reserves of fossil fuels and an increase in carbon dioxide emissions. The formal statistics indicate that requests for rush-hour electricity in the GCC countries rose between 2003 and 2009 by more than 60%, from 47 Gigawatts to 77 Gigawatts.

Saudi Arabia is the largest producer of electricity in the Arab world (IndexMundi, 2012). A forecasted surge in demand for electricity will necessitate expanding the electricity grid up to twice its current size by 2023 (Obaid and Mufti, 2008). In fact, Saudi Arabia over the last ten years has seen a significant increase in population (2.3% annually, 35% from

2000 to 2010 and 70% from 1990 to 2010) (Central Department of Statistics and Information, 2012). National development plans have analysed and shed light on the domestic consumption of petroleum products and the percentage changes over the years, noting a local domestic increase of fossil fuel energy consumption at an annual average of 10 % from 1.11 million barrels in 1970 to 1.02 billion barrels in 2008 (MOEP, 2012). These statistics clearly indicate that environmental issues are a serious concern in the country. Yet, mitigation measures to reduce CO₂ emissions in Saudi Arabia face a number of obstacles (Rahman and Khondaker, 2012), including a lack of (i) legislative framework, (ii) access to appropriate environmental-friendly technology and (iii) general awareness. The daily activities that are primarily responsible for emissions of greenhouse gases (e.g. extensive use of air conditioning) are continuously on the increase (The world bank, 2012).

The Saudi Government gives support to practical and realistic solutions for two main reasons: (i) it recognises the level of risk from climate change locally and globally; and, (ii) the Gulf Cooperation Council countries face increasing pressure to comply with international environmental standards aimed at reducing the impact of carbon emissions due to their membership in the World Trade Organization (WTO). Thus, it has recently committed to and become involved with all the various world summits to help protect the Earth (Presidency of Meteorology Environment (PME), 2005).

2.3.1. Risk of Climate Change in Saudi Arabia

“Many developing countries are likely to suffer greater impacts of climate change, in part because they often lack the adaptive capacity of developed countries” (Leiserowitz, 2007, 2008). Saudi Arabia particularly is vulnerable to climate change in that most of its ecosystems may be affected; for instance water resources are scarce and limited and there is an increasing tendency to rely on desalinated sea-water, which in itself is a high contributor to CO₂ emissions. The necessity of engaging in such practices will continue to affect the government's ability to protect the local environment and citizens from the consequences of climate change (Darfaoui and Assiri, 2011).

It is expected that climate change will affect all aspects of life in the Kingdom: Water resources, health, food and agricultural production; fisheries, biodiversity, forests, pastures, etc. (Darfaoui and Assiri, 2011). According to Food and Agriculture Organization of the United Nations (2010), ecosystems of arid land in those countries

bordering the Arabian Peninsula are among the most vulnerable to the threat of climate change (Food and Agriculture Organization of the United Nations, 2010).

The changes in rainfall and temperature are being used as a measure of climate change in a particular area (Elagib and Mansell, 2000, Lázaro et al., 2001, Moonen et al., 2002, Islam, 2009, Islam, 2010). In general there was an increase in the average temperature from 1.5 to 4°C in all parts of the Mediterranean region over the past 100 years, along with a decline in rainfall (Alpert et al., 2004). The Intergovernmental Panel on Climate Change's (IPCC) Fourth Assessment Report (AR4) shows an increase of more than 2°C in annual temperature by the year 2080, compared to a base temperature period from 1961 to 1990 (Lindner, 2006). The result of climate change simulations applied to predict the future weather of Saudi Arabia, suggested a rise in daily temperature by 3-5°C by the end of the 21st century (Al Zawad, 2008, Williams et al., 2012). They now note that the temperature has increased dramatically, reaching up to 60°C in the summer season for some parts of the country (Tieleman et al., 2003).

Rajab and Brodhom (2000), using the Hadley United Kingdom Centre Model (HadCM2), concluded, that by the year 2050 some parts of Saudi Arabia will have seen a decline in rainfall by up to 20-25% and that the temperature will have risen 2.0 to 2.75°C for the interior and by about 1.5°C for coastal areas when compared with the average current values (Almazroui et al., 2012). This means that it can be expected that the country will suffer from drought, regional water scarcity and food crises, resulting in the associated migration of the population. Indeed, there is often a high potential for the occurrence of drought near the Red Sea basin systems (the West Saudi border) (Krichak et al., 1997, Ziv et al., 2005, Alpert et al., 2004).

Saudi Arabia suffers from the potential risk of rising sea level, as its borders are largely coastal, overlooking at two borders the Arabic Gulf to the east and the Red Sea to the west. It also has many offshore islands, both large and small, on each side and two national parks. In 2011 a study by Rashidi et al, concluded that, in the future, the impact of sea level rise in coastal areas will have an effect upon biological coastal organisms (Rashidi et al, 2011). The Farasan Islands, an archipelago in the Red Sea 50 km from the city of Jizan, Saudi Arabia, were selected as a case study. Field-work was conducted over the course of three years (between 8th and 19th July 2007, between 17th April and 4th July, 2008 and between 15th May and 4th July, 2009 in the Farasan Islands. The results showed that the rise in sea level is likely to inundate 11% of coastal bird nests. If the sea

level rises by one metre, this would result in an additional 5% inundation of coastal areas in the Farasan Islands, which in turn would lead to the destruction of 26% of shorebird nests (AlRashidi et al., 2011). The sea surface temperature in the summer in the Red Sea over the past 10 years has increased at a rate of 1.46°C compared to temperatures from 1950 to 1997 and this increase leads to a reduction in the growth of coral reefs, which in turn can lead to a sea level rise and the loss of environmentally important habitats (AlRashidi et al., 2011).

2.3.2. The importance of Promoting Individual Sustainable Lifestyle

Increasingly, human practices and population growth are recognised as the cause of aggravation with regards the environmental crisis; thus, those who moderate their activities are likely to contribute to environmental protection and assist the natural resources conservation whilst minimising their negative impacts on the environment (Carpenter et al., 2012, Fransson and Gärling, 1999, Schultz and Zelezny, 1998, Halpenny, 2010). Notably, individuals often fail to choose the proper pro-environmental behaviours (Dunlap and Scarce, 1991, Bamberg and Möser, 2007, Howell and Laska, 1992, Tarrant and Cordell, 1997, Halpenny, 2010, Kollmuss and Agyeman, 2002).

Thus, it is necessary to emphasise the role of individuals as the main actors in the implementation of climate change solutions while helping them to adapt to a sustainable lifestyle (UNEP, 2010, Uphoff, 1992, Hopkins and McKeown, 2002). The engagement of individuals is not an option but a necessity choice. People need to deal with the consequences of climate change, by means of identification, development and support (Wolf and Moser, 2011). The ‘engagement principle,’ as defined by Lorenzoni et al. (2007), is the involvement of individuals in environmental issues, but has multiple dimensions and many constraint factors, indicating why people’s engagement is limited (Sutton and Tobin, 2011).

Individual lifestyle is defined as the “distinctive modes of existence that are accomplished by persons and groups through socially sanctioned and culturally intelligible patterns of action” (Lutzenhiser and Gossard, 2000). The patterns of lifestyle are used to describe groups of various daily activities and characteristics of individuals and their families (e.g. their place of residence and/or choice of transport type) (Sanquist et al., 2012). Most studies that address climate change focus on the importance of changes in lifestyle and consumption patterns (Duchin, 1998, OECD, 2002, IPCC, 2007, Spratt and Sutton, 2008, Lutzenhiser and Gossard, 2000, Sanquist et al., 2012). Social and behavioural patterns

are the main determinants of efficient improvements in resource use serving the environment and the creation of stable sustainability (Schipper et al., 1989). Changes in lifestyle can contribute to achieving low-carbon emission that is both equitable and sustainable (Roy and Pal, 2009).

The current challenge involves achieving the transition from the goals of economic growth to the objectives serving sustainable patterns and sustainable lifestyles (Roy and Pal, 2009, Spratt and Sutton, 2008, Goodwin, 2008). The current ‘people culture’ seems influenced by social control of choices and preferences (Sobel, 1981). Lifestyle pattern in general is associated with demographic variables, social determinants and psychological measurements (Plummer, 1974), and is affected by individual decisions at various points across the individual’s life cycle. Sanquist et al. (2012), argue that lifestyle and energy consumption are affected by demographic variables as well as by what people own and the way they use them (proficiently or otherwise). There is an association between lifestyle, social aspects, the complex contexts individuals find themselves in every day and individual characteristics/fundamental personality traits, such as their possessions and surrounding environment, area or region, type and size of house, air conditioning use relative to regional weather, the ICT they own, size of family and appliance ownership and usage (Wilhite and Lutzenhiser, 1999). Lutzenhiser and Hackett (1993) state a positive relationship between building size, individual lifestyle and energy consumption.

Typically, lifestyle is associated with several aspects, including:

- (i) The relationships that have been built by others or gained from social interactions, which have profound effects in creating a life-long pattern (including societal and social networks);
- (ii) The purpose and role desired by individuals in their life;
- (iii) The individuals’ attitudes and beliefs;
- (iv) Money, ability to plan effectively for the future and the impact of available options;
- (v) The functionality of the style to satisfy people’s needs and desires;
- (vi) The place in which an individual chooses to live or else the necessity which brought them to live there;
- (vii) Health factors;
- (viii) The dominant culture of the society in which they live and with which they interact;

- (ix) The experiences and skills acquired from previous experiences or other people;
- (x) The level of well-being and happiness which people achieve from their lifestyle or that which they seek to gain; and
- (xi) The individual's behaviour and pattern of thinking.

Individuals can collectively contribute to reducing the huge amount of greenhouse gas emissions by changing their patterns or lifestyle and transferring to a more sustainable lifestyle. They can participate in mitigation of greenhouse emissions in different ways: Reducing meat consumption, purchasing efficient equipment, using effective recycling methods, preserving green spaces, using water in efficient ways, using sustainable driving techniques, reducing the use of aircraft by reducing travel (especially those that require long-haul trips by air), using public transport instead of a private car, walking and cycling and achieving sustainability in energy consumption (Jackson, 2005, Noorman et al., 1999) by reducing the energy used in homes (Roy and Pal, 2009).

Individuals alone will not voluntarily choose to change their behaviour or lifestyle to cope with climate change unless they are enabled and supported psychologically and technically to do so and they look to the rest of society to be moving in the same direction. The key to changing public behaviour is to empower people to act and create positive perceptions of the need to take action and use targeted policies to motivate people to apply those changes (Spence and Pidgeon, 2009, American Psychological Association, 2010, Poortinga et al., 2006).

In spite of the fact that the lifestyle and cultural customs of the people are not just based on personal choice within the concept of personal freedom, they are recognised as the most complex issues affecting most aspects of public life at the societal level, including environmental ones. Thus, this study focus on enhance individual lifestyles, through consider well many complicated factors that influence person's cognitive, affective and intention to change behaviour, including attitudes, beliefs, values, awareness, culture, social relationships.

2.3.3. Role of Group Behaviour and Collective Action in Mitigating Climate Change

Most existing initiatives have relied on government solutions while emphasising the need for collective action (Brown et al., 2010). In other words, there is overall acknowledgment that achievable practical steps to address climate change will demand some difficult

political, social, cultural and individual choices (Räthzel and Uzzell, 2009, Byg and Salick, 2009, Barr et al., 2011, Adger and Kelly, 1999, Sánchez-Cortés and Chavero, 2011), which actors at different levels of decision-making are currently trying to make sense of. Scientific evidence suggests that the passive effects of climate change will be severe in terms of standards of living, water shortages and disease (Khan and Kelman, 2012, Dawson et al., 2011, Thompson, 2010, Oerlemans, 2005). The seriousness of global warming, the effects of which are already becoming apparent around the world are likely to encourage collective action and lead to cooperation in order to address the problem (Cole, 2007, Arrow Kenneth, 2007, Brown et al., 2010). Still, there is a need to stimulate collective action and address the obstacles preventing this kind of action.

Climate change specialists highlight the challenges of collective action (Arrow Kenneth, 2007). The individual alone is unable to solve the problem but through the contribution of other individuals or groups, the problems can be overcome and solved (Ki-moon, 2009). People require cooperation with others who share the same interests in, or gain, mutual benefits from a specific issue. In addition, collective action is affected by individual incentives such as reduced costs, prevention of threat, satisfaction and well-being, as well as securing the future in terms of mutual benefits through local education and training programs and local activities.

While there is a need for effective approaches to take into account the spatial and temporal dynamics (Jongman et al., 2012, Prabhakar et al., 2009), the power of volume communication through the use of media and internet campaigns should also be deployed. Indeed, the most prominent collective problems appear with regard to public goods (including fresh air and pure water): The global climate is a global public good, which creates the biggest dilemma to the success of collective action (Cole, 2007). Cooperative action will significantly decrease the costs of mitigation and adaptation solutions. The activation of collective action helps to determine the appropriate institutional arrangements to deal with climate change issues, including mitigation and adoption actions (Glicksman, 2011). Many benefits can be gained from such initiatives: Economic, social and environmental (Hepbasli and Alsuhaibani, 2011).

Still, the limited individual response to climate change initiatives in part reflects an inability and a lack of opportunity to participate and is also due to the erroneous perception and expectations of society for such programmes. In addition, the effect of (i) lack or loss of collective coordinators and (ii) lack of shared responsibility, form the main

causes for the failure of many climate change initiatives (Lorenzoni and Pidgeon, 2006, Brown et al., 2010, Arrow Kenneth, 2007). However, individual action isolated from collective action has no meaning and is seen to have less benefit (Lorenzoni and Pidgeon, 2006). The role of coordinator must be played by the government and by civil society institutions. They are responsible for laying the foundations for achieving the collective interests of society through policies and duties and for enabling individuals to participate and contribute. For example, the contradiction in American people's views about climate change issues is partly caused by frustration and disempowerment (Immerwahr, 1999) cited by (Lorenzoni and Pidgeon, 2006).

Collective action must be at the heart of climate change response and today underscores the urgent need for collective action to save the planet: "collective efforts are vital for generating greater public awareness on climate change", said Secretary-General Ban Ki-moon in 2009 (Ki-moon, 2009). However, climate change mitigation requires coordinated actions and effective communication among stakeholders at a national and international level (Streck, 2002, Ostrom, 2009, Hirsch Hadorn et al., 2006, Brown et al., 2010, Cole, 2007, Ki-moon, 2009, Glicksman, 2011). Actually, the lack of public engagement in mitigation programmes – and more generally in decisions relating to climate change – has been attributed to (i) a lack of personal relevance, awareness, knowledge and insight; (ii) ways in which people associate these with other issues, such as increased living cost expenses; and (iii) the scientific complexity and uncertainty of climate change (Slocum, 2004, Few et al., 2007, Anguelovski and Carmin, 2011). It is difficult for people to imagine ways in which their daily activities affect the climate or contribute to climate change. This cannot easily be translated into the language of popular culture (Ungar, 2000).

This needs to focus on the examination of the particular traits that would allow individuals to perceive themselves as participants in a pro-environmental community as part of their daily routine. In order to prompt such participation in a pro-environmental community, moreover, this emphasise the need to rely on the utilisation of IS, ICT and social networks. The integration of information technology into lifestyle can help to improve and mitigate climate change (Roy and Pal, 2009, IPCC, 2007). Innovative approaches which rely on ICT solutions and creativity and which take in account all factors in order to change individuals' behaviour (including social issues and use of social networks) are likely to be successful in changing individuals' and groups' daily patterns

toward a sustainable lifestyle. Those technologies can help people to change their lifestyle regards energy consumption, for example, the use of 'smart grid' technologies that promote a change in consumption patterns through real-time feedback can effectively participate in promote individual sustainable behaviour (Ehrhardt-Martinez et al., 2010, Sanquist et al., 2012).

2.4. Ecology, Environmental Sustainability, and People

Human impact and implications on climate change and global warming have been known. Yet, people's awareness and knowledge of related issues is limited and often erroneous. The majority, for example, believe that human activities contribute to climate change/global warming, but many of them do not realise that the use of energy in their homes (in terms of greenhouse emissions) have a significant role in creating these problems (Whitmarsh, 2009b). Many people rely on international organisations to make the major structural changes necessary and believe that the responsibility to mitigate and address climate change and global warming is the duty of these organisations and do not see it as related to them personally (Whitmarsh, 2009b).

Actually, in order to serve the environment there is a need for major structural changes in such sectors as public transport, energy infrastructure and housing; at the same time, there is also a significant need to accompany those structural changes with effective citizen engagement approaches (American Psychological Association, 2009, Climate Change, 2010, Department for Environment and Rural Affairs, 2008, Joseph P. Reser and A. Ian Glendon & Michelle Ellul, 2010, Stern, 2000, Corner and Randall, 2011).

Engaging people in environmental issues poses significant difficulties (Lorenzoni et al., 2007). The volume of those obstacles presents the crucial role of people's involvement. They must engage in decision-making and facilitate the interaction; empowerment, feedback as well as taking into account their perspective by creating more interactive mutual channels. It is also likely to be critical that those seeking to investigate, select the effective strategies to engage people (Corner and Randall, 2011). A 'Blended Social Network' (BSN) incorporating appropriate features, however, can not only attract people but also turn them into advocates of environmental issues. At the moment, people's awareness of and involvement with issues of climate change are limited and participation in communities advocating such issues is even lower (Whitmarsh et al., 2011). It is urgent, then, to get people involved both individually and socially, if the mitigation of climate

change and global warming is to become a reality. Yet, sustainability means different things to different people: while, for example, some people value freedom of movement others might focus on economic competitiveness or environmental protection. A successful BSN would have to be comprehensive, accommodating, interactive and flexible. It would, firstly have to be thoroughly informative in order increase public awareness. Second, it would have to engage non-governmental associations and local communities in order to take advantage of common interests and shared trust, and as a result foster the participants' willingness to adopt sustainability and adjust their behaviour and actions. Finally, such a system should facilitate interactions through effective, mutual channels, and allow the participants to engage in decision-making and therefore create a sense of empowerment.

2.5. The Importance of the Role of Communities in Sustainability

This section aims to answer the question, what is the role of communities in achieving the goals and objectives of sustainability. The role of members, activities and programs at both the local and global levels, as well as the different forms of communities (the physical/virtual) related to sustainability will be discussed. Many aspects of social communities are illustrated as well as the role of social capital and the enhancement of social norms in order to create a cooperative environment that has the ability to change member's behaviour in alignment with community norms.

2.5.1. Communities of Practice, Virtual Communities, Social Networks and Sustainability

Social network can be defined as a set of social interactions and personal relationships that associated people and their social capital. A social group "can be defined as two or more individuals who share a common social identification of themselves or, which is nearly the same thing, perceive themselves to be members of the same social category" (Turner, 1982, p. 15). Communities of practice "are groups of people who share a concern or a passion for something they do and learn how to do it better as they interact regularly", (Wenger, 2008, p. 4). Network of Practice (NoPs) "refers to the set of various types of informal social relations that is conducive to information exchange in virtual or electronic way" (Brown and Duguid, 2002) .

There is a direct relationship between social networks, social groups and communities of practice. While some studies find a difference between networks of practice and

communities of practice, in fact communities of practice are similar to networks of practice except that the ties (the relationship between actors) are stronger in communities than in networks of practice. However, a community of practice is seen as a social group (Whelan, 2006, Brown and Duguid, 2000). For instance, most members involved in a community of practice believe that virtual communities are social groups (Hof et al., 1997, Chiu et al., 2006).

According to Kosonen (2008), virtual participation refers to the interaction between members in the virtual community to the end of helping others and improving the community atmosphere. Many forms of virtual participation are employed in virtual communities, which have effect on member's cognition and sense of virtual community (SOVC) (Tonteri et al., 2011, Nonnecke et al., 2006, Koh and Kim, 2003, McWilliam, 2000, Muniz and O'Guinn, 2001, Srinivasan et al., 2002, Shao, 2009).

The Sense of Virtual Community (SOVC) consists of five dimensions:

- 1) Members feel a part of, have rights in, and duties towards the community.
- 2) Members feel the community influences them, and they influence the community.
- 3) Members feel that they have a distinct identity in the community.
- 4) Members feel that they have a common social identity within the community.
- 5) Members feel that there is a strong emotional bond between the members of the community (Tonteri et al., 2011).

Social presence affects an individual's desire to participate in the association (especially in online virtual networks), where individuals feel that the members of a community are more coherent with one other as well as to the community, and they have a common belief in a common purpose and that their needs are met through their commitment to the community. These practices, as well as using various tools to support the establishment of social relations, start from the identification of personal information to regulate activities outside the network allowing individuals to identify and understand their peers, thereby enhancing the cohesion of the society and community (Koh and Kim, 2004, Tonteri et al., 2011).

Furthermore, a feeling of identification is fostered. Nahapiet and Ghoshal (1998) noted that, 'identification is the process whereby individuals see themselves as one with another person or group of people' (Nahapiet and Ghoshal, 1998, 256). Thus, within virtual communities, the participation of individuals is increased and integration occurs.

Typically, the strength of the relationship fosters the identity. There are two types of identity: individual and social. Many studies explain the dimensions of identity and membership, and also how to share emotional connections (e.g., Blanchard, 2008, Blanchard and Markus, 2004, Ellonen et al., 2007, Koh and Kim, 2003), how members create their own virtual identities online (e.g., Baym, 1997, Rheingold, 1993, Wellman and Gulia, 1999) and how community members are able to identify their peers and connect community actions to specific identities (Blanchard and Markus, 2004).

The ability of virtual communities to adapt, achieve their goals and involve members, plays an important role in influencing the nature of virtual communities, including their success or failure (Mynatt et al., 1998). There is a positive relationship between participation and cognition. The increasing amount of member participation and contributions lead to an increasing amount of shared knowledge (Brown and Duguid, 2001, Brown and Duguid, 2000, Hustad and Teigland, 2005). According to Warf (1994), the means of acquiring, storing and exchanging knowledge affects members and their social relations. Grant (1996b, 115) mentions the importance of the intersection between individual knowledge sets in gaining integrated knowledge. Lesser and Everest (2001) mention the importance of knowledge in enhancing practices and effectiveness. Furthermore, the members of a community have an opportunity to learn: Members are easily able to gain 'expert knowledge' of the kind that is difficult to obtain elsewhere (Tonteri et al., 2011, Ardichvili et al., 2003, Jeppesen and Frederiksen, 2006).

When a community has adapted to the needs and level of its members, that can lead to efficient and effective ways of accessing services, resources and knowledge: Members are saved effort and time-consuming tasks, leading to individual satisfaction and engagement (Teo et al., 2003). Communities with high levels of adaptability should attract more members and this fosters participation (DeSanctisa et al., 1993, Daugherty et al., 1995, Suler, 1996). Communities are seen to increase member satisfaction when they have the opportunity to enhance their competencies and their role within society (Probst and Borzillo, 2008, Büchel and Raub, 2002). Its flexibility is measured in terms of its capacity to respond to environmental changes (Prahalad and Doz, 1987).

The sharing of values and objectives binds together the members of social networks or communities, creates cooperative action and utilises the community (Cohen and Prusak, 2001). People engage with a community to seek knowledge, solve problems, meet or find other people as friends, to seek support, friendship and a sense of belonging (Andrews,

2002, Zhang and Hiltz, 2003, Chiu et al., 2006). Social integration is necessary in engaging people in a community. Social integration is established and developed over time and gives individuals the feeling of belonging to the community (Kollock, 1999, Nambisan, 2002, Nambisan and Baron, 2007). The community enables consultants to build better solutions based on proven and reliable solutions.

There are various levels of members in a community. Some may be core members, whereas others may sit on the periphery (Oreszczyn et al., 2010). Furthermore, structural features must be adapted to satisfy community users' or user groups' needs and their preferences at the inception state (design phase changes) or by adapting behaviour at run-time (Höök, 1997). However, seven actions mentioned by Wenger must be taken in account in order for Communities of Practice to be successful:

- 1) Design the Community to Evolve Naturally.
- 2) Create opportunities for open dialog with inside and outside perspectives.
- 3) Welcome and allow different levels of participation.
 - a. (Wenger identifies three main levels:
 - a) The core group who participate intensely in the community through discussions and projects (This group typically takes on leadership roles in guiding the group.),
 - b) The active group who attend and participate regularly but not at the level of the leaders,
 - c) The peripheral group who, while they are passive participants in the community, still learn from their level of involvement. Wenger notes that the third group typically represents the majority of the community) (Wenger et al., 2002).
- 4) Develop both public and private community spaces.
- 5) Focus on the value of the community.
- 6) Combine familiarity with excitement.
- 7) Find and nurture a regular rhythm for the community (Wenger et al., 2002).

The communities are important for fostering communication within the society, as communication plays a significant role in promoting society's demand for environmental legislation and regulation by using lobbying/advocacy: It can lead to achieving citizen engagement with environmental issues and is likely to be a potential bridge between top-down and bottom-up approaches. 'When government policies are contributing to the

problem, however, NGO- and citizen-sponsored campaigns can be used to advocate changes in government policy' (Maibach et al., 2008, p. 14).

A Community of sustainability will have multiple relationships with various societies and organisations, including:

- Individuals (members) who represent the core of community action and development.
- Social groups, including local communities, groups and NGOs.
- Decision and policy makers at all levels (local, sub-national, national and international).
- Private sector and industrial firms.
- Scientists, experts and environmental interest groups.
- United Nations (UN) agencies, multilateral development banks, development cooperation agencies and others concerned with helping countries to achieve the Millennium Development Goals (MDGs) and improve the environment.
- Education segments (e.g., academics and students).

2.6. Social Networks and Pro-environmental Action

The focus on social dimensions is important in tackling environmental problems and improving people's behaviours (Whitmarsh and Lorenzoni, 2010); actually, little mitigating action is taken by the public, for example, there is little change in individual consumption behaviour with regards to individual energy conservation (Lorenzoni et al., 2007). Individuals have failed to engage in sustainability, thus motivating the public collectively would have better results; it is necessary to have good strategies taking into account social variables in order to achieve effective and pro-environmental actions, for example, reducing emissions of greenhouse gases (GHG) (e.g. carbon dioxide). The focus on societal engagement and motivating community participation might be effective in achieving such an objective (Whitmarsh et al., 2011).

Brulle (2010, p 1) states that the public sphere and civil society institutions are important and crucial means of bringing about behaviour change regarding pro-environmental actions. "Professionalization" approaches in many of the environmental campaigns, which focus on relationships based on the imposition of power and inequality rather than providing a space for discussion and dialogue, may face resistance and thus failure (Brulle, 2010). However, the combination of social norms and 'intrinsic' incentives (for

example, the social sense of belonging) seems to be an effective and persistent way to promote pro-environmental behaviour. This leads to increased social capital, which is generated from social relations, is likely to be a crucial variable in predicting pro-environmental actions and establishes collective social norms rather than self-interest when dealing with environmental issues (Thoyre, 2011). The greater the level of social capital within the community, the more engaged community members are in pro-environment actions, due to the trust among members and their collective involvement in the problem solving process (Jones, 2010, Corner and Randall, 2011).

Sustainability-orientated communities exploit social identity to strengthen social capital which assists in promoting environmental strategies and services that are concerned with changing anti-environmental behaviours (Rabinovich et al., 2010, Rowson et al., 2010). According to Rowson et al. (2010) the utilisation of social networks to increase social capital might support flexibility and the ability to adopt environmental strategies and regulations.

It seems that social dimensions alone are not enough to attract people to sustainability or change public behaviour towards pro-environmental actions. Furthermore, there is a long-standing debate in the field of social science about whether a human or social structure has more effect in behaviour change and actions (e.g., Giddens, 1984, Blake, 1999). Some studies refer to the fact that there is no evidence that social networks can affect pro-environmental behaviour (Olli et al., 2001, Nye and Burgess, 2008), but the majority of recent studies emphasise the role of social networks in changing people's behaviour to be more pro-environmental. These studies present evidence about the role of social networks in the diffusion of behaviour in general (Haythornthwaite, 1996, Valente and Pumpuang, 2007, Fell et al., 2009, Rabinovich et al., 2010, Rowson et al., 2010) and in terms of conserving energy in particular (e.g., Capstick and Lewis, 2008, Nye and Burgess, 2008).

Furthermore, a large number of social networks – such as trade unions, rugby clubs, mother and toddler groups – are unlikely to have at their core, a role in changing people's behaviour toward the environment, but they continue to play a crucial role in the dissemination of change through the society (Corner and Randall, 2011). Essentially, social networks have the power to harness social norms and therefore, have the potential to serve environmental issues as well they can be particularly useful in providing social support and creating an environmental social identity (Climate Change Communication Advisory Group, 2010, Rabinovich et al., 2010). A range of interests, discourses and

frameworks can be discussed and transmitted through social networks and the language used during the communication with the public has a role in delivering the message regarding environmental issues and directing people's attention to solutions proposed to solve environmental problems (Whitmarsh and Lorenzoni, 2010).

Corner and Randall (2011) suggested that local and national governments must encourage and support the existing social networks because of the important role they play in creating and improving individual responsibility, which leads to people changing their behaviour and adjusting their actions to pro-environmental ones. According to Butler (2010), social networks are likely to bridge the 'governance trap'. However, many problems occur from 'top down' communication models because government representatives are perceived as untrustworthy (Poortinga and Pidgeon, 2004). Thus, the heterogeneity of the masses (the public) and the forms of messages communicated to people, as well as the types of media and communication contexts, are likely to be important issues when overcoming the 'top down' problem because if the messages are not communicated well, this will prevent people from engaging in pro-environmental actions (Whitmarsh and Lorenzoni, 2010).

2.7. Summary of Chapter Two

This chapter has included an initial overview of climate change and sustainability, as well as giving an introduction to the importance of environment sustainability and the importance of promoting individual sustainable lifestyles. It has offered an overview of the risk behind global warming, and an investigation of virtual communities and social networks and their role in helping people engage in pro-environmental practices and adopt a sustainable lifestyle.

The following chapter shows the importance of engaging people in sustainable communities to promote sustainability practices through understanding the literature review related to citizen engagement in sustainable communities.

CHAPTER 3: Literature review Part II: Citizen Engagement in Sustainability

Introduction to Citizen Engagement in Sustainability; Related Aspects/Factors Influencing Citizens Engagement; Several Strategies for Promote Sustainable Lifestyle; Current Engagement Initiatives; Needs for New Innovative Engagement Model and Summary of Chapter.

3.1 Introduction

This chapter discusses the importance of engaging people in sustainable communities and examines the challenges that must be overcome in order to make people more active in sustainability issues. Moreover, this chapter introduces the topic of ‘citizen engagement’ in communities of sustainability, the question of potential benefits of citizen engagement in the community and an exploration of the barriers to citizen engagement in sustainable communities at two-levels, individual and social. Different kinds of barriers are discussed including, barriers related to lack of cognition, barriers related to lack of emotional effect, barriers related to people’s ability and those that prevent them from changing behaviour. This chapter also presents the concept of environmental citizenship in relation to factors affecting citizen engagement in pro-environmental communities. Moreover, this chapter introduces the role of social marketing in engagement with some criticisms as well as recommendations. Finally this chapter concludes with a presentation of the current engagement initiatives.

3.2 Citizen Engagement in Sustainability

Individuals vary in their views on environmental issues, as they are from different cultures and geographical locations and have varying degrees of knowledge, different attitudes, norms, beliefs and levels of trust (in scientists, governments and international organisations). Their views also depend on the nature of their thinking (Finger, 1994, Henriksen and Jorde, 2001).

Environmental issues are classified as socially and individually relative and there is a direct relationship with individual activities, but often individuals do not feel a significant personal threat (Boardman and Darby, 2000), and attribute the causes of environmental problems to other persons or groups, such as the industrial segments, the volume of

transportation and business or the United States or China (Lorenzoni and Pidgeon, 2006, Whitmarsh, 2009b, Whitmarsh et al., 2011).

It is important to undergo structural change and correct people's perceptions. Some individuals believe that environmental issues are the responsibility of social and international organisations and that they do not constitute a direct threat to them. People's attitude and perceptions can be changed by involving all people; a process which at present remains limited (Whitmarsh et al., 2011).

This, interdisciplinary work has produced promising results from various perspectives and a solid foundation to establish different approaches to bring about interaction with environmental issues and refine or change the behaviour of individuals and groups. In addition, it leads to the development of visions to help understand and create an effective impact by attracting people to the issue of climate change (Whitmarsh and Lorenzoni, 2010).

People must be aware and understand the impact of their contribution to mitigating environmental problems. They also need to be motivated to participate in a collective actions and offering support to local communities and social initiatives (such as counselling, self-help group, or pressing neighbour to conserve in natural resources used including water and energy consumption) that aim cope environmental issues and help to adopt pro-environmental behaviour (DFT, 2007, Whitmarsh and Lorenzoni, 2010, Lorenzoni et al., 2007).

Recent research results show that individuals face a wide range of social constraints and institutional and psychological boundaries that limit their ability to adopt relevant behaviours for supporting environmental issues, and as result mitigate climate change and moderate its effects (Blake, 1999, Lorenzoni et al., 2007, Jaeger et al., 2001).

Cultural variations and social structures are significant contributors to the generation of boundaries that prevent participation and lead to limited involvement by the public (Marcel, 2006). Improving public understanding, tailoring messages to people's situations and their preferences and removing barriers by contributing to evaluation and follow-up feedback, all help to remove boundaries and lead to more people being engaged in mitigating the impact of environmental problems such as climate change. It leads to the adoption of active solutions for those issues (Whitmarsh, 2009b).

The ‘engagement principle,’ as defined by Lorenzoni et al. (2007), is the involvement of individuals in environmental issues. It includes multiple dimensions of engagement and constraint factors, in order to understand why people’s engagement is limited (Sutton and Tobin, 2011). It is necessary to involve individuals and a variety of groups in order to gain a better environmental future (Larsen et al., 2011). This includes motivating people to make a more active contribution to mitigating the level of greenhouse gas (GHG) emissions at both local and global levels. This is necessary and depends on the level of social involvement (Whitmarsh et al., 2011).

There is no dispute that addressing climate change is very important for society and the world. There is also considerable interest in understanding how to engage the public in climate change and foster pro-environmental behaviour in individuals and society, nationally and internationally (American Psychological Association, 2009, Climate Change Communication Advisory Group, 2010, Department for Environment and Rural Affairs, 2008, Spence and Pidgeon, 2009, Stern, 2000, Corner and Randall, 2011). It is deemed necessary to include the perspective of multiple disciplines and have knowledge of the concept of socio-technical systems (Correlje and Verbong, 2004, Hofman et al., 2004, Verbong and Geels, 2007, Nye et al., 2010). It is important to know how to influence the main factors of engagement: (i) ‘cognitive’ (e.g. understanding/knowledge), (ii) ‘affective’ (e.g. emotions/interest and concern) and (iii) ‘behavioural’ (e.g. action) (Lorenzoni et al., 2007). For instance, this attempt to influence individual’s ‘knowledge’, the implicit ‘values’, ‘beliefs’, ‘personal norms’, and ‘attitudes’ (Stern, 2000, Rokeach, 1973, Joireman et al., 2001, Karp, 1996, Stern and Dietz, 1994, Stern et al., 1999, Nordlund and Garvill, 2003, Rokeach, 2008).

Public engagement is influenced by (i) the emotions or affective factor which is likely stimulate people feeling a ‘moral obligation’, sense of ‘awareness of consequences and concern’, and leads to ‘ascription of responsibility’; (ii) ‘perceived behavioural control and the facilitating conditions’, as well as people’s ‘habits’ (Ockwell et al., 2009, Boardman and Darby, 2000, Kahan et al., 2010, Kollmuss and Agyeman, 2002, Ajzen, 1985, Ajzen, 1991, Ajzen and Fishbein, 1980, Schwartz, 1977, Schwartz and Howard, 1981, Guagnano et al., 1995, Hopper and Nielsen, 1991, Halpern et al., 2004); (iii) the ‘economic and costs’ expenses which is important dimension effect public to engage in sustainability (Halpern et al., 2004, Anable et al., 2006, Kurani and Turrentine, 2002) while (iv) the ‘social’ dimension has considered as a main element that influence public

engaging in sustainability, this dimension associated with social norms and ‘trust’ factors (Triandis, 1977, House, 1981, Shumaker and Brownell, 1984, Moscovici and Duveen, 2000, Breakwell, 1993, Kelley and Thibaut, 1978, Giddens, 1990).

Popular support for policies to reduce climate change had priority in political organisations and with world leaders, especially during the international negotiations of the 2009 Conference of the Parties (COP15) (United Nations Climate Change Conference Host country, 2009). However, obligations by global organisations are very important for forcing governments to direct people to be pro-environmental by engaging them in sustainability solutions. Global organisations and international agreements have a significant effect on people’s engagement with environmental issues but unfortunately, there is less acceptance of this in general opinion: For instance, half of the U.K. population believes that initiatives to improve the environment are a waste of time while international agreements are weak (Norton and Leaman, 2004).

Some governments (Western governments, particularly the U.K. government) are aware that the role of public engagement makes public engagement a priority, through considering the debates; regulation, policy-making and the kind of society people want to live in. It knows the importance of empowering communities to contribute in decision-making to bring about change in a particular aspect (Whitmarsh and Lorenzoni, 2010). The engagement approach is likely to lead to the creation of environmental citizenship. Andrew Dobson (2003) mentions that citizen engagement must be used to foster ‘environmental citizenship’ that leads to individuals or groups taking environmental responsibility.

3.2.1. Environmental Citizenship

According to Wolf et al. (2009), environmental citizenship leads to civic sense of responsibility, which is one of the most important elements of pro-environmental behaviour. Environmental citizenship is created when citizen engagement occurs, while citizen involvement generates positive citizen’s attitudes, values and beliefs. Sometimes this is referred to as citizen identity towards pro-environmental actions. This leads to a sense of responsibility, which is fundamental and core to environmental citizenship (Dobson, 2003). Furthermore, environmental citizenship can be promoted by provision of environmental solutions, citizen support and empowerment to participate in sustainability policy and decision-making (Dobson, 2010).

3.2.2. Barriers to Engagement in Individual and Social Levels

The cognitive, emotional and behavioural dimensions considered as a main elements to form an environmental citizenship, thus, the issues associated with these aspects need to be addressed while developing a cooperative communication channels which aim to connect and involve all stakeholders, ordinary people and various kinds of society groups and communities, to contribute promoting sustainability. Section 5.3.1.1, 5.3.1.2 and 5.3.1.3 in Chapter 5, present the role of these factors to promote individual engagement in sustainability.

Two levels of barrier individual and social challenges, those are associated with cognitive, affective and behavioural factors (Lorenzoni et al., 2007). The individual barriers include information overload, confusion over conflicting evidence, the format of information, inaccessibility posed to non-experts, a lack of knowledge, a lack of locally relevant information, scepticism, a lack of trust, information conflicts with values or norms, disempowered feelings and a failure perceived by others. The social barriers include limited political activity, a lack of action from business/industry, 'free riders', a lack of an enabling infrastructure/mechanisms (physical/infrastructure barriers) and social norms (Ockwell et al., 2009). Some of those barriers can be overcome easily, for example, a lack of knowledge can be overcome through the provision of information. Other points are more complex and difficult to overcome or remove, such as those related to the psychological, social and structural aspects. They require deep and complex efforts to overcome (Whitmarsh, 2008). Indeed, these social barriers are significant and widespread. They hinder efforts to mitigate climate change by willing volunteers and individual workers (Ockwell et al., 2009).

Given the above barriers, public engagement in environmental problems may prove particularly challenging and require a wide range of strategies to address them (Lorenzoni et al., 2007, Corner and Randall, 2011). Personal determinants such as age, gender, education levels, income, or location, for example, may affect the level of engagement (Sutton and Tobin, 2011). Thus, communities may have to overcome those barriers by applying appropriate engagement approaches and by providing people with affordable best-practice solutions some people, for instance, find it difficult or think it too costly to adopt environmental solutions or they think it wastes time; some others think no alternatives they would select are available communities could assist by providing support and information.

3.3 Related Aspects of Citizens Engagement in Sustainability

The following sections will presents several aspects effecting citizen engagement in sustainability, including; public opinion and awareness, demographic variables, education and cognitive, affective and emotional, behavioural change determinants including attitudes and sense of responsibility.

3.3.1 Public Opinion and Awareness

The question of public perception is vital for policymakers in the western and developing world as governments are increasingly faced with an obligation to meet carbon reduction targets. Failure to take public values and views into consideration when making decisions on climate risk management will inevitably prove problematic (Leiserowitz, 2007, 2008). Thus, public support for or opposition to proposed climate policies (e.g. treaties, regulations, taxes and subsidies) will be greatly influenced by the public's perception and understanding of the consequences of climate change (Leiserowitz, 2006). Also, "scientists need to know how the public is likely to respond to climate impacts or initiatives, as those responses can attenuate or amplify the impacts" (Bord et al., 1998, P. 75). Moreover, public opinion is critical because it is a key component of the socio-political context within which policymakers operate (Leiserowitz, 2007, 2008). Public opinion can fundamentally compel or constrain political, economic and social action to address particular risks. Climate policies will require a degree of adoption or acceptance from those who will be affected by them if they are to be successfully implemented; Such policies must take into account the context, including multiple value preferences for characteristics and functions of natural and human systems, over short and longer time periods (Ofwat, 2008, Leiserowitz, 2007, 2008).

Successfully mitigating or adapting to global warming will require changes in the behaviour of billions of human beings who each day make individual choices that collectively have an enormous impact on the Earth's climate (Leiserowitz, 2007, 2008). Firstly, people's perception of climate change may be the most important factor determining their willingness to accept the scientific conclusion that humans are causing global warming (or global climate disruption). Meanwhile, social scientists have found that public perceptions strongly influence the way people respond to the hazards of climate change (Leiserowitz, 2007, 2008). Individual decisions need to involve value judgements, which will be defined by socio-political processes and influenced by

development, equity and sustainability considerations, alongside considerations of uncertainties and risk (R. T. Watson and Team, 2001, Lorenzoni et al., 2005).

Studies of climate change mitigation and adaptation have become widespread in the scientific and policy domains, while less attention has been given to public awareness (Sheppard, 2005), despite its importance for evaluating the processes and scenarios of climate change (Hulme and Dessai, 2008). Public perceptions can help in the operation and design of future policies (Hulme and Dessai, 2008, Deppisch and Hasibovic, 2011). Moreover, social scientific research has demonstrated that risk perceptions are critical components of public and social responses to hazards (Leiserowitz, 2007, 2008). Policy implementation may be misunderstood, neglected or even opposed by the electorate. Public feedback is essential in the evaluation of action plans and in order to drive climate change studies towards effective adaptation and planning requirements, risk management and sustainable development (Asrar et al., 2012).

Most people relate to climate change through (i) personal and cognitive skills (Lorenzoni and Pidgeon, 2006, Bickerstaff et al., 2006), (ii) the availability of solutions, alternatives or sustainable infrastructures (Bostrom et al., 1994, Read et al., 1994, Bord et al., 1998, Birkmann, 2011), (iii) the cost of application (Leiserowitz, 2007, 2008, Bord et al., 1998), (iv) the risks associated with the phenomenon (Lorenzoni and Pidgeon, 2006, Kirby, 2004, Poortinga et al., 2006, Poortinga and Pidgeon, 2003a) and (v) the level of trust in products, governments, media, scientists (Cvetkovich and Löfstedt, 1999, Siegrist et al., 2000, Poortinga and Pidgeon, 2003b, Poortinga and Pidgeon, 2004) and other societal actors (Ungar, 2000, Birkmann, 2011). Where public policy and citizen frames of reference differ (e.g. regarding the balance between long-term and short-term considerations), the practice of risk communication becomes much more difficult (Lorenzoni and Pidgeon, 2006).

An increased awareness of environmental issues does not necessarily lead to actions or behaviour change. There are other, complex psychological, social and environmental, factors in addition to awareness that affect behaviour (Whitmarsh et al., 2011). When individuals are aware of environmental problems, with the understanding and sufficient information they have, they also feel the extent of the threat to life and their personal safety, in addition to their responsibility towards these risks. Then engagement occurs, otherwise any broken link in those constructs leads to the obstruction of the engagement. The negative appraisal which comes from awareness leads to an increase in the sense of

responsibility in order to minimise the threat, leading to engagement in pro-environmental actions (Story and Forsyth, 2008). Latane´ and Darley (1970) have determined awareness, appraisal and responsibility as the variables that affect individual behaviour and can, therefore, be used to engage individuals in environmental aspects (Story and Forsyth, 2008).

3.3.2 Demographic Variables, Education and Cognitive

Sutton and Tobin (2011) give demographic variable guidance for developing strategies to attract people to environmental issues by overcoming constraints (Sutton and Tobin, 2011). It is likely that there is a relation between socio-demographic variables and pro-environmental attitudes and intentions (McFarlane and Boxall, 2000, Mohai, 1992, Steel et al., 1994, Sutton and Tobin, 2011, Carmen, 1999). Gender, for example, is an important variable should be taken into account in developing environmental strategies. As indicated by various studies, females are more engaged in environmental studies than males (Davidson and Freudenburg, 1996, Mohai, 1992).

Another effective way to obtain cognition and increase public awareness is learning through formal education and ‘social learning’ (Hopkins and McKeown, 2002, Huckle and Sterling, 1996, Hignite, 2006, Cortese, 2003); Western countries use education to disseminate cognitive understanding among citizens and attract people to engage in environmental actions, e.g. currently the UK government spends much effort educating people to overcome obstacles and remove the barriers which prevent the adoption of environmental solutions (DEFRA and Great Britain, 2006). According to Gombert-Courvoisier et al. (2014), environmental education is currently applied as a priority program in French schools to enhance environmental understanding.

Education is a means to creating individual and collective engagement over the long term (Ockwell et al., 2009). Currently there is an increase in the attention given to education as a means of collective engagement, which in turn has increased collective participation in environmental aspects by adapting ‘social learning’, which is described as a framework for sustainability assessment and management (e.g., Keen et al., 2005, The Social Learning, 2001, Steyaert and Jiggins, 2007). Nye and Burgess (2008) reported that participants in the charity Global Action Plan’s Eco-Teams programme consistently pointed to a sense of mutual learning and support as a key reason for making and maintaining changes in behaviour (Nye and Burgess, 2008). A recent survey by the

development Education Association indicated that learning about ‘global issues’ reduces by half the number of people who feel that no benefit will come to environmental issues from personal action. Similar studies found that learning about environmental issues reduces the powerlessness that an over-individualised presentation of environmental problems can bring, from around 33% (in those who had not taken part in similar learning experiences) to around 16% (Hogg and Shah, 2010).

3.3.3 Changing Behaviour and Engagement

One of the most significant factors preventing the success of environmental campaigns is external intervention. Changing behaviour through penalties and restrictions or even government enforcements of laws, policies and regulations is considered unacceptable, today and is often destined to fail (Bamberg, 2006, Fujii et al., 2001, Whitmarsh and Köhler, 2010).

Interventions from governments to motivate behaviour changes, however, are good in some cases if implemented in a timely manner (Verplanken and Wood, 2006). In fact, there is some variance in environmental issues and people’s actions and habits must be taken into account, in some cases, by the government when it is generally faced with significant resistance to behaviour change, e.g. in terms of travel-behaviour (Lethbridge, 2001). Hence, effective deliberation is needed as a process which includes all stakeholders and effectiveness of the process for regulation and policy is emphasised (Hendriks et al., 2007).

Some research mentions that online information provision and feedback (from organisation to users) empowers people to take control of their behaviour (e.g. energy use) and also lets them overcome specific habits. Yet, the feedback must be tailored to the consumer’s needs and provided in a language which the user can understand (Nye and Burgess, 2008, van Houwelingen and van Raaij, 1989). In addition to affordable alternatives for the public, effective information is required in order to change behaviour, lifestyles and habits. For example, travel-smart is a good concept that serves the environment, dealing with transportation problems in effective ways. However, the public proved reluctant to adopt it. Individuals with strong car-use habits do not consciously deliberate over travel choices or pay attention to information about alternative modes (Verplanken et al., 1997). Appropriate information about the effects of carbon emissions, though, can help people make the right decisions and overcome their habits and routines (Vliet et al., 2005).

3.3.4 Role of Attitudes in Behaviour Change

To change behaviour, an appropriate approach must be selected to change negative attitudes, such as bad social practices, norms and beliefs, and replace them with new conventions: This is called the ‘culture cognitive framing’ of institutions, routines and practices (Scott, 2001). Social norms and notions of ‘free-riders’ affect attitudes. A range of studies note that individual attitudes towards scientific issues are influenced by the cognitive abilities, while information and knowledge increase the ability to discriminate (Evans and Durant, 1995, Bibbings, 2004). There is also a strong relationship between individual attitudes and behaviour (Ockwell et al., 2009) , but the mismatch of the two leads to an increased demand to investigate the structural and social factors, which affect individuals’ behaviour. Recent studies show that appeals to fear, anxiety for the future and guilt affect attitudes but might not necessarily lead to action or behavioural changes (Rutter et al., 2001). Moser and Dilling (2007) claim that people are motivated by economic values and individual attitudes (Dobson, 2003). In the context of energy use, habits and economic influences appear to be particularly salient (Clark et al., 2003, Poortinga et al., 2004, Verplanken et al., 1998). The close relationship of environmental studies with issues pertaining to the social sciences and the humanities makes apparent the necessity of interdisciplinary work in order for the general public to be engaged in sustainability.

3.3.5 Role of Responsibility in Changing Behaviour

Responsibility is society’s or an individual’s obligation to act to benefit society. It is related to anyone who has an impact on the environment. This responsibility can be passive, by avoiding socially harmful acts or active, in that the individuals in question perform activities that directly advance social goals. However, how obligated individuals feel to respond to environmental issues depends partly on their ethical and social responsibility level (Gärling et al., 2003). Pro-environmental behaviour will increase with environmentally responsible people, but it will also enhance the knowledge and responsibility of these same people (Hallin, 1995). Responsibility is a complex relationship between social elements. One of those relations is explained by Steg et al. (2005) as a link between appraisal and intentions (Story and Forsyth, 2008). In their study, Latané and Darley (1970) argue that in general responsibility has an impact on action, but environmental action is linked more to intentions and attitudes than responsibility (Story

and Forsyth, 2008). Individual responsibility is a stronger determinant of behaviour than cognitive or demographic variables (e.g., learning, income, gender) (Hines et al., 1987). Moral responsibility is linked to pro-environmental behaviour (Bamberg and Möser, 2007).

The 'self-perception' theory Bem (1972) shows the role of self-identity in behaviour change. Individuals who think they have direct personal responsibility for an environmental problem are likely to believe that personal action directly affects the environment (Kaiser and Shimoda, 1999). However, the engagement of people in pro-environmental behaviour might stimulate changes in individual attitudes and self-identity, which lead to further behavioural changes (Ockwell et al., 2009).

3.4 Strategies to Promote Sustainable Lifestyle

The following sections will present a discussion of different strategies used to promote a sustainable lifestyle, which include: to empower motivation and emotion, direct versus indirect/external interventions, to offer solutions, products and alternatives, to activate the role of local communities, communication and activities, and to implement the social marketing strategy.

3.4.1 Motivation and Emotion

Moral commitment is a strong determinant of pro-environmental action: It is necessary to enhance the normative incentives and discourage the egoistic motivations (Lindenberg and Steg, 2007). Recent environmental campaigns often rely on the provision of beneficial information by focusing on showing some financial benefits. This kind of message might be positive and this it can seem to be more beneficial when compared with negative messages (Burgess et al., 1998). DEFRA (2002) claims that non-environmental incentives often lead to environmentally beneficial actions (Stern, 2000, DEFRA, 2002). However, this kind of approach, which relies on economic incentives, is likely not to work with all types of environmental actions, e.g. using cars for driving. Some studies into environmental problems claim that financial incentives are often used particularly to underpin energy conservation (Brandon and Lewis, 1999). Whitmarsh (2009) mentions that most people use energy-saving options to save money or for other financial incentives, not due to pro-environmental thinking (Whitmarsh, 2009b).

Government policies often rely on non-environmental motivations to attract people to consider environmental problems, e.g. the British government supports policies that

encourage individuals to conserve energy through economic incentives (Department of Environment, 1994, DETR, 2000, HM Government, 2006). Actually, behaviour does change through financial incentive and knowledge provision and this is the current UK government thinking regarding the environmental problem (e.g., (HM Government, 2009, Hinchliffe, 1996, Ockwell et al., 2009, Whitmarsh et al., 2011).

Some researchers find that using money, as an incentive to attract people to environmental issues is a short-term solution and more effective methods are needed, including enhancing mutual communications. Crompton (2008) claims that effective communication resources should replace values, not enhance materialism or self-interest. People will revert to previous behaviours when financial motivations are gone (Dobson, 2003).

It is likely that some solutions include environmental enhancements as well as a negative economic impact (Stern and Great Britain, 2007, Lorenzoni et al., 2007). Dobson (2010) explains that pro-environmental factors, rather than financial or other types of external motivation must be fostered. A moral basis is important for pro-environmental actions (e.g., Thøgersen, 1996, Gatersleben et al., 2002). Recycling is one example of individual motivation attributed to environmental concerns (Schultz et al., 1995). Dobson (2010) argues that the environment is served by promoting local decision making, increasing local participation and constructing solid social capital through working with existing stakeholders to gain social change (i.e., social networks and community-based organisations) (Corner and Randall, 2011). However, the current approaches are insufficient to gain significant behavioural changes for most environmental issues (Ockwell et al., 2009).

The affective factor is related to the emotional level of evaluation of environmental problems and the subject's perspectives about expected impact. It has a direct relation to the cognitive factor in that it evaluates and interprets knowledge and information, depending on a person's norms and beliefs (Macey and Schneider, 2008). 'Emotional capital', namely, knowledge, contacts and relations as well as emotionally valued skills and assets, which hold within any social network are characterised at least partly by affective ties' (Nowotny, 1981, p.148).

People need to express their emotions and bear responsibility for environmental problems: We must expect people to be sad or angry, feel guilt or shame and yearn for

that which is lost, or to search for more reassuring answers (Randall, 2009). People who feel socially and emotionally supported will be more likely to be pro-environmental, thus, it is important to support emotions, as, without this support, people are likely to be in denial of personal responsibility, blaming governments and others or become less concerned with environmental problems (Lertzman, 2008).

3.4.2 Direct Versus Indirect/External Interventions

An environmental policy, whether it is a top-down/direct intervention or bottom-up/indirect intervention, is linked to such issues as the borders of public and private, state control and the rational behaviour of individuals (Lewis and Institute for Public Policy, 2007). One of the disadvantages of a top-down approach is the uncertainty and risks of its long term success. People might return to their old behaviour when the 'force factor' is removed (e.g. when the tax or regulation is removed, people return to former behaviours) (Dobson, 2003). In addition, there is some behaviour that cannot be regulated. For instance, the London Congestion Charge has led to a significant decrease in the number of vehicles in London city centre: That means a reduction in the quantity of CO₂ emissions in London's atmosphere (Transport for London, 2006). The potential indirect effects of this procedure includes increasing CO₂ emissions in the earth's atmosphere due to people driving further to avoid these charging zones (Lorenzoni et al., 2007). This shows the need to motivate people to be pro-environmental through self-motivation. The belief is that bottom-up approaches are likely to be useful in gaining public engagement with environmental issues (Ockwell et al., 2009). Bottom-up approaches occur through deliberation and discussion on environmental aspects through social processes and democracy by focusing on one shared goal. Those deliberations ensure participation on a wide range of public issues, representing varying civil society spectrums and different experts and concerns. 'The ebb and flow of public debate carried on in the media, in private conversations, in formal and informal settings (Mansbridge, 1999), from pubs to parliaments and back again' (Parkinson, 2004, 380). However, policies, legislation and regulations might lead to a reduction in the impact of negative attitudes and bad behaviour towards the environment. This environmental legislations lead to changed behaviour, no matter what the people think and also overcomes anti-environmental opinions, values, social norms and beliefs (e.g. the individualists and fatalists in cultural theory (Thompson et al., 1990). It stimulates social innovation towards the creation of pro-environmental solutions and produces environmentally friendly

alternative products, e.g. the development of new vehicles with zero emissions SAM and WRI (2003) that have catalysed the development and commercialisation of hybrid vehicles (Ockwell et al., 2009).

Exploring alternative approaches to low carbon behaviours highlights the respective strengths and weaknesses and the tensions between a top-down, regulatory approach that forces positive behaviour and more bottom-up approaches that promote voluntary, grassroots action to environmental issues (Ockwell et al., 2009).

Bottom-up approaches lead people and social groups to seal the gap between governments and people, e.g. a minority believe that the government shares their own views on environmental matters or listens to their concerns (Poortinga and Pidgeon, 2003a). In the UK, some people believe that if the government wants to involve people, firstly it must change the way the country is run (The Hansard Society, 2011).

The majority of people believe that various motivations and effective technological solutions let them engage more than taxes or higher bills do (DEFRA, 2002, O'Connor et al., 1999, Whitmarsh et al., 2011). Based on the results of research, people easily accept the evidence that supports their views and ignore evidence contrary to their views (Lord et al., 1979). People are likely to cling to the attitudes that are consistent with their behaviour and that protects their identity (Kunda, 1990, Kahan et al., 2007). Additionally, involving people in decision making about environmental aspects leads to increased quality and more acceptance of the decisions from the audience and creates strong trust. Climate Change Communication Advisory Group (2010) mentions three features of public deliberation:

- 1) Civic features (increasing the informed, attract and engage people);
- 2) Governance features (improving policies and decisions); and,
- 3) Cognitive features (promoting learning).

It is important to create political space and pressure for decision-makers to act in new and ambitious ways (Thøgersen and Crompton, 2009, Blok, 2007).

3.4.3 Solutions and Availability of Products and Alternatives

The lack of alternatives discourages people from adopting environmental initiatives. A recent empirical study, for example, indicates that people living in rural areas are likely to use cars due the lack of suitable transportation alternatives (DEFRA, 2002, Carmen, 1999). Stimulating people to be pro-environmental is closely connected to the availability

of attractive and effective alternatives and options (Whitmarsh et al., 2011), and the infrastructure of the pro-environmental (Köhler, 2006).

The infrastructures of cities, towns, countries and states must be integrated and support pro-environmental initiatives to facilitate engagement toward sustainability. Indeed, there is a significant deterioration in infrastructures at the world level, e.g. most housing stock is energy inefficient, greenhouse emissions are high and transportation alternatives to driving are not available in most countries (DEFRA, 2002) or they are costly (DFT, 2007). Also infrastructure has become less reliable and not safe in most cases (Davies et al., 1997). However, the cost of the alternatives has had a bad effect on engagement as DEFRA (2002) explains: The high cost prevents engagement in pro-environmental action (DEFRA, 2002).

Alternatives are necessary and very important. While the use of those alternatives is the actual target if environmental issues are to be addressed the integration of those alternatives within infrastructures is a critical success factor in engaging people. They are the bedrock of moving towards full pro-environmental actions and sustainability.

Using pro-environmental products and activating pro-environmental options are necessary for future wellbeing. They improve tendencies towards altruism and enhance social harmony (Mazar and Zhong, 2010).

The integration of both innovation on the industrial side and change on the behaviour side, has reduced the impact people have on the environment (Whitmarsh and Köhler, 2010). However, the industry has not yet changed its business model switching to environmentally-friendly technologies as the basis of its products (Whitmarsh and Köhler, 2010). Thus, governments, communities and ordinary people share the responsibility of requiring environmentally friendly products and stimulating industrial firms to produce creative pro-environmental products and other options.

There exists some domestic pro-environmental technology, such as smart meters and micro-generation equipment which can be used to help residents to adopt sustainable lifestyle: These technologies require more attention, as they have a role in professional dealings and are appropriate for use by approaches that encourage people to adopt solutions and better techniques for overcoming routine energy use (Nye et al., 2010). One of features of this research conceptual engagement model is empowering expanding use and setup such technology in properties.

3.4.4 Role of Local Communities and Communication

By means of mutual communication, cooperation is increased and this leads to a stimulation of competition. E-communication is likely to have an important role in attracting people to be pro-environmental as it facilitates the acceptance of regulation and motivates grass-roots action (Ockwell et al., 2009). An empirical study presents issues that discourage stakeholder contribution, such as using approaches for participation that lack managerial skills or have inadequate policies or regulations. In addition, institutional practices may be incomplete or flawed (Owens, 2000, Kerkhof, 2006). Communication plays a role in overcoming the challenges faced by people engaging in environmental issues. It is an effective way to mitigate an impact on the environment (Ockwell et al., 2009).

To address the challenges facing pro-environmental action, it is suggested that strategies combining strong top-down government with bottom-up approaches are used to facilitate public acceptance of new regulations. Using effective communication leads to a promotion of societal demands for environmental regulation, e.g. using communication for lobbying/advocacy (Lorraine, 2009). Maibach et al. (2008, p. 14), point out the significant role of communication in attracting people to environmental action and the role of NGOs and related communities in advocating change in government policy and legislation. Most current communication approaches fail to attract people, because they do not address implicit values, affective factors and individual attitudes (Ockwell et al., 2009). The communicators need to tailor different messages towards a diversity of values, depending on the target objectives of communication (Boardman and Darby, 2000, Kahan et al., 2010).

3.4.5 Role of Activities in Engagement

Awareness constraint prevents individuals engaging in environmental aspects. With regards energy consumption, it might be difficult for most individuals to know their daily behaviour in terms of energy-use levels or daily energy expenditure (Nye and Burgess, 2008). There are a range of motivations, demographic variables and contextual influences that affect individual attitudes (Gatersleben et al., 2002).

Uncertainty about the causes of some environmental problems, particularly global warming, is a result of a deficit in individuals linking the local with the global, thus

understanding how daily activities in their own lives may be linked to environmental problems (Hargreaves et al., 2003, p.37). It is better to engage people in pro-environmental action by linking information to personal interests, local environmental issues and personal concerns, emphasising additional benefits such as saving money, improved air quality, quieter streets and personal fitness. All those issues are effective in mitigating the impact of activities on the environment (Betsill, 2001, Whitmarsh, 2008).

It is important to avoid the sense which many individuals share that their efforts to respond to environmental issues are wasted due to other people not taking action (Hinchliffe, 1996). We need to enhance the role of local and global environmental communities and give more support to strengthen trust among members, give more personal confidence and create better actions in environmental issues. Some stakeholder benefits effect and prevent decision-making. The effect of stakeholder groups on public participation in decision-making are more clearly seen where there is a motivation for these affected parties to participate in decision-making (Whitmarsh, 2009a). When people have an ability to participate online or in workshops in different locations, it is likely that these people will feel they have geographical representation and that their problems are recognised (Whitmarsh, 2009a).

Effective technologies with recent improvements in communication contribute to overcoming spatial and temporal barriers (Larsen et al., 2011). The linking of local forums to global forums leads to stakeholders to act in local forums in order to participate in international and global initiatives. It leads to the integration of local and regional actions and initiatives. It leads to contributions and cooperation between sustainability communities. Local people, when engaged in some environmental problem, with a commitment to protecting their local environment, can increase their personal sense of responsibility over time for other environmental aspects (Hallin, 1995, Story and Forsyth, 2008). When governments deal with environmental issues, they must give more attention to some issues such as incentives, communication, practices, education and procedures for physical planning, and facilitate local participation. People need involvement at the national and local levels and allowing contributions through effective communications is needed for policies to gain legitimacy (Larsen et al., 2011).

3.4.6 Social Marketing

The social marketing strategy emerged in the early 1970s and since that time it has been used to describe a wide range of campaigns and projects that aim to change the behaviour of society in different fields (Hastings, 2007). According to Darnton (2008), social marketing is ‘explicitly trans-theoretical’. This view is opposed by Hastings (2007), who emphasised that there is no theory of social marketing; indeed, it is a ‘what works’ philosophy and experience which came from previous similar campaigns and programmes that have been applied (National Social Marketing Centre, 2006).

One recent approach to engaging people in environmental issues is the social marketing approach in environmental campaigns. Moreover, some scholars have stated that social marketing strategies have succeeded in campaigns aimed at changing negative habits (McKenna et al., 2000, Pechmann and Reibling, 2000, Gordon et al., 2006, Hastings, 2007, National Social Marketing Centre, 2006), and these strategies are useful in promoting pro-environmental behaviour (e.g., McKenzie, 2000, McKenzie-Mohr and Smith, 1999, Peattie and Peattie, 2009). The social marketing approach can play a role in changing the social norms and building social capital (Corner and Randall, 2011), thus, assisting to remove social barriers to behaviour change and stimulating communities and social networks to engage to serve the environment (McKenzie, 2000).

This strategy is well-known and typically applied by governments and non-governmental organizations in tackling global environmental challenges (Department for Environment and Rural Affairs, 2008, Crompton, 2010). Furthermore, social network approaches were applied in different countries and fields to support pro-environmental actions (e.g. the Australian government’s ‘Travel-smart’, Australian Department for Transport, Energy and Infrastructure campaigns, 2009; Sustrans, 2009) and in the health field (e.g., Gordon et al., 2006, Hastings, 2007, National Social Marketing Centre, 2006).

Social marketing is a framework for providing and customising information depending on the particular behaviour by classifying people's behaviour. The capacity of this kind of strategies in creating behavioural changes, however, have been criticised (Maio et al., 2007).

According to Jackson (2005) it is likely that approaches based on information will affect attitudes, but the link between attitudes and behaviour seems to be weak. Jackson (2005), in a study about pro-environmental attitudes and behaviour, discusses these issues in

detail. Furthermore, a social marketing campaign tailored to audience preferences and attitudes is likely to lead to a conflict between people's current values, beliefs and preferences and the goal and objectives of the campaign (Corner and Randall, 2011). Corner and Randall (2011) mentions that the elements of behaviour change in social marketing strategy might conflict with other broader objectives. Crompton and Kasser (2009) mentioned that there is evidence that using social marketing in environmental campaigns to disseminate and foster positive values, norms and beliefs, change behaviour towards pro-environmental actions and enhance performance in the long term does not satisfy the campaign's goal and objectives and is less than the campaign designers desired and expected. According to Lazer and Kelley (1973), Corner and Randall (2011) these methods are likely to be a means to bringing about specific behavioural changes (e.g. consumption behaviour) (Lazer and Kelley, 1973, Corner and Randall, 2011). Though not appropriate for a comprehensive change of behaviour then, social marketing could prove successful in fostering sustainable consumption practices (Peattie and Peattie, 2009). These strategy seems deficient in overall behaviour application and they fail to induce a systematic change of behaviour (Climate Change Communication Advisory Group, 2010). Thus, it seems to be that, accompanying social marketing with other strategies and enhancing the ability of the approach to include all types of environmental behaviour can play a significant role in engaging people toward sustainability. The study recommended that the strategy be evolved to create an 'individual social marketing' stance.

3.5 Current Engagement Initiatives

The current body of scholarly knowledge on sustainability and climate change seeks to explore the effect of engaging people in the mitigating process (Moser and Dilling, 2007, Whitmarsh et al., 2011, O'Neill et al., 2013). The focus is on understanding how to stimulate the masses into collaboration and adoption of a sustainable lifestyle (Crompton and Kasser, 2009). The literature review concludes that most studies into fostering sustainable lifestyles continue to be based upon traditional approaches. These approaches still commonly rely upon the analysis of large scale actions e.g. those of governments and NGOs (Owens, 2000) and often neglect the role of small scale collective actions, such as the role of individuals and local communities or small groups of people despite the poor performance of many behavioural change campaigns (Owens, 2000) that often rely on repeating the same common methods that fail to include important issues that can affect

and assist people in changing anti-environmental behaviour. For instance those programs neglected important determinants within a person's culture, demographic variables, attitudes, and issues that are related to a locality as well as human wellbeing dimensions.

Below is a list of the type of existing and most widely applied initiatives and well-known methods that are currently used to engage the public regards sustainability:

(i) In education, the use of formal education to promote engagement (Hopkins and McKeown, 2002, Huckle and Sterling, 1996) by capitalising on the curriculum (Hignite, 2006). The students occupying a sustainable campus would practice what they learn about sustainability (Cortese, 2003). This is currently under development as part of French school programmes (French Ministry of National Education and French Ministry of Higher Education and Research, 2004 cited by (Gombert-Courvoisier et al., 2014)). In higher education and university (Adomssent et al., 2007, Blass et al., 2010, Martin, 2012, Karatzoglou, 2013, Nejati and Nejati, 2012, Xiong et al., 2013, Gombert-Courvoisier et al., 2014).

(ii) Public information-intensive campaigning through different communication channels including media and television programs or the Internet. This kind of campaign is popular and commonly applied in most countries around the world (Huckle and Sterling, 1996, Rice and Atkin, 2012).

(iii) Creating action events and using word-of-mouth (WOM) in environmental campaigns for discussion or marketing environmentally friendly products or alternative pro-environmental solutions (Buttle, 1998, Pickett-Baker and Ozaki, 2008). Through media or direct communication campaigns, activists attempt to discuss and assist people in adopting sustainable lifestyles. Local and international environmental organisations attempt to create activities and events to educate and increase awareness among people, for example the Greenpeace Organisation widely apply word-of-mouth in its campaigns and discourses that aim to engage volunteers in protecting the environment and donating to save the planet. However, in order to attract people's attention, often new innovative ideas within the context of creating an 'action event' might be applied, such as, the use of action events with the aid of human geography action. Geographers not only select their drawing from spatial nature but also collaborating with expertise from other social science fields to re-introducing the spatial into debates to increase public awareness (Barr, 2003, Hobson, 2006, Winter, 2008);

(iv) Community based social marketing: This is dominant in the research of climate change studies; This type of method has different designs and applications; Western countries used this method to promote sustainability; Community-based social marketing has now been applied in a variety of projects and in different countries, for example, across Canada these tools are used to increase awareness and promote changes in public lifestyles (McKenzie-Mohr, 2010, McKenzie-Mohr, 2011, Kassirer, 2012) and also to encourage efficient water use, in an effort to offset the cost of building a new water processing plant. For example, Durham Region, Ontario, developed a community-based social marketing strategy to reduce water use by 10% (Region, 1997, McKenzie-Mohr, 2000). The United Kingdom applied social marketing to engage public in pro-environmental behaviours (Andreasen, 1995, Barr et al., 2006). However, despite the fact that the social marketing strategy is considered as the most appropriate in successfully engaging people regards sustainability, compared with other methods, it remains criticised by researchers (Corner and Randall, 2011, McKenzie-Mohr, 2000). (See section 3.4.6).

3.6 Needs for Innovative Engagement Model

Current efforts still do not reach the optimum rate or achieve satisfactory results in attracting people. The necessity of bridging the gap in the current strategies and addressing in detail the issues related to engaging the public in pro-environmental actions continues to be highlighted (Sutton and Tobin, 2011, Whitmarsh et al., 2011, Asmar, 2009). This concern indicates the necessity of new innovative approaches that empower people to overcome current challenges and barriers; are acceptable to all concerned and have the characteristics of permanence and continuity. “Designing a sustainable human future requires a paradigm shift toward a systemic perspective emphasizing collaboration and cooperation” (Cortese, 2003, p.16). There is a need for new innovative models that benefit from previous studies and models with new extra features added, drawing from different disciplines including environmental, physiologist, computer engineering, information systems and information communication technology domains for their inspiration. This domain of research could contribute to the creation of an effective approach that may affect and attract people to willingly adopt pro-environmental actions. Previous successful applications and studies in other similar areas, that utilise information systems and ICT, emphasise the design of such a sustainable human model. The

conceptual model in this study proposes features that could help overcome the limitations of previous initiatives and encourage people to engage in pro-environmental actions.

Information technology is widely available today. As a result, an increasing number of Internet intervention approaches have emerged, which aspire to improve lifestyle. Recently, Internet interventions have been widely applied with an end to refining the public's anti-environmental behaviours with increasing frequency. The interventions display ease of accessibility, overcoming spatial and temporal barriers, and access to information 24/7 at the beneficiary's location or home. Moreover, extra features that complement the Internet can be used to enhance the effectiveness of interventions such as those enabling interactive strategies, those that increase the fun-value, those that facilitate immediate support, e-mail, chat, Internet telephone service (IP-telephony), goal setting and tailored feedbacks. One example of technology helping people to change their lifestyle regarding energy consumption is the 'smart grid' technologies that promote a change in consumption patterns through real-time feedback (Ehrhardt-Martinez et al., 2010, Sanquist et al., 2012). Some studies have attempted to build strong and powerful interventions by focusing on designing attractive interfaces or recommending regular updates for the contents of the website. However, some features are not unique and can be used by other approaches but the online interventions are likely to be more accurate and comprehensive. "The effect size comparisons in the use of Web-based interventions compared to non-Web-based interventions showed an improvement in outcomes for individuals using Web-based interventions to achieve the specified knowledge and/or behaviour change for the studied outcome variables" (Wantland et al., 2004). Wantland et al. (2004) mention in more detail the effectiveness of Web-based versus non Web-based interventions (Wantland et al., 2004).

Despite the evidence of the effectiveness of interventions via the Internet in changing behaviour, the current interventions that rely on the Internet still face criticisms and have some limitations. Furthermore, in most cases, the size of these operations is small (Norman et al., 2007, Van den Berg et al., 2007, Walters et al., 2006, Leslie et al., 2005); often not optimal (Webb et al., 2010, Leslie et al., 2005, Glasgow, 2007, Campbell et al., 2002); typically the engagement lessens over time (Eysenbach, 2005); some visitors tend to leave the website before finishing (Eysenbach, 2005, Danaher et al., 2005, Glasgow et al., 2007); a minority of the participants are those visiting these sites more than once

(Verheijden et al., 2007, Brouwer et al., 2011); and there is no systematic overview for the Internet interventions (Brouwer et al., 2011).

The conclusion demonstrates that significant improvements can be made with respect to people's perceptions of and the determinants for attracting the public towards the interventions via the Internet as well as the means of delivery. Therefore, the application of online and social networks with added ICT techniques might contribute to improving the effectiveness and create engagement. The addition of some features yielded from ICT techniques is likely to lead to improvements in the quality of services provided and the performance of online social networks. This could promote individuals' preparedness to engage in sustainability through the effect of public cognition, affect, and intention to change behaviour. This ICT technique make networks flexible enough to link physical with virtual networks. For instance, ICT can assist in creating and forming a cyber-physical social network. The user's profile and environmental labelling, using context-aware and place-based techniques, contribute to build the blended social network (BSN), which has features similar to face-to-face communication or physical social networks and can be used to connect the virtual environments to the existing physical social networks and the outside world including local people, events and activities. Thus, the BSN overcomes spatial and temporal boundaries. In addition, this type of social network might facilitate access to and use of resources and information immediately and without delay; it also might increase trust among users, improve cooperation between social network members and offer efficiency and attractive features that other social networks do not. This ICT techniques can be used to enhance the collective actions and participations; increase public awareness; enhance personal norms and social norms; facilitate the overcoming of habit; increase behavioural control, promote the availability of alternatives; reduce cost; overcome individual and social barriers; form new educational technique to promote e-learning by facilitate tailored information, services, and feedback; strengthen trust between members; support local and global community and local solutions; support physical activities and local events; and activate the role of cooperation and communication. This seeks to create an online approach which is more effective; the model would organise, empower, and regulate the contributions of all beneficiaries and incorporate the capabilities of technology as an intermediary and amplifier, determinant for shaping behaviour, and promoter to design persuasive models and powerful interventions. This study focuses on the role of social networks and ICT technology in

facilitating communication and integration, aiding the promotion of pro-environmental actions and assisting people in their adoption of sustainable lifestyle behaviours. The behaviour change strategies rely on interactive technology and online communications, which seem to enhance the effectiveness of the solutions, perhaps in turn, promoting public engagement regarding sustainability. The proposed model also encourages developing and expanding the use of technology with an end to serving sustainability. Electronic devices, such as smart meters may contribute to the success of efforts to change behaviour. The Intelligent systems are seen as facilitating the sustainable development process by supporting sustainable lifestyles when they enable the provision of regular feedback regards the real impact of people's activities on the environment, which might affect their consumption and encourage conservation. This model also supports the expanding use and development of this type of technology by supporting and encouraging friendly environmental business sectors and firms.

This can be achieved through the proposed conceptual model which focuses on the involvement of all interested including interested and related partners; that is, scientists, ecologists and environmental activists, governments and non-governmental organisations, individuals and associations with local, national, and international interests, industry and business firms and ordinary people. This collaborative approach aims to enable direct and online support in addition to providing information in an accurate and easily accessible manner to the beneficiaries.

It is clear that using the Internet on a website only basis for intervention is not enough. The need for additional dynamic techniques to create powerful responses is highlighted in this study. Online social networks and ICT characteristics might help to improve the Internet interventions by offering tailored dynamic interventions rather than static or general interventions.

3.7 Summary of Chapter Three

This chapter has included an investigation of the literature review related to citizen engagement in sustainable communities. The examination focused on understanding barriers hindering engagement at two-levels, individual and social, as well as exploring the related cognitive, educational, affective and emotional factors influencing citizens engagement, the motivation aspects, the affordable products and alternatives, local communities and the nature of communication, environmental activities and physical

events. In addition, this chapter reviewed the effect of direct and indirect/external interventions. It has introduced the role of gender and demographic variables in engagement and factors that may help change people's behaviour and engagement, which includes examining the role of attitudes in behaviour change and engagement, the role of responsibility in changing behaviour, and engagement and the role of awareness in engagement. This chapter discusses the aspects of social marketing and engagement. This chapter shows previous studies efforts in promoting sustainable a lifestyle, previous studies of using ICT in social and online social networks, and their roles in influencing individual sustainable behaviours, in addition of highlighting the needs for an innovative model for engaging people towards sustainable lifestyle.

The next chapter presents a detailed account of theories and models to provide a theoretical background for the proposed model.

CHAPTER 4: Literature review Part III: Theoretical Background for the Research Model and Validation Framework

Introduction to the Engagement and Behavioural Theories and Models, Theoretical Behaviour Change Theories; Individual and Interpersonal Level, Stages of Behaviour Change Models and Summary of the Chapter.

4.1 Introduction

This chapter introduces the theoretical background underpinning the conceptual model and the validation framework for testing the research model.

Most consensus theories are identified from the literature to determine the most influential factors that might affect individual intentions to change behaviour and explore how these factors work together to attract people towards environmental issues. This is undertaken with the aim of: (i) to reach the formulation of the conceptual research model and determine its constructs, and (ii) check the validity and influence of the model on people's intentions to change negative lifestyles to be compatible with a sustainable lifestyle (the conceptual model and validation framework development is discussed in Chapter 5).

The criticism in the literature about these theories is worth considering thus, it is necessary to utilise these theories, borrowing from or adapting other theories in order to overcome the shortcomings by building an integrated theoretical basis for the development of the conceptual engagement model and to build a comprehensive theoretical validation framework in order to validate and assist the research conceptual model. Most models/theories that aid the determination and measurement of factors that might affect people's intentions to change behaviour and encourage them to adapt to a sustainable lifestyle were examined in this study.

4.2 Engagement, Behavioural Theories and Models

Jackson (2005), mentions two functions identified in behavioural models and theories which are: (i) the 'heuristic', which help to expose behaviour factors and the interrelations between these factors, and (ii) the 'empirical', which is used to understand the

relationships between the factors and the intervention in order to predict the behaviour patterns.

The scope of this study, which is to understand the effect of online social networks and ICT on promoting people's preparedness to change anti-environmental behaviour. This study focuses on theories and models at an: 'individual level', 'interpersonal level' and 'community/network level'.

4.2.1 Individual Level

4.2.1.1 The Deficit Model

The deficit model assumes that people positively cope with environment issues only if they have enough knowledge about the consequences of their own behaviour on the environment. The assumption of the model is that the linear progression of the knowledge will lead to an increase in people's awareness stimulating their concern over time, which then will affect people's attitudes towards environmental issues; thus reflecting on the harmony of their behaviour with pro-environmental actions (Kollmuss and Agyeman, 2002) (Figure 4.1).

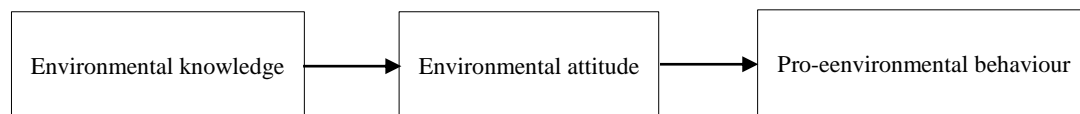


Figure 4.1: Linear 'deficit' model of pro-environmental behaviour (Source: Kollmuss and Agyeman (2002)).

Numerous public information campaigns conducted on a large scale have been dominated and applied in environmental programs, which have attempted to empower people by letting them know and understand more about the connections between their own behaviour and a range of environmental threats; thus engaging people to change their negative behaviours and attracting them towards pro-environmental actions. There are many examples of this technique, such as the 'Save It' campaign in 1970 which highlighted the need to reduce energy consumptions and the 'Are You Doing Your Bit?' campaign in 1998, which linked elements of sustainable development to individuals (Anable et al., 2006). Typically, this model is dominant in the most pervasive information campaigns in the media and is equipped to deal with various types of media; that is, the use of the Internet, television, local radio, newspapers and other media. The implementer of these strategies believes in the effect of the mass media and deems it as an appropriate, quick and easy way to reach a large number of people, enhancing public awareness in a

short period of time. As a result, many models have arisen that suggest and promote how to utilise this media (Ball-Rokeach and DeFleur, 1976). However, such initiatives disregarded the fact that we should expect very little from the provision of information alone (e.g., Jackson, 2005, Lorenzoni et al., 2007, Hounsham, 2006, Anable et al., 2006, Irwin and Wynne, 1996).

4.2.1.2 Rational Choice Theory

Economic models assume that the reasons people act pro-environmentally rely on purely economic grounds; that is, rational choice theory and using economic measurements to change people's negative behaviours. People are viewed in this theory as acting by relying on their assessment of the costs and benefits regarding the available choices and an interest in maximising their benefits and welfare (Halpern et al., 2004, Anable et al., 2006). The economic dimension is important and often has an emotional impact on people, but to rely on purely economic grounds to provide an explanation, seems to be inadequate (Halpern et al., 2004, Kurani and Turrentine, 2002, Anable et al., 2006).

Intervention employing this model can be applied directly or indirectly. Direct interventions are often voluntary in nature and concerned with changing an individual's perceptions (i.e. interested in changing individual's values, norms and attitudes), while indirect interventions are usually not interested in changing people's attitudes and rely on attaining change by force of law. Most government strategies focus on indirect interventions to help in environmental issues and reduce CO₂ emissions. So far, most governmental debates regarding the management of environmental problems focus on this concept to form environmental policies and legislations using price signals and legal punishments, such as policy instruments that aim to increase the price of fuel or add tax to roads in an attempt to force people to modify their car use or travel behaviour. This approach has notably failed to reduce the growth of CO₂ emissions into the atmosphere and enhance the transport infrastructure (Kurani and Turrentine, 2002).

The conceptual model of this study focuses on capitalising from direct interventions, looking to voluntary incentives and the maintenance of well-being of the people. As indicated in Chapter 7, the proposed conceptual model seeks to offer cost incentives and economic benefits to people by promoting pro-environmental choices instead of resorting to coercion by law enforcement or indirect interventions.

4.2.1.3 The Theory of Planned Behaviour

A widely applied theoretical framework is the theory of planned behaviour (TPB) (Ajzen, 1985, Ajzen, 1991, Ajzen and Fishbein, 1980), which is used to explain behaviour and behaviour change. The main assumption of TPB is that a person's behaviour is a result of a person's positive or negative evaluations of the given behaviour which are reflected in a person's attitudes and person's perception of the prevailing opinion of important others reflected in a social norm, as well as an individual's perception of their capacity to perform the behaviour which is reflected as perceived behavioural control.

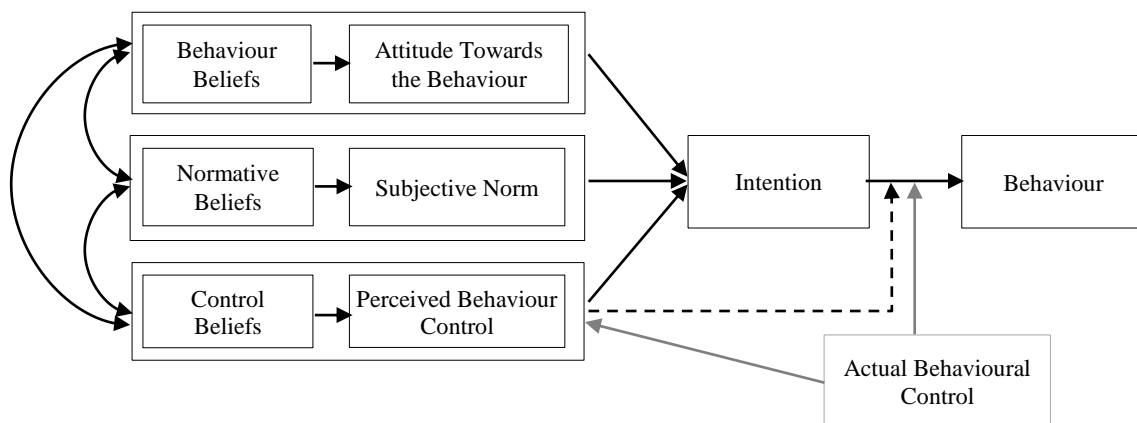


Figure 4.2: The theory of Planned Behaviour (TPB), (Source: Ajzen (1991)).

As depicted in Figure 4.2, this theory emphasises the perceived individual benefits, constraints and perceived social pressures in relation to behavioural choices and the most proximal predictor of behaviour is the intention to change behaviour, which is used as an indicator of whether people are willing to change the behaviour. This intention is determined by a person's attitudes, subjective norms and perceived behavioural control. Attitudes indicate the degree a person evaluates a behaviour change to be favourable or unfavourable. Subjective norms are related to the perceived social rules and pressure that relates to a given behaviour. It is related to a person's perceptions of the extent to which society's view is alike in endorsing or disapproving of a given behaviour as well as the person's motivations to accept these social pressures. The perceived behavioural control or individual capabilities constraint in TPB concerns to person's perception of the ease or difficulty of embracing a given behaviour. The TPB assumes that structural constraints have an indirect impact on intentions to select or change behaviour (Ajzen and Fishbein, 1980). The psychological constructs mediate the relationship between structural constructs, socio-demographic and given behaviours. This theory considers that a person's decision to select a behaviour relies on planning, rational choice, evaluation of

costs and benefits and a focus on self-interest, motivational issues such as money, effort, hassle, time and social acceptance. Pro-environmental behaviour is determined by a person's intention to perform the given behaviour. The intentions are determined by attitude, perceived behavioural control and subjective norm. These attitudes are related to the degree to which a person deems a behaviour favourable or unfavourable.

The TPB constructs might be relevant to behaviours that involve relatively high costs (in terms of time, effort and money), such as car use or energy saving (Lindenberg and Steg, 2007). Furthermore, there is some criticism regarding how appropriate this theory is for changing some patterns of lifestyle; actually some aspects of lifestyle are more complex and are strongly associated with the habitual. For example, the use of public transportation and travel behaviour are not the rational-choices that TPB considers them to be (Aarts and Dijksterhuis, 2000, Anable et al., 2006). This does not mean that it has not been used for the purpose of explaining these phenomena. Empirically TPB has been employed in a wide spectrum of relevant behaviour and intention studies. For reviews see (Ajzen, 1991, Armitage and Conner, 2001). For instance, TPB has been applied to explain car and bus use (Bamberg and Schmidt, 2003, Heath and Gifford, 2002), travel mode choice (Bamberg et al., 2003, Harland et al., 1999, Heath and Gifford, 2002), environmental activism (Stern, 2000), recycling and the use of unbleached paper (Harland et al., 1999, Hopper and Nielsen, 1991, Stern et al., 1995), the use of energy-saving (Harland et al., 1999).

4.2.1.4 Norm Activation Model

The norm activation model (NAM) (Schwartz, 1977, Schwartz and Howard, 1981) has received extensive attention in the behaviour related literature (Schwartz, 1977) and has been developed to explain pro-social and altruistic behaviour. The NAM has been successfully applied to various pro-environmental behaviours (Guagnano et al., 1995, Hopper and Nielsen, 1991). The behaviour within (NAM) might give up personal benefits for social collective considerations; thus, in this model's perspective, pro-environmental behaviour is determined by the extent of moral obligation and personal norms. The elements that determine pro-environmental behaviours in the NAM model are: (i) The extent to which people feel a moral obligation to adopt pro-environmental behaviours, (ii) the extent of awareness towards the consequences of their choices on the environment, and (iii) who is assumed responsible for environmental problems. So, pro-environmental behaviour in this model seems to be a consequence of altruistic behaviour when people

have to give up personal benefits for the sake of environmental benefits. Altruistic behaviour is attained by activating personal norms, which are considered to stimulate the moral obligation in people. In more detail, people might feel pride when their behaviours are compatible with personal norms or feel guilty when their behaviours are against personal norms. Two determining variables related to this process are that: (i) people need to be aware of the consequences of their behaviour on the environment, which is called ‘awareness of consequences’, and (ii) people need to feel responsibility for the consequences, termed, ‘ascription of responsibility’.

The NAM model has been successfully applied to serve and explain various pro-environmental behaviours, including recycling (Guagnano et al., 1995, Hopper and Nielsen, 1991) and energy conservation (Black et al., 1985).

4.2.1.5 Values-Beliefs-Norms Theory

Stern and colleagues in 1991, use several theoretical bases to build the structure of the value-belief-norm (VBN) theory of environmentally significant behaviour (Stern, 2000). This theory is specifically focused on predicting pro-environmental behaviour rather than how to influence engagement in pro-environmental behaviour. This theory extends the Schwartz’ norm activation model (1977) by integrating general values that are obtained from value theory (Schwartz, 1992, Schwartz, 1994), basic, general values which let people evaluate the relationship between themselves and the environment which then lead to the generation of environmental interest and concern which appear in the new environmental paradigm (NEP) (Dunlap et al., 2000).

This conceptually compelling model proposes a causal chain of relationship variables and a given behaviour basically emerges from general values that a person holds Figure 4.3.

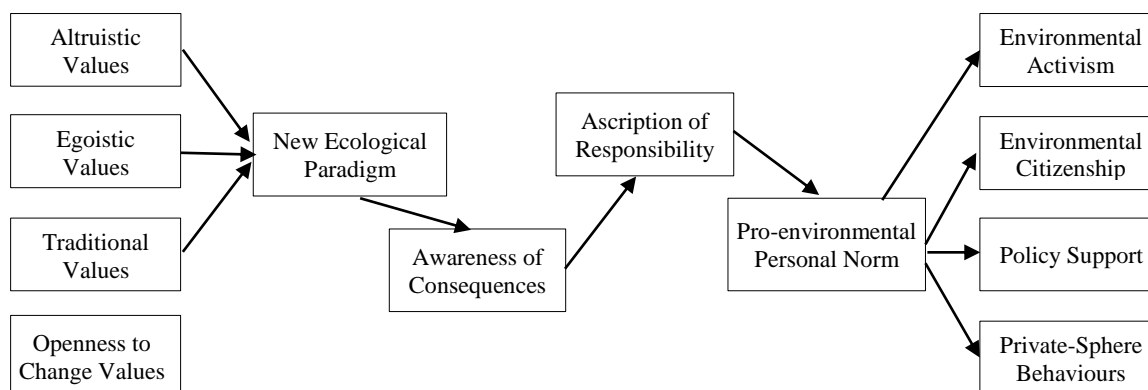


Figure 4.3: Value Belief Norm Theory (VBN), (Source: Stern et al. (1999)).

According to VBN theory, the variables (i.e. values, beliefs and norms) might influence intentions and behaviours indirectly and directly. Values are considered a strong guidance for predicting people's behaviour in their lives (Rokeach, 1973), including pro-environmental actions. For example, self-transcendence values are relevant to different kinds of pro-environmental intentions and behaviours (Joireman et al., 2001, Karp, 1996, Stern and Dietz, 1994, Stern et al., 1999, Nordlund and Garvill, 2003). The VBN's proposed causal chain of factors begin with basic, general values that then finally lead to the prediction of specific behaviours reliant on these sequential outcomes. According to this theory, environmental values lead to beliefs such as the New Ecological Paradigm, leading to an increase in awareness of consequences and personal responsibility. This leads to a pro-environmental personal norm, which leads to increased pro-environmental behaviours. However, there are two value dimensions: (i) Self-transcendence and concern for others versus self-enhancement and concern for self, and (ii) openness to change and variation versus conservatism and tradition. Rokeach (2008) sees values as core guiding principles for people in their life behaviours (Rokeach, 2008). So the VBN theory emphasises this concept to describe people's perceptions regarding the relationship between humans and the environment (New Environment Paradigm (NEP)), which have an impact on a person's environmental beliefs and norms; thus finally influencing pro-environmental behaviours. The environmental concern is likely associated with the extent to which people believe in their behaviours having negative consequences for the environment, which is labelled in this theory, 'awareness of consequences'. This theory assumes that the person who has higher concern, then has increased awareness of the negative impact of his/her own behaviour on the environment; that is, negative consequences. Consequently, assuming that people who have more awareness of their negative impact, are likely to believe they have a responsibility regarding this problem the result is an 'ascription of responsibility', which stimulates a person's feeling about moral obligation to cope with the problem. It follows that 'personal norms' can be activated to evaluate the antecedent environmental behaviours. For instance, this theory proposes that, high moral obligation leads to high intentions to support pro-environmental behaviours.

The VBN theory focuses on predicting intentions towards pro-environmental behaviours, based on the composition of its variables. It seems to be suitable for explaining behaviours that are related to low costs; that is, in terms of time, effort, money and 'good' intentions

(Lindenberg and Steg, 2007). The VBN theory has been applied specifically to pro-environmental actions and has successfully explained car use (Nordlund and Garvill, 2003), environmental activism (Stern et al., 1999), and acceptability of policy measures, especially for intentions to reduce energy use, conservation and acceptance of energy policies (Steg et al., 2005).

Stern (2000) agrees that in general, theories of environmental behaviour including VBN still need development and that there are other contextual variables that might influence pro-environmental behaviour not included in VBN. The VBN theory was developed as a “basis of support for a social movement” (Stern et al., 1999, p. 81). Furthermore, the VBN model is composed only of variables at an individual-level and does not directly address any social factors, which is an approach that appears to downplay their influence in pro-environmental behaviours. Notably, the ‘norms’ in VBN indicate the personal norms that are associated with habits and not social norms as the authors emphasise that a personal norm is part of the self-concept while in fact social norms are not (Anable et al., 2006). Often, it is not possible to build on support for existing social norms. Thus, social norms necessarily need to change and the extent of the impact a movement will have, depends on forces of social change, which rely on changing social norms. Thus, both personal norms and social norms are essential to pro-environmental behaviours.

It is beneficial to develop a new model that incorporates complementary constructs from NAT, VBN and the TPB; and involve important factors such as affective determinants, social-symbolic motives e.g. self-identity and the habitual dimension (Wall, 2005, Anable et al., 2006, Bamberg et al., 2009).

4.2.2 Interpersonal Level

Sociological theories rely on the interpersonal level; that is, social networks, social support, social capital and the role of social mentoring (Halpern et al., 2004). Thus, behaviour change is likely to be more effective if the focus is not only on the individual level, but also on those who socially have a common concern or objectives. Strategies that focus on the individual only as isolated from the social environment (i.e. ignoring the social relationships, cultural constraints and economic influences) are likely to miss the crucial determinants which are related to social and community levels (Anable et al., 2006). The social and contextual factors are important to the development of interventions and might lead to forming individual intentions to change behaviour (Jackson, 2005).

4.2.2.1 Triandis' Theory of Interpersonal Behaviour

Triandis' theory of interpersonal behaviour (TIB), (Triandis, 1977), is considered a comprehensive theory that includes most elements influencing behaviour change, Figure 4.4.

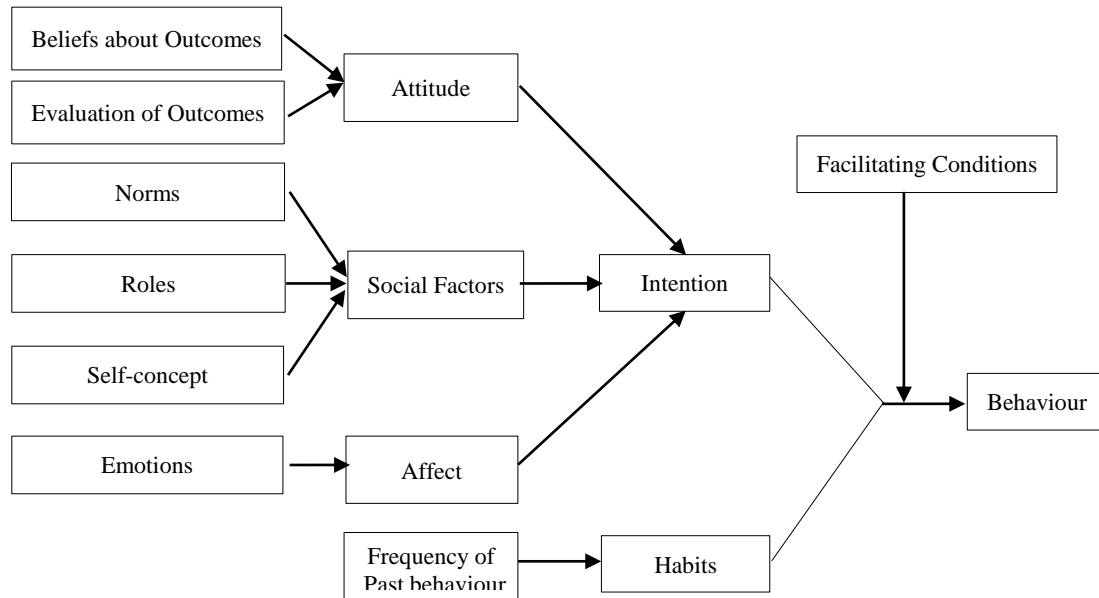


Figure 4.4: Triandis' Theory of Interpersonal Behaviour (TIB) (Source: Triandis (1977)).

Triandis' theory of interpersonal behaviour concludes that three factors combine to form personal behaviour: (i) habits, (ii) intention and (iii) the facilitating conditions. While Intention is formed from three factors: (i) attitudes, (ii) social factors and (iii) emotions. Social factors include: (i) norms, (ii) roles and (iii) self-concept. Two kinds of norms exist: (i) 'descriptive' (what people are doing) and (ii) 'Injunctive' (what people should be doing); that is, pro-environmental action is 'Injunctive' and not 'Descriptive'.

Some studies examining TIB, NAM and TPB in relation to travel behaviour, conclude that the TIB has much greater value and superior power than NAM and the TPB models (Bamberg and Schmidt, 2003, Anable et al., 2006).

4.2.2.2 Social Learning Theory

All the issues related to observing and modelling the behaviours, attitudes and emotional reactions of others are grounded in the constructs of social learning theory (Figure 4.5); thus focus is given to the role of skill and competency, in addition to the person's behavioural capability and self-confidence to change his/her behaviour (Halpern et al., 2004).

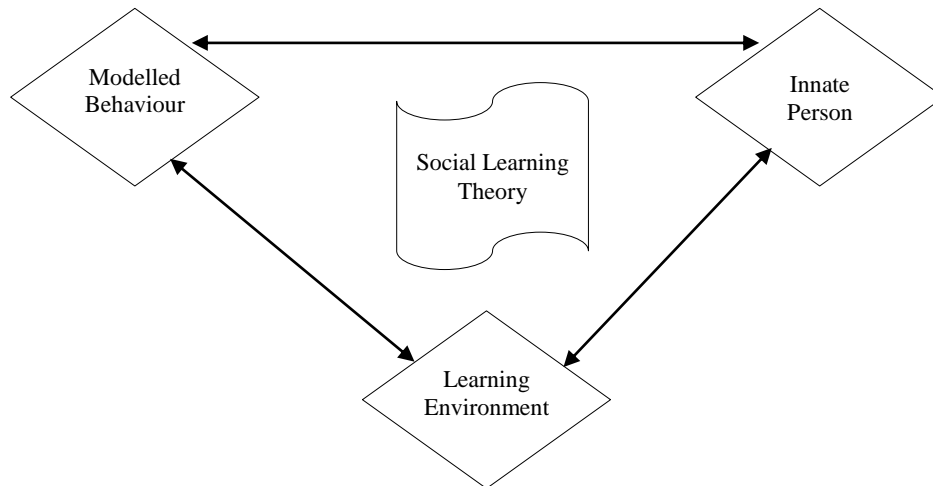


Figure 4.5: Social learning theory (SLT), (Source: Bandura and McClelland (1977)).

The self-efficacy of social learning theory is a fundamental concept. It shows the salience of a person's confidence on their ability to take or continue certain actions. Bandura's theory of social learning concludes that the direct experience that people have, as well as what a person learns from observing others around them, such as parents, their peers and those they have seen through the media or social media, might influence people to change behaviour. Furthermore, people model their behaviour on their skills and what they observe from others (Jackson, 2005). People behaviour can be influenced by the quality of knowledge and skills that people have. People observe and modulate what they observe from others, through trial and error practices in addition to observing peer responses to one's own behaviour. Thus, social theory seems to offer effective applications to behaviour change (Anable et al., 2006) and potentially offers effective applications for pro-environmental behaviour (Jackson, 2005). For example, in a travel context, full information about the available public transport for a specific journey that fits the user's situation, the costs, how the service will run and contextual guidance or exactly how to use the service can help people to use public transportation instead of using a car.

4.2.2.3 Community or Network Level

Many interpersonal theories exist that might potentially be useful in promoting sustainable lifestyles and assisting people to be prepared to engage in pro-environmental actions which rely on social influence and trust; that is, social networks and support theory (House, 1981, Shumaker and Brownell, 1984), social representations and social identity theories (Moscovici and Duveen, 2000, Breakwell, 1993), interpersonal communication

theory (Kelley and Thibaut, 1978). All these theories work on trust and might be suitable for application in terms of pro-environmental behaviour (Giddens, 1990). According to Whittington (1992, p. 693), “the transaction and tension between different social systems has been particularly neglected”. Community engagement offers an effective way to change a person’s attitude and behaviours when it provides a mutual communication channel to feed and move knowledge through their social networks; for instance, (Kurani and Turrentine, 2002) provided full insight about the role of community engagement in changing negative behaviour and attitudes.

4.2.2.4 Social Capital Theory

The social capital concept refers to the relationships and connections that have been established and exist between persons (Gray et al., 2006). These relationships include: Values, norms, rules, the networks and informal sanctions which are typically used to form a common co-operative environment and enhance the quality of a society’s social interactions (Halpern et al., 2004). Social proof is part of social capital (Halpern et al., 2004), and offers insight into how people see other people around them including strangers as a guidance for the appropriate and prevalent behaviour; thus behaviour of others can be seen as evidence of the dominant social norms and a guidance of how one should act.

4.2.2.5 Diffusion of Innovations

The diffusion of innovations (DoI) theory explains the manner of how new ideas, products or social practices spread among the members of society or outside a given society; that is, from one society to another (Halpern et al., 2004). Four fundamental elements encompass DoI theory, which are: (i) innovation, (ii) communication, (iii) the social system, and (iv) the time factor. Initially, the new worthy idea is exposed to people within society and then social networks and the media contribute to an accelerated dissemination of the idea. However, the nature of people and the social system, the characteristics of the idea, the time and the rate of diffusion, are all used to measure the quality of diffusions or adaptation. The rate of diffusions is typically determined to rely on the volume of various people adopting the new idea or behaviour (Rogers, 2010).

4.2.3 Concluding Remarks

This chapter gives an overview of the theoretical framework of the research model, which is based on theories at the individual, interpersonal and community or network level.

The reviewing of the literature led to the conclusion that, the deficit model and rational choice theory which focus on provision of information and economic incentives are important contributing concepts to the solution of incentivising people to decrease their negative impact on the environment by changing anti-environmental behaviours. The provision of information alone is not sufficient to change behaviour and it is typically inadequate to rely on purely economic grounds indicating the importance of supplementing rational choice theory to encourage people to adopt pro-environmental actions (Anable et al., 2006).

In similar vein by reviewing the literature, it was found that the theory of planned behaviour (TPB) is likely to be a simplistic method for the study of sustainable lifestyles because some important constructs are missing, particularly those related to social factors. The review suggests that all the constructs of the behavioural theories and models which have been discussed in this section; that is, the deficit model, the rational choice theory, the TPB, the norm activation model (NAM) and the value belief norm theory (VBN) are complementary to each other and each of them might satisfy a unique value for explaining one set of the selected sustainable lifestyle domain.

Focusing just on the individual level is insufficient since other important behavioural determinants, which are typically related to social, cultural and economic dimensions; might affect individual constraints and the interaction between constructs to form individual behaviours. For instance, the interpersonal theories address the sociological aspects and recognise the social link, affective, habitual and education factors that are dismissed by analysis of the individual level alone. The theories at community level (i.e. social capital theory (SC) and diffusion of innovation theory (DOI)) present the effective role of community, good communications and networks in influencing people's behaviour towards change.

This, the 'engagement theory' and 'Triandis' Theory' in addition to some complementary necessary constructs, are adequate to answer the research questions;

The next chapter will provide a detailed description of the conceptual model pertaining to this study.

CHAPTER 5: The Development of Conceptual Model, Research Hypotheses and Theoretical Validation Framework

The Conceptual Model Development; Background and an Overview of the model; The Underpinning of Model Components from Literature; The concept of 'Blended Social Network'; The six Proposed Enabling 'ICT Techniques'; The Research Hypothesis Development, The Development of Theoretical Validation Framework; (Measurement of Individual Preparedness to Engage in Sustainable Lifestyle and Measurement the effects on Behaviour Change).

5.1. Introduction

This chapter introduces the conceptual model of the study and describes the hypothesis development. First, this chapter provides background and an overview of the model, a diagram of the model, and a detailed discussion of its components. It presents 'the online social network/blended social network' and the six proposed overlapping 'ICT [information communication technology] techniques' included in the model. All relations and components included in the model are presented and discussed in this chapter. Finally, the chapter presents the theoretical framework to measure individual preparedness for a sustainable lifestyle and concludes with a summary of the structure of the chapter and formulated hypotheses.

5.2. The Development of the Conceptual Model Components Underpinned by Literature

This model aims to strengthen the relationship between environmental associations and citizens and to promote environmental citizenship through mutual engagement of environmental associations and citizens. Environmental associations seek to achieve their objectives by engaging citizens to support sustainability and adopt a sustainable lifestyle. In this way, the citizens feel that the community of sustainability is interested in their local environmental issues as evidenced by their support and assistance. Four main parties are involved in the formation of the model: communities of sustainability, individuals, social relations and information communication technologies. In terms of activating the role of social relations to make a positive change towards environmental issues, the model utilises the online social network by facilitating a bundle of selective ICT techniques. The

online social network and the bundled ICT techniques are used to generate structural change in an individual's determinants (Attitude, Values, Personal Norm (PN), Ascription of Responsibility (AR), Awareness of Consequences (AC), Perceived Behavioural Control (PBC), Subjective Norm (SN) and Habit (H)) towards promoting sustainability. Thus, the research model consists of (i) 'the online social network/Blended Social Network', (ii) six modules of 'ICT techniques', (iii) 'individual determinants' that might affect individuals' engagement towards a sustainable lifestyle, and (iv) 'the communities of sustainability' (characteristics and activities).

Six ICT techniques emerged from the literature and the field study conducted during the research. This in turn helped in identifying suitable factors and ICT techniques to answer the second research question, 'What factors, techniques and functionality within online social networks encourage individual engagement with sustainability?' This question was split into six sub-questions, as shown in Table 5.1. Thus, the conceptual model of the thesis consists of six overlapping ICT modules working together within the 'Blended Social Network' (BSN) and integrated with the existing online social networks which might affect individuals' 'preparedness to engage' towards sustainability. These modules are: 'Context-Aware', 'Location-Based and Event-Based activities', 'Social learning/online social media learning including Game-Based', 'individual social marketing' and 'individual profile and sustainable labelling technique'. Also, the 'Attraction and motivation techniques (Hook)/Attraction and hook technique' were added to the 'Blended Social Network' to use as a hook to attract people to adopt this model to enhance its social capital by increasing the number of members who are engaged and involved. Figure 5.1 shows a diagram of the components comprising the conceptual model.

This ICT techniques contribute to form an active environment to foster the collective actions which motivate people to participate in and support local and social solutions to mitigate environmental issues. For instance, these actions contribute to avoiding the sense which many individuals share that their efforts to respond to environmental issues are wasted due to other people not taking action. These ICT techniques focus on supporting individuals' emotion and using the bottom-up approach, which is likely useful in engaging the public with environmental issues. This can be used to stimulate a sense of moral obligation, and ascription of responsibility. It facilitate exposure to the risks associated with the phenomenon to increased people's awareness of consequences and

improve the public understanding of the impact of their contribution toward mitigating environmental problems. It seems to affect personal and cognitive skills, provide mutual education and support environment, and can be considered another effective way to obtain cognition and increase public awareness through social learning. This can be utilised to enhance public engagement through influencing people's perceived behavioural control and facilitating conditions and empowers people to take control of their behaviour. It can be used to motivate people to overcome their habits. It facilitates the accessibility of solutions and availability of products and alternatives for the public. This addresses the role of the dimension of economic and costs by decreasing the cost to engage the public in sustainability. This helps overcome individual barriers such as information overload, confusion over conflicting evidence, the format of information, inaccessibility posed to non-experts, a lack of knowledge, a lack of locally relevant information, scepticism, a lack of trust, information conflicts with values or norms, disempowered feelings, and perceived failure by others. This facilitates tailoring messages to people's situations and preferences and takes into account the differences between individuals, including the demographic variables (e.g., learning, income, gender), and considers public values and views into consideration when forming services to provide accurate and tailored information and solutions to the beneficiaries. With reliance on these ICT techniques, the information and services provided would be tailored to the user's needs and provided in a language which the user can understand. This enables the public to contribute to online information provision, evaluation and follow-up feedback. This ICT techniques seems to influence social norms and promote trust, which is considered an essential factor to engage people in sustainability. This can contribute to culture cognitive framing through changing negative attitudes and bad social practices, norms and beliefs, and replacing them with new conventions. This shift can activate the role of local communities and communication and enhance the role of local and global environmental communities, give more support to strengthen trust among members, give more personal confidence and create better actions in environmental issues. To make a more active contribution to mitigate environmental problems, this ICT design facilitates support and enables public connections with physical environmental activities. Communication plays a role in overcoming the challenges faced by people engaging in environmental issues.

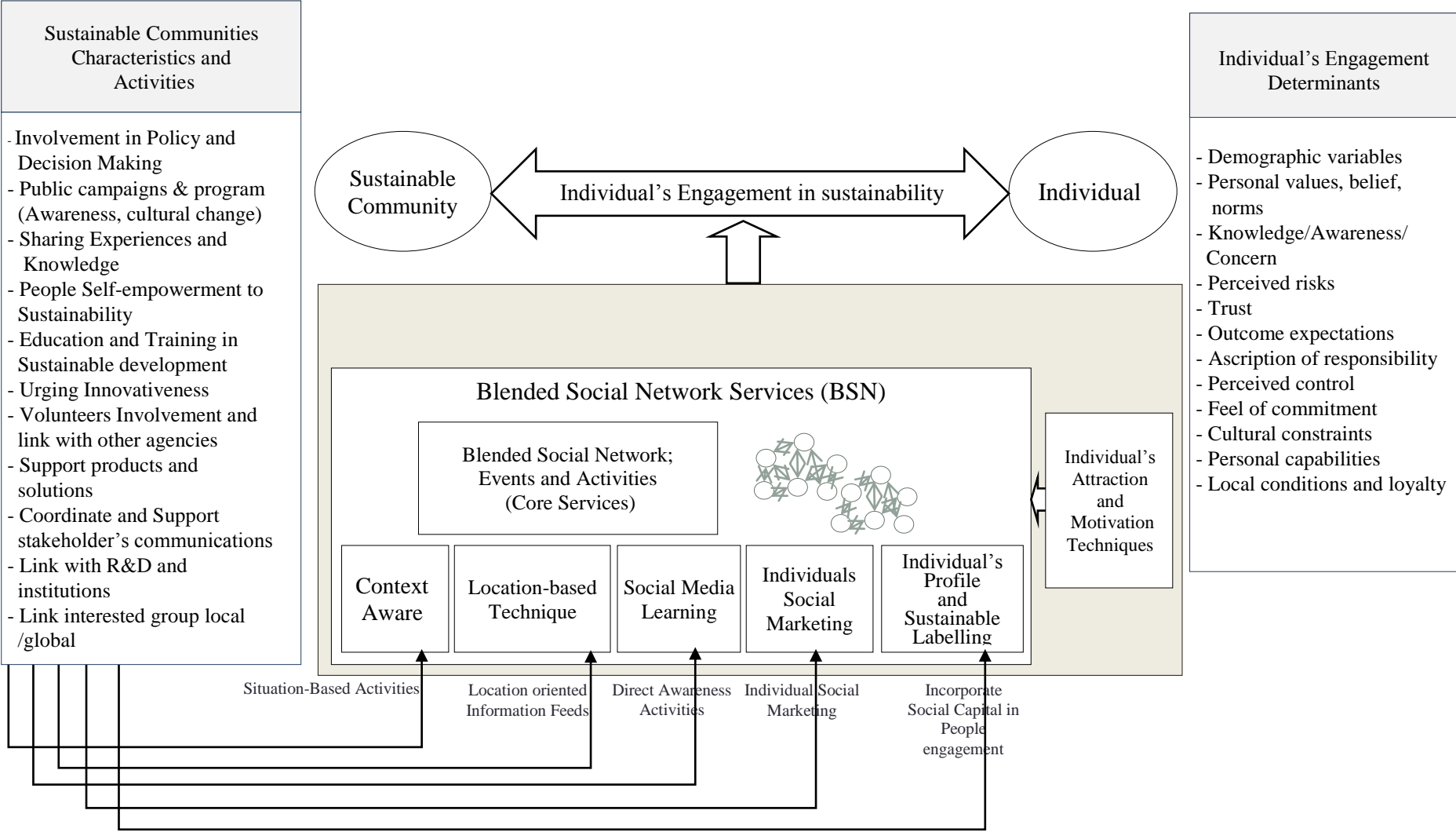


Figure 5.1: Conceptual model components of citizen engagement in sustainability

5.2.1. Individuals' Engagement in Community of Sustainability

The process is rife with challenges and barriers which prevent people from becoming involved in coping with climate change; this involves cognitive and affective factors. Thus, providing people with social knowledge and stirring their emotions about the issues will facilitate their acceptance of the proposed solutions.

This proposed conceptual model aims to encourage a person's engagement by influence individuals engagement factors. Thus, the proposed approach targeting to encourages people towards preparedness to engage by changing a negative lifestyle and adopting a sustainable lifestyle.

5.2.2. Social Network and the 'Blended Social Network' Approach

Social media are "web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (Ellison, 2007). The Internet is considered an effective avenue for success and it facilitates these interactions (Gunawardena et al., 1997). Social networking sites enable members to create events, join groups and become 'fans' of other members within these networks. They enable communication and constant contact with social institutions and the public. For example, policy makers and legislators might use social networks to inform supporters about activities and events. Social networks offer a means for regular two-way communication with the public that might lead citizens to contribute financially or volunteer. Analysing members' 'personal profiles' might lead to legislators better understanding which strategies are likely to be effective in persuading the public and to building knowledge about information that might affect public engagement. Most social networks allow members to communicate with each other through these engagement categories: blogs/newsletters, videos/clips, photos/images, media, context information, events/activities, links to websites, information about volunteering, links to payment tools or sites to make a financial contribution, stories and anecdotes, games, advertisements and marketing. Blogs allow members to add comments and they offer a good way to serve the environmental cause, including promoting discussion.

A member's participation might open up opportunities for enjoyable experiences and mental or intellectual stimulation as the members become more active with one another

in the community (Tonteri et al., 2011). The satisfaction of the member's hedonic needs leads to engagement with members and interaction with the community; this in turn leads to increased contributions and participation (Koh and Kim, 2003). Enjoyment is an important factor for individual acceptance of virtual networks in general (Moon and Kim, 2001). Furthermore, individuals are willing to participate in a virtual community if it satisfies their needs, such as transactions, interest, enjoyment and relationships (Hagel and Armstrong, 1996, Hsu and Lu, 2007). According to Preece (2001), sociability, interpersonal relationships evidenced by members of a community communicating with each other, and usability are likely to be extremely important factors for member participation and community success (Hsu and Lu, 2007).

Furthermore, most environmental campaigns lack a contextual basis for social change and focus on short-term solutions and practical measures that fall within the current economic imperatives. Thus, they fail to address the real environmental problems (Brulle, 2010, Corner and Randall, 2011). Such campaigns should be used to good effect instead of fragmenting and passing on a series of disjointed behavioural efforts to mitigate the impact of humans on the environment; they offer an active way to help experts exchange knowledge and find solutions to improve sustainability. Furthermore, the campaigns create a social mediation that contributes to the reduction of environmental risks from the expected climate change and global warming. In addition, campaigns offer a means of interaction between various procedures and stations of society. Moreover, social networks play a role in enabling the communication and the diversity of interventions and policies and promote education by encouraging dialogue and discussion among all related parties. This helps to motivate change in people's behaviour and enhances society's response to the initiatives to mitigate environmental problems (Whitmarsh and Lorenzoni, 2010). Additionally, social networks seem to be an effective way to exchange and transfer the expert information or experience outside the academic realm among members; a wealth of experience and practical knowledge from members can benefit and enrich efforts to address environmental problems (Moser and Dilling, 2007, Whitmarsh et al., 2010). For example, the exchange of images and videos through social networks is valuable and contributes to engaging people in pro-environmental actions. Such images and videos are effective in generating a sense of social normality for pro-environmental behaviour (Schultz et al., 2007).

Furthermore, online social networks support, create and transfer innovation, which is vital to achieve sustainability; they create a window for discussion and debate, which guarantees a democratic process and contributes to progress in creating and applying innovations in both strategy and science and technology (Wilsdon et al., 2004).

Today, social networks and social media are considered important sources of information on societal issues. Thus, these networks might have a significant impact on people's transition to a sustainable lifestyle and on environmental issues in general. Research should scientifically examine the effect of these tools in changing people's lifestyle. Scholars should investigate whether scientific information should be presented through these social networks (local, national and international) to the public in a professional manner rather than casually. Then, researchers should look into how the information is noticed, interpreted and used by individuals to enable them to adopt a sustainable lifestyle.

Two types of social network analysed in the literature can be used to facilitate engaging the public to change a negative lifestyle: physical or face-to-face social networks and virtual or online social networks. Another type of social network it can be classified as linking physical and virtual social networks and can be labelled the 'Blended Social Network'. This form of social network might have features that are superior to those in existing networks; thus, they are likely to overcome the cons and limitations of both online and offline social networks. This blended approach synthesises two types of online social networks, with some overlapping between them, to form the 'Blended Social Network' and enable offline social networks to communicate with it. The current online social networks enable distant communication via the Internet; that is, virtual or global social networks can be merged with other types of online social networks that have characteristics of physical social networks (cyber-physical social network). ICT can assist in creating and forming this type of social network. The user's profile and environmental labelling, with context-aware and place-based techniques, contribute to building the BSN, which offers features similar to face-to-face communication or physical social networks, with no boundaries and 24-hour continuity 7 days a week. Furthermore, this proposed model incorporates features similar to face-to-face communication through an entirely virtual model that mimics physical networks and actually links physical and virtual networks.

Thus, the 'Blended Social Network' overcomes spatial and temporal boundaries. In addition, this type of social network might facilitate access to and use of resources and

information immediately and without delay; it also might increase trust among users, improve cooperation between social network members and offer efficiency and attractive features that other social networks do not. The overlap between online and offline social networks in most cases leads to enhanced quality in these networks to serve environmental issues. The proposed model of the study focuses on this type of social network; thus, the following main research question and associated hypotheses were developed:

RQ1: What is the role of on-line social networks, i.e. the ‘Blended Social Network’, in promoting individual ‘preparedness to engage’ in a sustainable lifestyle?

Hypothesis A: The ‘Blended Social Network’ has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

5.2.3. Proposed Enabling ICT Techniques

This section was devoted to a discussion of the proposed enabling ICT techniques that will be associated with the engagement platform and to provide and answer to the second main research question of this study:

RQ2: What factors, techniques and functionality within on-line social networks ‘encourage individual engagement’ with sustainability?

Six modules are introduced under ICT techniques: ‘Context-Aware’, ‘Location-Based/Event-Based and local activities’, ‘Social learning/online learning involving the Game-Based’ technique, ‘Individual Social Marketing’ technique and ‘Individuals profile and sustainable labelling’ module, in addition to the ‘Attraction and Motivation Module (Hook)’, which is designed to attract users to use the ‘Blended Social Network’. The following sections present these techniques in detail with formulation of associated hypotheses.

5.2.3.1. Context-Aware

The context-aware technique can be classified into two categories, which depend on the way information and services are provided to users. The first category is presenting information and services for users only; applications use the context-aware technique to present context information pertinent to the user’s situation and in some cases to help users by suggesting appropriate choices. Furthermore, this technique presents ambient

information displays, shows information for users who are indoors/outdoors and provides remote-awareness for users. The second category is automatically executing the service; when the context changes, an application using the context-aware technique triggers a command or reconfigures the system on behalf of the users.

The context is defined as the user's location and orientation; aspects of the current situation; the entire user environment and the environment surrounding the user; identities of both user and issue around the user, i.e. people and objects and the changes occurring to those objects in time; the current situations of the user. Thus, the context answers who, where and what questions for both users and resources nearby. However, the context is a constantly changing execution environment (Herrmann et al., 2011, Brdiczka et al., 2007, Loke, 2006, Miguel et al., 2003, Van Setten et al., 2004, Dey et al., 2001). Dey et al. (2001) see context as a set of knowledge about the user's situation (i.e. physical, social, emotional and informational state); "We define context as any information that characterizes a situation related to the interaction between users, applications, and the surrounding environment" (Dey et al., 2001, p. 100). Pascoe defines context-aware as a subset of physical and conceptual states that describe a particular object and its entity (Pascoe, 1998). The context of the environment can be classified as follows: (i) user's environment, which includes location and personal attributes, social and emotional states and nearby people and objects, (ii) physical environment, which includes infrastructure available, appliances and devices available, nature of issues around the user including the event and the activities environment, (iii) the time environment, including all issues related to date and time (e.g. season, weather), and (iv) the computing environment, which means processor, device and computing machine accessibility, network efficiency and capacity, ICT availability, the method of connection, connectivity and the cost of communication and computing. Context is any information that might be useful in describing incidents, i.e. people, places or objects, which affect the interactions that occur between the user and other users or objects. The context synthesis from a set of elements and attributes is related to the location, identity and personal situations, groups of people and computational and physical issues or objects (Abowd et al., 1999).

The places, people, things and time are components of context-awareness. People include both individuals and groups, either co-located or distributed. Places represent geographic spaces, such as a country, city, coast, home, certain building, offices, commercial and trade business buildings, health centres, education establishments (e.g. schools), tourist

places, farms and factories, where things represent physical or logical objects. Context-awareness includes information about identity (e.g. person), location, status, events or activities and time. Identity refers to a unique identifier for the object (e.g. person). Location not only includes information about space in two dimensions, but also includes all information associated with exploring the spatial relationships between entities, such as co-location, nearby or containment, and the purpose of the location. Places can be represented in the context of geographic coordinates or relative spatial relationships. For a person, the specific factors of personality or activity are presented, such as attending an event or participating in it. Support status basically refers to any form of support that can be queried. Time is part of the context information which is used to help characterize a situation online and, in some cases, it enables leveraging off the richness and value of historical information for related entities. Typically, the time context appears in conjunction with another context, such as timestamp, time span or historical time for such entity; it also indicates an instant or period of time during which some other contextual information is known or relevant. In some cases, time is only used to see the relative ordering or causality of events.

Different types of information about the user and the environment around the user are necessary to obtain on time to perform targeted tasks correctly. For instance, information regarding the user's location, topics that might affect the user's desire or interests, the quality of contents fed to the user, i.e. texts, reports, the aid of resources which include learning resources, recorded audio, video, games and the locations of other users or members likely contribute to integrate the knowledge, thus enhancing the quality of services provided. As a part of the conceptual model components, this study investigates the effects of 'context-aware' ICT technique on influencing individual engagement in sustainable behaviour. The research question and associated hypotheses are:

RQ 2.1: What is the effect of using the 'Context-Aware' information provision and support within the BSN framework on individuals' 'preparedness to engage' towards sustainability?

Hypothesis B. (1): The 'context-aware' technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

5.2.3.2. Location-based Services

The activation of local solutions leads to increased levels of assistance and support for current initiatives at both local and national levels for the community, government and international programs. Such activation will set a precedent to initiate activities on a larger scale (Lorenzoni and Pidgeon, 2006). For example, voluntary initiatives to put target limits on emissions of greenhouse gases by households or businesses can reduce energy consumption without relying on a guide from the central government. Hassol and Udall (2003) mention that these local initiatives involve local citizens. Thus, there is growing recognition that local initiatives to mitigate the effects of climate change "in the locality" will provide solid ground for changing negative behaviour; the actions of participants have tangible benefits (Rayner and Malone, 1997, Lorenzoni and Pidgeon, 2006, Hassol and Udall, 2003). Many local initiatives are quick and convenient solutions that focus on reducing costs and are generally successful. Still, however, their success on a global level is limited, as the case of reducing greenhouse gases indicates. Similarly, the evaluation measure for localised initiatives indicates that local sustainability is limited. To be useful local initiatives, therefore, should be supported and coordinated in actions and legislation at all levels: local, state and national. Some local initiatives are limited in recognising appropriate solutions; for example, they may not benefit from the processes that operate on larger scales and do not react to those solutions due to lack of communication, lack of control or lack of ability to take advantage of emission reduction programmes at the state or international level. They may in addition lose tangible benefits from the available technologies and others' expertise. Thus, acknowledging the difficulty of taking more effective action at the local, regional or global level, as mentioned by (Kates and Wilbanks, 2003), the initiatives should go hand-in-hand with others at all levels. Other options include a focus on and support for local solutions to the issues of climate change and inclusion of local solutions within the policies of sustainable human development (Wilbanks, 2003). Local initiatives help to increase understanding of the local impact of environmental issues and are partly explained by researchers as indicators for measuring the impact of local and regional diversity on climate change. Actually, this type of initiative has been affected by local environmental problems and has a considerable impact on local people's emotions. A qualitative study by Bickerstaff et al. (2006) concludes that individuals in a local area (who are well aware of affairs of the region or area in which they live) face difficulties in preventing risks to their local area or daily life

for themselves or family members (for example, the lack in empowering and enabling the local participations, the lack in infrastructure and limited in pro-environmental alternatives, lack of financial and technical support for the local people and local initiatives). However, the dominance of national governments might not be valid, or it may be coming to an end, while the United Nations (UN) has neglected social, institutional and community principles and tends to favour programmes and policies that work within the system of sovereign nation states (Climate Change Communication Advisory Group, 2010). A local and global level of recognition and deliberation has importance and should be given priority when targeting sustainability to solve environmental problems (Larsen et al., 2011). However, four issues must be taken into account when sharing local knowledge and experience: (i) environmental problems are local and, to a certain extent, related to the behaviour of individuals, households, corporate actors and the local community, (ii) policies, the legitimate and decision-making processes for environment issues, on local, national and international levels may fail if the public does not support them, (iii) environmental justice must be integrated and (iv) environmental problems are not confined to specific geographic areas; rather, they represent a global problem which affects life in all areas and no geographic area alone can solve the problem (Larsen et al., 2011). However, local engagement is likely to be a strong force linking local and global levels of community engagement (Larsen et al., 2011).

People are not only engaged on a local level but are also involved in remote global dialogues virtually through the Internet. Online communication leads to dynamic participation when the Internet and other technical solutions aid and facilitate local environmental issues (e.g. local citizens' complaints) with a move towards 'localized internationalization'. Local solutions can become extensively international in their activities and reach global levels (K. Larsen and Persson, 2005). People might need direction to take optimal advantage of the region's natural resources, to encourage and support local initiatives and programmes and to link them globally. It is necessary to activate the idea of acting locally and thinking internationally. Local and national initiatives should be linked with global initiatives and supported both technically and financially.

Environmental activities are important for creating an 'environment sense' in individuals in various categories and age groups. For example, participation in environmental

activities will lead to positive attitudes towards environmental issues. Mutual benefits result from these activities; for example, a 'green exercise' leads to fostering society's health and the advancement of social bonds (Chawla, 1999). According to Larson et al. (2011), participation in outdoor recreation activities, such as hiking and walking, leads to individuals' enhanced performance with respect to pro-environmental attitudes, behaviour and actions. However, the provision of space for outdoor environmental activities, e.g. green spaces, could foster pro-environmental engagement and behaviour (Corner and Randall, 2011). However, the lack of knowledge about relevant, available pro-environmental activities will lead inevitably to a lack of involvement and participation (Sutton and Tobin, 2011). Social presence theory (Short et al., 1976) notes that the presence of members might be complemented with off-line communications, which may affect members' sense of virtual identity. According to Rothaermel and Sugiyama (2001), offline communications seem to be an important element for strengthening the relationship between members of a community. Offline communications through events and activities can empower virtual community members to understand and enhance trust, as well as make it easy to identify other members. Online communications can be reinforced through offline communication or face-to-face activities (Lin, 2007, Koh et al., 2003, Andrews et al., 2002, Hummel and Lechner, 2002). Offline activities may reinforce cohesiveness between members of a virtual community (Koh and Kim, 2003). These activities have an effect on the sense of enjoy-ability (Koh and Kim, 2003); thus, connectivity with offline environmental events and activities and meeting activists might promote sustainability objectives and enhance engagement towards pro-environmental actions.

Through location-based and event-based modules, this model can provide detailed information about the physical place surrounding members, including events, activities, members and anything of interest or related to the place or location. For instance, local awareness campaigns can invite members who are in a specific place to participate in local events or activities.

This conceptual model uses online social networks and ICT techniques to tailor appropriate event-based information, relying on situational and individuals' determinants to activate the efficient recommendation system. These systems might have a positive effect on the quality of information and the selection of an accurate strategy and thus on cognitive, affective, and individual intention to change behaviour.

The business and industrial segments play an important role in tackling responsibility and participation in the process of mitigating environmental problems. It is necessary to attract and involve all partners within the local community. ‘Environmental organizations can help to embolden business and political leaders to begin to inject public debate with values that move far beyond self-interest and materialism’ (Crompton, 2008). Furthermore, involving local stakeholders, such as concerned businesses, industries, communities and individuals, is useful for substantive and normative reasons (Fiorino, 1990). Stakeholders can be integrated by improving the quality of decision-making based on diverse knowledge and by allowing the representation of explicit values, and various social and personal preferences, when making decisions about where we are currently, where we need to go and what would we hope to accomplish; in other words, there is a need to strengthen trust, ownership and learning among participants (Pahl-Wostl, 2006). The second set of ICT techniques that are incorporated in the proposed model and the associated research question and hypotheses are:

RQ 2.2: Does the use of ‘individual-centric and Location-Based (Event-Based/activities, local Events participation)’ within BSN have a positive effect on individuals’ ‘willingness for engagement’ in sustainability?

Hypothesis B.(2): ‘Location-based’, ‘location environmental events’, ‘environmental activities’, ‘link local to global’ and ‘enable communication with business and stakeholders’ have a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

5.2.3.3. Social Learning

Education significantly strengthens the role of promoting a feeling of a ‘citizenship environment’, in which people know their environmental rights. It also enhances pro-environmental principles and shared responsibility (Dobson, 2003). Educational programmes can change behaviour towards the pro-environmental (DEFRA and Great Britain, 2006). However, mutual learning is important for generating changes in behaviour (Nye and Burgess, 2008). Social support might encourage individuals to engage in sustainability objectives (Parker et al., 1994, Ferney et al., 2009, Severson et al., 2008, Selltiz et al., 1976). The immediate and systematic support and monitoring of public situations through updates and provision of up-to-date information promotes

engagement (Parker et al., 1994, Selltiz et al., 1976, Ferney et al., 2009, Severson et al., 2008).

Many methods can be used to educate people to increase public knowledge and change behaviour. Education, movies and environmental films are good ways to develop social norms in society to face the challenges of climate change and increase public response. Contests, small films and multimedia products are attractive items to facilitate acceptance of external interventions and can engage people towards sustainability objectives (Brouwer et al., 2008, Ferney et al., 2009). They can create a clear visual image of environmental issues. This can increase engagement and encourage a willingness to contribute to improving alternative environmental solutions; it can also create environmentally active and pro-environmental persons (e.g., Climate Change Communication Advisory Group, 2010).

The proposed model for social learning has many properties that are superior to the existing models for social learning because it is concerned with affective factors; it takes into account personal characteristics, situational characteristics and location, event and time determinants to form appropriately oriented social learning which offers accuracy, quality and speed in investigation and response to the person's situation by responding to the nature of the factors influencing people's behaviour and the dynamic character of a given situation, including temporal and spatial events. This was accomplished by taking advantage of ICT: 'Context-Aware', 'Location-Based', 'Profiling and labelling', and 'Event-Based and Game-Based' modules.

Game-based learning approaches include the existing methodologies for education, which are designed to stimulate thinking to resolve complex issues through play. Authentic questions are displayed and integrated with multiple tools and resources which are incorporated to motivate learners to learn by doing and guide them to select the path of events and the way of thinking. Both the hedonic and the challenging in the game-based learning approach are used to motivate learners to overcome complex incidents, so they exert effort to demonstrate and prove their prowess (Brooks et al., 2009, Urban, 2009, Boyd et al., 2009, Williamson et al., 2005, Underwood and British Psychological Society, 2007). Game-based learning theories are in their infancy stage, though. Researchers are attempting to study computer games with socio-cultural approaches to learning by mixing open-ended and closed-ended problems (Gee, 2007, Freitas et al., 2011, Williamson et al., 2005). Advantages of game-based learning include training and practice, help in

decision-making, enhancement of skills and experience, increased awareness of consequences, interpretation and analysis of problems through simulations with real cases and contributions to building a cognitive framework (Boyd et al., 2009, Williamson et al., 2005, Brooks et al., 2009, Underwood and British Psychological Society, 2007). Squire and Jan (2007) conclude that players use the outcomes from game-based playing as guidance for their decisions. Playing games may improve innovation and enhance ways of thinking and achieving social value (Shaffer and Gee, 2007, Squire and Jan, 2007). According to Squire and Jan (2007), players participate in a complex integrated system to stimulate the ‘emotional and cognitive’ and enhance their skills to solve complicated problems.

As a part of the conceptual model components, this study tries to explore the expected role of the ‘Social learning’ techniques associated with the engagement platform on the individual preparedness towards sustainability behaviour. The research question and hypotheses were formulated as follows:

RQ 2.3: What are the roles of ‘social learning/online learning, including Game-Based’, to encourage people to promote ‘preparedness to engage’ towards sustainability?

Hypothesis B. (3): ‘Social learning’ technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

5.2.3.4. Individual Social Marketing

Social marketing strategies might change social norms to build environmental social capital (Corner and Randall, 2011). Social marketers, both scholars and practitioners, have come to accept that the fundamental objective of social marketing is not promoting ideas, as Kotler and Zaltman (1971) mention, but influencing behaviour (Andreasen, 1995); thus, this technique has been expanded for use in different aspects and countries. The social marketing approach has been applied in a wide range of countries and fields and used to support pro-environmental actions in various countries. For example, it is widely applied in the US and interest in social marketing has grown significantly beyond North America and the United Kingdom. In particular, innovative work has been conducted in Australia and New Zealand (Stannard et al., 1998, Otto et al., 1994). For example, the Australian government undertook a campaign called ‘Travel-smart’ (Corner and Randall, 2011). Social marketing centres have been established in Scotland, Canada,

and Poland, and social marketing training programs have been held across the globe. However, social marketing has been applied in different aspects to promote positive behaviour. According to Hornik (2002), there is evidence of social marketing's impact on health promotion campaigns designed to change behaviour, so it has been extended to apply to the health field (Gordon et al., 2006, Hastings, 2007, National Social Marketing Centre, 2006). UNAIDS has recently invoked social marketing as a primary tool in its fight against AIDS, and the World Bank is regularly conducting distance learning sessions using social marketing concepts (Andreasen, 2002). Social marketing can also apply to such purely behavioural challenges as keeping girls in school in developing countries (Schwartz et al., 1994) and inducing parents to stop abusing their children (Stannard et al., 1998). However, these strategies are useful in promoting pro-environmental behaviour (McKenzie, 2000, McKenzie-Mohr and Smith, 1999, Peattie and Peattie, 2009). The use of a social marketing approach in environmental awareness campaigns which focus on social norms and seek to remove social barriers to behavioural change can lead to engaging communities and social networks to serve environmental issues, for example, climate change (McKenzie, 2000). It has been used to increase public awareness and to let people have more interactive dealings with environmental issues. It also plays a significant role in supporting international organizations and national initiatives for environmental problems; for example, the British government used this approach when dealing with the public to incentivize the public's behaviour towards pro-environmental action (Department for Environment and Rural Affairs, 2008). Using this approach, the Department for Environment and Rural Affairs (DEFRA) tailored its communications to seven categories, with each category having special motivation and behavioural-change solutions. This kind of approach is popular in governments (Department for Environment and Rural Affairs, 2008) and non-governmental organizations (Crompton, 2010) which seek to engage the public on environmental issues. However, there is criticism of this approach: some studies claim that the tailoring of messages is limited (Dale and Newman, 2008, Jones, 2010, Corner and Randall, 2011). The limitation of this approach leads to the urgent exploration of alternative ways to engage the public, both in communications and in practice (Corner and Randall, 2011). Alternative approaches to engaging individuals must seek to foster desirable behavioural intentions and practices (pro-environmental) and discourage actions that harm the environment (Story and Forsyth, 2008).

Social marketing approaches use traditional advertising methods to spread information and shift attitudes, but they also use community representatives to work with their neighbours to establish social influence and create new habits and group norms (McKenzie-Mohr, 2000, McKenzie-Mohr and Smith, 1999). While social marketing can be effective in promoting environmentally sustainable behaviours, these efforts have some critics in the literature; they require time and money and may not be scalable with current resources. Thus, one innovative approach proposed in this model to engage people in environmental issues was labelled the ‘Individual social marketing’ approach to environmental campaigns, which proposed with other modules in this study to decrease time, cost and effort of running the social marketing campaigns; thus, sort and fix most of the issues related to the criticism mentioned above about social marketing. The research question and hypotheses associated with these ICT techniques were as follows:

RQ 2.4: Can ‘Individual Social Marketing’ be used within the BSN to promote individuals’ ‘willingness to engage’ in a sustainable community?

Hypothesis B. (4): The ‘individual’s social marketing’ technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

5.2.3.5. Individuals’ Profiling and Sustainable Labelling

Environmental problems are social problems. Social dimensions and social variables play significant roles in determining people’ decisions to change anti-environmental behaviour (Whitmarsh et al., 2011, Whitmarsh and Lorenzoni, 2010). Social identity theory (SIT) suggests that people’s identity as members of a group (social capital) affects individuals’ knowledge and behaviours. According to (Bourdieu, 1993), the social capital can be defined as a composite of social network connections, “contacts and group memberships which, through the accumulation of exchanges, obligations and shared identities, provide actual or potential support and access to valued resources” (Bourdieu, 1993, p. 143).

With social capital, three types of connections between members can exist, bonding, bridging and linking; all these types of connectedness play important roles in affecting social networks’ communities (Coleman, 1988, Putnam et al., 1994). According to Granovetter (2005), Pretty and Smith (2004) and Krishna (2012), social capital has a positive impact and improves social well-being; it involves strong links with local

communities (Casaló et al., 2007, Koh and Kim, 2004, Tsai and Ghoshal, 1998, Deroian, 2002, Whitmarsh and Lorenzoni, 2010). Social capital influence can help sustainable development to manage the environment and conserve natural resources.

This highlights the importance of exploiting the role of social networks in using social relations to attract/influence people towards sustainability and achieve acceptance of the solutions proposed.

It was recognized that the desire to enhance one's social capital is a strong incentive to engage them to immerse in collective actions to cope with social dilemmas. A sense of reciprocity can foster strength, trust and continuity and contribute to creating a sense of obligation between members (Pretty, 2003, Coleman, 1988, Putnam et al., 1994). The sense of belonging in interactive environments as well as the tendency to imitate peers can contribute to promote sense of obligation between members and can lead to pro-environmental actions and promote the intention to change behaviour.

Individuals can be influenced by their social capital's sustainable profile through profile and sustainable labelling techniques to be compelled and participate in sustainable development. Profiling and sustainable labelling which highlight to members the sustainable performance of neighbours and their related social capital can lead to increased pressure on individual to engage in a sustainable lifestyle, which is crucial to the ability and flexibility to work and adapt to conditions that threaten to deplete environmental resources and to preserve those environmental resources (Rawson et al., 2010). Furthermore, a sustainable lifestyle can be promoted by utilizing the influence of individual social capital sustainability achievement through the profiling and sustainable labelling technique, to promote engagement in sustainable lifestyle and tackle environmental problems.

This study seeks to test the two proposed techniques, which can be used to increase individual preparedness to engage in sustainable lifestyle; the individual profiling and the sustainable performance labelling, which can be used to encourage people's engagement in sustainability by utilising member's social capital and imitating sustainable performance of other people.

In this research, the research question and hypotheses associated with the effects of individual profiling and sustainability performance labelling on individual preparedness to engage in sustainability is formulated as follows:

RQ 2.5: What are the roles of ‘individual profiling and sustainable labelling’ to encourage people to promote ‘preparedness to engage’ towards sustainability?

Hypothesis B.(5): The ‘individual profile’ and ‘sustainable labelling’ technique lead to increased social capital and social support, which in turn has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

5.2.3.6. Proposed Innovative Hook and Attraction Module

Social networks have penetrated the community, so people are attracted to and tend to use on-line social networks for several reasons. Their special characteristics distinguish them from other means. They provide a sense of presence, sociability and usability, a sense of belonging, a space for discussion and dialogue and satisfaction of needs, such as transactions, interest, enjoyment, hedonic pleasure and relationships (Blanchard, 2008, Blanchard and Markus, 2004, Koh and Kim, 2004, Sangwan et al., 2009, Tonteri et al., 2011, Moon and Kim, 2001, Koh and Kim, 2003, Hagel and Armstrong, 1996, Hsu and Lu, 2007). In addition, the linking of friends or members who have same concerns and interests is a significant feature of social networks (Chiu et al., 2006, Ley, 2007, Miyata, 2008, Tu, 2002).

Given the importance of attracting people to use the 'Blended Social Network', the conceptual model of the study incorporates the design of an efficient and effective module using the characteristics of existing social networks and explores new distinctive characteristics which might have more efficient attraction features than current online social networks. Thus, the study adds a new technique related to this matter informed from literature to the construct of the conceptual model which is labelled the ‘Attraction and hook technique’. Two stanchions form the hook and attraction module: (a) participate in current trends events and (b) create permanent incentives for users. Figure 5.2 shows the mechanism of Individual’s attraction and motivation techniques.

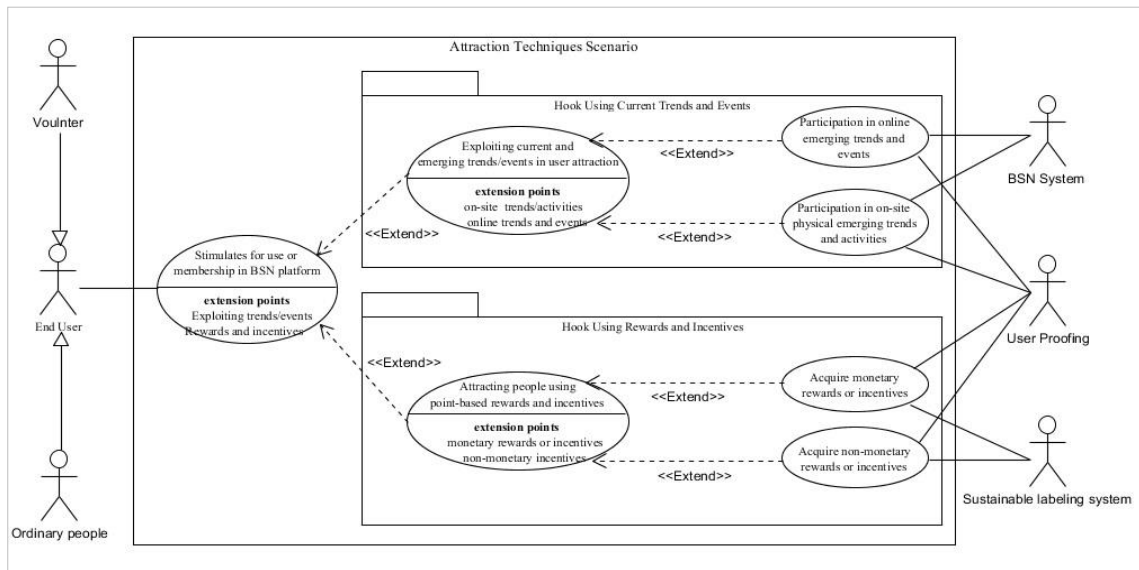


Figure 5.2 Individual's attraction and motivation techniques mechanism

Event Activities and Trends; Participating in Current Trends and Events:

Where spatial presence is salient with a clear definition of identity for members, members can benefit from physical and virtual social relations. Such relations enable communication with recognized people, which enhances the level of trust among members (Eiser et al., 2002, Poortinga and Pidgeon, 2003b, Poortinga and Pidgeon, 2004, Dawes, 2008, Climate Change Communication Advisory Group, 2010, Blok, 2007). The event-based approach grounds the social networks in specific locations that are linked to a unique composition of individuals who are engaged in protective or risk-exacerbating behaviours. The virtual communications that link people with physical events or are similar to face-to-face communication may attract people to use them and consider them a foundation for location-based services (Steiniger et al., 2006).

The hook technique function enables members to follow both the logical and physical current trend events, on a small scale (local or national) and on a larger scale (global). Members can follow logical events in a timely manner through the Internet and discussion forums and they can also receive suggestions to follow current trend physical activities and events on a small or large scale; in addition, members can follow up-to-date and recent news about those events. The mechanism utilises an individual's profile and sustainable labelling to suggest appropriate trend events and information of interest based on their profile, location and current situation.

This technique works through virtual and physical events and activities. There are two types of activities: physical activities, which are sometimes called field activities, and virtual activities, which are provided through the Internet. These activities represent trend events that draw people's feelings at the current moment. They may be local or global, internal or external, including political events, social or cultural activities, sporting occasions and even catastrophes and disasters. This model enables members to participate in such activities virtually through forums and newsrooms, discussions and post comments.

This technique is also used to enhance and enable people's involvement in current events by informing members about the events and facilitating their participation in the events. It enables connections among people and recommendations for current physical activities or incidents nearby through, for example, podcasts. These connections are a means to enable individuals or even groups to find out what is going on around them and to draw people at both the micro and macro levels. Thus, such connections might work to attract people to engage in the 'Blended Social Network'. The associated research question and hypotheses were formulated as follows:

RQ 2.6: What are the roles of adding the 'participating in current trends and events/Event activities and trends' technique within the 'attraction module' to encourage people towards 'preparedness to engage' towards sustainability?

Hypothesis B. (6): Adding 'participating in current trends events/Event activities and trend' within the 'attraction module' has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

Create Permanent Incentives:

Furthermore, this hook technique can also be used to invite related organizations, commercial sectors and decision makers for policy and regulation to give members incentives in the form of status in their sustainable profile through the 'Attraction incentives module'.

The theory of rational choice or standard economic theory assumes that individuals tend to act rationally and choose their behaviour based on cost, expected benefit or 'expected utility'. The theory suggests that human behaviour forms as selections on the basis of

costs and maximising benefits. Most of the social-psychological models consistent with standard economic theory consider behaviour as a decision-making process and assume that behaviour is part of planning for the future, based on the expectation of benefits (Loewenstein et al., 2001). Behaviour in these models relies on intention and expected outcomes, which led to social-psychological approaches that can be seen as building on standard economic theory. Models of individual behaviour tend to be linear, or multi-linear, in shape and the simplest follow rational choice theory, which assumes that individuals perform cost/benefit calculations and act accordingly.

Rational economic models assert that people engage in environmental behaviours according to what will give them the most individual economic benefit. This model has been popular with economists and many incentive-based environmental programmes. Applications of this model include grants for home insulation and increased taxation on polluting fuels. In surveys, more people claim they conserve for economic benefit than out of environmental concern (DEFRA, 2002). While economics certainly plays a role in behaviour, the immediate drawback of rational economic models is that people are not purely rational and do not determine their everyday behaviours after an exhaustive cost-benefit analysis. Few even follow the money-saving advice they receive (Hirst et al., 1981). The most interesting finding of incentive-based programmes is not that economic incentives can motivate behavioural decisions, but that they rarely appear to do so. While people often claim economic rather than social reasons for conserving, research suggests that social norms are actually more influential than saving money (Nolan et al., 2008). Thus, taking into account the care in containment of social factors dealing with environmental aspects and developing tackling strategies are both important issues.

Many people in the US oppose any increase in fuel prices or price of flights (Bord et al., 1998); it is likely that they would accept initiatives that do not affect an individual's life or cost of living and that they would oppose initiatives that have a significant impact on lifestyle. Whitmarsh (2009) mentions that most people use energy-saving options to save money or for financial incentives, not due to pro-environmental thinking.

Environmentally beneficial actions often result from non-environmental concerns, such as a desire to save money (Stern, 2000, DEFRA, 2002). In the context of energy use, habit and economic influences appear to be particularly salient (Clark et al., 2003, Poortinga et al., 2004, Verplanken et al., 1998). Other research has found that financial motivations most commonly underpin energy conservation (Brandon and Lewis, 1999).

To ensure the achievement of diffusion in this kind of network, the properties of the diffusion of innovation theory (DOI) from Rogers and Everett (1995) were compared. This theory suggests that specific factors affect the diffusion of any innovation (e.g. product, idea, tool, solution) or behaviour. These factors are communication, the social system, and time. These factors have been taken into account when constructing the proposed conceptual model, so the attraction module incorporates these factors and conditions. Furthermore, the literature concludes that the effect of permanent incentives on personal behaviour must be taken into account to build permanent and effective attraction techniques; thus, such techniques may overcome the problem of people returning to their previous behaviour when the incentives expire.

However, personal identity is built by configuring a person's profile. Each person has a detailed profile in addition to labelling for pro-environmental activities which reflect the person's actions and behaviour towards participating and learning from the network to increase knowledge and serve the environment. The labelling and profile are extremely important to promote sustainability. Specific criteria can be added to enable showing the current level of attraction to environmentally friendly activities and environmental behaviour for each member. This contributes to accurately identifying a person by demographic and behaviour determinant variables, which seems to strengthen the functionality of the proposed model in attracting people to use it; thus, it can help people and stimulate them to adopt pro-environmental behaviour. According to rational theory, the cost and benefits and moral incentives and awards may stimulate environmental behaviour if continuously applied. These and other factors proposed in this technique might create systematic, permanent incentive stimulation which is fair and useful for people, attractive and acceptable to all parties and applicable for all spectrums of society. This collaboration might create a solid platform to serve the environment while stimulating users with permanent systematic incentives and activate the role of the private sector and business firms as well as associations, assemblies, government agencies and environmental organizations. This systematic stimulation module works by giving rewards, discounts and incentives to individuals; these incentives will vary depending on the pro-environmental person's behaviour, such as based on the position of the environmental label and points earned by the person. The incentives may include discounts from utility service providers, for example, electricity and water companies or energy suppliers; discounts for environmentally friendly products or devices; any other

activities related to encouraging the user as well as in honouring, encouragement and courtesy incentives.

This technique complements the basic model proposed in this study; it specializes in attracting people towards using the proposal model and seems to help people to adapt, deploy and diffuse the model. This module does not work alone, but within an integration model, and therefore supports the conceptual online social network to be integrated and comprehensive by including many integrated solutions to attract people towards pro-environmental behaviour.

RQ 2.7: What are the roles of adding the ‘permanent incentives’ technique within the ‘attraction module’ to encourage people towards ‘preparedness to engage’ towards sustainability?

Hypothesis B. (7): The ‘permanent incentives’ created through the ‘attraction module’ within the ‘Blended Social Network’ has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

5.2.4. Communities of sustainability: Characteristics and activities

A community of practice is defined as ‘a set of relations among persons, activity, and the world, over time and in relation with other tangential and overlapping communities of practice’ (Lave and Wenger, 1991, p. 98). Wenger et al. (2002) define a community of practice as ‘a group of people that share a concern, a set of problems or a passion about a topic and who deepen their knowledge and expertise in this area by interacting on an on-going basis’ (Wenger et al., 2002). McDermott (1999, p. 1) defines communities of practice as ‘groups of people who share ideas and insights, help each other solve problems and develop a common practice or approach to the field’. Such communities sometimes work virtually via the Internet; hence, they are called virtual communities or on-line communities. According to Nye et al. (2010), virtual communities are sets of communities of practice that are informal entities: their members are linked with each other via virtual links (e.g. the Internet) to share common interests or solve specific problems (Nye et al., 2010).

Many studies have explored the role of online communities on their members (Balasubramanian and Mahajan, 2001, Kardaras et al., 2003, Preece et al., 2004, Wachter

et al., 2000, McLure Wasko and Faraj, 2000). A virtual community overcomes spatial and temporal borders by enabling people to communicate with their peers at any time, any place, through their virtual network (e.g. the Internet), thus establishing the social relationships that strengthen the sense of belonging among members: this is called a 'sense of community' (SOC) (Chiu et al., 2006, Ley, 2007, Miyata, 2008). The members or group of members of an online community link and communicate via electronic media (e.g. the Internet) to share objectives of interest and to achieve common goals without the constraints of geographic boundaries, ethnic origins or time zones (Kardaras et al., 2003, Romm et al., 1997). The communities consist of (i) people, (ii) purpose, (iii) policies and (iv) computer systems. Blanchard and Markus (2004) state that the members of a virtual community feel a commitment to and need to 'give back' to their peers in their community (McLure Wasko and Faraj, 2000). According to Blanchard and Markus (2004), members of virtual communities engage in community-like behaviour, such as helping others and giving mutual support to achieve certain objectives, and a 'sense of virtual community' (SOVC) results from continued engagement in such behaviour. The expected benefits will have an impact on participation in the virtual community. The community provides a basis for identifying concerns, thereby encouraging participation (Blanchard and Markus, 2004, Wasko and Faraj, 2005).

Indeed, much attention has been given to the community as a means of empowerment, providing innovations to find solutions for environmental problems, e.g., innovations in low carbon use (Seyfang and Smith, 2005, Smith, 2007). Such civil communities can enhance people's response to environmental issues and can also improve social capital and civil society (Ockwell et al., 2009). Furthermore, they can contribute to raising awareness, motivating pro-environmental action and providing space for people to discuss and suggest means of mitigating environmental problems (Ockwell et al., 2009). As a result of their potential benefits, various community-based groups have emerged. In 2007, for example, there were approximately 2,000 to 4,000 such communities (NEF, 2007). However, '[practice] does not exist in the abstract. It exists because people are engaged in actions whose meanings they negotiate with each other' (Wenger and Etienne, 1998, p. 72). The mutual engagement between members occurs due to their engagement in meaningful actions; thus, they develop shared practices and are linked through their mutual engagement in such activities (Oreszczyn et al., 2010). However, environmental communities have the following objectives and goals: (i) adopt effective communication

to bring about behavioural and cultural changes and to become a knowledge-based and cooperative organization; (ii) integrate the ‘knowledge management’ concepts and best practices into the community and allow all members to deliberate on how to improve performance and enhance environmental issues locally and globally, (iii) transform environmental activities and spread tacit knowledge and experiences so that they become explicit and more organized in institutional-based works, (iv) dispose of spatial and temporal boundaries: discussions of experiences and knowledge can be deliberated on-line 24/7, locally and globally and (v) develop relations and enhance trust to harness social capital and knowledge organisation.

The manner by which information is exchanged within a community is likely to increase its innovation and solutions: innovation growth is a result of encouraging members and increasing the sharing and merging/combining of knowledge within the community (Tsai and Ghoshal, 1998, Deroian, 2002). The members of a community of practice have the ability to exchange experiences by virtual participation (Hagel and Armstrong, 1997), share interests, information and knowledge or ideas and gain emotional support from the community and community members (Casaló et al., 2007, Koh and Kim, 2004). Explicit or formal knowledge, as well as less tangible, tacit and informal knowledge is shared and exchanged in the community: this can lead to changes in action and processes (Probst and Borzillo, 2008, Brown and Duguid, 2001, Nambisan and Baron, 2007). Furthermore, the community is likely to reuse the knowledge, to increase efficiency (Davenport and Probst, 2002), or give a fast response to circumstantial changes or member requests, and this is likely to reduce learning curves for community members (Lesser and Storck, 2001, Dubé et al., 2005). The community thus overcomes boundaries to knowledge transfer, as the knowledge can be shared throughout the community (Wenger, 2000) and outside the community (Wenger et al., 2002). Floyd and Lane (2000) mention that the community needs to exploit existing and new knowledge. Members can increase mutual knowledge-sharing and the efficiency of knowledge exchanges (Lane and Lubatkin, 1998, Chiu et al., 2006).

The community can gather data from various perspectives and backgrounds, including expertise and member feedback. Through a community, human capital is exploited to develop the best solutions (Lesser and Everest, 2001). The engagement of people in a sustainable community can be the way to change people’s opinions when they blame

businesses or industrial segments or rely on government responsibility (Lorenzoni et al., 2007).

Frey and Stutzer (2006) claim three factors involve people: (i) the importance of personal relationships and recognizing the benefits of a community for stimulating change, (ii) the importance of the role of mutual communication for learning about and acknowledging responsibilities and (iii) the public being given priority in participating in decision making: more involvement in decision making means more adoption of decisions (Ockwell et al., 2009).

Interventions do not necessarily lead to people participating or enhancing pro-environmental action, but they can stimulate individuals towards positive environmental action (e.g. conserving energy by reducing energy consumption, using renewable energy alternatives or natural resources, such as solar or wind power) through effective communication, social interaction and letting people feel the benefit of participation (Ockwell et al., 2009).

Exchanging knowledge between communities and local people (residents, visitors, and tenants) allows people to feel part of the community and contribute to improving sustainable activities. It gives them an opportunity to discuss local environmental problems and allows them to enjoy neighbourly support and cooperation. It also gives other community members a chance to present valuable initiatives for their local community. Ockwell et al. (2009) argue that communication is significant for promoting the acceptance of policies and regulations (Climate Change Communication Advisory Group, 2010). Effective communication plays an important role in encouraging people to remove structural barriers (behavioural/societal) (Climate Change Communication Advisory Group, 2010).

Poortinga and Pidgeon (2003a) mention distrust between government and citizens regarding environmental problems: citizens tend to believe that the influence of industries leads to a lack of government response to environmental issues, in particular, to climate change. However, they accept the need to share the responsibility for environment issues among all social groups (individuals, society, businesses and industries, firms and governments) (Bibbings, 2004). On the other hand, many people feel that individual efforts to mitigate the impact of environmental problems, e.g. climate change, are not enough, while other society members do not share sufficiently the necessary

responsibility or action (Hinchliffe, 1996). Of course, governments require various methods to help to rebuild confidence in individuals and this leads to a sharing of responsibility at all levels of society by activating communities. Communities have a strong influence over our lives and an ability to be pervasive on many levels (Communities of Practice Promoting Sustainability in Organizations and Society, 2003 OD Network Conference). Technology is used to support and mediate social interaction and to facilitate a sense of togetherness.

According to Tu (2002), social presence is the ‘degree of salience of another person in an interaction and the consequent salience of an interpersonal relationship’. Social presence has an impact on people’s desire to support the association, in particular on-line virtual networks. According to McKenna and Green (2002) and Spears and Lea (1992), social identity is considered an important factor which plays an active role in social group communications (McKenna and Green, 2002, Spears and Lea, 1992). In a community, social identity is called a sense of community and a sense of virtual community has crucial effects on members’ behaviours (Blanchard, 2008, Blanchard and Markus, 2004, Ellonen et al., 2007, Hars and Ou, 2002, Yoo et al., 2002, Dholakia et al., 2004). For instance, an SVOC promotes member’s participation (Chiu et al., 2006). The sense of belonging/membership also promotes integration, enhances commitment and stimulates the emotion to engage with community objectives (Blanchard, 2008, Blanchard and Markus, 2004, Koh and Kim, 2004, Sangwan et al., 2009), which leads to increased member satisfaction, experience and participation (Casaló et al., 2007, Thompson and Sinha, 2008).

According to this study, it is likely that solutions which pay special attention to activating the role of environmental organisations and scientists and which emphasise the role of social relationships (i.e. family, friends, neighbours, and other related relationships) will be most successful. When developing environmental solutions, it will be necessary to take advantage of and facilitate certain issues, including those associated with building and developing environmentally complementary integrated solutions.

5.3. The Development of Theoretical Validation Framework

The framework of theoretical validation of the study is divided into (i) the basic theoretical validation framework for measuring ‘preparedness to engage’ which is presented in the first following section, including a detailed discussion of ‘cognitive’ and

‘affective’ factors in relation to general information about the ‘intention to change behaviour’ factor and (ii) the theoretical framework used to test the validity of the model in promoting individuals ‘intention to change behaviour’. The second following section includes details about the second theoretical framework and all associated determinants.

5.3.1. Measurement of Individual Preparedness to Engage in Sustainable Lifestyle

As indicated in the literature, three individual engagement factors can be used to measure individuals’ ‘preparedness to engage’; these factors are ‘cognitive’, ‘affective’ and ‘Intention to change behaviour’ (Lorenzoni et al., 2007). Figure 5.3 shows the basic theoretical framework to measure ‘preparedness for engagement’.

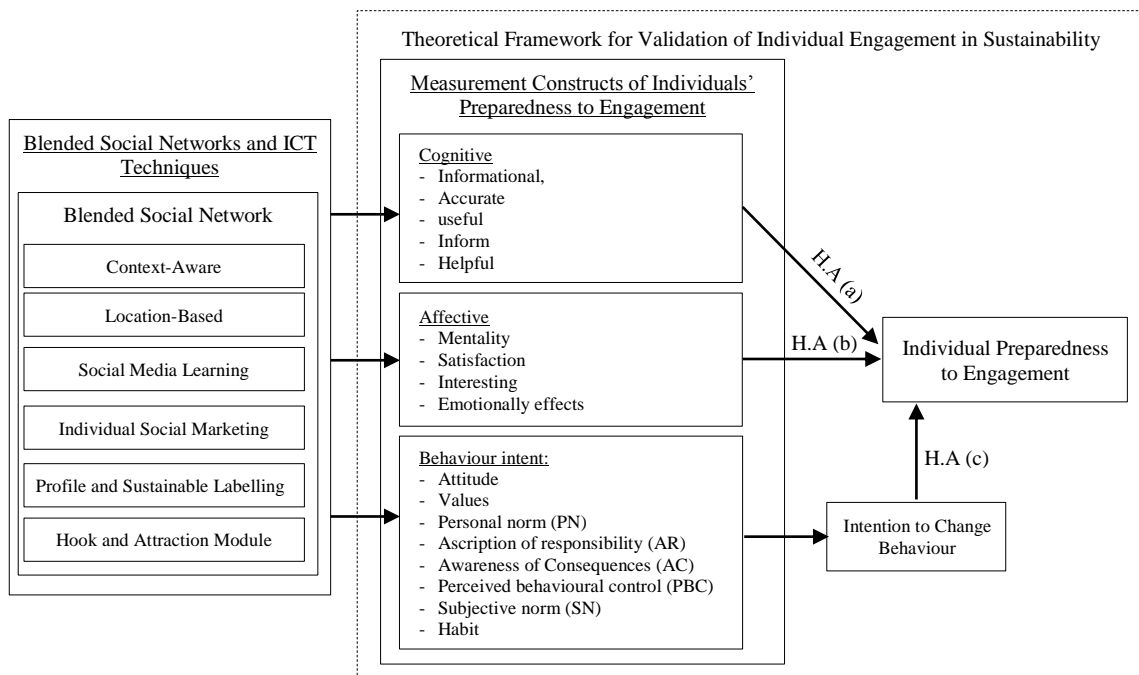


Figure 5.3: The theoretical framework to validate the effects of the ‘Blended Social Networks’ on individuals’ ‘preparedness to engage’ towards sustainability.

5.3.1.1. Cognitive

The cognitive aspect is important for engaging people in sustainability and tackling environmental problems. It is concerned with the mental process of knowing and knowledge issues and is skills-related (e.g., perception, awareness, intuition, reasoning, judgment). It gives the brain a way to think, learn, and remember. Those skills allow individuals to collate the huge influx of information they receive daily at work, at school and in life. The cognitive aspects affect the way people deal with information obtained. However, knowledge is a basic cognitive component and information is its core. So information is the base of the cognitive structure. By providing information, then, we can

build up the cognitive structure in question. However, information is the way to show what was hidden and contributes to adjusting people's behaviour and activities, e.g., in energy use (Kempton et al., 1992, 1217). The integration of information is important; e.g., if information is integrated in a cognitive or emotional way it influences behaviour (Newhouse, 1990, 29). Indeed, there is little engagement in sustainability programmes due to a lack in the cognitive aspect arising from a lack of information. Norton and Leaman (2004) mention that most people feel there is a lack in the provision of information to the public from the government: for example, only eight per cent reported that the government provides all the information needed by the public on climate change (Norton and Leaman, 2004). However, the provision of environmental information in some cases does not concern the emotional effects, e.g. inducing feelings of guilt or a lack of interest or empowerment, and this in turn may have reversed effects when trying to involve people in environmental issues (O'Neill and Nicholson-Cole, 2009, Hargreaves, 2010, Whitmarsh et al., 2011). Information and the corresponding emotional response to climate issue, for example, remains limited, even though, the severity of the issue has reached a state of global consensus (Pfleeger and Atlee, 2010, Lorenzoni et al., 2007, Royce, 1970). This state of affairs then, makes apparent the need to customise information and tailor communication, which may include feedback, and has a significant impact on the cognitions and actions taken (Boardman and Darby, 2000). Information should be tailored to the audience's norms, values and beliefs. Trust in information and resources is very important, as is the reliability of information (Whitmarsh et al., 2005). It is important for people to have sufficient information and knowledge to help them mitigate bad effects on the environment. For example, one study claims that consumers expend considerable effort to understand their detailed energy use from bills or meters (Kempton and Layne, 1994). More campaigns and information presented to the public leads to high levels of public awareness and acceptance of the issues concerning climate change, in this case (Lorenzoni et al., 2007, O'Neill and Hulme, 2009). However, the provision of information alone is not sufficient to encourage people to change their behaviour (Jackson, 2005) or lifestyle or to enhance public acceptance of environmental policies or legislation. E.g., Lorenzoni et al. (2007) state that 'it is not enough for people to know about climate change (cognitive) in order to be engaged; they also need to care about it (affective), be motivated and able to take action (behaviour)'.

The provision of information in an uncritical way, however, is not sufficient. The ‘information-deficit’ model, which assumes that members of the public are ‘empty vessels’ waiting for information to lead them to rational action, is criticised as inappropriate and ineffective (e.g., Irwin and Wynne, 1996). This does not mean that we can ignore that uncertainty and a lack of knowledge lead to less participation and understanding of environmental issues and engagement in environmental issues (Whitmarsh et al., 2011); also, this is not to say that education about environmental issues is unimportant, but rather that education alone is rarely enough to bring about behavioural change. A deficit of environmental information can be a barrier to pro-environmental action at many levels, such as realising an environmental problem exists, knowing which behaviours are problematic and identifying which alternative behaviours would be beneficial (Lorenzoni et al., 2007; Whitmarsh, 2009). O'Neill and Nicholson-Cole (2009) believe that if people do not have a sufficient understanding of climate change the result will be to reject environmental policies. However, appraisal of information is likely to affect engagement. This appraisal effect comes about through social and physical action (Kollmuss and Agyeman, 2002). For instance, individuals with a negative assessment of the effects of climate change are more positive in dealing with environmental issues (Bord et al., 2000). Culture also has an effect on the appraisal of information: Kahan et al. (2010) argue that culture plays a significant role in individuals’ perspectives in their assessment of the credibility of climate change experts. This the change behaviour programs need to considered the following points (i) need to identify the change needed form audience precisely, (ii) know the audience needs, the current knowledge they have and respect their preferences when interact with them; (iii) find out about existing barriers to making the change including the external barriers such as the costs, time, not convenient, conflicting with their attitudes or laws, availability of technology and alternatives, etc.; and the personal barriers such as recognize the problem, know what to do, their attitude for example they do not consider it a priority, feel it’s too hard, doesn’t have friends doing it etc.; (iv) using appropriate strategies to reach the audience using the behaviour change principles such as commitment, getting involved, Feedback and follow-up, credibility, vivid and use language and memorable image which provide a demonstration that will stick in audiences’ mind; get personalise information and ensure data personally relevant; use more emotional messages than logical ones. Jamieson et al. (1993) claims that people may ignore information or interpret it so it reinforces existing attitudes, beliefs or values (Jamieson et al., 1993).

5.3.1.2. Affective

The interventions and language used to attract people to environmental solutions must be given more thought; it must have the ability to arouse the emotions of and motivate individuals and social groups. Some researchers have found that people engage with terms interpreted as affective; for example, Whitmarsh (2009b) claims that ‘global warming’ is more emotional than ‘climate change’: both phrases refer to the same issue, but using ‘global warming’ in a campaign is more effective (Whitmarsh, 2009b). However, there are constraints when dealing with the affective factor. Situational and personal constraints may affect an individual’s willingness to accept the solution to an environment problem, Garmen Tanner (1999) classifies those constraints into two categories: (i) the subjective, which refers to constraints that are inconsistent with the desire of the person regarding an environmental issue; for example, the belief that any conduct will have no environmental impact or a lack of attention to environmental issues, and (ii) the objective, which refers to constraints that prevent an individual's ability to apply the desired pro-environmental solutions; for example, limited time (time constraints) and cost or financial deficits (financial constraints) (Carmen, 1999). These constraints are needed to understand individual affective behaviour with regards to specific environmental issues, for example, reducing energy consumption (Sutton and Tobin, 2011). Constraints have influence in attracting people to environmental issues and vary due to demographic characteristics (Semenza et al., 2008, Sutton and Tobin, 2011). Both affective and cognitive factors are important for lifestyle changes. When trying to change lifestyle, people must have sufficient knowledge of the problems and how to deal with them. For instance, as a result of asking people about personal lifestyle changes to mitigate their environmental impact, most participants refer to recycling and conserving energy use in their home (e.g. turning off lights), but few refer to changed travel behaviour (DEFRA, 2002, Whitmarsh, 2009b).

5.3.1.3. Behaviour

Social and behavioural patterns are the main determinants of efficiency improvement in terms of resource use when it comes to serving the environment and creating long-term sustainability (Lutzenhiser, 1994, Schipper et al., 1989, Schipper, 1991, Stern et al., 1986, York, 2006). Sutton and Tobin (2011) define behavioural engagement as ‘actions that are undertaken when an individual chooses to invest personal resources (e.g., time, money,

energy, etc.) into efforts to address the climate change issue' (Sutton and Tobin, 2011). They claim that it is important to investigate and find ways to help people overcome the constraints they face concerning engagement in those activities and to identify the specific behaviour that individuals can undertake to make them more attracted to environmental issues (Sutton and Tobin, 2011). Most previous campaigns have failed to change people's behaviour because they failed to address factors or constraints that prevent pro-environmental individual action (Owens, 2000, Sutton and Tobin, 2011). Such campaigns however, can succeed in achieving behavioural engagement if they satisfy the following conditions: (i) the intention and desire of individuals to take action in environmental issues and (ii) the ability to undertake actions they willing to take (Sutton and Tobin, 2011).

However, programmes to change behaviour should start from the individual then gradually be extended to the rest of a target audience, and while a programme is running it should give people the ability to evaluate it and provide feedback (Hastings, 2007, Corner and Randall, 2011). People must feel the programme is commensurate with its social context and daily events (Pligt, 1985, Kollmuss and Agyeman, 2002). The 'spill-over effect technique', which claims that small behavioural changes will produce long-term and significant changes, must be considered when addressing behaviour change issues (Thøgersen and Crompton, 2009); and local initiatives need to be taken in consideration and given more attention and support. However, there is a difference between cognitive or affective engagement and behavioural engagement. Behavioural engagement might be spoken of independently as cognitive and affective engagement (Lorenzoni et al., 2007, O'Neill and Hulme, 2009, Sutton and Tobin, 2011). Cognitive and affective engagement may not lead to pro-environmental action, while behavioural engagement must lead to changes. Some studies find that the cognitive and educational do not necessarily lead to behaviour change even when they succeed in improving the cognitive and affective elements of engagement (Hines et al., 1987, McKenzie, 2000, Scott and Willits, 1994, Carmen, 1999). Thus, the study gives the behaviour change factor deep investigation. The following section presents details about the theoretical framework adapted to measure this diminution.

5.3.2. Theoretical Framework to Measure Behaviour Change

Note that while attitudes, norms and agency are common to most behaviour change models and theories, habit and emotion only appear in some, e.g. the theory of interpersonal behaviour (TIB) but not the theory of planned behaviour (TPB). Stern (2000) summarises the factors that influences environmentally significant behaviour as:

- Attitudes, values and beliefs - relating to the environment, but also to other issues, including comfort, aesthetics, quality, and time spent with family;
- Contextual forces - including social, economic, institutional and political factors;
- Personal capabilities (e.g. knowledge and skills) and resources; and,
- Habit (Lorraine, 2009).

In contrast, Steg and Vlek (2009) summarise it as perceived costs and benefits, moral and normative concerns, affect, contextual factors and habits. According to Steg and Vlek (2009), to be effective, the interventions must be able to affect and change behavioural determinants, change individuals' behaviours, change environmental quality and change individuals' quality of life (Steg and Vlek, 2009).

In general, values such as materialism, self-interest and self-efficacy may result in reluctance to use behavioural expressions, even those that have the consensus view of representing a desirable value. This occurs when people believe a value opposes their culture's values. This applies in pro-environment behaviour (Kasser et al., 2007, Maio et al., 2009, Corner and Randall, 2011).

This study is concerned with helping individuals improve their environmental behaviours, so the value-belief-norm (VBN) model is distinct when compared to other change behaviour theories and models; the VBN model was especially developed to predict environmental behaviour rather than other general behaviour, but actually this model has received criticism in the literature and is still under development (as mentioned in chapter four, Section 4.2.1.5). Most other behaviour change theories are used to examine factors that influence some kind of pro-environmental behaviour; for example, the theory of planned behaviour (Ajzen, 1985) and the norm activation model (Schwartz, 1977) are successful when used to examine such environmental aspects (Bonaiuto and Bonnes, 2002). These theories originally were not created to explain environmental behaviours but rather general behaviour, e.g. the TPB has been used to explain a wide array of

behaviours, such as weight loss and voting choice (Ajzen, 1991, Armitage and Conner, 2001).

Sustainable lifestyle is mixture of complex dimensions. It includes various types of behaviour domains, such as energy-saving, transportation including car use versus bus use, travel mode choice, recycling and the use of unbleached paper, resource and water saving and environmental activism support; each has its own related factors which must be considered to identify appropriate theories/models. Several authors indicate that different types of environmentally related behaviour are associated with different behavioural determinants (e.g. McKenzie-Mohr et al., 1995, Axelrod and Lehman, 1993, Stern and Oskamp, 1987). Thus, the type of behaviour to be examined should determine a suitable corresponding theory. Some theories/models might be beneficial when used to examine change in certain behaviours but fail or are less appropriate for examining other kinds of behaviour. For instance, the TPB might be relevant in explaining behaviours involving relatively high costs (time, effort, money), such as energy use (the energy saving depends on reducing the high cost and enhancing efficiency of the power), while the VBN variables seem to be more suitable for explaining behaviour that requires relatively low costs (time, effort, money) and ‘good’ intentions such as car use (the case of car use depends on low cost in terms of effort, money and time as well as maintenance) (Lindenberg and Steg, 2007).

Furthermore, generally, perceived behavioural control and attitudes are most strongly related to environmentally relevant behaviours and intentions, and subjective norms to a lesser extent. Several studies have extended the theory of planned behaviour with the norm-activation model (NAM) Schwartz (1977) variables and the personal norm concept in particular (Parker et al., 1995). Personal norms significantly add to the explanation of the theory of planned behaviour for a range of energy-related behaviours (i.e. the use of energy-saving light bulbs, the use of unbleached paper, meat consumption and car use for short distances) (Harland et al., 1999). Harland et al. (1999) find that personal norms (a NAM concept) add significantly to the explanation of various environmentally related behaviours, over and above the power of the TPB variables.

Therefore, all of the variables that might be used to examine a sustainable lifestyle are important to be involved in the theoretical testing framework of the study. One objective of the study is to enclose all factors affecting people’s intention to adopt a sustainable

lifestyle for use in examining the conceptual model. The proposed model in this study focuses on creating an adaptation of collective, co-operation and compatibility approaches with all patterns of lifestyle from online social networks and ICT. Thus, the model must include and investigate all factors in related theories/models to create a comprehensive theoretical validation framework which can be utilised to enable measuring all kinds of sustainable lifestyles with consideration of the conditions that can affect measuring a person's intention to engage towards sustainability. However, the study concludes that the Triandis theory construct has involved most factors that influence people's intention to change anti-environmental behaviour, including social dimension, but some determinants still need to be included; thus, the theory is appropriate for this study after adding those extended variables. Figure 5.4 shows the theoretical framework applied in the study to measure the effect of the 'Blended Social Network' and the 'ICT techniques' on individuals' 'intention to change behaviour'.

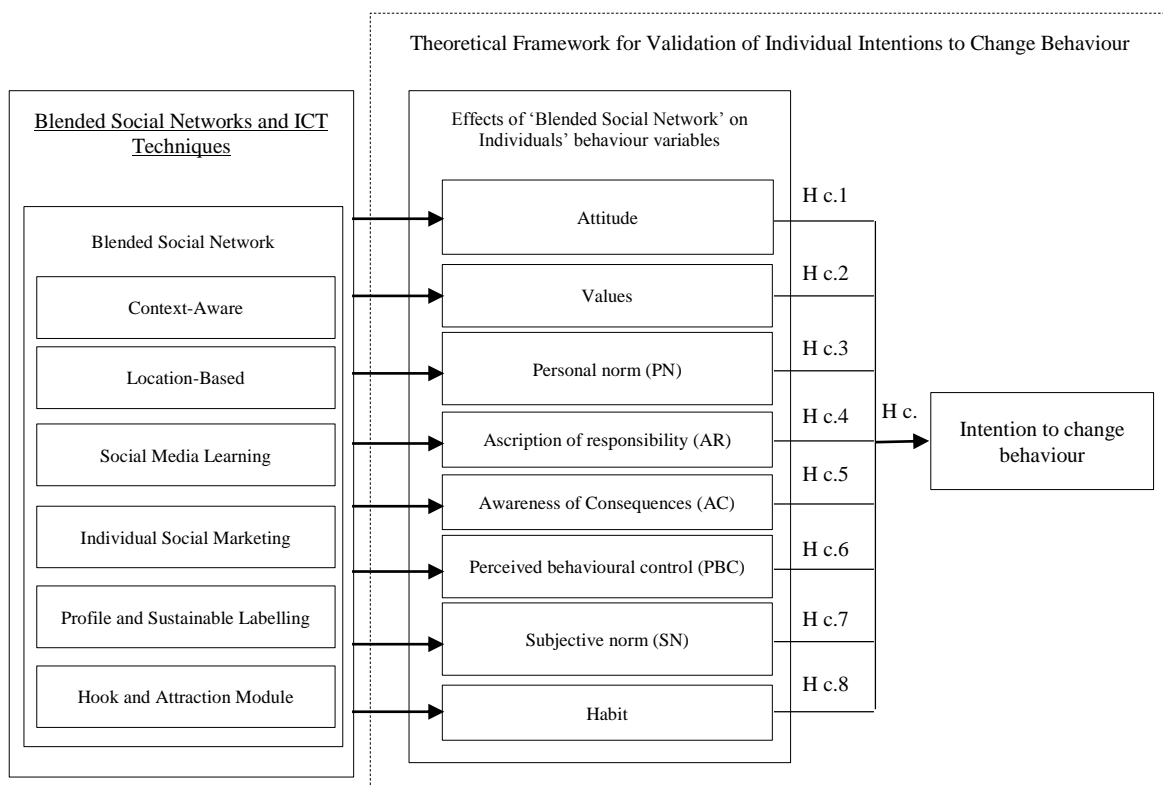


Figure 5.4: The theoretical framework to validate the effects of the 'Blended Social Networks' on individuals' 'intention to change behaviour'.

5.4. Summary of Chapter Five

Chapter Five presents the research hypotheses and detailed information about the conceptual research model. It presents the components of the model and the way in, which they might affect individuals' engagement in a community of sustainability. The discussion also covers the importance of exploiting social networks and social capital to conserve the environment. This chapter offers an overview of the idea behind the 'Blended Social Network' and its expected effect on achieving sustainability goals. The chapter discusses the innovation of the new technique to attract users to the 'Blended Social Network', which is labelled the 'Hook and Attraction Module'. Two stanchions form the 'Attraction module': (i) 'participate in current trends events' and (ii) 'create permanent incentives', and they are reviewed and discussed in this chapter. In addition, the enabling ICT techniques are presented in this chapter, including details about the ICT techniques proposed in the model: the 'Individuals Profile, and sustainable labelling', 'Education, Social learning, and Game-Based Learning', 'Local conditions, Link local with Global, Place-Based, and Event-Based and environmental activities', 'Communication with business and all stakeholders', 'Context-Aware', 'Social Marketing' and the proposed innovation of 'individual Social Marketing'. The chapter also presents the research hypotheses. The chapter includes and defines communities of sustainability, their role to affect engagement of the public towards sustainability, their characteristics and their current activities to assist the public to adopt a sustainable lifestyle.

In addition, the second portion of the chapter presents the theoretical validation framework which was built to measure individual preparedness to engage in a sustainable lifestyle. Two theoretical frameworks were used in this study: (i) the 'basic theoretical framework to measure preparedness to engage', underpinned by the literature, with more detail about its components, which are 'cognitive', 'affective', and 'behaviour' and (ii) the 'theoretical framework for measuring behaviour'. Finally, the summary of the research questions and hypotheses are summarized in Table 5.1.

Table 5.1: Summary of research questions and hypotheses

Research Area	Research Question with associated hypothesis
Role of BSN in Individual Engagement (RQ1)	RQ1: What is the role of on-line social networks, i.e. the ‘Blended Social Network’, in promoting individual ‘preparedness to engage’ in a sustainable lifestyle?
	Hypothesis A: The ‘Blended Social Network’ has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.
ICT Techniques (RQ2)	RQ2: What factors, techniques and functionality within on-line social networks contribute to ‘encourage individual engagement’ with sustainability? This includes:
The motivational ICT techniques within BNS that might affect individuals’ preparedness to engage towards sustainability	Context-Aware
	RQ 2.1: What is the effect of using the ‘Context-aware’ information provision and support within the BSN framework on individuals’ ‘preparedness to engage’ towards sustainability?
	Hypothesis B. (1): The ‘context-aware’ technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.
	Location-Based
	RQ 2.2: Does the use of ‘individual-centric and Location-Based (Event-Based/activities, local Events participation)’ within BSN have a positive effect on individuals’ ‘willingness for engagement’ in sustainability?
	Hypothesis B.(2): ‘Location-based’, ‘location environmental events’, ‘environmental activities’, ‘link local to global’ and ‘enable communication with business and stakeholders’ have a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.
	Social Learning
	RQ 2.3: What are the roles of ‘social learning/on-line learning, including Game-Based’, to encourage people to promote ‘preparedness to engage’ towards sustainability?
	Hypothesis B. (3): ‘Social learning’ technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.
	Individual Social Marketing
	RQ 2.4: Can ‘Individual Social Marketing’ be used within the BSN to promote individuals’ ‘willingness to engage’ in a sustainable community?
	Hypothesis B. (4): The ‘individual’s social marketing’ technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.
	Profiling and Labelling
	RQ 2.5: What are the roles of ‘individual profiling and sustainable labelling’ to encourage people to promote ‘preparedness to engage’ towards sustainability?
Hypothesis B.(5): The ‘individual profile’ and ‘sustainable labelling’ technique lead to increased social capital and social support, which in turn has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.	
Attraction and motivation techniques (Hook)	RQ 2.6: What are the roles of adding the ‘participating in current trends and events/Event activities and trends’ technique within the ‘attraction module’ to encourage people towards ‘preparedness to engage’ towards sustainability?
	Hypothesis B. (6): Adding ‘participating in current trends events/Event activities and trend’ within the ‘attraction module’ has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.
	RQ 2.7: What are the roles of adding the ‘permanent incentives’ technique within the ‘attraction module’ to encourage people towards ‘preparedness to engage’ towards sustainability?
	Hypothesis B. (7): The ‘permanent incentives’ created through the ‘attraction module’ within the ‘Blended Social Network’ has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

The following chapter provides the research methodology and design pertaining to the study.

CHAPTER 6: The Research Methodology Design

Introduction, Research Design Alternatives, Approach, Strategy, Time Horizon, Data Collection, Research Design Strategy of This Research (Literature Review, Survey Instrument, Methodology of Prototype Platform Development, Validation of the Research Model), Ethical Considerations and Final Chapter Summary

Methodology preface

Research can be defined as a careful and detailed study of a subject; it is a systematic process of investigation to discover new facts or principles, collect information on a subject or reach a new understanding to solve a problem or examine an issue associated with a branch of knowledge leading to new insights (Pollard and Liebeck, 1994: p. 680, Wilkes and Krebs, 1995: p. 1316, Cambridge dictionary, 2008, Robson and Hall, 1997, Klein and Hirschheim, 2001, Palvia et al., 2003, Ishak and Alias, 2005). The research design provides “a blueprint that enables the researcher to structure a research problem in such a way that the outcome is the production of valid, objective and replicable answers” (Gill and Johnson, 2010, p. 72). Cavana et al., (2001) defined research design as a set of specific structures with reasonable judgments for available choices; in addition, it provides instructions that aid in producing a valid and trustworthy investigation outcome. The research design is “a logical plan for getting from ‘here’ to ‘there’, where ‘here’ may be defined as the initial set of questions to be answered, and ‘there’ is some set of conclusions (answers) about these questions” (Yin, 2009, p. 26).

6.1. Introduction

The research design and methodology were established to enable the study to answer the research questions and understand the phenomena under investigation, thus obtaining accurate research results in a systematic and scientific manner. However, the domain of the study and the nature of this thesis, as well as the research questions, were taken into account to determine the methodology of this study. This chapter introduces the methodological approach applied in the thesis with justification of the applied data collection techniques. The first section provides insight into the philosophical position of

the study and the thesis paradigms, followed by the approach choices, research strategy and stages of the study, time horizons of the study and methods applied in the study.

The methods section will explore the questionnaire survey and focus group technique then provide details of the data collection, sampling procedure, data analysis and methods that involve the nine-step process used to develop a research questionnaire (Churchill and Iacobucci, 2009). The explanation will include the sampling design process, the sample choice, justification, validity and reliability as well as exploratory factor analysis (EFA). The last investigation part in this chapter presents the methodology used to develop a prototype platform.

6.2. Research Design Alternatives

This study adopts a positivist philosophical belief and employs quantitative (i.e. survey questionnaires) data collection methods.

The information known about the phenomenon can influence the selection of research methodology. According to Trauth (2001), “the less that is known about a phenomenon the more difficult it is to measure it” (Trauth, 2001: p. 7); for instance, a data collection method lacking accessibility to the information or difficulty in gathering appropriate data to apply inevitably affects the research design choices, particularly the research methodology. Typically, the literature and previous studies in the domain can assist researchers to provide the required information. This study builds an engagement model to involve people in collective action to cope with climate change by changing negative environmental behaviours. The lack of previous studies investigating public intention to change negative behaviour towards adopting a sustainable lifestyle was a major obstacle in understanding public opinion regarding the phenomenon under investigation. The researcher found no studies exploring the best IS model to engage the public in sustainability and no studies examining public perceptions and intentions to adopt a sustainable lifestyle in developing countries, in particular Saudi Arabia. Thus, it was necessary to apply empirical analysis to examine the existing public perceptions about the phenomena and environmental aspects. Quantitative techniques to provide fundamental knowledge are considered appropriate for examining behaviour and adoption issues (Spence et al., 2011, Pidgeon et al., 2008, Whitmarsh et al., 2011); thus, a quantitative survey was selected for this study as part of the methodology.

This study focuses on the topic of public engagement in pro-environmental behaviour in Saudi Arabia; a topic that has not been researched until now, to the best of the researcher's knowledge. More specifically, this study proposes a Blended Social Network focusing on environmental issues as a means of involving, and adjusting people's behaviour. For the completion of this study, four distinct methodologies are employed, each responding to different aspects of the topic under consideration. Firstly, this study relies on a literature review for a thorough understanding of various fields that relate to the subject matter. Secondly, it employs a public survey in order to identify the current status of public perception regarding climate change in Saudi Arabia and the barriers that prevent people from adopting a sustainable lifestyle; the findings of the survey informed adjustments to both the conceptual model and the theoretical framework that is used in the validation phase of this study. Thirdly, it combines the finding of the first two phases to design and implement the Blended Social Network which is an integrated collaborative platform enable individuals and all sustainability parties to promote sustainability and finally, it uses a poll survey followed by focus groups in order to validate the proposed engagement model.

Any research can be classified into three categories: exploratory, descriptive, and explanatory (Sekaran, 2006, Ghauri and Grønhaug, 2005, Churchill and Iacobucci, 2009, Hair et al., 2003).

Exploratory studies: In exploratory studies, the researcher collects data and information using an unstructured and informal method to become familiar with situations and facets before doing a rigorous design. Typically, this type of study is suitable when information about the phenomena, situations or subject of study is scarce and useful information from similar studies or cases is lacking (Sekaran, 2013). An exploratory study is considered an effective aid to obtain necessary information about the phenomenon. This type of study can lead to increased researcher knowledge through reliance on theory building and grounded theory hypothesis testing (Sekaran, 2013). Moreover, the exploratory study can facilitate delineation of the phenomenon, formulation of hypotheses, exploration ideas, constructs and variables, explanation of concepts and identification of priorities for the research (Parasuraman et al., 2006).

Descriptive studies: In descriptive studies, researchers have prior knowledge about the phenomenon (Churchill, 2007), which aids them in identifying the direction of predictions (Churchill, 2007) and enables them to describe the issues related to the

phenomenon (e.g. personal attitude, perception, behaviour and intention (Saunders et al., 2009)). Descriptive studies also help the researcher ascertain and understand the characteristics of constructs related to the situations by providing good answers for what, why, how and who questions.

Explanatory and causal or hypotheses testing studies: In explanatory studies, researchers attempt to conduct experiments to identify cause and effect (Churchill and Iacobucci, 2009). Explanatory studies are typically used to understand associated relationships, identify differences among sets of data or variables and explain the interdependence of factors. This kind of study enables researchers to obtain a full understanding of the studied constructs and their effects (Parasuraman et al., 2006).

These three types of research, though, could coexist in and serve different facets of a single study (Churchill and Iacobucci, 2009). For example, exploratory research can be applied in the first stage to provide insights into the phenomenon under study and the outcomes can be used to guide the next stage, such as descriptive or causal study. The first stage of this study is based on prior existing theories, models and literature that were carefully scrutinised to create the new conceptual model tested in the Saudi context. This study provides exploratory in nature in the next stage. The study examines associated relationships between concepts and constructs by hypothesis testing and also examines multiple factors associated with and influencing each other within the conceptual model's constructs and related to the phenomenon under study; thus, this study in part can be classified as explanatory (Saunders et al., 2011). However, the study employs exploratory techniques due to the importance of anticipating and understanding the potential study sample; the public perception and the current situation are important for the study purposes, so it is essential to conduct an exploratory study to explore public perceptions and identify challenges and barriers that the public may encounter in dealing positively with environmental issues. The results of this exploratory study also assist in refining the research questions. Also, this study developed a system platform for empirical examination of the proposed engagement model then employed the explanatory study to test the model hypotheses.

6.3. Research Approach

For the methodology design of a study, Saundres et al suggest five sequential layers delineating different aspects of the research and composing the general, theoretical orientation of the investigation (Saunders et al., 2011), Figure 6.1. These layers are the research philosophy, approach, strategy, time horizon, and data collection method. The following subsections provide more detail about these layers linked to the research process.

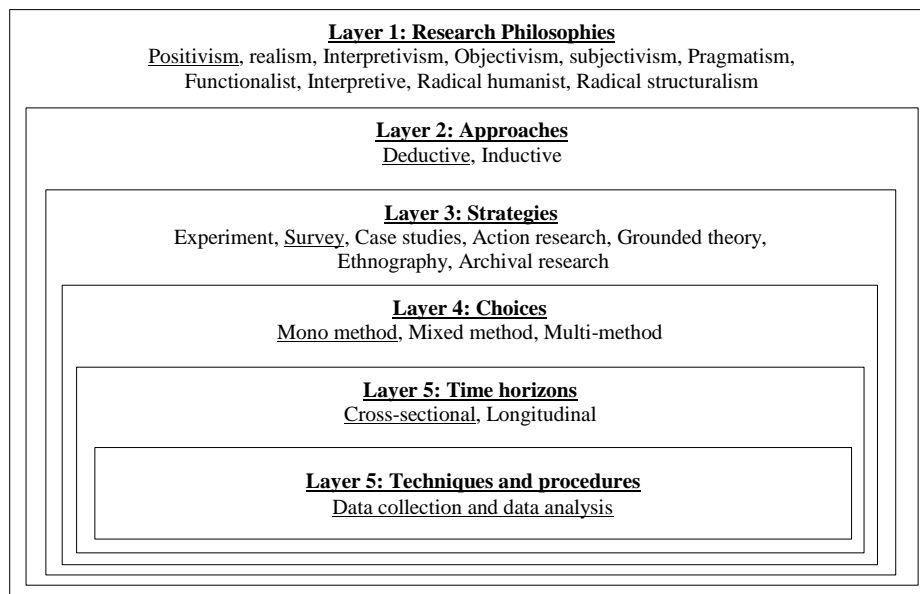


Figure 6.1: Five layers of research design and tactics adapted from (Saunders et al., 2011).

6.3.1. Research Philosophy

The research philosophy is related to the researcher's beliefs about developing knowledge (Saunders et al., 2011). This in turn affects the method of collecting data, which data are relevant to the phenomenon and how to analyse and use the data (Saunders et al., 2009). The scientific/positivism, post-positivism and interpretivist views are the most popular philosophies for structuring research paradigms (Cohen et al., 2013, Olivier, 2009, Creswell, 2013, Bryman, 2012, Guba and Lincoln, 1994, Trauth, 2001). In positivism, the researcher assumes that the phenomenon has a stable reality and can be measured objectively and independently of the researcher and the instruments of the study (Myers, 1997, Pervan, 1994, Avison and Pries-Heje, 2005). Positivists are concerned with discovering the true nature of a single reality (Peter and Olson, 1983). This philosophical perspectives mainly relate to verifying theories based on the data gathered in the study; this position is suitable if the study generates a hypotheses or has measurable or

quantifiable research variables, such as dependent and independent variables, tests theories or draws conclusions about the phenomenon by selecting a sample to represent the population of the study (Orlikowski and Baroudi, 1991). On the other hand, the knowledge of reality in the interpretivist perspective comes from multiple sources and is socially constructed by human actors (Walsham, 1995). Research in this position is based on interpreting and explaining human meaning in social life. The interpretivist researcher focuses on many realities (Peter and Olson, 1983).

Positivist paradigm: The positivist perspective is the way to obtain a truth and understand a phenomenon well to predict and control it; thus, the researcher sees the world of reality as deterministic and operated by laws (i.e. cause and effect by applying a unique approach that relies on a scientific method). It assumes that reality is a mechanistic or mechanical affair. Thus, researchers who subscribe to this philosophy believe in empiricism and see observations and measurements as the core of the scientific endeavour (i.e. researchers can study facts that are only directly observed and measurable). Anything beyond that is impossible. Furthermore, the researcher in this type of philosophical position often uses deductive reasoning with applied theories to test hypotheses.

In the literature, the controversy over which paradigm is best has increased over the decades and still the debate is on-going. One set of researchers insists that a single paradigm must be adopted and that mixing more than one paradigm in a single study leads to inaccurate results. This perspective is reflected in their research; they emphasise that if the researcher selects a particular paradigm, it is better to stay within that paradigm because it is difficult for a researcher to argue simultaneously within more than a single paradigm (Burrell and Morgan, 2011, Collis and Hussey, 2014, Bryman, 2012).

On the other hand, other researchers have argued the superior benefits of applying a mixture of paradigms (i.e. multi-paradigm or meta-triangulation research) (Gioia and Pitre, 1990, Lewis and Grimes, 1999, Straub, 1994). This perspective sees “the two paradigms as the two extremes of a continuum” (Collis and Hussey, 2014). Saunders et al. (2009) argue that, typically, research is located in a domain between the two paradigms and not in one certain paradigm (Creswell, 2013, Saunders et al., 2009).

In regards to IS methodology, Trauth (2001) states that “it is important to distinguish the philosophical underpinnings from the methods that are employed to enact them”. “The use of qualitative methods does not necessarily imply interpretive research. This therefore

means that choosing an approach requires knowledge of the full body of work to understand the different philosophical perspectives” (Renken and Moswetsi, 2006: p. 112). No universal approach has garnered consensus among IS researchers, which makes the choice of an appropriate approach arduous (Galliers, 1992), and the researcher seeks multi criteria to select a better approach. However, three major paradigms exist in IS research; positivist/scientific, interpretive/constructionist and critical theories/critical realism (Orlikowski and Baroudi, 1991, Chua, 1986, Klein and Myers, 1999). Indeed, most IS research is classified under positivist (Mingers, 2003, Nandhakumar and Jones, 1997, Walsham, 1995). Reinforcing this view are the findings of Chen and Hirschheim’s (2004) survey, which indicate that more than eighty per cent of published IS research is addressed under a positivist philosophy. Moreover, (Orlikowski and Baroudi, 1991: p. 5) classifies IS research as positivist if there is evidence of formal propositions, quantifiable measures of variables, hypothesis testing and the drawing of inferences about a phenomenon from the sample to a stated population.

This study followed the positivist paradigm in terms of using a theory-driven deductive approach. Hence, the researcher assumed objectivity and that the validity and reliability of measures could be proven statistically. In general, the nature of the research questions and the aim of the research can easily classify the philosophical paradigm of this study as positivist. More specifically, this study proposes and tests a hypothesis by relying on existing theories and collected data in order to increase the understanding of a phenomenon and influence its future development. A conceptual engagement model was composed, for this purpose, which was validated through a process of testing in the real world and refinement according to obtained data. The finalised model, then, led to the development of a prototype platform that was employed to test the hypotheses of this study in real situations. “In the context of IS research, the conceptual model proposed usually leads to the development of a prototype platform with the intention of illustrating the theoretical framework” (Burstein and Gregor, 1999, p.124-125). According to Baskerville and Wood-Harper (1998), using ‘prototyping’ in information system is compelling. This study is classified under IS research and methodology. Typically, information systems are associated with and involve a technical component (Cecez-Kecmanovic, 1994, Parker et al., 1994); thus, applied prototype system can bridge the gap between technological and social issues in IS research.

6.3.2. Research Approach

Through the research approach, the researcher attempts to determine the nature of the association between theory and the study. For instance, there are two broad research approaches, deductive and inductive, and the researcher must choose between them. Formal logic is employed in deductive reasoning, while informal logic or critical thinking is used in the inductive approach (Trochim, 2006, Trochim, 2005, Burney and Mahmood, 2006).

This study applied a deductive approach, so the study initially develops a model and hypotheses then, through the design, a research strategy to test the hypotheses.

The study begins with the literature review on the topic of the research, and then the search is narrowed to a specific model with its associated hypotheses that will be tested and then narrowed again to the collection of observations regarding the hypothesis. This deductive reasoning eventually assists and enables the study to test the hypotheses within its specific context and thus confirm (or not) the original proposed model (Trochim, 2006, Trochim, 2005, Burney and Mahmood, 2006). The logical sequence of actions within this deductive study is a conceptualised model with literature underpinning the ideas, development of a hypothesis to test the research hypotheses, and finally we get a confirmation for the hypothesis (Trochim, 2006, Trochim, 2005, Burney and Mahmood, 2006).

A deductive approach will be used in this study to achieve the objectives of the study, based on the nature of the study and the problem. The study aims to build an engagement model and formulate hypotheses, and a research strategy is defined to examine these hypotheses. The behaviour change and engagement theories are used to measure and design most behaviour change and engagement initiatives in general, thus it is rational to utilise these theories as a base for development of the study engagement conceptual model to engage the public in sustainability and the validation framework. Drawn from the IS domain, change behaviour literature was used to investigate the association between technological aspects and social science to promote people's intention to change their behaviour and engage in sustainability. This study employed various deductive steps to determine the research findings.

Firstly, this study relies on a literature review for a thorough understanding of various fields that relate to the subject matter (Chapters 2, 3 and 4). Secondly, it employs a public

survey in order to identify the current status of public perception regarding climate change in Saudi Arabia and the barriers that prevent people from adopting a sustainable lifestyle (Chapter 7); the findings of the survey informed adjustments to both the conceptual model and the theoretical framework that is used in the validation phase of this study. Thirdly, it combines the findings of the first two phases to develop the prototype of the BSN, which is an integrated collaborative platform that enables individuals and all sustainability parties to promote sustainability. Finally, the hypotheses will be tested using statistical analysis methods, include correlation and multiple regression analysis. A poll survey was used followed by focus groups in order to validate the proposed engagement model. (Chapter 8).

Significant models and theories in multi-disciplinary areas or different fields can provide a basis for gathering concepts about better ways to engage the public toward sustainability, which creates an opportunity to build an engagement model based on those revisions and theories. This thesis applies a deductive/hypothetical-deductive reasoning approach through sequence steps: identifying concepts, operationalising these concepts, formulating hypotheses and then testing the hypotheses (Robson, 2011, Creswell and Plano, 2011). In more detail, this study begins with an intensive and critical literature review in Chapter 2, 3 and 4, to identify the relevant concepts about what affects public engagement (step 1). Based on the finding from the literature, the concepts are operationalised and presented in Chapter 5 (step 2). Chapter 5 also contains details of the components of the conceptual model for engaging the public toward sustainability. The links between the concepts and the associations among them are identified and then formulated as theoretical hypotheses (step 3). The hypotheses will be tested theoretically using statistical data analysis techniques and descriptive analysis techniques (see Chapter 7) and correlation, multiple regression and explanatory analysis with factor analysis techniques are provided in Chapter 8 (step 4).

6.3.3. Research Strategy

Data collection methods and analysis of data: The scientific research methodology involves a series of methods and procedures that pass from the underlying philosophical positions to research design and data gathering. Data collection methods are an integral part of any research design and a measure of its reliability. Beyond that, various skills, assumptions and research procedures can be suggested for certain research methods. According to Phillips (1976), there are two types of data collection methods and analysis

of data: qualitative and quantitative. The nature of the research questions under consideration will identify either precise and objective quantitative methods or to understand the phenomena qualitatively by being as close as possible to the problem situations. Silverman (2013), Kaplan and Duchon (1988), and Creswell and Clark (2007) advised triangulating the data collection. Triangulation is a popular strategy which employs both qualitative and quantitative approaches (Creswell and Plano, 2011).

The selection of suitable data collection methods relies on the subject and the research objectives in addition to the nature of the problem under investigation. According to Selltiz et al. (1976), the researcher must be careful in choosing the data collection method to generate primary information that is accurate and relevant to the problem situation. The inductive paradigm is linked to the qualitative data collection method, and the deductive paradigm is linked to the quantitative method. Two determinants are used to specify a proper research method, (i) the capacity of the method to addressing the research objectives, and (ii) the suitability and accessing for the resources, time, skills and information (Punch, 2005). This study, mainly applied a quantitative method as a proper method to achieve the research objectives and to answering the research questions. According to Himma and Tavani (2008) the quantitative methods are common used in the IS research domain. The objective measurement, enable researcher to interpret the values to explain and test the theoretical association between concepts. The data analysis of quantitative method relying on numbers can be seen as evidence to obtained solid findings to examine nature of the problem. In addition, it provided more control in isolate the researcher opinion or bias, so it can be generalise the finding relying on finding of statistical analysis for data which collected quantitatively and represented numerically. This approach considered as most appropriate data collection method for the positivist philosophical approach and offers obvious interpretation of the reality (Guba and Lincoln, 1994).

Quantitative: Quantitative research is deductive and considered the classical scientific approach which depends on natural science perspectives (Pather and Remenyi, 2005). This outcome-oriented paradigm was initially applied in natural science and then later was commonly used in the social sciences; different methods underneath this approach include survey methods, laboratory experiments and mathematical modelling (Bryman and Bell, 2003). The quantitative research method is commonly applied in IS research (Myers and Avison, 2002). A quantitative analyst may attempt to recognise exactly what

portion of individuals perform one task or another (Neuman, 2014) by producing statistical analysis through a large-scale questionnaire or the structured interview method. Quantitative techniques can be applied to check the validity of the hypotheses, predict causal explanations and examine the inter-relationships between constructs. It depends on collecting absolute data and numbers which can be analysed in an unbiased manner to obtain fixed and unique results. Interpretation of the numerical data offers scientific facts about the problem investigated.

Qualitative: The qualitative method is applied to obtain social facts through the actors' life and insights; the researcher sees reality as socially constructed; thus, immersion and involvement in the phenomenon and people's lives provide more insight into the phenomenon (Flick, 2014, Taylor and Bogdan, 1984, Berg and Lune, 2004, Powdermaker, 1966). Researchers in this paradigm seek to answer such questions as where, when, how and precisely in what conditions behaviour comes into being. The skill and experience of the researcher directly affect the quality of outcomes; thus, it is not surprising to obtain different outcomes for the same project in the same conditions (Denzin and Lincoln, 2003). The results of qualitative methods cannot be generalised and are only associated with particular cases.

It is important for the researcher to focus on appropriate methods to answer the research questions accurately, not on the appropriate research method per se (Moody and Buist, 1999), so the researcher should consider (i) the appropriateness of the method to answer the questions and achieve the objectives of the study and (ii) the feasibility related to availability of resources (e.g. the time, cost and money, experts and skills, and accessibility of information resources) (Punch, 2014).

In general, while the positivist approach has strength in validation, some critics argue that it is weak in understanding the surroundings of the problem in depth; thus, the applied qualitative technique might improve the quality of the study in understanding the problem to be investigated in depth and validating the conceptual model theoretically. Qualitative methods are employed in phase four of this study in order to support the findings of the quantitative method used in the validation phase, and gain a deeper understanding from individual perspectives. The focus group process was used to assert the quantitative validation results of the conceptual model.

6.3.4. Time Horizon

The time horizon is a fundamental element in the research design which must be carefully considered before the process of data collection starts. The researcher needs to select among two choices, as appropriate, for the study. ‘Cross-sectional’ studies are typically employed to examine multiple measurements by collecting data at a particular single point in time or within a short time frame while ‘longitudinal’ studies are designed to repeatedly explore multiple variables over extended points of time, in some cases years, by collecting data from the same sample (Churchill and Iacobucci, 2009). Typically, ‘longitudinal’ studies are more informative but time consuming and costly. On the other hand, ‘cross-sectional’ studies provide quick results and can be considered superior for particular type of studies. According to Agarwal and Prasad (1999), a ‘cross-sectional’ research design is more appropriate for studies that measure intentions (Agarwal and Prasad, 1999). However, the ‘cross-sectional’ approach is often applied in quantitative studies (Palvia et al., 2004, Chen and Hirschheim, 2004). The ‘cross-sectional’ method is generally applied through the survey method to collect data and is commonly used to collect the main data for IS studies (Pfleeger and Kitchenham, 2001, Biemer and Lyberg, 2003, Galliers, 1992, Lawrence and Low, 1993, Rouse et al., 1995). According to De Vaus (2014), and Saunders et al. (2011), ‘cross-sectional’ studies using the questionnaire technique are the most appropriate method to use to collect primary data regarding usage and users at a particular point in time (De Vaus, 2014, Saunders et al., 2011). It is deemed to be an efficient and cost-effective method that can provide access to more people with a large sample size at extended distances in extended geographic areas (Leung, 2001, Bernard, 2011, De Vaus, 2014). Feasibility considerations, the nature of the topic under investigation and constraints on time and cost led to the adoption of a ‘cross-sectional’ data collection method. In summary, this study follows a deductive approach, a survey strategy and a cross-sectional questionnaire data gathering.

6.3.5. Data Collection Method

In carrying out any type of study, it is essential to use a proper data collection method. The purposes of research and the nature of study questions mainly establish the appropriate research methods. Churchill and Iacobucci (2009) note that the features of data collection methods and the associated weaknesses and benefits can depend on the actual study’s conditions, which can be observed in research dealing with different

countries and various traditions, customs and cultures. “Typically, surveys gather data at a particular point in time with the intention of describing the nature of existing conditions, or identifying standards against which existing conditions can be compared, or determining the relationships that exist between specific events” (Cohen et al., 2013 : p. 205). According to Palvia et al. (2003), the survey method is one of the most popular techniques used in IS research. Palvia et al. (2003) reviews the methodology of 843 articles in IS and finds that the questionnaire method is used most frequently. The questionnaire method has been employed in phase of this study to measure citizens' perceptions and their willingness to change anti-environmental behaviour. According to many researchers, the survey method is the most appropriate method to examine public opinions and measure intention to change behaviour (Spence et al., 2010, Leiserowitz, 2007, 2008, Renn and Levine, 1991, Bord et al., 1998); thus, the survey method is selected as a main data collecting method.

Saunders et al. (2011) point out three forms of data collection methods associated with the survey technique: questionnaire, structured observation and structured interview (Saunders et al., 2011). The questionnaire is widely used and is the most common method worldwide that is applied to collect primary data about use and users at a particular point in time (Saunders et al., 2011, De Vaus, 2014); it is also widely applied in IS studies (Pfleeger and Kitchenham, 2001, Biemer and Lyberg, 2003, Galliers, 1992, Lawrence and Low, 1993, Rouse et al., 1995). The advantages associated with the questionnaire technique contribute significantly to its popularity (Zikmund et al., 2012, Kumart, 2011, Sekaran, 2006).

Questionnaires tend to be a less costly, notably in experiments concerning large sample sizes and large extended geographic areas; hence, the questionnaire is an effective way to access more people at extended distances (De Vaus, 2014) and instantly acquire information to start immediately data verification and analysis; the data are easily examined and interpreted without having middleman bias or interviewer biases due to uniformity and the use of consistent question presentation. Thus, this technique does not guide or provide cues that might influence the validity and reliability of the data gathering (Leung, 2001, Bernard, 2011). Anonymity is almost guaranteed, which can lead to improved opportunities to obtain greater levels of responses in addition to more valid responses, which in turn will reflect on the quality of the information gathering.

The questionnaire is an ideal tool for sampling located in broad or vast geographic areas (Sekaran, 2006), so this assists the researcher to cover a wide area in a short time with less cost (Phillips, 1971). “If potential respondents are scattered over a wide geographical area, you have no choice but to use a questionnaire, as interviewing in these circumstances would be extremely expensive” (Kumar, 1996, p. 110). The questionnaire technique was selected for this study as the targeted sample is spread over a vast geographic area. Saunders et al. (2011) mention that questionnaires are more suitable for descriptive and explanatory investigation because most of the questions included are structured, standardized and closed-ended (Saunders et al., 2011). Furthermore, this study applied a survey to identify people’s behaviour, knowledge, attitudes, beliefs and level of awareness regarding climate change and environmental issues. According to Hair et al. (2006b), belief and attitude can be explained through questions and such questions are proper for a questionnaire (Hair et al., 2006b). Bostrom (1998) states that surveys are best to investigate people’s behaviour in a variety of contexts (Hansen et al., 1998). Furthermore, this kind of study seeks to validate associations among concepts within the proposed online social network engagement model, in addition to providing support for the research’s hypotheses. According to Reagan (2006, p. 92), questionnaires can be used to “describe, find, or validate” relationships within conceptual models and hypotheses (Reagan, 2006, p. 92). Furthermore, questionnaires offer empirical data and scientific interpretation to provide support for or negate the research propositions (Hansen et al., 1998). Given that, this study aims to build a comprehensive conceptual engagement model for the public, it is fundamental to recognise actual public situations and people’s characteristics before offering generalisations of the results of the conceptual model. The survey enables the researcher to obtain insight into the characteristics of the people targeted, which is necessary to assure validity and accuracy in the study. Dillman (2000, p. 9), claims that questionnaires use formalised and structured questions to acquire insight into “the distribution of characteristics in a sample” (Dillman, 2000, p. 9).

Nevertheless, despite the advantages of questionnaires, it is necessary to avoid key pitfalls reported in the literature. In particular, the researcher needs to resolve the negative concerns connected with questionnaires prior to beginning data collection, including:

- Misunderstandings due to vague expressions in the language used that might lead to different understanding of particular questions from one person to another.
- When not any of the presented options represent a participant's opinion towards

the issue, the participant is forced to choose an option that may not really represent the participant's actual perspective because no true choice is available.

- Shortcomings to clarify specific issues, in particular whether a participant does not understand a question or needs to clarify a related issue.
- Typically, people's preference to communicate orally rather than in writing (Selltiz et al., 1976, Smith, 1991, Kumart, 2011, Sekaran, 2006).

To overcome these drawbacks and restrictions the questionnaire employed in this study includes both closed-end and open-end questions. Closed questions are used to enhance respondents' familiarity with the issues related to the phenomenon and to remind participants of issues that might not enter their thinking. On the other hand, open-end questions are used to capture participants' opinions that are not measured in closed-end questions. In addition, the end of the questionnaire offers an open-end question to make it possible for respondents to add comments or suggestions and feedback about the issues listed in the questionnaire.

6.4. Research Design Strategy of this Research

The research design is set up to provide broad knowledge about the engagement approach and how to achieve the objectives of a community of sustainability by engaging the public towards a sustainable lifestyle. The research design is chosen to explore the influencing factors and capabilities of ordinary people to make changes in their lives to cope with climate change by adopting a sustainable lifestyle. The complexity in achieving consensus in public attitudes leads to seeking innovative solutions through IS and ICT.

This section provides a detailed description of the strategy followed to achieve the research objectives. The design of this research (Figure 6.2) has four main phases, which are the initial main theoretical base stage followed by three empirical stages: the perception survey as an exploratory study, design and prototype development stage and the testing and explanatory validation stage. The details of each stage are outlined in the following sections.

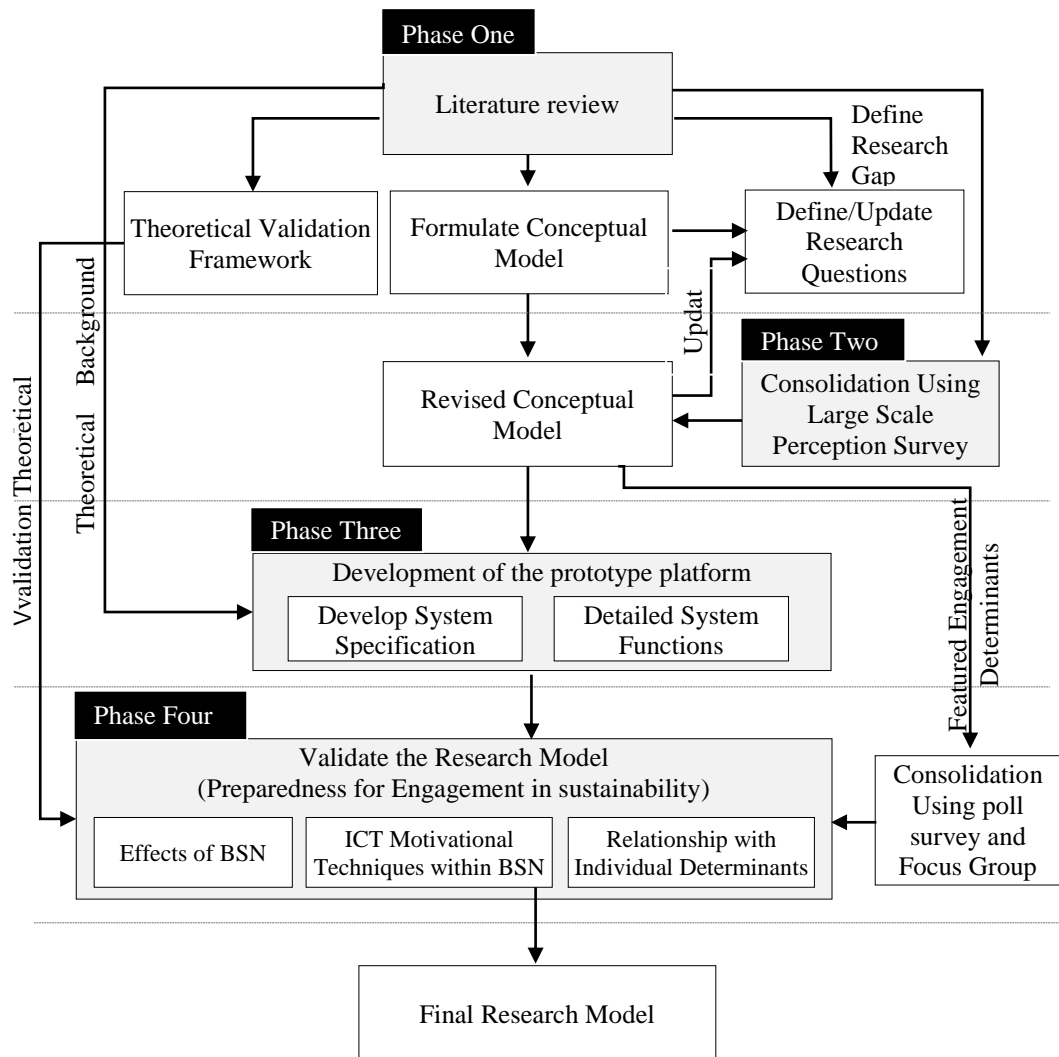


Figure 6.2: The design of this research methodology.

Phase One: A literature review constitutes the first phase of this study. It identifies the components of the preliminary conceptual model and the perception constructs that were used in the field study. Figure 6.3.

Phase Two: When the researcher can determine precisely what is required and how to measure the relevant constructs and items, the questionnaire becomes a powerful method and the best way to collect and gather facts and evidence (Sekaran, 2006). In phase two

of this study, the findings of the literature review were composed into a questionnaire that was randomly distributed. The results of this survey provided answers to the first research objective, ‘What is the current status of public perception regarding climate change in Saudi Arabia?’ More specifically, the questionnaire included questions concerning public perceptions regarding environmental issues, the barriers that prevent people from adopting a sustainable lifestyle, the state of existing infrastructure and the level of public trust in the available information about the environment. The findings of the survey informed adjustments to both the conceptual model and the theoretical framework that is used in the validation phase of this study.

Phase Three: Prototype modelling is conducted for testing and validation purposes. After building the conceptual model, we move to the development and manipulation of the data collection to design and build a new-generation system as an integrated online social network I call the ‘Blended Social Network’ platform. The study utilizes IS methodology and the ‘Grou.ps’ platform application to develop this system. This platform is used to assist and enable the researcher to explain and validate the concepts involved in the conceptual model.

The developed conceptual engagement model follows a multi-method to design and then develop and validate a physical public engagement platform reflecting the logical conceptual model, with strong emphasis on the social values that can drive pro-environmental behaviour. The combination of knowledge management and social tools provides a unique approach to environmental strategy engagement design. The entire process of designing the platform focuses on literature and actual people’s needs. For instance, a comprehensive view of the public is taken into account while building the innovation engagement system that can support and assist behaviour change and management.

The development stage uses IS and software engineering science to develop an engagement platform. In this stage, a group of resources and tools is approached to develop a consensus functional application via an online social network. This enables the researcher to represent the constructed variables of the proposed conceptual model gained from the second phase to visualize and measure them in a real platform. As a result of the previous stages, the general conceptual model emerges from the literature review and perception results, and then the development platform technique based on the primary variables is obtained from the questionnaire technique.

Phase four: The fourth phase concerns testing and validation through poll survey followed by focus groups employed to test and revise the thesis model; Chapters 7 and 8 present full details of this evaluation phase. This phase is the second phase of the data collection, which considers fundamental processes to assess the model constructs. The focus groups are made up of volunteers from the previous perception survey and 173 surveys are collected from the poll survey. Quantitative statistical analysis is applied to test the thesis hypotheses and derive the final results of the research.

6.4.1. Phase one: Literature Review

Phase One: The study begins with an extensive literature review of research on issues regarding climate change and public engagement, the findings of which were employed to build a new and effective conceptual model to engage the public toward sustainability.

Figure 6.3.

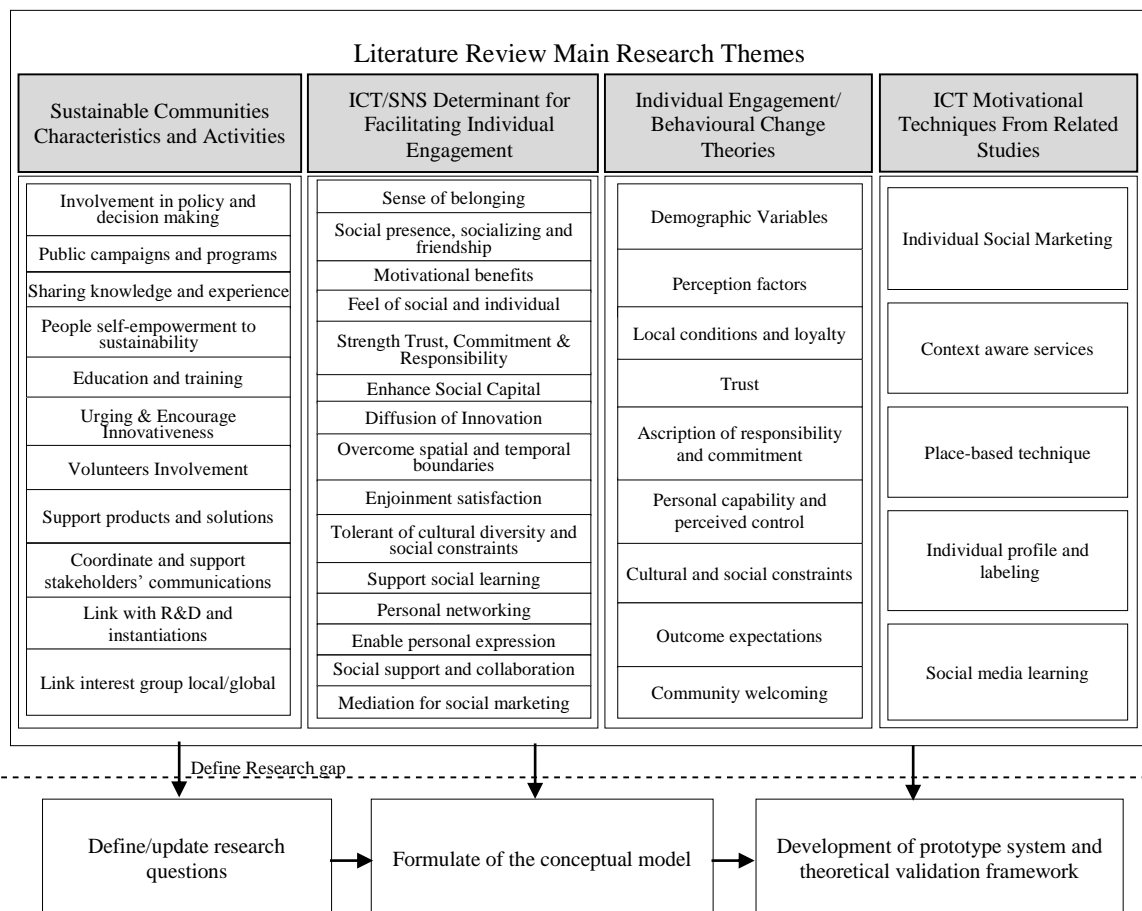


Figure 6.3: Phase one, literature review

The literature review assists the study in two ways: (i) it identifies the components of the conceptual model, and (ii) it assists in identifying constructs for the survey of public perceptions regarding climate change and barriers or challenges that prevent the public

from adopting a sustainable lifestyle. In addition, the study applies content analysis of the various theories used to examine and explain human behaviour and the engagement process. The results of this analysis, have been used to compose a theoretical framework for the validation of the Conceptual model and the corresponding engagement platform.

6.4.2. Phase Two: Survey Instrument

This stage of study has the following objectives: (i) assess and address people's general perceptions of climate change, (ii) examine the role played by a wide range of factors and how they affect people's perceptions of the risks associated with climate change, and (iii) measure the level of trust and acceptance of external interventions at a local and global level and determine the level of trust in sources of information.

At all stages of the design, construction and distribution of the questionnaire, this study follow the scientific standardisation methods advocated by most perception studies, including Spence et al. (2011); Pidgeon et al. (2008); and Poortinga et al. (2006): (i) the questionnaire contains a section on demographic variables: these consist of questions on gender, age, level of education, income and employee status, intended to characterise and describe the sample in question. They are used to gain actual descriptive information which is necessary for identifying the reliability and credibility of the sampling outputs. These are significant for validating the study's accuracy and ensuring that all segments of society are represented; (ii) to avoid the restriction of closed-end questions, the option 'other, please specify' is offered to participants on most of the questions; (iii) a pilot test taking about 35 minutes to complete was conducted with 30 people before the full sample was distributed; (iv) the quality of the data and measurements was tested before analysis. The Cronbach's alpha is 0.82, which confirms that the participant selection and questionnaire structure in this study have a high level of reliability (Deng et al., 2011). The consensus is that any value higher than 0.70 is acceptable for general studies (Hassad, 2010), whereas any value greater than 0.6 is credible for exploratory studies (Hair et al., 2006a). Final adjustments were made to the questionnaire to ensure that the final version is free of any technical errors.

6.4.2.1. Questionnaire Development

Developing an efficient structured questionnaire is crucial to obtain valid and reliable results in survey research (Dillon et al., 1990). For instance, highly structured questionnaires have several advantages, some related to assuring the reliability of data

gathering (Cornford and Smithson, 1996) and others to the short period of time spent to gather and analyse the data (Hall and Hall, 1996, Choudrie and Dwivedi, 2005), in addition to avoiding ambiguous or vague responses (Marsden and Wright, 2010).

However, Churchill and Iacobucci (2009) provides nine-step guidelines that can help researchers develop coherent valid questionnaires; this study follows those guidelines . Figure 4.4 illustrates the nine-step process to design a coherent systematic questionnaire instrument.

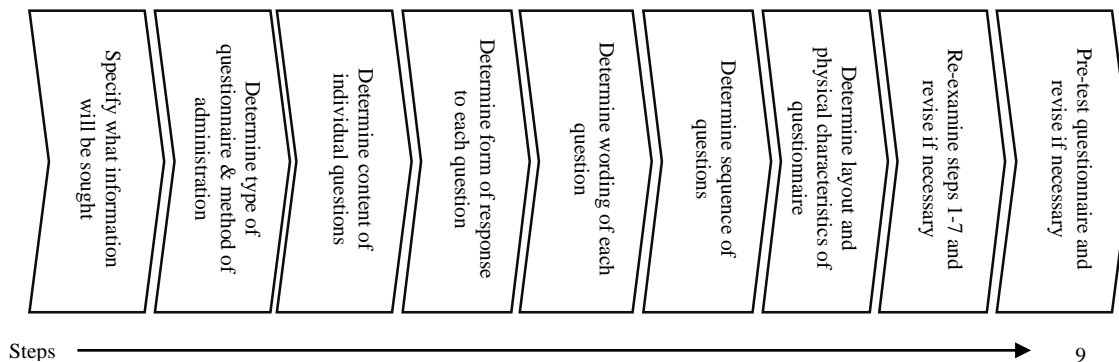


Figure 6.4: Questionnaire Instrument Development Process; Modified from (Churchill and Iacobucci, 2009)

The questionnaire is divided into three sections. The first aims at establishing a general profile of the respondents and the demographic variables. The demographic information provides a better understanding of the respondents taking the survey. The questionnaire asks for gender, age, education and income. According to Hansen et al.(1998), gender, age, education and income are standard questions essential on behaviour questionnaires to “seek out basic socio-demographic data” (Hansen et al., 1998: p. 244).

The second section is intended to examine citizen perceptions about climate change and the third section is used to understand participants’ opinions about the components of the study’s conceptual model, which relies on theory and the literature review.

6.4.2.1.1. Structure, Operationalisation and Measures

The measurement process begins with conceptualisation of the constructs and is followed by operationalisation of variables. According to Neuman (2014), conceptualisation is a procedure of "taking a construct and refining it by giving it a conceptual or theoretical definition" (Neuman, 2014). Straub et al. (2005) define operationalisation as a way to precisely report and measure a conceptualized variable (Straub et al., 2005).

The structure of the survey and the measurement factors therein are informed by related surveys and academic literature (Spence et al., 2010, Leiserowitz, 2007, 2008, Renn and Levine, 1991, Bord et al., 1998). We also add factors derived from previous studies to select measurement tools covering all aspects or determinants of people's perceptions of climate change.

According to Sekaran (2013), Likert scales are interval scale measurements and widely applied in IS surveys (Sekaran, 2013). The 5- and 7-point Likert scales are the most commonly used (Malhotra and Peterson, 2006, Dawes, 2008). In this study, most items are measured using a 5-point scale, ranging from "strongly disagree" (5) to "strongly agree" (1).

6.4.2.1.2. Pilot Study

To develop the questionnaire, I first carried out an in-depth literature review to determine principles, examine associations and measures of relevant variables and develop a pilot questionnaire (Reagan, 2006). Prior to distributing a questionnaire, it is essential to carry out tests on a small scale, particularly if targeting a large sample. The pilot survey assists in assuring the validity of the survey and the capability of the questionnaire to acquire the necessary information and improve the reliability of the instruments.

A pilot survey is an initial test of the larger survey (Teijlingen and Hundley, 2001) where smaller samples and contents are positioned against the larger study. This assists in guaranteeing that the offered technique will function in practice prior to carrying out a large, costly examination. A small study is conducted in advance to examine elements within the survey design and allow for important adjustments before ultimate commitment. This is inexpensive and leads to alterations and adjustments before incurring the heavy costs attached to a large investigative survey. According to Lancaster et al., (2004), pilot studies are fundamental in quantitative survey for several reasons, including enhancing the data gathering technique and verifying the measures (Lancaster et al., 2004) and obtaining new information that may not been realized in the first place. A pilot study is considered a scale development to accomplish pre-testing for a certain instrument (Baker, 1999); it is a way to avoid potential risk (De Vaus, 2014). For instance, the pilot study can alert the researcher to the parts of study that might lead to failure and it implies whether or not the offered instruments and techniques are improper; in addition,

the pilot test alerts the researcher if the research standards cannot be implemented (Teijlingen and Hundley, 2001).

Cavana et al. (2001) provide a set of principles and guidelines to design sound structure, content and wording of questions in surveys that can help in avoiding most measurement errors and increase the accuracy of outcomes. These principles include the following:

Question content and content validity: Just brief specific questions are required to collect the desired data; the researcher should avoid sensitive or double-barrelled queries and decrease participants' effort needed to complete the questionnaires. To avoid potential errors in measurement, it is best to apply multiple measures rather than a single indicator for each construct; multiple measures also yield richer explanations of constructs; "If the measurement instrument adequately covers the most important aspects of the construct that is being measured, it has content validity" (Churchill, 2007 : p. 370). Content validity is attained by developing a research instrument that satisfies all these conditions: performs a comprehensive check of prior empirical and theoretical research within the investigation topic, creates operational explanations regarding each construct and conducts a pilot study prior to setting up the entire work.

Question wording: According to Cavana et al. (2001), it is essential to assure that words have single meaning, no double negatives are used, no biased phrasing is imposed, no abbreviations are used and no incomplete sentences appear (Cavana et al., 2001).

Question structure: All questions must have a clear structure. For instance, in this survey sample, two types of structured questions exist: 5-point Likert scales and multiple choice questions.

Pre-test of questionnaires: The questionnaires are pre-tested in field work and then adjusted accordingly.

Obvious introduction of the instrument: The purpose of the study is described in the introduction to the survey.

Ethical concern: The privacy and confidentiality of the respondent are assured and explained in the covering sheet. Legitimacy is provided by naming all the sponsors of the research and the related work.

Instrument translation: The language selection in a questionnaire is very important and it should be close to the participants' level of understanding. Although the text of the questions considers the person's education level, common idioms may not be understood

by the targeted sample and the researcher should avoid sensitive words that may not be appropriate to the respondents' culture (Sekaran, 2013). Wrong answers and biased responses can occur when participants interpret questions differently in context due to inappropriate language that leads them not to recognize the questions. Thus, the language, idioms, phrases and wording must consider the respondent's perceptions and feelings. The instrument items have been translated from English into Arabic. For the objective of assessment of the study questionnaire, and as a screening technique, stimulation for respondents, and evaluation procedure, the study includes a pilot study.

The pilot study explores missing knowledge that may lead to modifications in elements of the instrument, elimination or alteration of questions or even the addition of new questions. Furthermore, it provides new ideas for the study. The pilot study is a useful tool for checking the methods of data collection because it reveals problems the study might encounter and it saves time and money.

Pre-test process and solicitation: Face validity: Face validity is a way to understand the degree of scale elements that explain the domain of the principle within the study subject. Face validity is fundamental to achieve content validity (Sekaran, 2013). According to (Straub et al., 2005), experts are solicited to judge the scale items with regards to face validity. During the pilot study, the measurement reliability of the internal consistency is checked. Face validity of this study was attained by asking experts to examine the instrument's items with regards to achieving the study objectives. The instrument was pre-tested to ensure clarity and avoid vague or difficult-to-understand questions or questions with contradictions. One student and three academic experts in the field of IS were asked to check the accuracy of measurements for each construct; thus, based on the experts' feedback, the instrument was modified; the wording of some questions was modified to improve the clarity of the questionnaire. This was carried out in two time steps: (i) initially, the instrument was mailed to three experts in the IS field via e-mail for their review and the first expert was asked to provide an opinion and advice. Based on these suggestions, the instrument was amended and then sent to another expert for the same purpose; (ii) in the second step of this routine, the instrument was forwarded to three professional statisticians for their opinions and suggestions to avoid practical and comprehension difficulties with the instrument and thus the instrument was simplified a second time. The feedback from both stages was taken into account; minor modifications

were applied in some questionnaires items, e.g. the correctness of wording, typography and some modifications related to the structure and format of the questions.

Pre-test and pilot sample size: Pre-testing a questionnaire with a real sample can assist the researcher to determine any probable failings or problems related to the instrument (Reagan, 2006). Hansen et al. (1998) states that pre-testing can “iron out many of the potential difficulties with which the researcher, who is bound up intimately with the subject, cannot always anticipate” (p. 247), and only a small number of participants in the pilot survey can be obtained by convenience sampling (Reagan, 2006, Hansen et al., 1998). However, the common sample size for a pre-test questionnaire Hunt et al. (1982) recommended for a pilot study is between twelve and thirteen, and the larger sample is likely to yield more accurate outcomes (Cooper and Emory, 1995). For this study, a convenience sample of thirty of Saudi citizens was used to pre-test the survey items. The participants were asked to take notes on question coherency and understanding, flow of the questionnaire, technical mechanics of the survey, length of the survey and grammar (Hansen et al., 1998, Reagan, 2006, Wimmer and Dominick, 2014). Thirty samples were returned, achieving a 100% response rate. Three incomplete surveys were exempted from the analysis. Thus, twenty-seven returned surveys contained valid responses. Of the surveys analysed, eleven respondents (40.7%) were female and sixteen (59.3%) were male. Based on the participants’ feedback from the pilot study, the survey was modified. For instance, wording to questions and responses was modified to enhance clarity.

6.4.2.2. Sample Design

Churchill and Iacobucci (2009) lists three fundamental issues that should be considered in designing a sample: target population, sampling frame and sampling method and sample size.

6.4.2.2.1. Targeted population

This study examined the intent to change behaviour. People younger than 15 years old can be considered unaware of the consequences of their own behaviour and generally have not had to make their own behaviour decisions. Thus, the questionnaires were distributed to Saudi citizens aged 15 and older.

6.4.2.2.2. Sampling Frame

Randomisation and bias are the most substantial elements in questionnaire techniques (Leedy and Ormrod, 2014). To ensure that the sample population represents the whole population of the city, the study gathers random samples from selected social places in the city. Notably, the research is oriented toward IS and socially related so social places are chosen from which to select the sample. Socialising places are suitable for random sampling and can represent all spectrums of society and all demographic variables of citizens because all types of people attend those places with equal probability. The study finds that the social places in the city can achieve such purpose. Typically, people attend those places to participate in family meeting, wedding events, social activities and social meetings, religious discourses and public meetings. However, the study uses public and government agencies, i.e. the ‘High Commission for the Development of Riyadh’ and ‘Municipality of Riyadh Region’ in addition to the yellow pages of the phone directory to contact those social places to assist the researcher. After selecting the places, the random distribution method was used to select the targeted participants.

6.4.2.2.3. Specifying the survey method and distribution technique

Data collection techniques within the survey method can use one or more types of questionnaires: structured or semi-structured interviews, self-administered or postal questionnaires (Cohen et al., 2013) or interviewer-administered questionnaires (Saunders et al., 2011). Figure 6.5.

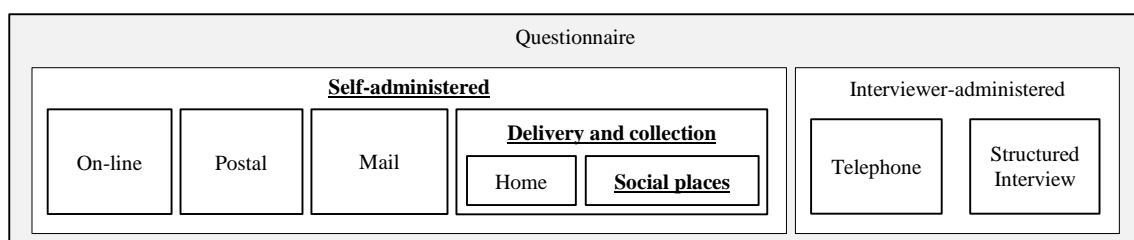


Figure 6.5: Types of Questionnaire Instrument; Modified from (Saundaes et al., 2003)

Specifying the method is crucial in survey design. The researcher identifies the process for data collection in detail. For instance, data can be collected using different techniques; according to Sekaran (2003), and Fink (2013), these techniques include postal surveys, self-administered surveys, telephone or face-to-face structured interviews and online surveys (Sekaran, 2013, Fink, 2013). Saunders et al. (2011) mention three techniques used to distribute the self-administered questionnaire, which are online, post, or delivery

and collection (Saunders et al., 2011). Each of these methods has its own features and drawbacks and none is superior or appropriate for all kinds of research or situations, so the selection of a specific suitable method is vital to the success of any type of research. Typically, important factors are associated with selecting a method, including the cost and time, the nature and characteristics of the targeted sample and the skills of the researcher (Sekaran, 2013). However, the postal technique is commonly used in the Western world because it is considered to be the most economical when compared to other methods, but this is not the case with the current study. Using postal services in the Saudi context is not feasible because few have personal mail boxes and many have no registered official address; in addition, mailed questionnaires are more costly and time-consuming and might not result in a good response rate in this country. Thus, a postal questionnaire was not employed.

The e-mail survey would seem to be ideal for this research as the targeted respondents are online users, but in fact this method requires a list of e-mail addresses of all users, which is not available for the study, so the e-mail survey was deemed to be inappropriate.

Based on the analytical specifications of this research, the "delivery and collection" distribution method by self-administered survey was deemed acceptable for this study. However, this method is less familiar, especially in the Western world (Saunders et al., 2011). The 'delivery and collection' technique, sometimes labelled the 'drop-off and collect' or the 'household drop-off', involves delivering, or dropping, the questionnaire to respondents at their houses. In the 'delivery and collection' technique, the researcher delivers the questionnaires by hand to the participants in their location and then picks up the completed questionnaires. Saunders et al. (2011) states that the 'drop-off technique' has mixed advantages of the mail and the interviewer-administered questionnaires (Saunders et al., 2011). For instance, this technique is similar to the interviewer-administered survey in regards to supporting personal contact with participants and makes it possible to answer questions and provide clarification if necessary (Hair et al., 2003); this might have a positive influence on the response rate. The 'drop-off technique' yields a greater response rate than the postal technique, thus minimizing non-response bias (Lovelock et al., 1976). Furthermore, another comparison was carried out by Assael and Keon (1982), who observes that the 'drop-off technique' is superior to individual and telephone interviews in reducing questionnaire error (Assael and Keon, 1982). However, many researchers believe that the 'drop-off technique' is the best fit when the

questionnaire involves small geographic areas (Lovell et al., 1976, Assael and Keon, 1982). This study uses this technique in certain small geographic areas, that is, social places.

6.4.2.2.4. Sample size

The questionnaire was conducted between 6 April and 26 June 2012. A self-administered, well-structured questionnaire was developed following previous studies and related constructs were extracted from the literature. A nationally representative sample of the Saudi population aged 15 years and older (n=1,173) completed the self-administered questionnaire using a distributed random sample. The target population were represented based on 2011 Saudi census data (Central Department of Statistics and Information, 2011). Samples were selected randomly with no incentive offered for participation.

6.4.2.3. Data Analysis

The subsequent section describes the data analysis strategy applied for phase two of the research. Data analysis in phase two commenced after the survey was administered. This section begins with an explanation of the data screening procedure. The following, section examines the working out of the descriptive statistical analysis and factor analysis conducted for each construct.

6.4.2.3.1. Response rate

The total number of returned questionnaires was 1,173, and the number of completed questionnaires valid for statistical analysis was 1,173, with a response rate of 86%. According to Fink (1995, p. 53), ‘All surveys hope for a high response rate. No single rate is considered the standard, however. In some surveys, between 95% and 100% is expected; in others, 70% is adequate’; an 86% response rate is high; thus, the portion of the questionnaires analysed is suitable for this research.

6.4.2.3.2. Preparation of the survey data for statistical analysis

The data were reviewed and then coded. After the data were made ready for analysis, the Statistical Package for the Social Sciences (SPSS), version 20, was used for the statistical analyses. Descriptive statistical analysis, such as mean, percentage and frequency, as well as regression analysis were applied to examine the study hypotheses (Agresti and Finlay, 1997). Within the data analysis process, many actions were carried out prior to analysis

of the data. Initially, a visual check was performed on the raw data. All returned questionnaires were numbered and sight-edited to ensure legibility and completeness. For instance, if the respondent's answers to most questions were exactly same, then the data were considered ineligible. Another check was performed to assure the data had been correctly entered. A systematic and manual checks was performed. Fink (2013) states that data preparation involves data coding, inserting data in a system, cleaning up the data and discovering missing data. The data were checked and coded based on the items in each question before being entered in the SPSS software for analysis. For example, the gender variable was coded as 1 for 'Male' and 2 for 'Female'. The nationality variable was coded 1 for 'Saudi' and 2 for 'non-Saudi'. The level of education variable was coded 1 for 'Secondary and less', 2 for 'College (i.e. Diploma)', 3 for 'University degree' and 4 for 'Masters and above'. All survey variables were coded in the same manner. Different statistical analyses have been applied in this study from essential descriptive analysis to analysing the data to include mean, standard deviation, percentage and frequency. In addition, other statistical tests were used to verify and analyse the study hypothesis. The Cronbach's alpha was used to check the reliability of the data measured; frequencies, descriptive, exploration and crosstabs were used as descriptive statistics and hypothesis testing relied on multiple regression analysis.

6.4.2.3.3. Content and Construct Validity and Reliability

Instrument validation is crucial in empirical studies (Straub, 1989). Two important issues related to data correctness are reliability and validity. Reliability is the extent to which measures yield consistent results. Validity is the extent to which the results correspond to the true position of the person or object on the characteristic being measured. The following section presents the steps established to examine the instrument of the study, in particular two main scientific tests: reliability of measures including internal consistency and factor analysis and the validity of scales, including assessment of the unidimensionality. After establishing the content validity of the measurements, five techniques were applied to examine the validity in this study: face validity, convergent validity, discriminant validity, unidimensionality and EFA.

6.4.2.3.3.1. Reliability

Reliability is associated with the internal consistency of the measurements in the survey (Churchill, 2007) and used to identify whether the outcomes are repeatable (Bryman and Bell, 2003). The reliability measure is used to ensure that the instrument is free of random error. This shows consistency and stability of the instrument (Sekaran, 2013). In this research, comprehensive item analyses and reliability were applied to clean the measures of each variable. The measurement items were evaluated and then any item that would lead to reduced survey reliability was eliminated. Reliability coefficients were used to examine the internal consistency of a group of measurement items and to measure the degree of homogeneity among items. Test-retest, split-half and Cronbach's alpha are statistical techniques for examining reliability (Bagozzi, 1984), and Cronbach's alpha is the most common technique for examining instrument reliability. An alpha score of 0.7 or higher is considered sufficient reliability (Hair et al., 1995). Cronbach's alpha is commonly used to measure internal consistency to examine the reliability of survey items (Cronbach, 1951, Nunnally, 1978, Selltiz et al., 1976). According to Hair et al. (2006b), analysts consider a value of 0.7 and greater to be acceptable (Hair et al., 2006b), and most researchers believe that a value greater than 0.6 is satisfactory (Malhotra et al., 1996, Nunnally, 1978, Van de Ven and Ferry, 1980, Hair et al., 2006b). In this study, certain items were removed to improve the alpha coefficients. The results of the statistical analysis of the Cronbach's alpha value show great reliability in that the maximum value is 0.84 and the minimum is 0.626. One drawback of the alpha is that it assumes that all the measurement items in the instrument have equal reliability (Anderson and Gerbing, 1988). Alpha is commonly used as a guide to establish unidimensionality (Shah and Goldstein, 2006). According to Bollen (1989), alpha is an inferior measure and has misleading reliability because in most empirical practices the alpha scale has only a lower bound of reliability (Bollen, 1989), and the scale might not establish unidimensionality, even if its value is high (Gerbing and Anderson, 1984). A suitable alternative technique is confirmatory factor analysis (CFA), which offers several indexes of reliability, including individual item reliability, composite items reliability and average variance extracted (AVE) (Hair, 2006, Fornell and Larcker, 1981).

Individual item reliability: is used to explain the degree of variance presented through the construct rather than the error, which usually relies on squared multiple correlation (SMC) or squared factor loading (SFL) measures. These techniques are used to explore

the item's power to catch the internal variance of the construct. Fornell and Larcker (1981) states that an item with an SMC value of 0.5 or higher is considered to have good reliability. In this instrument, all individual items' reliability value is greater than 0.5.

Composite reliability: According to Featherman and Pavlou (2003), composite reliability is the ability to detect items that underlie a construct (Featherman and Pavlou, 2003). Composite reliability is used to identify the internal consistency of constructs and to assure that the measures are suitable to represent the concept underlying the constructs (Koufteros, 1999). In contrast to Cronbach's alpha, factor loadings are used rather than supposing each item has equal weighting (Perugini and Bagozzi, 2001). Many researchers believe that a composite reliability value of 0.7 or higher is acceptable (Hair et al., 1995).

Average Variance Extracted: AVE is used to measure the amount of variance captured by the construct versus the amount of variance due to measurement error. AVE of 0.5 or higher reflects adequate convergent validity (Hair et al., 1995, Barclay et al., 1995). AVE less than 0.5 reveals that an error remains in the items (Hair et al., 1995). In this study, the AVE value is higher than 0.5 and the composite reliability (CR) for all constructs is greater than 0.7.

6.4.2.3.3.2. Validity of the Instrument

Face validity: Face validity refers to the extent of the ability of measurement items to represent the domain of the concept underlying the construct; it is considered an essential index to confirm content validity (Sekaran, 2003).

Data Screening: Initially, the data analysis strategy examines the raw data through a 'screen' of the data returned from questionnaires. Hayes (2005) defines data screening as a "process of examining the data file for errors in the data file itself" (p. 79). Data screening is essential to assure that data are correct and study findings are accurate (Hayes, 2005). Data screening begins with developing a matrix of minimum and maximum values to discover any potential errors in the data received (Hayes, 2005). In this research, every construct was checked by producing a table of minimum and maximum values. For example, in items measured by a 5-point Likert-type scale ranging from 'strongly disagree' = 1 to 'strongly agree' = 5, if the table's data value was not between 1 and 5, there was an error in the data. In addition, data screening assists in identifying any missing data as well as in analysing the linearity and homoscedasticity. Linearity and homoscedasticity expose the way in which "residuals tended to be spread

around the regression line” (Hayes, 2005, p. 298). According to Hayes (2005), if after plotting the residuals the residuals are not distributed over the regression line vertically in roughly the same amounts, then the researcher should move back to the data and verify errors to assure the ‘goodness of fit’ is not overestimated (Hayes, 2005).

Construct Validity : According to (Churchill, 2007), construct validity is a difficult test compared with other validity measures. The constructs are exposed by multiple-item measures. In this study, construct validity and reliability were examined after the content validity of the measurements was proven. The study assessed validity using four techniques: convergent validity, discriminant validity, unidimensionality and EFA.

Multicollinearity: Furthermore, this study screened the data for multicollinearity. This kind of test is typically used to expose the way in which the variables are correlated with each other (Hair, 2006, Hair et al., 1992). Researchers must have higher rather than lower tolerance to ensure that the variables are unique and no overlapping with other constructs exists and that the variables examine conceptually the same constructs (Hayes, 2005). Hair et al. (1995) suggested that multicollinearity values higher than 0.10 are acceptable.

Unidimensionality: If the instrument has more than one set of items, each set acting as an indicator of a certain construct, unidimensionality of the variables/constructs needs to be examined (Hair et al., 1995). Unidimensionality is the degree to which each item is related to only one latent construct (Anderson and Gerbing, 1988, Kline, 2005). Steenkamp and Van Trijp (1991) state that unidimensionality is used to ensure that only one construct accumulates a set of items (Steenkamp and Van Trijp, 1991). According to Hair et al. (2006b), the unidimensionality test is that every summated scale must comprise items associated and loaded highly on a single variable (Hair et al., 2006b). This study assessed the unidimensionality of the scales by using EFA and testing the correlation coefficients applied convergent and discriminant validity to the instrument.

Convergent validity: Convergent validity refers to the value of the correlation between two multiple measurement scales that are designed to measure the same concept and is accomplished when a number of items/indicators are employed in a consistent manner (Straub et al., 2005). According to Hair et al. (2003), convergent validity is the degree of an associated indicator’s latent variable in relation to other indicators within the same latent variable (Hair et al., 2003). An item is expected to be correlated with other items to measure the same constructs, that is, achieve convergent validity, but should be not

associated with items that measure other constructs, such as discriminant validity (Hair et al., 2006b). In this study, several indicators/items were utilized to measure the constructs to improve the convergent validity of the instrument. Most of the scales were adopted from the literature that proved the scales were actually subjected to checks of validity.

Convergent validity typically uses the statistical significance and standardised loadings to assess the individual measurement items underlying related constructs (Anderson and Gerbing, 1988). However, loadings need to be at least 0.5, and ideally 0.7 and higher (Hair et al., 1995). This study applied convergent validity using statistical significance and the standardised loadings, in addition to AVE, the critical ratio (t-values) for each indicator item and construct reliability. Typically, factor loadings are considered to be significant at a 0.05 value if the t-values are higher than ± 1.96 and significant at a 0.01 value if t-values are higher than ± 2.58 (Hair et al., 1995, Anderson and Gerbing, 1988, Kline, 2005).

Discriminant Validity: Discriminant validity is used to show the extent of the distinction in the measure versus other measures. Hair et al. (1995) define discriminant validity as the degree to which a variable is distinctive from other variables which are operationalised as being different (Hair et al., 1995). Anderson and Gerbing (1988) suggests AVE to test discriminant validity; to ensure discriminant validity, each construct needs to be greater than the squared correlation between a pair of latent constructs. In this study, discriminant validity was proven by analysing the square root of each measurement's construct (AVE) to expose any correlations that might exist between the construct and other latent constructs (Chin, 1998). For instance, an AVE of 0.50 or higher reveals satisfactory discriminant validity (Fornell and Larcker, 1981). In this instrument, the square root of the AVEs was greater than all cross-correlations and all AVEs values were higher than 0.5.

Exploratory Factor Analysis: The aim of EFA is to explore the trust in an instrument's measures and determine whether the indicator items fall into their underlying constructs. EFA applies principle component factor analysis and varimax rotation to be executed on each multiple-item measurement scale by analysing the scales one by one. Factor loadings below 0.4 are viewed as low, and low-loading items should be eliminated (Hair et al., 1995, De Vaus, 1993, Field, 2005, Thompson, 2004). In this study, factor loading were used to examine the scale items.

6.4.3. Phase Three: Development Prototype Methodology of Blended Integrated Social Network System

The system development method that mainly applied in this part of thesis was as follows: at the beginning, the intention was to explore the functionality of the system within a social network platform and investigate the method to ensure that the online social network system achieves acceptance of a sustainable lifestyle by ordinary people in real-world practice. Based on the result, the solution statements were formulated to present the motivations with a general concept. Then, further investigation was conducted to compose a comprehensive system framework. The framework was used to identify and extract the knowledge required and then to design the platform architecture applying the prototype solution. The system engineering methods were used to design and develop platform components following the prototype development method. The prototypes were tested in a real-world situation.

6.4.3.1. Selecting the Development Methodology for this Study

Success of system development depends on the plan used and the sequence of tasks and activities (Satzinger et al., 2012). System development methodology presents instructions to complete activities in the systems development lifecycle; it involves a mixture of identifying models, techniques and tools (George et al., 2007). The following section presents the prototype system development life cycle that used to develop the prototype BSN platform followed by prototype BSN platform conceptualization and domain analysis using Unified Modelling Language (UML).

6.4.3.1.1. Prototype System Development Life Cycle

Several development methodologies with many life cycle paradigms can be applied in developing a software system and no common methodology is suitable for all kinds of system development. Developers may be confused when facing multiple alternative choices and they may want to select the best methodology among them to apply in developing their systems. This study used modified selection criteria originally suggested by (Tegarden et al., 2013) as a guideline for selecting an appropriate methodology for a particular system. These criteria include clarity of the requirements, familiarity with the technology, level of complexity of the system, level of reliability required and time (Tegarden et al., 2013); Table 6.1.

Table 6.1: Selection criteria for system development methodology (Tegarden et al., 2013)

Selection criteria	Modified Definition (Tegarden et al., 2013)	Structured Methodologies	RAD Methodologies (throw-away prototype)	Agile Methodologies
User Requirements Involvement	When requirements must be verified from the user perspective	Poor - Good	<u>Excellent</u>	Excellent
Familiarity with Technology	Level of developer knowledge in technology	Poor - Good	<u>Excellent</u>	Poor
Complexity	Level of system complexity	Good	<u>Excellent</u>	Poor
Reliability	Reliability of gathering system and functional requirements	Good	<u>Excellent</u>	Good
Short Time Schedule	Ability to deliver the system in factor of time	Poor - Excellent	<u>Excellent</u>	Excellent
With Schedule Visibility	Ability to estimate time schedule to develop the system	Poor - Excellent	<u>Good</u>	Good

According to the selection criteria above, this study concludes that the throw-away prototyping development methodology is the most appropriate life cycle model to be employed to develop and implement the existing study prototype platform. Pinto and Martins (2004) report that a throw-away prototyping system development methodology model is commonly used to develop a domain concept and build a semantic model. The system developed in this study is used for validation of the conceptual model; thus, throwaway prototyping methodologies are suitable for this purpose. Tegarden et al. (2013) states that when the requirements need to be verified from the user perspective throwaway prototyping methodologies are appropriate (Tegarden et al., 2013). Time is the most significant factor affecting the choice of system development methodology. This study was limited by the duration of studying for a PhD; according to Tegarden et al. (2013), “prototyping and phased development-based methodologies are excellent choices when timelines are short” (Tegarden et al., 2013).

6.4.3.1.2. Prototype BSN Platform Conceptualization and Domain Analysis Using Unified Modelling Language (UML)

The O-O methodology breaks the problem under investigation into objects. Objects are part of the system that is associated with activities and data. The object might have processes (methods) and states with named attributes. O-O-based system development commonly

utilises the unified modelling language (UML). The current study found that object-oriented methodologies using UML are more appropriate for modelling and presenting the knowledge domain and analysis and design of the prototype platform functions and requirements.

UML is an autonomous platform to apply software engineering concepts by utilizing notations and a well-defined set of rules (Eriksson and Penker, 2000). UML is considered the most effective tool for modelling a dynamic software system. According to Booch et al. (2011), UML is effective for imagining pictures of the system, building a construct, and documenting the component parts of a software project (Booch et al., 2011). It is a meaningful language which can handle all sites considered essential to build and be used to set up the software system for different types of software systems, i.e. enterprise information systems, distributed systems including web-based application systems and real-time embedded software systems. UML has several superior advantages over other languages that have been used for data modelling. The most powerful feature of UML is its capability to incorporate views using different data set diagrams. It can represent the system class and subclass hierarchies, the relationships and associations between the different systems' parts; in addition, its ability to represent axioms that define constraints, rules and restrictions makes UML powerful for use in symbolizing ontologies (Kogut et al., 2002), and UML is commonly used as the standard for modelling software systems and to examine and support systems studies (Burton-Jones and Meso, 2002). Eriksson and Penker (2000) show that in addition to its ability to present software models, it is also useful in addressing business models. According to Wand and Weber (2002), UML is useful for several reasons, including (i) its ability to facilitate and support communications between users and observers, (ii) its ability to facilitate system analysts to understand and represent the domain of the system and requirements, (iii) it is considered a good tool offering rich input that facilitates the design and implementation operations, and (iv) it is affordable and a good means of documenting system requirements. This language is a powerful tool commonly used to represent the purposes and domain of the system, as in this research. UML takes into account five types of views that can be represented for any software system.

6.4.4. Phase Four: Validation of the Integrated Blended Social Network Model

The purpose of the fourth stage is to adjust and quantify the proposed model, review the variables obtained from the third stage to a particular final verified model for the Saudi context and verify the validity of the proposed model to assist Saudi citizens to adopt a sustainable lifestyle. The fourth phase concerns testing and validation. This started with an exhaustive investigation and critical examination of existing theories, models and relevant literature combined with consultation with related academics on the subjects of public engagement, behaviour change and information systems to build a proper theoretical framework to examine the conceptual model of the thesis. The resulting theoretical framework was assessed through a poll survey of 173 volunteers (173 questionnaires) and focus groups with Saudi citizens. The aim of this process was to obtain guidance and ideas about the content of the BSN that would eventually be employed to evaluate the conceptual model. The research hypotheses, thesis conceptual model and its constructs were assessed and evaluated using both quantitative and qualitative approaches, i.e. relying on poll questioners followed by discussion question sessions. The quantitative method by poll survey was used to gather primary data, while the qualitative method provided a deeper understanding of people's meaning and brought in a social and cultural perspective. The selection of both methodologies in this stage facilitated gathering greater knowledge about public perceptions and willingness to change anti-environmental behaviours within the social, cultural context of Saudi Arabia. The above validation procedures were deemed necessary in order to ensure that the conceptual model for Saudi Arabia could be generalisable and therefore, a basic model under development for worldwide use. However, further study needs to be conducted to examine additional cases that rely on this basic model to develop a global model or multiple models that are suitable for all the countries of the world. Chapters 7 and 8 present full details of the evaluation phase.

6.4.4.1. Poll Survey and Focus Group Sessions

The focus group process relies on a group of people selected to assist decision makers to determine the best solution and/or select from among alternatives. This tool addresses multiple criteria in the decision-making method. It is useful for social and IS studies and is commonly used to assist researchers in investigating a sophisticated or difficult problem. The researcher relies on focus group tools to share participants' thoughts, feelings, attitudes, perceptions, ideas, experience and knowledge about the object related

to the topic investigated (Kaufman, 2003). This technique helps researchers understand not only participants' thoughts but also how and why they have those thoughts and their way of thinking. The focus group process helps developers, researchers and decision maker's model structures and relationships between factors and thus the focus group is a suitable tool to address both rational and intuitive decisions to select appropriate alternatives when the researcher is investigating a sophisticated or difficult problem. Therefore, the researcher can act as an instrument for data collection and observation in a more objective manner.

The study employed the poll questionnaire sessions followed by focus groups discussions to validate the conceptual model (see Table 6.2). This study employed participants through the second stage of the research. Using a 'perception questionnaire', participants were invited to take part in focus groups by asking them to leave their e-mail addresses on the questionnaire template; disclosure of the e-mail address was voluntary. The direct poll with real-time data gathering and validation check method was applied, utilising the preliminary programmed system, which was embedded in the poll instrument devices. Six sessions were held in Al-Riyadh with 176 participants. The total 176 survey respondents completed the poll and the results of 173 were used in the analyses. Three responses were eliminated due to the fact that the same rating was given for all items implying that the respondents were not fully engaged in the response process. Out of the 176 questionnaires received, all participants were Saudi citizens. Hair et al. (2006a) state that to analyse the model there must be an 'absolute' minimum of 50 participants. However, the sample size adhered to in this validation phase were concordant with Hinkin's (1998) recommendation for a minimum of 150 (Hinkin, 1998). Given this, the 173 participants whose responses were used in this study provide results within the range of an appropriate sample size for validating the model.

Lindlof and Taylor (2011) state that employing six to twelve people in a focus group is considered ideal and the optimal size; less than six might prevent gaining different comments and views, and more than twelve might lead to time-consuming discussion which in turn can lead to a reduced number of topics examined in the discussion. Having more than twelve also can interfere with equal chances to participate for all members. The study used two sessions, each lasting for around 45-50 minutes, as suggested by (Lindlof and Taylor, 2011). This length of time is sufficient to build trust and familiarity

among the focus group members, which is considered fundamental to achieving the purpose of the focus group in data capturing (Denzin and Lincoln, 1998).

Table 6.2: Summary of methods used for data collection and outcomes of the thesis.

Phase	One	Two	Three	Four
Method used	Literature review	Random survey	Development of the prototype BSN platform	Six sessions of poll survey followed by two focus groups session.
Where	United Kingdom	Social places in Saudi Arabia	United Kingdom	Language education centre, Saudi Arabia
When	2011-2014	2012	2013	2013
Outcomes	Conceptual model and theoretical framework for validation	Perceptions and Saudi environmental profile	Development of prototype platform	Validation and revision of the conceptual model
Number of participants	-----	1173	-----	173 and 7

Meetings of the focus groups were conducted in a ‘neutral’ location, which was a computer lab room or private education centre. ‘Neutral’ places eliminate a sense of intimidation or hesitance to contribute (Lindlof and Taylor, 2011). This selection enhances informal settings, which is necessary to encourage participants in the discussion (Lunt and Livingstone, 1996). The interviewer moderated the focus group for the topic discussion domain and objectives monitored it to stay with the topic, encouraged all members to participate and sought to create one harmonious group feeling, as specified by (Lindlof and Taylor, 2011). The poll survey and the focus groups offered very useful and practical insight into the composition of the conceptual model and the prototype platform. The use of focus groups in this study helped the researcher to assert the findings obtained from the poll survey. The outcomes from the poll survey and focus group process were analysed using quantitative and qualitative analysis. The discussions were focussed on understanding people’s experience with each ‘Blended Social Network’ system module. In particular, questions focussed on the effect of the model’s constructs on the person’s preparedness to engage in sustainability issues as well as the effect of the model on the person’s feelings, the system characteristics, the effect of the system on the person’s cognition and whether the person was willing to change behaviour after using this system. For example, questions included, ‘How do you feel about sustainability when

you deal with this ‘Blended Social Network’ platform?’ Each respondent was asked to provide basic demographic information, including gender, education level and income. Focus group members were between 18 and 45 years old.

The participants collected in one place to see the system and asked to validate the model through structured poll questionnaires. The questionnaires were used to validate the conceptual model approximately 30 participants were in each validation session.

6.4.4.2. Reliability and Validity of Poll Instrument

In the validation phase, the same steps set up to examine the instrument in phase two, ‘the perception’ survey, were applied. In particular, the reliability of measures included internal consistency and the factor analysis to examine content and construct validity and reliability of the instrument; validity of scales included an assessment of unidimensionality. After assisting with the content validity of the measurements, five techniques were applied to examine validity in this phase: face validity, convergent validity, discriminant validity, unidimensionality and exploratory factor analysis.

The study also applied CFA, which offers several indices of reliability used to measure variables’ reliability, including individual item reliability, composite items reliability and average variance extracted (Hair, 2006, Fornell and Larcker, 1981).

6.5. Ethical Considerations

Ethical practices ensure that all measures related to an individual’s privacy are applied in the study. The researcher must be careful when dealing with personal data at all stages of the study: data collection, analysis and presentation of results. It is fundamental to follow ethical standards to ensure that all personal information is protected and secure from exploitation and distortion (Cavana et al., 2001, Fink, 2013). While participants are encouraged to voluntarily respond without being pressured to do so, it is necessary to employ moral practices, including assuring the confidentiality of participants’ data and informing participants that their opinions and data are protected from exploitation and distortion (Cavana et al., 2001, Fink, 2013). To deal with the ethical concerns arising from the research, this study adopted the ethics instructions supplied by Cardiff University. An individual ethics application and questionnaire were submitted to and approved by Cardiff University before starting the survey (Approval No. H01/2007, Appendix B). In April 2011, a copy of the survey was submitted to Cardiff University with an enquiry form to acquire ethics approval. This form clarifies the purpose of the study and assures

confidentiality of respondent information. Additional ethics approval was obtained from the Ministry of Higher Education; I declared the aim of the investigation and approval was obtained to ensure that the questionnaire data and outcomes of the research will be employed only for academic purposes. The necessary information about ethical issues was presented to participants and the study applied human ethics strictly. Such data presented the aim and nature of the study, the study plan, the data collection procedure and process, the totally voluntary contribution, the coverage of secrecy and privacy of respondent data, safe data keeping and access and disposal of data. For instance, during this study, any computer-based data were securely stored and access to the data was restricted to the researcher and authorized persons. In the first meeting before the interview, participants were given complete information about the study, which identified the study purpose and what exactly was needed from participants. In addition, participants were notified that they could refuse to reveal information if they thought it had an effect on their privacy or they recognised a question as intrusive. The study also assured that participation was voluntary and confidential; the participants could withdraw from the questionnaires at any time. In addition, the participants' names and identity information was not identified in any part of the research; delivered questionnaires were anonymous and all determining information was extracted before proceeding with subsequent analysis.

6.6. Summary of Chapter Six

This chapter has included information about the research design and methodology which established to enable answer the research questions in a systematic and scientific manner. It also provides information about the approach applied in the thesis with justification of the methods used, including insight into the philosophical position of the study and the thesis paradigms. The approach choices, research strategy and stages of the study, time horizons of the study and methods applied has in detailed presented. Followed by the methods of data collection, data analysis, the procedures that the study follows to develop the questionnaire survey and focus group technique. The chapter provides details of methods applied to test reliability and validity of the data. Finally, the last part of this chapter presents the methodology applied to develop the prototype platform. The next chapter will present findings of the field study about public perceptions about environmental issues and the research model components.

CHAPTER 7: Understanding Public Perceptions of Climate Change and Sustainable Lifestyles

The Descriptive Analysis finding of Public Perceptions of Climate Change and Sustainable Lifestyles; (Awareness, Attitudes, Beliefs, Perceptions of Risk, Feel of Responsibility, Intention to Change Behaviour, Limitations and Barriers of Behaviour Change), Evaluation Public Perception Towards the Proposed Engagement Model components (Social Networks, Location-Based, Social Marketing, Social Learning, Attraction Techniques).

7.1. Introduction

This chapter aims to achieve two objectives with regards to sources of primary data. The first objective is to identify citizen profiles and public perceptions concerning climate change and sustainability. In addition, it aims to ascertain the role of communities of sustainability in the engagement process. It analyses a list of variables obtained from the study and provides more detail about the citizen profile, economics and expected risk from future climate change involving the country. It describes and discusses each finding and result, as well as the data-gathering instrument employed in this stage. It outlines the people's current vision, beliefs, attitudes as well as their level of cognitive awareness and concern regarding sustainability and, in particular; climate change phenomena. The role of location as an incentive affecting people's behaviour and measurement of the level of trust in the source of information is also addressed in this section. The followed section of the chapter focuses on determine current major challenges and barriers that face public which prevent them to adopte a sustainable lifestyle. Research objective (b) about the current citizen profile and public perceptions is addressed in this part.

The second objective is to refine and adjust the content of the preliminary conceptual model. That is the model's components that had been identified through the literature review will be re-evaluated taking into account the findings of the survey and the entire model will be adjusted and will acquire its final form. Thus, the public perception survey results will be used for revising the conceptual model to reflect the real situation. Section 7.2.4 in this chapter presents the generic engagement model dimentions informed from the letrature (Table 7.1), that can contribute in encourage individual intention to adopt a sustainable lifestyle. This section, also, presents findings of the statistical analysis to

assert the appropriateness of these techniques/approaches (i.e. the Role of Environmental Organizations and Social Networks, the Role of Location Loyalty and ‘Location-Based’ Technique, the Role of Individual Social Marketing, the Role of Social Learning Technique, the Role of Attraction Techniques; Local Trends, Events, and Incentives) to be integrated within the proposed model, based on the data obtained from the field study.

Table 7.1: The Featured Dimensions influencing overall Individual Engagement informed by literature (Social Networks (SN), Social Marketing (SM), Location-based Services (LBS), Context-aware, Social Learning, Local events and Trends, Incentives, Loyalty Awards and rewards).

Engagement Techniques	Definition	References
Social Networks (SN)	According to Boyd and Ellison (2007), social network can be defined as “web-based services that allow individuals to (1) construct a public or semi-public profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system. The nature and nomenclature of these connections may vary from site to site.”(Boyd and Ellison, 2007, p. 210).	(Haythornthwaite, 1996, Valente and Pumpuang, 2007, Fell et al., 2009, Rabinovich et al., 2010, Rowson et al., 2010, Capstick and Lewis, 2008, Nye and Burgess, 2008, Corner and Randall, 2011, Climate Change Communication Advisory Group, 2010).
Social Marketing (SM)	“Social marketing is a framework for providing and customizing information depending on the particular behaviour by classifying people's behaviour” (Maio et al., 2007).	(Hastings, 2007, McKenzie, 2000, McKenzie-Mohr and Smith, 1999, Peattie and Peattie, 2009, Corner and Randall, 2011, Department for Environment and Rural Affairs, 2008, Crompton, 2010, Gordon et al., 2006, National Social Marketing Centre, 2006).
Location-based Services (LBS)	“The location-based services can be defined as services utilizing the ability to dynamically determine and transmit the location of persons within a mobile network by the means of their terminals. From the mobile users’ point of view, the LBSs are typically services accessed with or offered by her/his mobile terminal” (Virrantaus et al., 2001, p.67).	(Rayner and Malone, 1997, Lorenzoni and Pidgeon, 2006, Hassol and Udall, 2003, Wilbanks, 2003, Larsen et al., 2011, K. Larsen and Persson, 2005, Virrantaus et al., 2001, Quercia et al., 2010).
Context-aware	Pascoe defines context-aware as a “subset of physical and conceptual states that describe a particular object and its entity” (Pascoe, 1998). Two categories of context-aware are used to provide information and services to beneficiaries: (i) those related to offering information and services only and (ii) those regards executing the service automatically behalf of the beneficiary by triggers a command or reconfigures the system as the context and situation changes.	(Herrmann et al., 2011, Brdiczka et al., 2007, Loke, 2006, Miguel et al., 2003, Van Setten et al., 2004, Dey et al., 2001, Abowd et al., 1999).

Social Learning	Social learning is “the collective action and reflection that occurs among different individuals and groups as they work to improve the management of human and environmental interrelations (Keen et al., 2005, p.4).	(Wals, 2009, Nye and Burgess, 2008, Dobson, 2003, Parker et al., 1994, Ferney et al., 2009, Severson et al., 2008, Selltiz et al., 1976, Brouwer et al., 2008, Argyris and Schön, 1978, Argyris and Schön, 1996, Hall, 1993, Whitmarsh et al., 2009, Keen et al., 2005).
Local events and Trends	Subset of physical and conceptual events, news or activities that occur in small scale at local environment or in large scale at global level which affect interesting of most population locally or internationally. These on site events and activities can be used to promote sustainability and increase people’s awareness.	(Chawla, 1999, Larson et al., 2011, Corner and Randall, 2011, Rothaermel and Sugiyama, 2001, Lin, 2007, Koh et al., 2003, Andrews et al., 2002, Hummel and Lechner, 2002, Koh and Kim, 2003).
Incentives, Loyalty Awards and rewards.	Incentives is regards the benefits and methods which used to motivates and encourages people to change anti-environmental behaviour toward more sustainable lifestyle such as a rewards or financial benefits that given to people in recognition of their pro-environmental service, efforts, achievements, or behaviours. This study focus on offers rewards for performing tasks.	(Epstein and Buhovac, 2014, Loewenstein et al., 2001, Brandon and Lewis, 1999, Stern, 2000, DEFRA, 2002, Clark et al., 2003, Poortinga et al., 2004, Verplanken et al., 1998, Bamberg and Schmidt, 2003).

Based on previous studies, the linking the public with the physical environment is considered a crucial dimension in engaging the public towards sustainability (e.g., Chawla, 1999, Larson et al., 2011, Corner and Randall, 2011, Sutton and Tobin, 2011). This dimension is also embedded in the ‘Blended Social Network’ and a common part used in all modules/ICT techniques of the research model. One part of the survey aim was devoted to looking into the effect of this dimension on individual engagement. Section 7.2.2.1 presents more insight about the public experience of noticing signs of climate change which is used to explore the effect of the dimension. The survey explores: (i) The link between impact of noticed signs of climate change and perceived importance of climate change, (ii) perceived concerns and ways these translate into obligations in collective actions and responsibility.

7.2. Descriptive Statistical Analysis

7.2.1. General Characteristics of the Sample

The survey was collected from 1173 of Saudi citizen participants to whom it was distributed. The completion rate, therefore, 86%. The following sections present the descriptive statistics of the demographic attributes and Internet usage behaviour of the sample, together with some diagrams analysis, which form the basis of quantitative analysis of data in any research.

7.2.1.1. Demographic Attributes of Participants

This section presents respondents' socio-demographic characteristics, including age, gender, level of education, employment, average monthly income, and residency period living in the local area. Table 7.2 illustrates the participants' detailed demographic characteristics.

Table 7.2: Characteristics of the survey sample.

Demographic Characteristics	Category	Research Sample (n=1173)	
		Frequency	%
Age	< 18	59	5.0
	19-24	256	21.8
	25-34	416	35.5
	35-44	235	20.0
	45-54	147	12.5
	55-64	40	3.4
	65+	20	1.7
Gender	Female	333	28.4
	Male	840	71.6
Level of education	Bachelor Degree or equivalent	432	36.82
	Certificate/Diploma	171	14.57
	High school	326	27.79
	Primary school	43	3.66
	Intermediate school	74	6.31
	Masters/PhD or equivalent	81	6.91
	No formal qualifications	20	1.71
	Other	26	2.21
Employee in	Agricultural Sector	71	6.1
	Commercial Sector	83	7.1
	Contract & Construct Sector	54	4.6
	Education Sector	277	23.6
	Environment Sector	59	5.0
	Industrial & Mining Sector	9	0.8
	Medical Sector	26	2.2
	Oil and Gas Companies	9	0.8
	Press & Media Sector	9	0.8
	Services companies	75	6.4
	The security and military sector	39	3.3
	Tourism Sector	5	.4
	Transportation Sector	15	1.3
	Others	442	37.7
Number of children	None	370	31.5
	1-3	608	51.9
	4 or more	195	16.6

Income per month Lived for	Up to 3,000 (Very low)	141	12.1
	3,001 – 6.000 (Low)	159	13.6
	6,001 – 9,000 (Medium)	224	19.1
	9,001 – 12,000 (Above medium)	119	10.1
	12,001- 25,000 (High)	159	13.6
	More than 25,000 (Very high)	41	3.5
	Prefer not to say	240	20.5
	No income	90	7.7
Lived for	Less than 6 months	45	3.8
	6 months –less than 1 year	62	5.3
	1 year – less than 3 years	205	17.5
	3 – less than 5 years	199	17.0
	5 years or more	507	43.2
	N/A	155	13.2

The overall respondents' demographic characteristics shows that, males account for 71.6% of survey sample, while females represented by 28.4%. 82.3% of respondents were aged between 18-44 years, 43.7% had a university degree or higher. An approximate of fifty five percent with average monthly income of 12,000 S.R or less, and 77.7% are lived in their local areas for a year or more. (Table 7.2 and Figure 7.1).

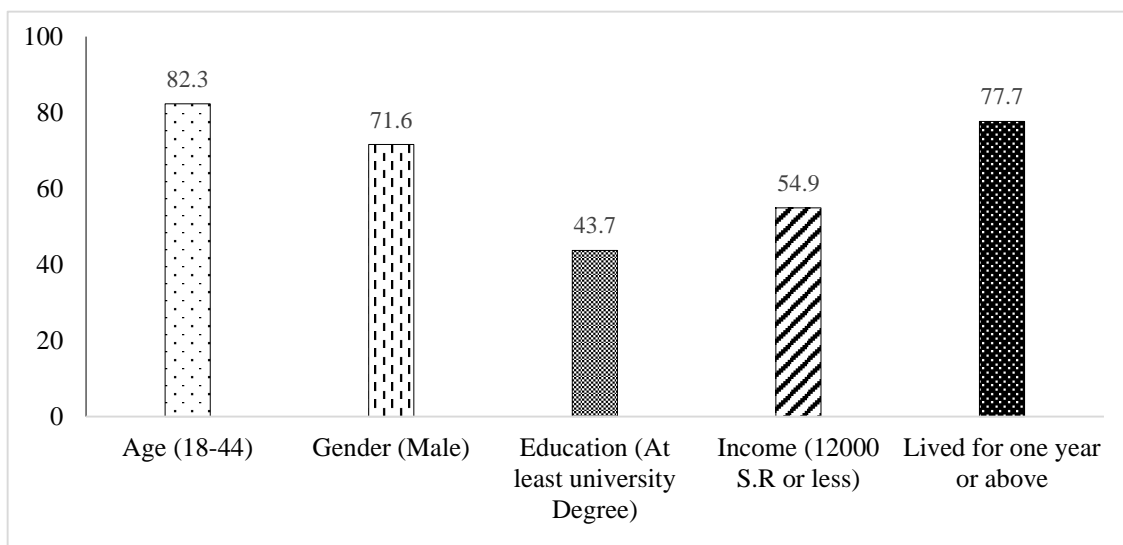


Figure 7.1: Summary of survey sample socio-demographic characteristics

7.2.1.2. Participants' Internet-related Behaviour

This section shows the analysis results of respondents' Internet-related behaviour of the current use of Internet services such as Internet experience, frequency of the usage and the Internet services usage purposes.

The analysis shows that most of respondents (69%) have internet experience of more 4 years, while 22% of the respondents have 1-3 years of internet experience and 9% of the respondents have 1-12 months internet experience. (Figure 7.2).

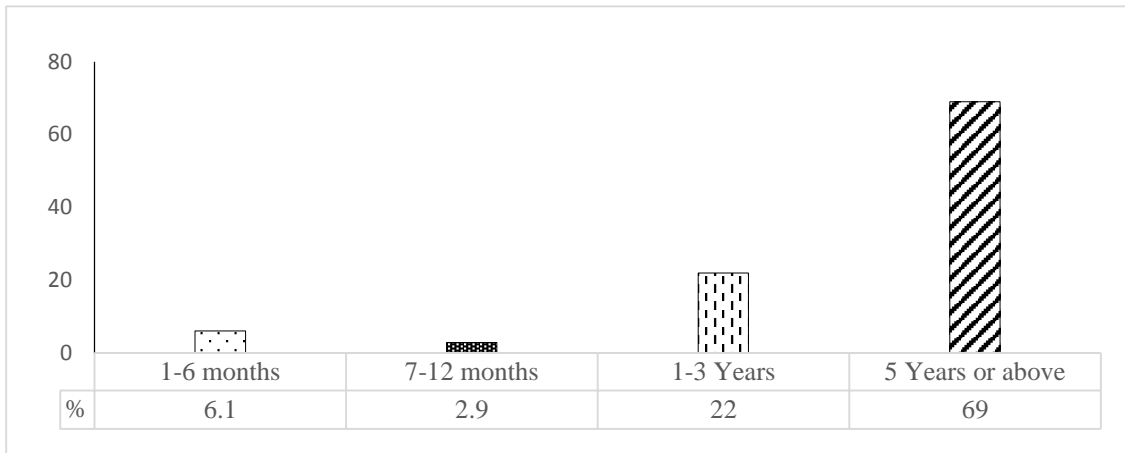


Figure 7.2: Sample respondents Internet previous experience

The survey analysis, also, indicated that the majority of the respondents are frequent users of the internet. More specifically 61% of the respondents use the internet daily, 16% use it several times a week, 10% use one to several times a month and 13% do not use at all. (Figure 7.3).

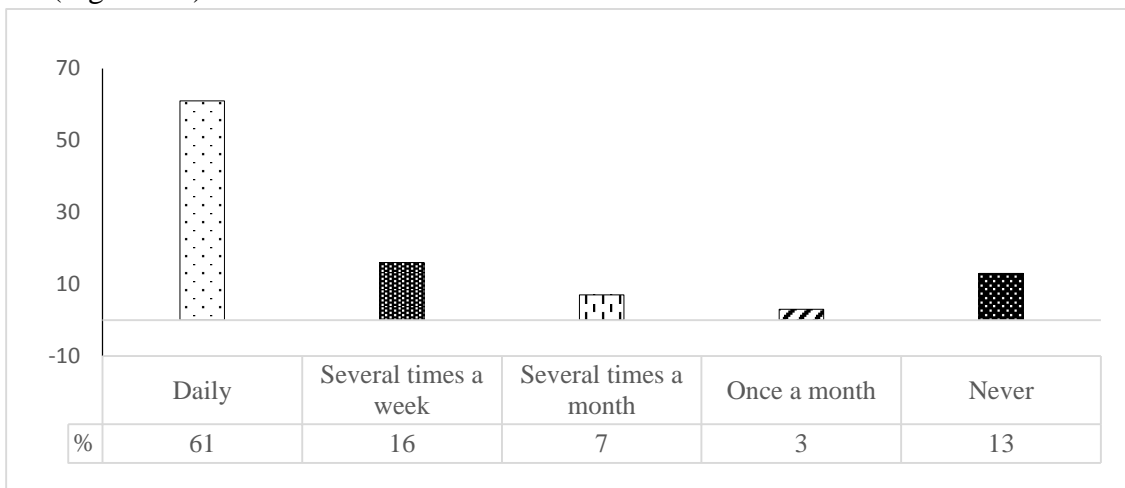


Figure 7.3: Sample respondents Internet usage frequency

Figure 7.4 shows that the majority of internet services usage was for: Browsing and for general information search (93%); Entertainment (89%); Online social networking (81%); Communication and e-mail (74%); Conducting online transaction (58%); Learning and education purposes (23%); and other usage purposes (19%), and each participants had the ability to select more than one answer according to the services that he/she use.

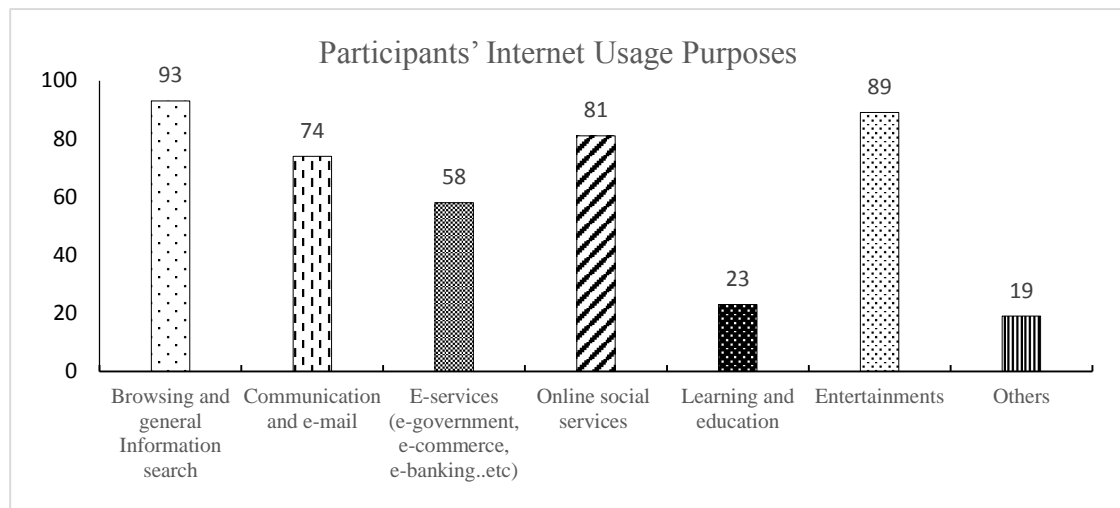


Figure 7.4: Sample respondents Internet usage Purposes

The statistical analysis shows, that almost 87% of participants were able to access the Internet from home or at work, while 13% had never done so (Table 7.3).

Table 7.3: The volume of participant's access and use of the Internet.

Access & use Internet	Frequency	Percentage %
Do you have access to Internet?		
Yes	1020	86.96
No	153	13.04
Total	1173	100

The survey findings suggest that the participants have sufficient involvement and experience of using information and communication technology which can be utilised for the purpose of tackling the climate change problem. The wide use of smart phones has contributed to the increase of internet subscribers too. In 2012, Saudi Arabia had a record number of 15.8 million internet subscribers (AME, 2013) and 44.8 million mobile phone accounts (MVF, 2013) were reported, giving a large proportion of the population access to the web services.

7.2.2. General Public Understanding of Climate Change

The following section provides information about respondents understanding of sustainability and climate change issues, their awareness and knowledge, perceptions of risk, public attitudes, beliefs and Intention to change behaviour, in addition to detailed discussion of different public views towards climate change phenomenon. An exploratory analysis was used to provide enrich information about the sample and the measures, as well as more insight analysis on the data gathered in this study.

7.2.2.1. Individual Engagement in Climate Change; ‘noticing signs of climate change’ as a Case

This survey was designed to examine public perceptions of climate change and related issues in Saudi Arabia. The survey was to some extent informed by related literature exploring and investigating the relationship between framed factors to provide theoretical insights into reasons for held perceptions. Construction of the measurement items in this study was designed to examine the spectrum of socio-cognitive, socio-affective and intention-to-change behaviour aspects. The associations within ‘intention to change behaviour toward sustainable lifestyles’, the ‘key perceived variables’ and ‘noticed signs of climate change’ were investigated and addressed (determinant factors are presented in Table 7.4). The following text presents and discusses key findings from the survey.

The analysis of user overall perception and awareness to sustainability and climate change issues, reveals that out of the full sample of 1173, 373 respondents (31.8%) agreed that they had personally noticed signs of climate change during their lifetime. Recurrent respondents’ observations include: The extreme fluctuations in weather, increase of temperature and decrease in rainfall, scarcity and depletion of water resources, drought and shortage in pastures, extinction and loss of wild animals and plants, damage in crops and decrease in the agricultural, food and fisheries productions, rising sea levels (for example on the Farasan Islands), flooding (for example the disaster of Jeddah, 2009 and Riyadh in 2010) and air pollutants affecting health (for example the spread of diseases, particularly respiratory diseases such as asthma). Others noticed signs have been reported but with no direct scientific link to climate change (for example earthquakes in the Red Sea, Albahaa, Almadenah and Tabouk as well as some volcanic activities in northern and western parts of the country). It is interesting to note that 800 (68.2%) respondents mentioned that they had not noticed any sign of climate change.

The results highlight the hidden relationship between ‘noticed signs’ and ‘perceptions’ of climate change in Saudi Arabia in a representatively sampled population and provides insight into how people are affected by these observations. This study suggests that those who have noticed signs of climate change are not only more interested in and concerned about climate change but they also perceive greater priority and obligation of participation in collective action and more responsibility. Also, the survey reveals through reported participants’ observations, that the relationships observed may have occurred as a result of: (i) Noticed signs of climate change, (ii) the social environment and (iii) what decision makers and government have presented in recent years that is salient to the public (for example, through the media, science and education).

Table 7.4: Questions measurement perceptions and intention to change behaviour toward sustainable lifestyle.

Construct	Questions	Response options	Noticed any sign mean (SD)	Not noticed any signs mean (SD)
Noticed any signs of climate change	Have you personally noticed any signs of climate change during your lifetime?	Yes/No		
Perceive Important of climate change	How important is the issue of climate change to you personally?	Five-point Likert scale (Not at all important, Fairly important, Very important, Extremely important).	2.94(1.08)	3.15(1.11)
Perceived Concern	How concerned, if at all, are you about climate change, sometimes referred to as 'global warming'?	Five-point Likert scale (Not at all concerned, Not very concerned, Fairly concerned, Very concerned).	2.42(0.83)	3.41(1.01)
Perceived Collective actions & Responsibility	It is hard to take action against climate change even if you want to.	Five-point Likert scale (Strongly disagree, Tend to disagree, Neither agree nor disagree, Tend to agree, Strongly agree).	2.24(1.16)	2.25(1.11)
	It is my responsibility to help to do about climate change	Five-point Likert scale (Strongly disagree, Tend to disagree, Neither agree nor disagree, Tend to agree, Strongly agree).	3.02(0.97)	3.49(1.14)
Perceived country risk	Saudi Arabia region could be affected by a climate change?	Five-point Likert scale (Strongly disagree, Tend to disagree, Neither agree nor disagree, Tend to agree, Strongly agree).	2.83(0.87)	3.20(0.98)
Intention to change behaviour toward sustainable lifestyle	I can personally help to reduce climate change by changing my behaviour	Five-point Likert scale (Strongly disagree, Tend to disagree, Neither agree nor disagree, Tend to agree, Strongly agree).	3.19(1.09)	3.40(1.07)
	I feel a sense of urgency to change my behaviour to help to reduce climate change	Five-point Likert scale (Strongly disagree, Tend to disagree, Neither agree nor disagree, Tend to agree, Strongly agree).	2.96(0.97)	3.24(1.07)

The current survey indicates that those who have noticed signs of climate change are more favourable towards the adoption of more environmentally friendly lifestyles. They can participate in the mitigation of greenhouse emissions in various ways (including the following that have been reported in the survey): Less reliance on private transport given the low cost of oil, driving more environmental friendly vehicles, using public transports (Presidency of Meteorology Environment (PME), 2005), more efficient use of energy in homes (Roy and Pal, 2009), better preservation of water and less reliance on desalinated water, living in more adapted energy friendly flats or houses, using effective recycling methods and preserving green spaces (Spence et al., 2011).

7.2.2.2. Awareness and Knowledge

This survey assessed public awareness and knowledge regarding climate change. In this respect, 31% of respondents reported having personally noticed signs of climate change during their lifetime, while more than two-thirds (69%) had not. Conversely, 66% had heard of climate change, while 34% had not (Table 7.5). When asked for more detail about when they thought that Saudi Arabia would start feeling the signs of climate change, nearly 14% stated that they did not know or had no opinion, 17% expected it to occur in the next 50 years, 11% in the next 25 years and 14% in the next 10 years. Less than a third (31%) stated that we were already seeing the signs of climate change, while the aggregate of ‘in the next 100 years’, ‘beyond the next 100 years’ and ‘never’ was less than 5%.

Table 7.5: General knowledge of respondents.

General Knowledge of Climate Change	Frequency	Percentage %
Have you heard of climate change?		
Yes	778	66.3
No	395	33.7
Total	1173	100

To assess the level of public knowledge about the causes of climate change, this study presented a range of causes to respondents, then asked them to select freely those, which they believed to cause climate change. The highest rates were assigned to industrial/factory emissions (11.46%), followed by cars/traffic/exhaust fumes

(10.27%), CO₂/carbon emissions (9.91%), emissions/fumes/waste gases (9.77%), radioactive waste (9.54%), the hole in the ozone layer (8.13%), natural causes (the earth's cycles/weather patterns) (8.01%) and finally fossil fuel consumption/burning (4.52%) and GHGs (6.12%) (See Table 7.6).

The ranking of public perceptions regarding the causes of climate change indicates that a quarter of respondents believed climate change to be caused partly by natural processes and partly by human activity (24%), that slightly fewer (23%) believed it to be mainly caused by natural processes and that only 16% identified human activity as the main cause, while just as many (17%) selected 'don't know' or had 'no opinion' (Table 7.7).

Table 7.6: Perceived factors that cause climate change.

Perceived items that cause of climate change	Response Sample (n=1173)		
	Frequency	Percentage %	Rank
Which of the following items do you think can be a cause of climate change?			
CO ₂ /carbon emissions	611	9.92	3
Emissions/fumes/west gases	602	9.77	4
Greenhouse gas	377	6.12	10
Cars/traffic/exhaust fumes	633	10.28	2
Industry/factory emissions	706	11.46	1
CFCs/aerosols	219	3.56	13
Fossil fuel consumption/burning	279	4.53	12
Radioactive waste	5.88	9.55	5
Chemicals	408	6.62	8
Using up the earth's resources	361	5.86	11
The hole in the ozone layer	501	8.13	6
Natural-earth's cycles/weather patterns	494	8.02	7
Destruction of rainforest/trees	381	6.18	9
Total	*6160	100	---
*The participant can select more than option, so the total greater than Sample (n=1173)			

Table 7.7 Perceived climate change more general causes

Variable	Response Sample (n=1173)		
	Frequency	Percentage %	Rank
The climate change/global warming in general is caused by:			
Climate change is entirely caused by natural process: earthquake, volcano eruption	105	8.95	5
Climate change is mainly caused by natural process	279	23.79	2
Climate change is partly caused by natural process and partly caused by human activity: fossil fuel energy use	288	24.55	1
Climate change is mainly caused by human activity	187	15.94	3
Climate change is entirely caused by human activity	84	7.16	6
I think there is no such thing as climate change	27	2.30	8
Don't know	134	11.43	4
No opinion	69	5.88	7
Total	1173	100	---

Notably, only 22% of the sample agreed (i.e. tended to agree or strongly agreed) that they were uncertain whether climate change is really happening, while 54% disagreed and the remaining 24% neither agreed nor disagreed.

7.2.2.3. Perceptions of Risk

The impact of climate change was either 'extremely important' or 'very important' individually (31%), collectively (31%) and globally (28%). In contrast, the impact of climate change was felt 'not at all important' or 'not very important' individually (32%), collectively (33%) and globally (31%). 'Fairly important' was selected for each of the three categories by approximately 37%, 36% and 41% of the sample respectively. In other words, if the 'fairly important' option, which actually means that the respondent did not know, is ignored, the results can be reinterpreted as follows: Almost half (49%) assessed the potential effects of climate change on them individually as 'extremely important' or 'very important', 49% felt this for the effects on them collectively as a society and 48% for the global effect, while slightly more than half considered it to be 'not at all important' or 'not very important' at each level.

Moreover, only 25% of respondents selected 'tend to agree' or 'strongly agree' in relation to whether they were 'very concerned with environmental issues', while 38%

neither agreed nor disagreed with this. The remainder marked ‘strongly disagree’ or ‘tend to disagree’ (37%). Figure 7.5 shows citizen’s perceived concern.

Overall, the level of public concern was nearly 46%.

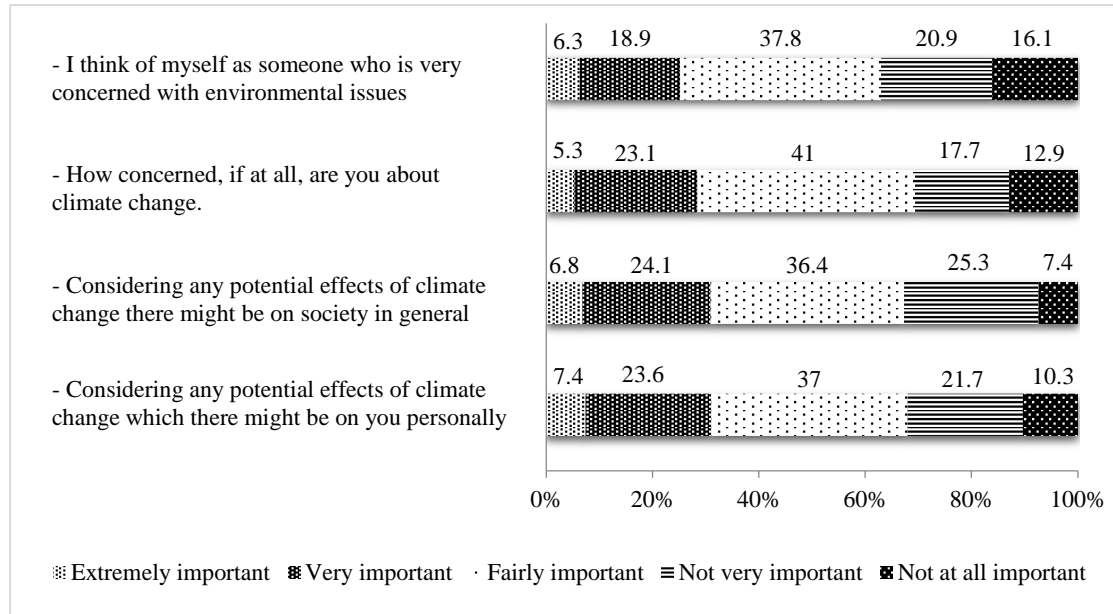


Figure 7.5: Citizen perceived concern about environmental issues, 2012

In contrast, in this survey only 23% of respondents felt that climate change affected or would affect them personally; 39% stated that climate change did not affect them or was not going to do so, while the remainder (38%) were unsure. Similarly, only 24% of respondents tended to agree or strongly agreed that their local area was likely to be affected by climate change, while 36% selected ‘tend to disagree’ or ‘strongly disagree’, leaving those who neither agreed nor disagreed as the largest group (40%). Again, at a national level, a quarter of people surveyed (25%) agreed more or less strongly that Saudi Arabia could be affected by climate change; most people (42%) neither agreed nor disagreed and a third (33%) disagreed to some extent.

Concern was slightly stronger at a global level but still only about a third (32%) of respondents agreed that climate change was a global problem and would affect all countries; the same proportion (31%) disagreed with this statement and 37% neither agreed nor disagreed. Figure 7.6 shows citizen’s perceptions of risks.

Overall, 41% perceived risks.

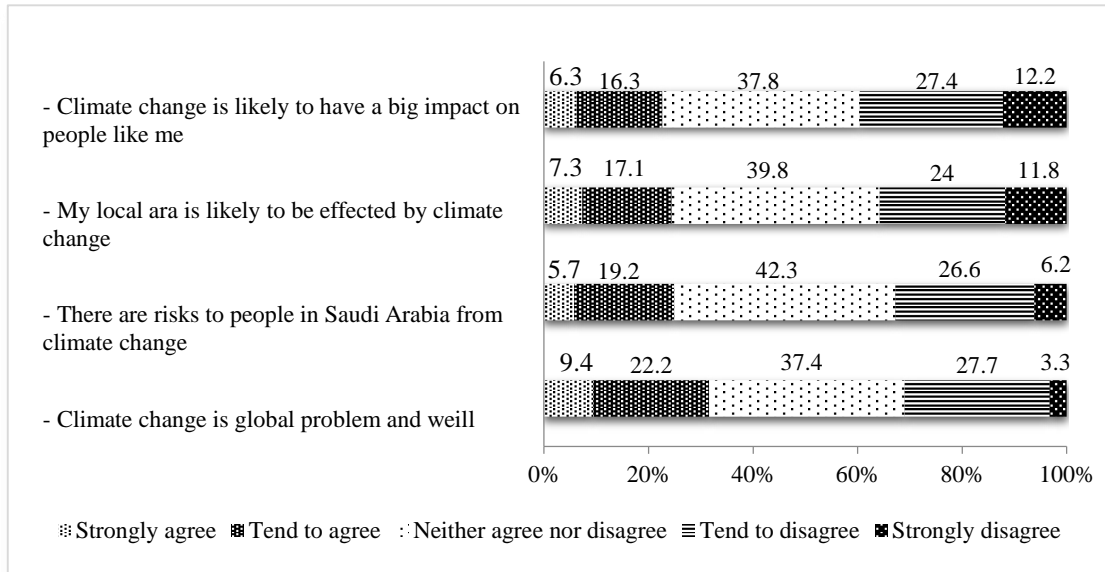


Figure 7.6: Citizen perception of risks, 2012

7.2.2.4. Trust in Source of Information

While easy access to useful information is essential, understanding how to interpret it is equally important. It is also clear that the stimulation of the passions in recipients of information will have a direct effect on attracting people to environmental issues and that trust is essential to help people to accept information (Eiser et al., 2002, Poortinga and Pidgeon, 2003b, Poortinga and Pidgeon, 2004). These issues must be addressed before the deployment of information campaigns. However, trust reflects the public reliance on expertise and the actions (e.g. regulations or policies) of government, or institutions' recommendations to mitigate and control the potential hazards (Lorenzoni and Pidgeon, 2006). In general, the majority of people are likely to mistrust governments, industry or business sectors and even sometimes experts (Marris et al., 1998, Poortinga and Pidgeon, 2003b, Lorenzoni and Pidgeon, 2006).

To measure the level of trust, we used a five-point Likert scale from 1 to 5 (from 'a lot', 'a little', 'not very much', 'not at all' to 'can't choose'); most respondents selected 'a lot' or 'a little'. Scientists were regarded as most trustworthy (87%) followed by family members or friends (82%), environmental organisations (79%) and the media (i.e. television, radio and newspapers comprising 76%). Trust in government was weaker, at 68%, while that in energy suppliers was the lowest, at just 46% (Figures. 7.7 and 7.8).

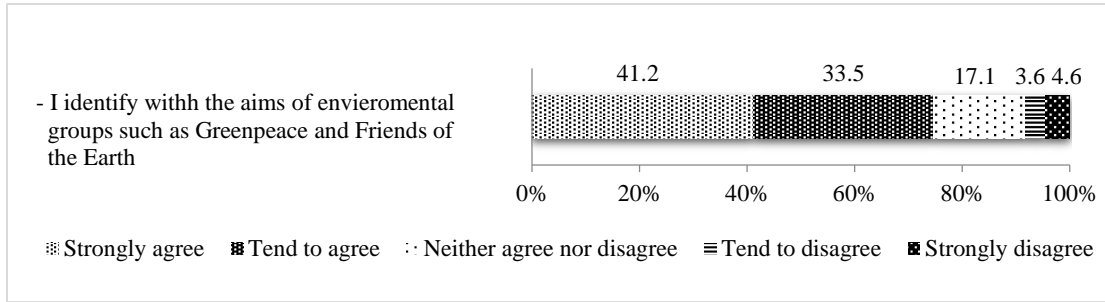


Figure 7.7: Level of public acceptance of environmental groups

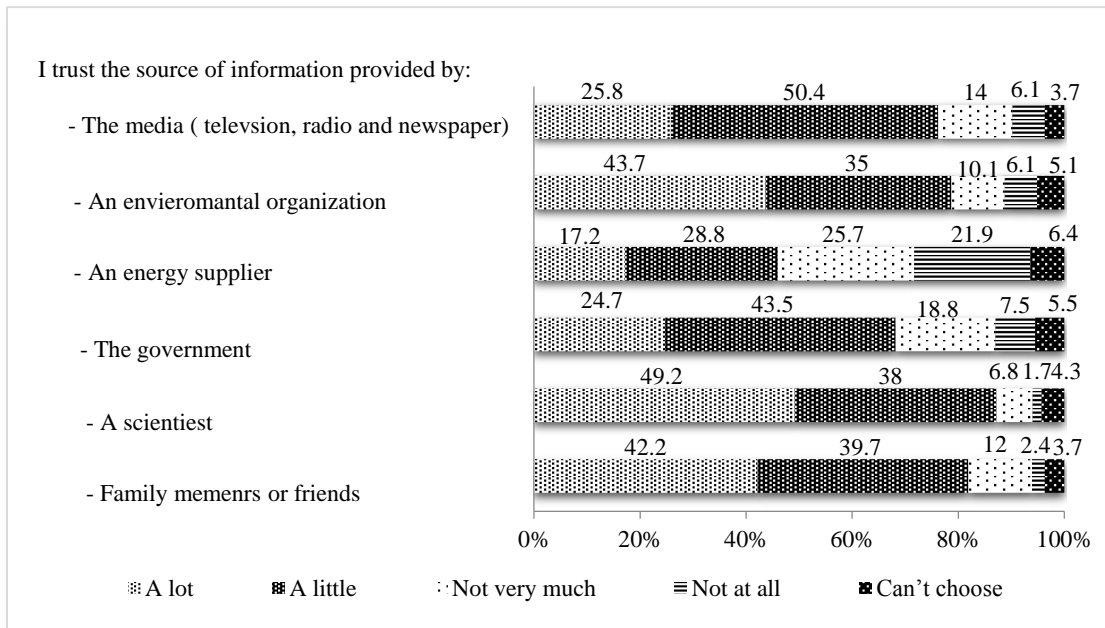


Figure 7.8: Comparison in level of trust in source of information between family and friends, scientists, government, energy supplies, environmental communities and media.

7.2.2.5. Sense of Responsibility and Intention to Change Behaviour

This study also wanted to gauge the extent to which people feel responsibility for their actions with respect to tackling climate change. In a direct question about this, 24% of the sample agreed that they could not personally help to reduce climate change by changing their behaviour, while 48% disagreed and 28% neither agreed nor disagreed.

Some participants (20%) agreed that it was their responsibility to help to do something about climate change, while 42% disagreed and 38% neither agreed nor disagreed.

Regarding feelings of responsibility, over a quarter of respondents (26%) agreed that they feel a sense of urgency towards changing their behaviour in order to help reduce climate change, while 39% disagreed and 35% neither agreed nor disagreed. Overall, the total measure of responsibility was 35%. (Figure 7.9).

A clear majority (67%) agreed that it would be hard to take action against climate change even if they wanted to, while only 14% disagreed and 19% neither agreed nor disagreed.

Overall, responses regarding the ability and intention to change behaviour showed that 21% agreed and 51% disagreed.

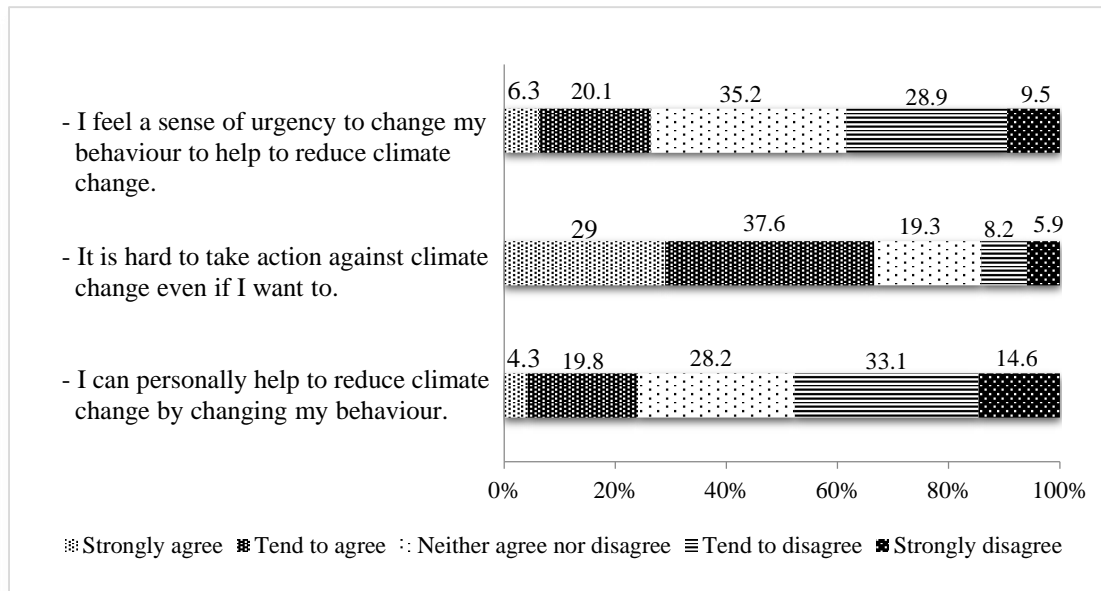


Figure 7.9: Measure the intention of people to change their behaviour or lifestyle to mitigate the effect of climate change.

7.2.2.6. Public Attitudes, Beliefs and their Perception Towards Climate Change

Three questions were asked regarding respondents’ feelings about climate change by using two five-point Likert scales from 1 to 5: ‘extremely important’, ‘very important’, ‘fairly important’, ‘not very important’ ‘not at all important’ and ‘strongly agree’, ‘tend to agree’, ‘neither agree nor disagree’, ‘tend to disagree’ ‘strongly disagree’. As above, these are reported here by combining responses 1 with 2, and 4 with 5.

As shown in Figure 7.10, unsurprisingly, nearly 32% of respondents stated that the issue of climate change was not important to them personally, while 27% believed that it was extremely or very important. Less than half (41%) had no clear opinion.

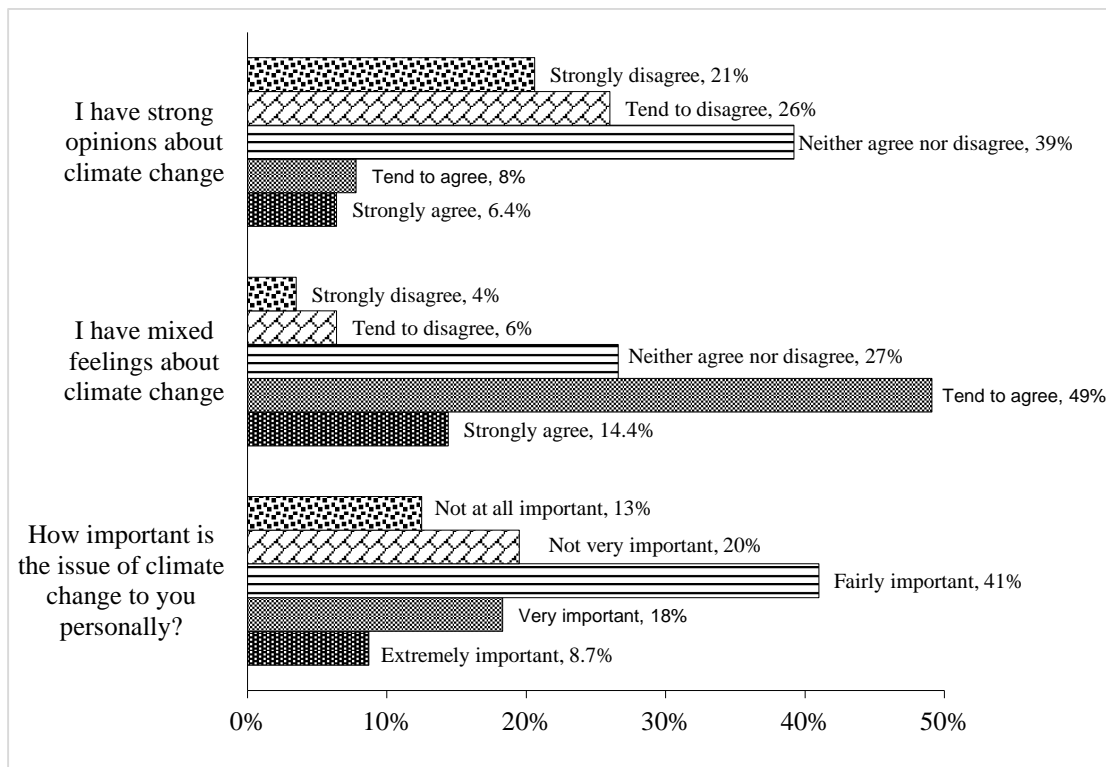


Figure 7.10: Participants' attitudes and beliefs towards climate change

Most people agreed that they had mixed feelings about climate change (64%), while only 10% disagreed. Interestingly, just 27% of the sample neither agreed nor disagreed in this regard. Consistent with these mixed feelings, few people (only 14% of the sample) agreed that they had strong opinions about climate change, while almost half (47%) disagreed and the remainder (39%) neither agreed nor disagreed.

7.2.2.7. Perceived Effect of Climate Change on Changing Lifestyles

This study uses seven measurement items to find out what actions people are actually taking towards mitigating the impact of climate change. The respondents were asked whether they had undertaken any of the following actions in an attempt to deal with a problem affecting their local area: (a) Contacted a local municipality; (b) Attended a public meeting; (c) Contacted an appropriate organisation to deal with the problem; (d) Contacted an Assembly Member; (e) Attended a protest meeting or joined an action group; (f) Helped organise a petition and/or (g) Contacted a local radio station, television station or newspaper.

Surprisingly, the range of answers was 5-10% for ‘regularly’ and 16-31% for ‘occasionally’, while the majority (50-66%) agreed that they had never taken action to fix an environmental problem. Roughly 8-12% did not answer. Furthermore, a significant proportion (45%) of participants selected ‘none’ when asked what proportion of their income they would be willing to pay on top of the cost of living if it helped to tackle climate change. Only 21% of respondents were willing to pay an additional two per cent per month, followed by 13% who would pay five per cent and 11% who would pay ten per cent. Collectively, the remaining options (15%, 20% and more than 20%) were supported by less than 10% of respondents (Table 7.8).

Table 7.8: Participants' willingness to pay to mitigate climate change.

Willing to pay to tackling climate change	Response Sample (n=1173)		
	Frequency	Percentage %	Rank
What is the proportion that you are willing to pay more on cost of living if that helps to tackle climate change?			
2%	240	20.5	2
5%	150	12.8	3
10%	129	11	4
15%	80	6.8	5
20%	40	3.4	7
More than 20%	4	0.4	6
None	530	45.1	1
Total	1173	100	---
- Mean/SD (4.36/2.48), Mode 7			

7.2.3. Self-report of Current Limitations and Barriers to Behaviour Change

As noted above, sustainable infrastructure and availability, empowerment and sharing responsibility on one hand, and the challenges and barriers on the other hand, are often driven by deep-seated attitudes and beliefs (feelings), as well as judgements with regard to tackling climate change. However, as presented in Figure 7.11, the survey found that the majority of respondents (72%) agreed that they faced barriers regarding climate change programmes. Detailed perceived barriers and challenges are depicted in Figure 7.12.

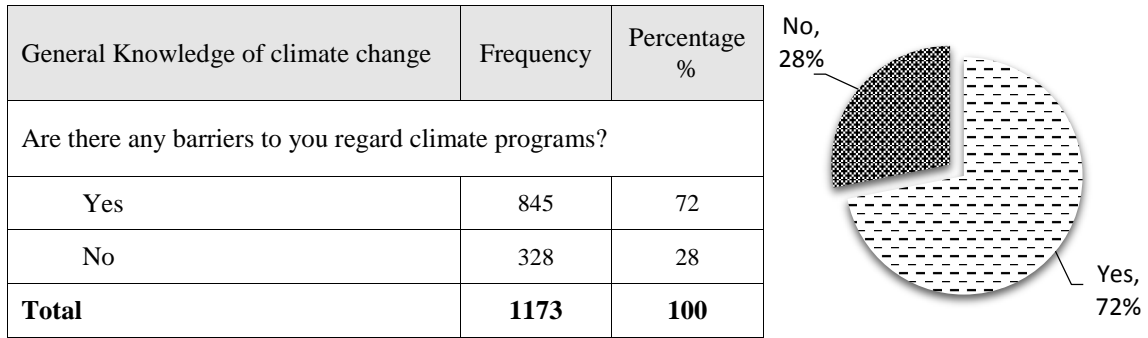


Figure 7.11: Percentage of people agree that they face barriers

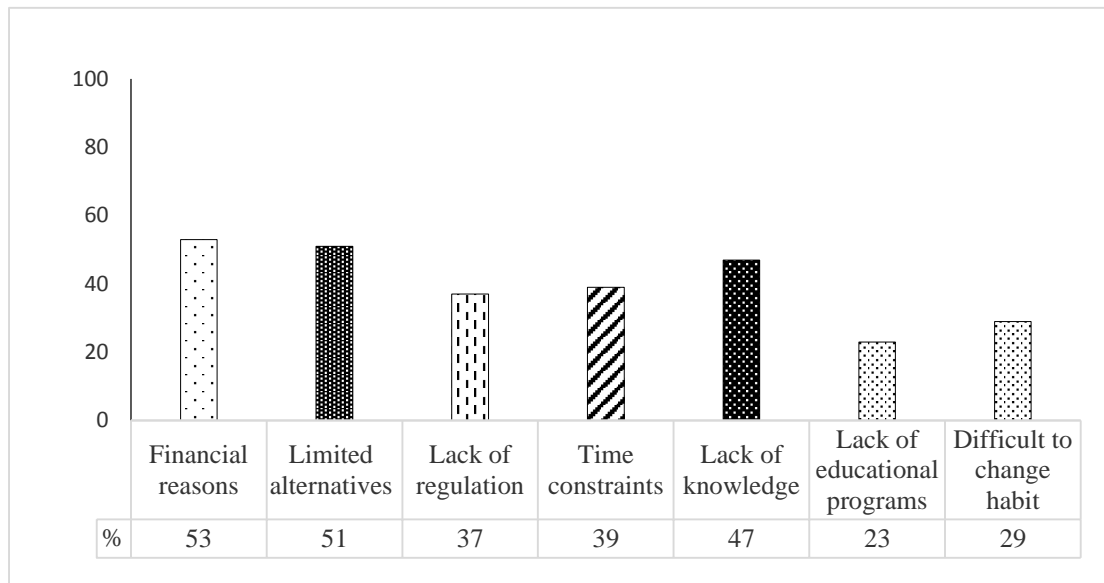


Figure 7.12: Self-report of perceived current limitations and barriers to behaviour change.

While the majority of respondents believe that the responsibility lay with environmental organisations, with local and national governments and with international bodies, a small proportion of respondents did believe that they had a role themselves; that is, by recognising that their own practices have exacerbated the problem, they also assume a moral responsibility and commitment to address environmental issues. There is a large consensus that efforts made by governments to mitigate the potential hazards of climate change will not be effective or feasible unless there is international support and international action (Norton and Leaman, 2004, Kirby, 2004). There is also the opinion that individuals had no direct role in mitigating the effects of climate change, even though they wished that they did. Thus, people may feel a moral responsibility to address environmental issues but may lack the cognitive ability and the empowerment to act.

Most respondents said that they faced many barriers to effective participation, some palpable and others not, some physical and others intangible. Thus, lack of individual response to climate change initiatives in part reflects their inability to participate. A sustainable lifestyle must overcome limitations of all kinds. For example, according to a study conducted in 2002, people tend to think that they are not able to control the risks resulting from climate change by themselves (Poortinga and Pidgeon, 2003b). Another qualitative study in the UK indicates that the public do articulate moral obligations towards society regarding climate change issues and they agree that they have a degree of personal responsibility (Bickerstaff et al., 2006), but they recognise that they fail to act because of the barriers (Lorenzoni and Pidgeon, 2006). For instance, the existing physical barriers mentioned include the high cost of environmentally friendly alternatives, which are often unfamiliar or inaccessible to people. Indeed, the alternatives are often not available. Many people complained either that the alternatives were poor or that they found it difficult to access information or reach appropriate solutions. In other words, suitable options did not exist, even if they wished to adopt them. Hence, people must be offered sustainable alternatives and the necessary guidance to connect with them.

Many respondents complained that they were unable to participate in the proposed solutions and were not empowered to contribute to decision-making. Previous environmental initiatives may have been affected negatively by people's inability and lack of empowerment, in other words, a failure to enable them to participate in discussions about policies and legislation regarding environmental issues. Enabling people to contribute is likely to make them more enthusiastic, leading them to pursue success rather than indifference or indeed, in many cases, opposition. In most cases, it is counterproductive to impose regulation or legislation by force, because people do not welcome external intervention. It is preferable that rules or guidelines are perceived as voluntary, fair, unambiguous, interesting and that the benefits are clear. Hence, decisions need to involve value judgements, which will be defined by socio-political processes and influenced by considerations of development, equity and sustainability alongside uncertainties and risks (Watson et al., 2003, Lorenzoni et al., 2005). However, many respondents also expressed the view that current laws and regulations were weak. On the one hand, it is extremely important to promote the involvement of citizens, enabling them to participate in negotiations, contribute to policy discussions,

share responsibility and decision-making before introducing commitments and laws. On the other hand, the role of the trust people have in decision-makers is important here too (Cvetkovich and Löfstedt, 1999, Siegrist et al., 2000, Renn and Rohrman, 2000, Lorenzoni and Pidgeon, 2006, Poortinga and Pidgeon, 2003b).

7.2.3.1. Level of Public Engagement in Climate Change in Saudi Context

The survey results reinforce the fact that people are unlikely to support initiatives that mitigate the potential effects of climate change unless they are convinced that climate change poses a serious threat to society or will affect them personally. The failure to recognise the problem of climate change and the low salience of the problem are obstacles that make it difficult to influence people's behaviour towards the mitigation of climate change and adoption of sustainable lifestyles (Bord et al., 1998). Eco-scientists have argued that one of the obstacles to people recognizing the problem is that climate change is generally hidden from people's immediate view (Aaheim et al., 2012). It can be recognised by means of climate conditions over a long period of time rather than seasonal periods and can only be understood through mathematical models and scientific measurements (Kollmuss and Agyeman, 2002). Thus, the survey indicates that Saudis have in general, low concerns about climate change as they lack knowledge on the subject, which is reflected in their perception of impact and consequences of climate change. This corroborates related surveys (Weber, 2010). Moreover, they see climate change as geographically and chronologically distant and with limited impact (Lorenzoni and Pidgeon, 2006). However, previous studies also reveal that the level of public concern is not constant. It may fluctuate and change over time depending on the surrounding circumstances, education, experience, attention given to the issue in the media, occurrence of a major weather-related disaster and the level of social cognition that links to reactions and concerns (Gallup, 2012). Thus, prominent signs of climate change are likely to increase people's awareness (Elagib and Mansell, 2000, Lázaro et al., 2001). In the case of Saudi Arabia, there has been an increase in ambient temperature, reaching up to 60°C in the summer season in some parts of the country (Tieleman et al., 2003). The rainfall has declined dramatically and most parts of country have suffered severe droughts (Alpert et al., 2004). Those major weather extremes and recent changes in ecosystems have affected the attitude of some Saudis toward climate change, as discovered in the survey.

Meanwhile, social scientific research has demonstrated that risk perceptions are critical components of public and social responses to hazards (Leiserowitz, 2007, 2008, Syal et al., 2011, Lorenzoni and Pidgeon, 2006). Climate change is already affecting several regions of the country in terms of water resources, health, food and agricultural production, fisheries, biodiversity, forests and pastures (Darfaoui and Assiri, 2011). There is also a high potential for the occurrence of drought near the Red Sea basin systems (the West Saudi border) (Krichak et al., 1997, Ziv et al., 2005, Alpert et al., 2004). Saudi Arabia may also be affected by the potential risk of rising sea levels, as its borders are largely coastal overlooking the Arabic Gulf to the east and the Red Sea to the west. The volume of those risks is likely to act as an incentive influencing people to change their negative behaviour, if the population perceives real signs of risk.

7.2.3.2. Discussion of Public Views Towards Environmental Sustainability; Climate Change Phenomena

As shown in Table 7.9, the results of this study indicate that Saudis' can be grouped into three categories with respect to their level of engagement with environmental issues and initiatives. (Pro-environmental (i.e. positive), neutral and negative (which may in some cases be hostile to environmental concerns)).

As shown in Table 7.10, those in the first category, who can be called "pro-environmental" (positive), have a good level of awareness and knowledge as well as a desire to adopt environmental solutions. They are enthusiastic towards the use of environmentally friendly products and the adoption of environmental solutions. They complain about the lack of environmental solutions, think that there is a lack of environmental infrastructure and that they face certain obstacles, which limit the effectiveness of their contribution. This category of people is relatively easy to help by providing alternatives and an improved infrastructure in order to overcome the obstacles they face.

Table 7.9: Participants group profile based on personal assessment of importance of climate change across with person's demographic variables. (How important is the issue of climate change to you personally?)

Demographic characteristics		level of environmental loyalty and interest (n=1173)									
		Negative				Neutral		Positive			
		Not at all important (N=146/1173)		Not very important (N=230/1173)		Fairly important (N=481/1173)		Very important (N=214/1173)		Extremely important (N=102/1173)	
		Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)	Freq	(%)
Gender	Male	99	67.81	145	63.32	357	74.22	159	73.95	80	78.43
	Female	47	32.19	84	36.68	124	25.78	56	26.05	22	21.57
Age	< 18	9	6.16	16	6.99	18	3.74	12	5.58	4	3.92
	19-24	35	23.97	65	28.38	98	20.37	42	19.53	16	15.69
	25-34	37	25.34	75	32.75	191	39.71	68	31.63	45	44.12
	35-44	35	23.97	41	17.90	96	19.96	39	18.14	24	23.53
	45-54	24	16.44	25	10.92	62	12.89	28	13.02	8	7.84
	55-64	3	2.05	7	3.06	14	2.91	12	5.58	4	3.92
	65+	3	2.05	0	0.00	2	0.42	14	6.51	1	0.98
Highest qualification	No formal qualifications	4	2.74	4	1.75	2	0.42	6	2.79	4	3.92
	Primary school	8	5.48	8	3.49	8	1.66	17	7.91	2	1.96
	Intermediate school	11	7.53	16	6.99	28	5.82	14	6.51	5	4.90
	High school	35	23.97	58	25.33	146	30.35	56	26.05	31	30.39
	Certificate/Diploma - Advanced Diploma	15	10.27	24	10.48	70	14.55	53	24.65	9	8.82
	Bachelor Degree or equivalent (=NVQ4)	55	37.67	99	43.23	185	38.46	58	26.98	35	34.31
	Masters/PhD or equivalent	12	8.22	13	5.68	34	7.07	9	4.19	13	12.75
Other	6	4.11	7	3.06	8	1.66	2	0.93	3	2.94	
Income per month	Up to 3,000 (Very low)	19	13.01	39	17.03	43	8.94	29	13.49	12	11.76
	3,001 – 6,000 (Low)	13	8.90	35	15.28	61	12.68	26	12.09	24	23.53
	6,001 – 9,000 (Medium)	15	10.27	33	14.41	111	23.08	43	20.00	22	21.57
	9,001 – 12,000 (Above medium)	13	8.90	19	8.30	51	10.60	27	12.56	8	7.84
	12,001- 25,000 (High)	27	18.49	28	12.23	71	14.76	21	9.77	12	11.76
	More than 25,000 (Very high)	10	6.85	4	1.75	21	4.37	4	1.86	2	1.96
	Prefer not to say	41	28.08	53	23.14	92	19.13	36	16.74	18	17.65
No income	8	5.48	18	7.86	31	6.44	29	13.49	4	3.92	
Working status	Working – full time (30+ hours per week)	80	54.79	118	51.53	337	70.06	124	57.67	69	67.65
	Not working	20	13.70	23	10.04	15	3.12	24	11.16	4	3.92
	Not working- disabled	1	0.68	0	0.00	2	0.42	2	0.93	1	0.98
	Not working-retired	3	2.05	3	1.31	5	1.04	7	3.26	2	1.96
	Student	37	25.34	59	25.76	99	20.58	36	16.74	20	19.61
	Working – part time	5	3.42	26	11.35	23	4.78	22	10.23	6	5.88

Table 7.10: Participants group profile based on personal assessment of importance of climate change across with perception's constructs (i.e. uncertainty, perceived risks, opinion and feeling, willing to change behaviour, willing to pay, take actions, the barriers) (How important is the issue of climate change to you personally?)

Measurement Dimensions			level of environmental loyalty and interest (N=1173)					
			Negative		Neutral		Positive	
			Not at all important (N=146/1173) & Not very important (N=230/1173)		Fairly important (N=481/1173)		Very important (N=214/1173) & Extremely important (N=102/1173)	
Constructs	Measure items	Scale	Freq	(%)	Freq	(%)	Freq	(%)
Uncertainty	I am uncertain that climate change is really happening.	Disagree	116	30.85	221	45.95	175	55.38
		Neutral	104	27.66	127	26.40	54	17.09
		Agree	156	41.49	133	27.65	87	27.53
Perceived Risks	There are risks to people in Saudi Arabia from climate change	Disagree	193	51.33	175	36.38	96	30.38
		Neutral	111	29.52	173	35.97	155	49.05
		Agree	72	19.15	133	27.65	65	20.57
Opinion and feeling	I have strong opinions about climate change	Disagree	203	53.99	224	46.57	119	37.66
		Neutral	130	34.57	170	35.34	150	47.47
		Agree	43	11.44	87	18.09	47	14.87
Willing to change behaviour	I feel a sense of urgency to change my behaviour to help to reduce	Disagree	208	55.32	144	29.94	98	31.01
		Neutral	71	18.88	209	43.45	133	42.09
		Agree	97	25.80	128	26.61	85	26.90
Willing to pay	What is the portion that you willing to pay more on cost of living if that help to tackle climate change?	0.02	69	18.35	106	22.04	65	20.57
		0.05	45	11.97	67	13.93	38	12.03
		0.10	42	11.17	47	9.77	40	12.66
		0.15	25	6.65	29	6.03	26	8.23
		0.20	5	1.33	14	2.91	21	6.65
		More than 20%	21	5.59	33	6.86	16	5.06
		None	169	44.95	185	38.46	110	34.81
Take actions	Actions in an attempt to solve a problem affecting local area.	Regularly	36	9.57	45	9.36	40	12.66
		Occasionally	115	30.59	151	31.39	102	32.28
		Never	188	50.00	240	49.90	161	50.95
		N/A	37	9.84	45	9.36	13	4.11
The Barriers	Are there barriers to you regarding climate change programs?	Yes	294	78.19	332	69.02	217	68.67
		No	82	21.81	149	30.98	99	31.33

People in the second intermediate category (neutral) are neither enthusiastic nor against environmental issues. This attitude arises from what is lacking in their knowledge and awareness as well as the attention they pay to other issues that they see as more important. It may be necessary to increase knowledge and promote awareness among members of this group in order to encourage beliefs and attitudes towards more sustainable lifestyles and to overcome the obstacles they face in order to empower them (Leiserowitz, 2007, 2008, Read et al., 1994, Bord et al., 1998). Indeed, disempowerment is a crucial challenge and a vital barrier that prevents people from contributing to mitigating climate change, even though the public recognises moral obligations and feel direct personal responsibility (Lorenzoni and Pidgeon, 2006, Immerwahr, 1999, Bickerstaff et al., 2006). To address this, each case must be examined in detail and individual solutions identified based on demographic determinants such as age, gender, ethics and level of education (Spence et al., 2011, Leiserowitz, 2007, 2008) in addition to geographical, social and personal characteristics. This study concludes that such factors are likely to have the power to contribute alongside other determinants in forming an effective approach to engaging people in changing negative behaviour and moving towards a sustainable lifestyle. Future work will investigate this issue in much more detail with a view to proposing a comprehensive framework and approach for engaging people in tackling climate change.

Those in the final category are not interested in and may in some cases be hostile to environmental concerns, believing that environmental proposals would affect them financially or morally. Many recent studies emphasise that, while instituting regulations and policies, decision-makers must ensure that they do not affect people's interests or well-being (Leiserowitz, 2007, 2008). Also, people have a tendency to accept initiatives that do not affect their individual life or cost of living, while opposing initiatives that have a significant impact on lifestyle (Bord et al. 1998). For instance, in this survey a significant portion of respondents selected 'none' when asked what portion of their income they would be willing to pay on top of the cost of living if it helped tackle climate change. Some respondents thought that they should not take action if there were financial implications and many of them opposed any increase in fuel price or the cost of air travel as well as being less willing to reduce travel by air.

For this category, it is necessary to investigate the reasons that lead to such perceptions, which may be a lack of knowledge or awareness or a failure to evaluate risks. Some previous studies found an association between knowledge, public awareness and risk assessment (Lorenzoni and Pidgeon, 2006, Kirby, 2004, Poortinga et al., 2006, Leiserowitz, 2007, 2008). In some cases, they may be due to selfishness, underestimation of direct threat and indifference. The reasons for such attitudes must be addressed. This highlights the roles of compulsion, regulation and legislation (Ockwell et al., 2009). It is expected, however, that addressing the situation with regards to the other two categories may solve many of the problems associated with this third one.

In general, citizens' points of views regarding their current lifestyles can be analysed from a cognitive perspective. It is difficult for people to imagine ways in which their daily activities affect the climate or contribute to climate change and the effects of anti-environmental practices cannot easily be translated into the language of popular culture (Ungar, 2000). In particular, this study shows that citizens across a broad spectrum do not know that human activities are a major cause of climate change and do not realise that the use of fossil fuels forms the core of the climate change problem. Most respondents were not aware that their daily activities or their current patterns of living would exacerbate the problem. This is not surprising when considering the fact that the majority of people did not realise that the transformation into a sustainable lifestyle pattern contributes to mitigating the effects of climate change.

The majority of people tend to think that they are not able to control the risks resulting from climate change by themselves (Poortinga and Pidgeon, 2003a) and the practice of communication is made much more difficult (Lorenzoni and Pidgeon, 2006) by various factors including, the physical, financial, political, social, institutional and technical (Birkmann, 2011).

In conclusion, three factors emerge from the study as key determinants in Saudi's ability to engage in climate change mitigation actions, namely: Locality, Humanity and integration. These will inform the Saudi government in their address to the people when engaging them with regards climate change mitigation.

In terms of Locality, the design of campaigns must focus on promoting environmental awareness and on introducing people to environmental and health issues both locally and internationally. The campaigns must instil in the public a spirit of volunteerism and take account of individual differences when formulating initiatives. Through direct communication with different groups in society, locally and internationally, the dissemination of knowledge regarding local environmental issues, the highlighting of local issues and the promotion and strengthening of current positive environmental behaviours which contribute to the preservation of the environment, it is possible to develop people's thinking skills and creativity and to provide them with various life skills that serve environmental ends. This study shows that locality affects people's behaviour. It is one of the determinants which must be addressed. Different people behave differently as a result of the location in which they live. Some of the most important factors that affect local characteristics are the cultural, social, physiological and economic conditions under which the residents of each neighbourhood or district live.

From a Humanitarian perspective, environmental solutions must take into account the welfare and wellbeing of humans. They must consider the individual's basic requirements for a good life, take into account health factors and avoid harming the social relationships between individuals, their social security or their freedom of choice and action.

Finally, in terms of integration and involvement, it is necessary to intensify and expand integration to the participation of all concerned by the adoption of a direct participatory approach, inviting the interactive contribution of all stakeholders in the preparation, approval, design and implementation of programmes of action. This means that it is necessary to raise environmental awareness among people and policymakers, making them aware of the extent and nature of the risks associated with climate change. This study shows that the skill levels of organisations and individuals alike are very low at local and national levels and must be supported and strengthened by developing interactive and attractive plans, which follow a more effective approach towards climate change adaptation. The awareness of local people must be raised in order to ensure their participation in the rehabilitation process, linking them to local, national and international initiatives and informing them of local, national and global solutions. It will also be necessary to guide them through the rational use of resources and

solutions to finding suitable alternatives. People must be directed to take optimal advantage of the region's natural resources, to encourage and support local initiatives and programmes and to link them globally. It is necessary to activate the idea of acting locally and thinking internationally. Local and national initiatives should be linked with global ones and support given to them both technically and financially.

7.2.4. Public Perception Towards the Concepts/Techniques Proposed in the Engagement Model.

As stated earlier, the second objective of the survey is to confirm and refine the components of the proposed conceptual model that had been identified through the literature review. The finalised conceptual model, then, will function as the basis for the development of the engagement platform in sustainability. The following sections present an evaluation of the components of the conceptual model and their suitability for the engagement platform.

7.2.4.1. Exploit the Role of Environmental Organizations and Social Networks

As shown in section 7.2.2.5, the survey results shows that the public of trust in sources of information on environmental affairs is strongest for scientists followed in descending order by environmental associations, friends and family members, government, the media and lastly, service providers. These results clearly point to the effectiveness of taking advantage of the level of confidence that individuals have in environmental bodies – as well as friends and family members (social networks) – when disseminating information in campaigns which attempt to raise public awareness of environmental affairs or to direct people towards sustainable lifestyles. According to this survey findings, it is likely that solutions which pay special attention to activating the role of environmental organisations and scientists and those which emphasise the role of social relationships (family, friends, neighbours, etc.) will be most successful. Most participants (85%) tended to agree that social networks affected their decisions and choices with regards to climate change issues, while only 15% disagreed (Table 7.11).

Table 7.11: The role and effect of Social Network.

Social Network effect	Frequency	Percentage %
Do you think the social network you have may be affect your perceptions regard climate change?		
Yes	998	85.08
No	173	14.92
Total	1173	100

The findings reveal that ‘social networks’ can contribute on enhance engagement of individuals towards acceptance of the proposed solutions by changing social norms through incorporating social relations between individuals. In addition to the effects of the physical social network, the survey explored the influence of virtual social networks on issues of engagement and intention to change. To this end, the survey focused on three broad categories of influence; cognitive, affective and intention to change. Table 7.12 presents the participant’s responses (on a 5 point Likert scale) as well as the mean and standard deviation value for each item.

Table 7.12: Descriptive findings for public perception of the role of ‘virtual social networks’ facets

Engagement Measurement Dimensions	Items	Responses (%) (n=1173)						
		1 Strongly Disagree	2	3	4	5 Strongly Agree	Means	SD
Cognitive: (Useful, Helpful, Learning and full information, and Inform)								
The virtual social networks provides useful and helpful information.	SNS1	0.5	11.5	18.8	55.4	13.8	3.70	0.86
They learn and have tremendous amount of information from virtual social networks.	SNS2	2.5	7.6	23.9	57.1	9.0	3.63	0.85
Virtual social networks provide appropriate and specialised information.	SNS3	1.0	8.7	19.7	59.8	10.7	3.71	0.81
Affective: (Mentality and emotionally effect, Satisfying and interesting, Enjoyment, satisfaction, pleasure and exiting)								
The experience of social networks have mental and emotional effects.	SNS4	7.2	17.5	17.1	43.5	14.7	3.41	1.15
The virtual social networks are satisfying and interesting.	SNS5	0.3	1.3	14.5	66.0	17.9	4.00	0.64
The virtual social networks are exiting and entertaining.	SNS6	8.0	8.7	32.5	42.1	8.7	3.35	1.03

Intention behaviour (Attitude, Subjective norm (SN), Values and Intention)								
The virtual social networks affect their attitudes.	SNS7	8.7	14.6	33.5	35.1	8.1	3.19	1.06
The virtual social networks affect their social norms.	SNS8	8.9	11.3	27.2	44.7	7.9	3.32	1.07
The virtual social networks affect their values.	SNS9	11.1	19.6	32.3	31.6	5.4	3.01	1.08
The virtual social networks promote a sense of presence, identity and belonging.	SNS10	1.4	14.3	27.1	50.0	7.2	3.47	0.87

The conclusions reflect the respondents' experience with existing 'social networks' and show that:

- 1) 69.2 % of respondents 'agreed' or 'strongly agreed' that the virtual social networks provides useful and helpful information (SNS1: mean = 3.70; SD = 0.86).
- 2) 66.1% 'agree' or 'strongly agree' that they learn and have tremendous amount of information from virtual social networks (SNS2: mean = 3.63; SD = 0.85).
- 3) 70.6% 'agree' or 'strongly agree' that virtual social networks provide appropriate and specialised information (SNS3: mean = 3.71; SD = 0.81).
- 4) 58.3% 'agree' or 'strongly agree' that the experience of social networks have mental and emotional effects (SNS4: mean = 3.41; SD = 1.15).
- 5) 83.9% 'agree' or 'strongly agree' that the virtual social networks are satisfying and interesting (SNS5: mean = 4.00; SD = 0.64).
- 6) 50.8% believed that the virtual social networks are exiting and entertaining (SNS6: mean = 3.35; SD = 1.03).
- 7) 43.2% 'agree' or 'strongly agree' that the virtual social networks affect their attitudes (SNS7: mean = 3.19; SD = 1.06).
- 8) 52.6% 'agree' or 'strongly agree' that the virtual social networks affect their social norms (SNS8: mean = 3.32; SD = 1.07).
- 9) 37% 'agree' or 'strongly agree' that the virtual social networks affect their values (SNS9: mean = 3.01; SD = 1.08).
- 10) 57.3% 'agree' or 'strongly agree' that virtual social networks promote a sense of presence, identity and belonging (SNS10: mean = 3.47; SD = 0.87).

These results reveal that participants recognise the power of social networks to influence them cognitively and emotionally but also to affect their intention to change behaviour.

Essentially, these results indicate that social networks have a definite influence on individual behaviour determinants which could be favourably used to engage the public in sustainability. The high means shown on Table 7.12 clearly support such an assumption, which is further confirmed by the right shift of distribution shown on Figure 7.13 and the fact that 94% of the answers were in or above the mid-point of the measurement scale.

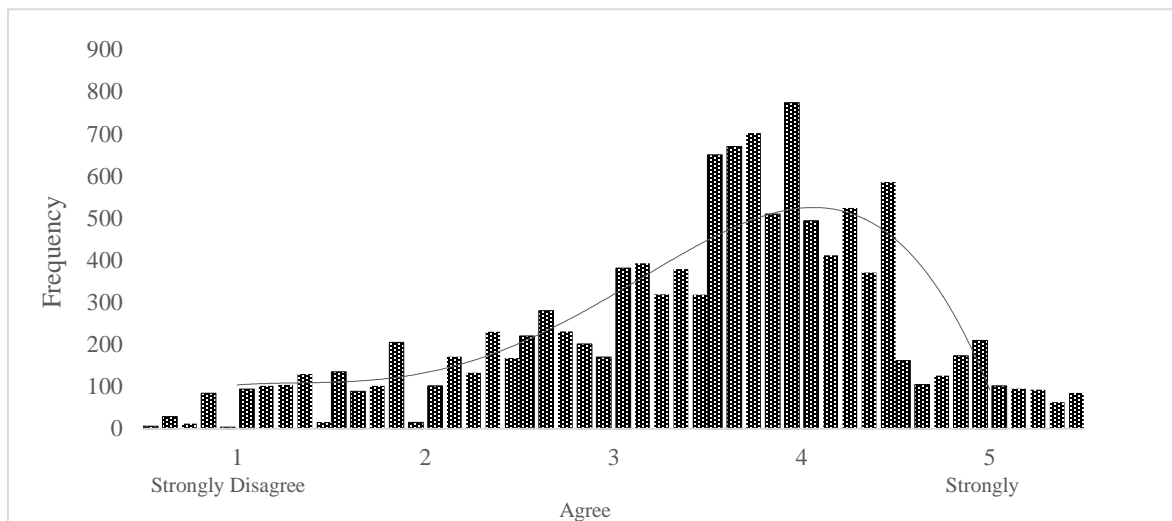


Figure 7.13: Distribution of respondents answers on the role of ‘social networks’ on engagement determinants

More significantly, however, these findings lead to the conclusion that a social network dedicated to the environment can serve as an accurate and reliable tool for the validation of the conceptual model proposed in this study.

7.2.4.2. Ascertaining the Role of Location Loyalty and ‘Location-Based’ Technique

One of the main objectives of the model is to influence ‘cognitive’, ‘affective’ and ‘behavioural’ factors through ICT techniques. The study utilises these ICT techniques to facilitate individual engagement towards sustainability in different ways and in several aspects, one of which is the linking of individuals with physical events and activities that are occurring near their locality. The importance of linking the public with their physical environment has been ascertained in the relevant literature. The literature reports that the physical interaction of people with their environment and the linking of the public with their

environment through physical participation in activities and events have a major impact on engagement with sustainability and lifestyle change (e.g., Chawla, 1999, Larson et al., 2011, Corner and Randall, 2011, Sutton and Tobin, 2011). The role of activities in engagement is presented in this section. Thus, this dimension is seen as an integral part of the conceptual model and therefore included in all ICT techniques that are proposed therein (i.e. ‘Context-Aware’, ‘location-Based’, ‘Individual social marketing’, ‘Social learning’, ‘Attraction module’ and the ‘Profiling and sustainable labelling’ techniques). The physical interactions and personal views about physical activities and environmental events were statistically examined in this phase. The survey in this phase of study explores empirically the effect location and how people physically interaction with their environment.

This survey asked respondents six questions in order to identify the effect of location: (a) ‘The place where I live is unique and distinctive’; (b) ‘I feel like I belong to the community here’; (c) ‘If I were to move I would like to live in a similar place to where I live now’; (d) ‘I am proud to live in this area’; (e) ‘Living here helps me to live my life the way I want to’ and (f) ‘this place reminds me of my childhood’.

Combining all six measurements, nearly 36% strongly agreed that they were loyal to their home and local area, 32% tended to agree, 17% neither agreed nor disagreed, 8% tended to disagree and only 7% strongly disagreed. Thus, most significantly, more than two-thirds (68%) agreed to some extent, while only 15% disagreed.

The results obtained from the finding including the participants comments concluded that another drawback to previous initiatives is that they failed to pay attention to local variations when devising the necessary solutions. This study shows that respondents felt an affiliation for their own district or location and that, individuals recognised a moral responsibility towards the places that they lived. In addition to local issues, they believed that specific environmental issues had a direct impact on their lives. They knew more and had more accurate knowledge of the details of their local issues. For instance, they had full cognitive awareness of risks that constituted a direct threat to them as a result of events and discussion among people in their councils, in addition to the impact on their neighbours. The fact of belonging to a place has a significant impact on the adoption of local environmental causes by local people. When cognition is full and integrated; the emotional effects are high, clear

and concrete. This study shows a lack of communication with officials to resolve local environmental issues as well as a weakness and a lack of clear and effective channels of communication.

Indeed, the activation of local solutions leads to increased levels of assistance and support for current initiatives at both local and national levels for community, governmental or international programmes. This will set a precedent to initiate activities on a larger scale (Lorenzoni and Pidgeon, 2006). Thus, there is growing recognition that local initiatives to mitigate the effects of climate change ‘in the locality’ will provide a solid basis on which to change negative behaviour. The actions of participants and their activities have tangible benefits (Rayner and Malone, 1997).

Many local initiatives are quick and convenient solutions, which often focus on reducing cost. In general, the results are win-win without achieving significant emission reductions at a global level. Thus, evaluation measures for localised initiatives indicate that local sustainability is limited in this regard. In order to be useful, local initiatives should be supported and coordinated by actions and legislation at all levels: Local, national and international. Some local initiatives are limited with respect to recognising appropriate solutions. For example, they may not benefit from the processes that operate on larger scales and may not react to these due to lack of communication, lack of control or lack of ability to take advantage of emission reduction programmes at the national or international level. In addition, they may lose tangible benefits from the available technologies and other expertise. Thus, acknowledging the difficulty of taking more effective action at the local, regional or global level, initiatives should go hand-in-hand with others at all levels (Kates and Wilbanks, 2003).

Other options include focus and support at a local level for the issue of climate change and inclusion of local solutions within the policies of sustainable human development (Wilbanks, 2003). Local initiatives help to increase understanding of the local impact of environmental issues and are partly explained by researchers as an indicator of the impact of local and regional diversity on climate change. In fact, this type of initiative has been affected by local environmental problems and has had more impact on local people’s emotions. A qualitative study concluded that individuals in a local area, who are well aware of affairs relating to the

region or area in which they live, face difficulties in preventing risks to their local area or daily lives for themselves or family members (Bickerstaff et al., 2006).

7.2.4.3. Ascertaining the Role of Individual Social Marketing

This study measures the public perception to which an individual believes that s/he about the effect of the ‘community-based social marketing’ in engaging public in cope public social issues (i.e. dilemma or problem).

Table 7.13: Descriptive findings for public perception to the role of ‘individual social marketing’

Engagement Measurement Dimensions	Items	Responses (%) (n=1173)						
		1 Strongly Disagree	2	3	4	5 Strongly Agree	Means	SD
Cognitive: (Useful, Helpful, Inform)								
I feel that the local community has influence on my cognition.	ISM1	5.8	13.6	32.7	36.7	11.2	3.34	1.03
I feel that the local community has inform me about my interest issues in appropriate way.	ISM2	7.6	9.5	30.2	43.5	9.3	3.37	1.03
Affective: (Mentality and emotionally effect)								
The local community has influence on my emotion.	ISM3	3.7	8.4	33.8	43.9	10.2	3.49	0.92
Intention behaviour (Intention)								
The local community can assist people to change their behaviour toward sustainable behaviour patterns.	ISM4	1.2	7.4	34.3	42.7	14.4	3.62	0.86
How interested are you in learning more about programs offered by local community to enhance local environment?	ISM5	3.7	15.9	24.7	42.5	13.2	3.46	1.03
How likely are you to respond to an invitation from your local community to have them look for ways to improve your home’s environmental and energy efficiency?	ISM6	1.3	13.6	31.6	43.5	10.1	3.48	0.89
How interested would you be to receive information from your neighbour and local community about ways to reduce your impact in environment?	ISM7	2.5	13.7	30.5	43.1	10.1	3.45	0.94

Respondent's perception to the role of 'community-based social marketing' was measured by seven-item scale reflecting the evaluation of participants to the effect of 'individual's social marketing' on their preparedness to engaging in sustainability. Table 7.13 presents the descriptive statistical analysis findings. This results shows that:

- 1) 47.8% of the total sample 'agree' or 'strongly agree' that they 'feel that the local community has influence on their cognition' (ISM1: mean = 3.334, SD = 1.03).
- 2) 52.8% of the total sample 'agree' or 'strongly agree' that they 'feel that the local community has inform them about the interest issues in appropriate way' (ISM2: mean = 3.37, SD = 1.03).
- 3) 54.1% of the total sample 'agree' or 'strongly agree' that 'the local community has influence on their emotion' (ISM3: mean = 3.49, SD = 0.92).
- 4) 57.1% of the total sample 'agree' or 'strongly agree' that 'the local community can assist people to change their behaviour toward sustainable behaviour patterns' (ISM4: mean = 3.62, SD = 0.86).
- 5) 55.7% of the total sample 'agree' or 'strongly agree' that they 'interested in learning more about programs offered by local community to enhance local environment' (ISM5: mean = 3.47, SD = 1.03).
- 6) 53.5% of the total sample 'agree' or 'strongly agree' that they 'will respond to an invitation from their local community to have them look for ways to improve their home's environmental and energy efficiency' (ISM6: mean = 3.48, SD = 0.89).
- 7) 53.3% of the total sample 'agree' or 'strongly agree' that they 'interested to receive information from neighbour and local community about ways to reduce their impact in environment' (ISM7: mean = 3.45, SD = 0.94).

The mean of the seven measurement items was range (3.34-3.62) which indicates that the respondents felt that community based social marketing would be very useful to engage them in issues. In fact the findings indicate that more than 84% were in or above the midpoint of the scale those felt community based social marketing would affect them to engage in issues. Figure 7.14 presents the distribution of respondent's answers on the role of 'individual's social marketing' on engagement deterrents.

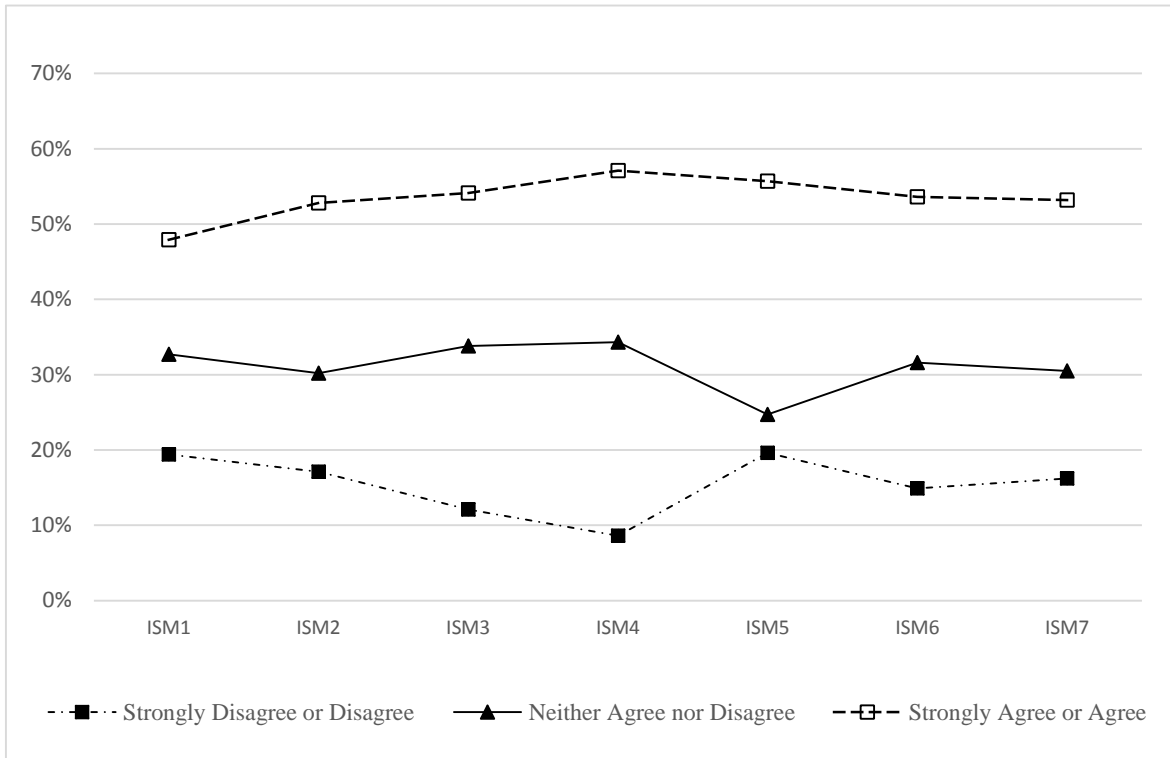


Figure 7.14: Distribution of respondent's answers on the role of 'individual's social marketing' on engagement deterrents

This results support to apply individual social marketing to promote sustainability this technique is evolution for the 'community-based social marketing' which recently often used to support environment by develop activities and campaigns that aimed to change or maintain individual's behaviours for the benefit of people and society.

7.2.4.4. Ascertaining the Role of Social Learning Technique

Social learning is "the collective action and reflection that occurs among different individuals and groups as they work to improve the management of human and environmental interrelations" (Keen et al., 2005, p.4). Albert Bandura's social learning theory (1977) suggests that most of individual's behaviour is learned observationally, through imitation and modelling from the surrounding environment and people, thus, people can learn from one another. The survey explored the effects of social learning by using fifteen questions.

Table 7.14: Descriptive findings for public perception to the role of ‘social media learning technique’ on respondents’ engagement determinants

Engagement Measurement Dimensions	Items	Responses (%) (n=1173)						
		1 Strongly Disagree	2	3	4	5 Strongly Agree	Means	SD
Cognitive: (Useful, Helpful, Learning and full information, Inform)								
I use Internet communications technology tools to get useful and helpful information.	SLT1	6.1	9.0	33.9	43.0	8.0	3.38	0.97
I am able to get faster feedback from my peers.	SLT2	8.0	7.0	33.0	42.0	10.0	3.39	1.03
I use Internet communications technology tools when I want to learn about something new.	SLT3	5.0	6.1	40.9	39.0	9.0	3.41	0.92
I learn many things by interacting with other Internet users.	SLT4	7.0	10.0	26.9	42.0	14.1	3.46	1.07
I feel like I learn and have a tremendous amount of information about many issues.	SLT5	11.0	13.0	25.0	37.9	13.0	3.29	1.18
It is informational which inform me about my interest issues in appropriate way.	SLT6	9.0	9.0	37.9	38.0	6.1	3.23	1.01
Affective: (Mentality and emotionally effect, Satisfying and interesting, Enjoyment, pleasure and exciting)								
The learning through Internet communications technology tools get mentally and emotionally involved in the issue.	SLT7	2.8	15.3	42.6	31.5	7.7	3.26	0.91
The learning through Internet communications technology tools is satisfying and interesting.	SLT8	4.8	11.9	44.0	33.2	6.1	3.24	0.91
The learning through Internet communications technology tools is exiting and enjoyment.	SLT9	6.1	17.8	35.8	33.2	7.0	3.17	1.00
Intention behaviour (Attitude, Subjective norm (SN), Values, Intention)								
The learning through Internet communications technology tools effect my attitude towards the issues.	SLT10	3.9	18.8	32.8	37.5	7.0	3.25	0.97
The learning through Internet communications technology tools effect my social norm.	SLT11	5.2	24.7	33.7	30.0	6.4	3.08	1.00
The learning through Internet communications technology tools is effect my values toward the discussion issues.	SLT12	7.0	14.5	37.8	32.6	8.2	3.21	1.02

The learning through Internet communications technology tools is effect may intention to change behaviour.	SLT13	8.4	18.6	34.1	33.4	5.5	3.09	1.03
I use Internet communications technology tools when I want to learn about something new.	SLT14	3.4	10.2	31.1	42.8	12.4	3.51	0.95
I feel a sense of community learning becomes interactive and I post information that might be of interest to other people.	SLT15	2.8	15.3	42.6	31.5	7.7	3.26	0.91

The results are presented on Table 7.14 and show that:

- 1) 51% of respondents ‘agreed’ or ‘strongly agreed’ that ICT tools provide useful and helpful information’ (SLT1: mean = 3.38; SD = 0.97).
- 2) 52% of the total sample ‘agreed’ or ‘strongly agreed’ that they get faster feedback from their peers when they use ICT tools (SLT2: mean = 3.39; SD = 1.03).
- 3) 48% of respondents ‘agree’ or ‘strongly agree’ that they ‘use Internet communications technology tools when they want to learn about something new’ (SLT3: mean = 3.41; SD = 0.92).
- 4) 56.1% of respondents ‘agree’ or ‘strongly agree’ that they ‘learning many things by interacting with other Internet users’ (SLT4: mean = 3.46; SD = 1.07).
- 5) 51% of respondents ‘agree’ or ‘strongly agree’ that they ‘feel like they learn and have a tremendous amount of information about many issues’ through the social learning (SLT5: mean = 3.29; SD = 1.18).
- 6) 44.1% of respondents ‘agree’ or ‘strongly agree’ that they ‘inform about the interest issues in appropriate way through social learning’ (SLT6: mean = 3.23; SD = 1.01).
- 7) 39.2% of the total sample ‘agree’ or ‘strongly agree’ that ‘the learning through Internet communications technology tools get their mentally and emotionally involved in the issue’ (SLT7: mean = 3.26; SD = 0.91).
- 8) 39.4% of respondents ‘agree’ or ‘strongly agree’ that the ‘the learning through Internet communications technology tools is satisfying and interesting’ (SLT8: mean = 3.24 ; SD = 0.91)

- 9) 40.3% of respondents 'agree' or 'strongly agree' that 'the learning through Internet communications technology tools is exiting and enjoyment' (SLT9: mean = 3.17; SD = 1.00).
- 10) 44.5% of respondents 'agree' or 'strongly agree' that 'the learning through Internet communications technology tools effect they attitude towards the issues' (SLT10: mean = 3.25; SD = 0.97).
- 11) 36.4% of respondents 'agree' or 'strongly agree' that 'the learning through Internet communications technology tools effect they social norms' (SLT11: mean = 3.08; SD = 1.00).
- 12) 40.8% of respondents 'agree' or 'strongly agree' that 'the learning through Internet communications technology tools is effect they values toward the discussion issues' (SLT12: mean = 3.21; SD = 1.02).
- 13) 38.9% of respondents 'agree' or 'strongly agree' that 'the learning through Internet communications technology tools is effect they intention to change behaviour' (SLT13: mean = 3.09; SD = 1.03).
- 14) 55.3% of the total sample 'agree' or 'strongly agree' that they 'use Internet communications technology tools when they want to learn about something new' (SLT14: mean = 3.51; SD = 0.95).
- 15) 39.2% of respondents 'agree' or 'strongly agree' that they 'feel a sense of community learning becomes interactive, and they post information that might be of interest to other people' (SLT15: mean = 3.26 ; SD = 0.91).

The overall results indicate that the respondents found social learning to be useful to them and recognised its ability to encourage their engagement in social issues. More specifically, 81% of the answers were in or above the midpoint of the scale and, as shown in Figure 7.15, the mean for the fifteen items is between 3.08 and 3.51.

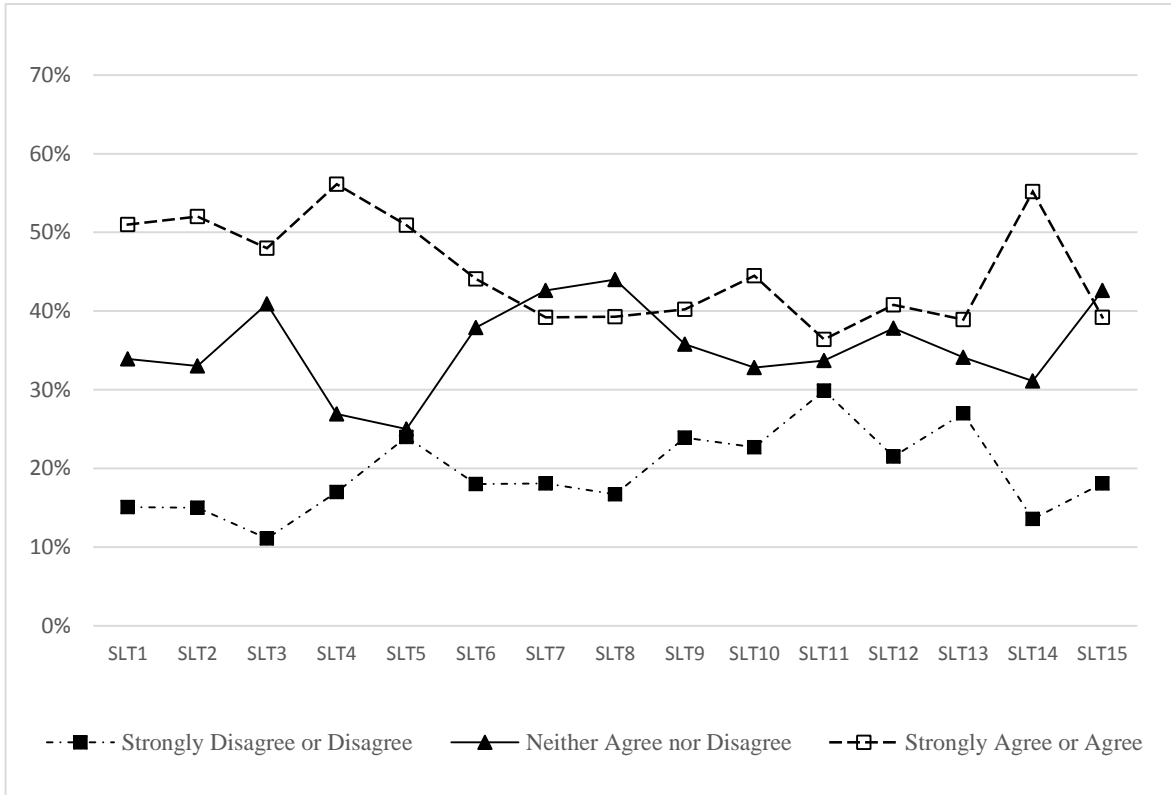


Figure 7.15: Distribution of respondent’s answers on the role of ‘social learning’ on engagement determinants

7.2.4.5. Ascertaining the Role of Attraction Techniques; Local Trends, Events, and Incentives

Local trends, events, regards enabling participation in subset of physical and conceptual events, news or activities that occur in small scale at local environment or in large scale at global level. These on site events and activities can be used to promote sustainability and increase people’s awareness. The loyalty awards and incentives, are benefits offered to people in recognition of their pro-environmental service, efforts, achievements or behaviours, and are used as a means to motivate and encourage people to change anti-environmental behaviour. This study presents the extent to which respondents have of general perception about the ‘attraction techniques; local trends, events, and incentives’ as presented in Table 7-15.

Table 7.15: Descriptive findings for public perception to the role of attraction techniques ('local trends, events and incentives') on participants' engagement determinants

Engagement Measurement Dimensions	Items	Responses (%) (n=1173)						
		1 Strongly Disagree	2	3	4	5 Strongly Agree	Means	SD
Cognitive: (Informational; Useful; Helpful, Learning and full information)								
I feel like that the current trends, events, news, and incentives assist to learn a tremendous amount of up-to-date useful and helpful information.	ATT1	2.5	10.9	32.3	42.0	12.3	3.51	0.93
The current trends events and news inform me about what occur around me in appropriate way.	ATT2	5.8	17.1	31.8	35.6	9.6	3.26	1.04
Affective: (Mentality and emotionally effect, Satisfying and interesting)								
The current trends events, news and the incentives may affect me mentally and emotionally.	ATT3	7.4	16.9	33.6	35.1	7.0	3.17	1.03
The following-up of the current trends events and news is entertaining and interesting.	ATT4	7.1	18.6	30.3	33.5	10.5	3.22	1.09
Intention behaviour (Intent to change behaviour)								
Incentives and rewards can help people like me to improve their performance in dealing with environmental issues and managing energy consumption.	ATT5	7.8	14.3	26.9	38.8	12.2	3.33	1.11
The incentives can stimulate me to improve my productivity in managing environmental issues.	ATT6	8.2	16.9	33.8	34.4	6.7	3.15	1.04
The incentives can increase my effectiveness in managing environmental issues.	ATT7	8.6	17.1	32.8	33.6	7.8	3.15	1.07
I belief that the incentives are useful in managing environmental issues.	ATT8	2.4	11.8	34.9	33.2	17.8	3.52	0.99
The incentives can motivate me to continued use pro-environmental products and to support local environment.	ATT9	1.5	7.8	39.5	32.4	18.8	3.59	0.93

Nine items applied to measure respondents' perception about the effect of the role of 'local trends, events, and incentives' on their engagement determinants. The findings are:

- 1) 54.3% of the total sample 'agree' or 'strongly agree' that they 'feel like that the current trends, events, news, and incentives assist to learn a tremendous amount of up-to-date useful and helpful information' (ATT1: mean = 3.51; SD = 0.93).
- 2) 45.2% of the total sample 'agree' or 'strongly agree' that 'the current trends events and news inform them about what occur around them in appropriate way' (ATT2: mean = 3.26; SD = 1.04).
- 3) 42.1% of the total sample 'agree' or 'strongly agree' that 'the current trends events, news and the incentives effect their mentally and emotionally' (ATT3: mean = 3.17; SD = 1.03)
- 4) 44% of the total sample 'agree' or 'strongly agree' that 'the following-up of the current trends events and news is entertaining and interesting' (ATT4: mean = 3.22; SD = 1.09).
- 5) 51% of the total sample 'agree' or 'strongly agree' that the 'incentives and rewards can help people to improve their performance in dealing with environmental issues and managing energy consumption' (ATT5: mean = 3.33; SD = 1.11).
- 6) 41.1% of the total sample 'agree' or 'strongly agree' that the 'incentives can stimulate them to improve their productivity in managing environmental issues' (ATT6: mean = 3.15; SD = 1.04).
- 7) 41.4% of the total sample 'agree' or 'strongly agree' that the 'incentives can assist to increase their effectiveness in managing environmental issues' (ATT7: mean = 3.15; SD = 1.1).
- 8) 51% of the total sample 'agree' or 'strongly agree' that they 'belief that the incentives are useful in managing environmental issues' (ATT8: mean = 3.52; SD = 0.99).
- 9) 51.2% of the total sample 'agree' or 'strongly agree' that the 'incentives can motivate them to continued use pro-environmental products and to support local environment' (ATT9: mean = 3.59; SD = 0.93).

The overall results indicate that the respondents found the ‘attraction techniques; local trends, events, and incentives’ to be useful to them and recognised its ability to encourage their engagement in social issues. More specifically, 79% of the answers were in or above the midpoint of the scale and, as shown in Figure 7.16, the mean for the nine items is between 3.15 and 3.59.

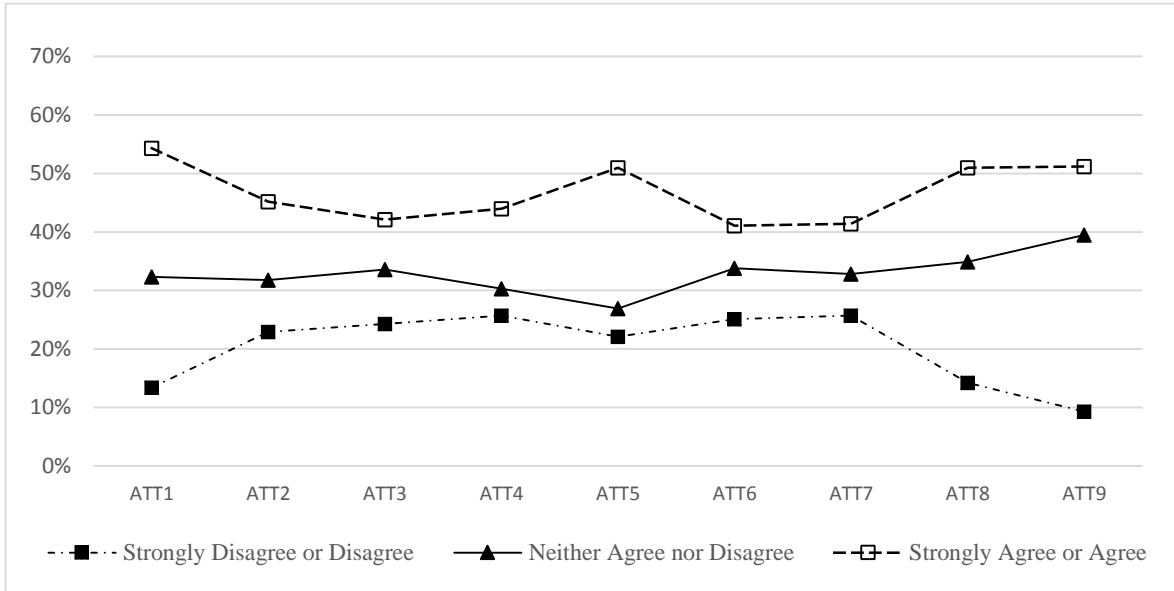


Figure 7.16: Distribution of respondent’s answers on the role of the ‘attraction techniques; local trends, events, and incentives’ on engagement deterrents

7.3. Results of the Revision of Conceptual Model Components

As stated earlier, the second objective of the survey is to confirm and refine the components of the proposed conceptual model that had been identified through the literature review. The finalised conceptual model, then, will function as the basis for the development of the prototype engagement platform that can contribute to the task of encouraging the public to engage in sustainability. The survey findings identify and obtain the actual information needed to revise and test the engagement model. Furthermore, the findings were used to assert the role of different concepts and techniques, which were obtained from the literature, to be exploited in defining an appropriate effective development of the engagement platform. Section 7.2.4 in this chapter presents the detailed analysis results for validating the conceptual model components. The data collection, data analysis for the sample assert the participants perception towards the impact of the conceptual model components (BSN platform and the

associated ICT techniques) on individual engagement factors. The statistical analysis results reveal that all model components, which are Social Networks, Context-Aware, Location-Based, Social Media Learning, Individual Social Marketing, Individual Profiles and Sustainable Labelling and Individual Attraction and Motivation, have a positive influence on people overall readiness for engagement.

Based on the investigation results of participants' perception of the research model components, as identified earlier and presented in Chapter 5, the revised conceptual model is presented in Figure 7.17. The revisions will be used in the next phase of developing the prototype BSN platform that will be presented in the following chapter. The revised conceptual model can contribute to bridging the gaps between individual behaviour lifestyle and engagement in pro-environmental sustainability issues. The following section summarises this chapter.

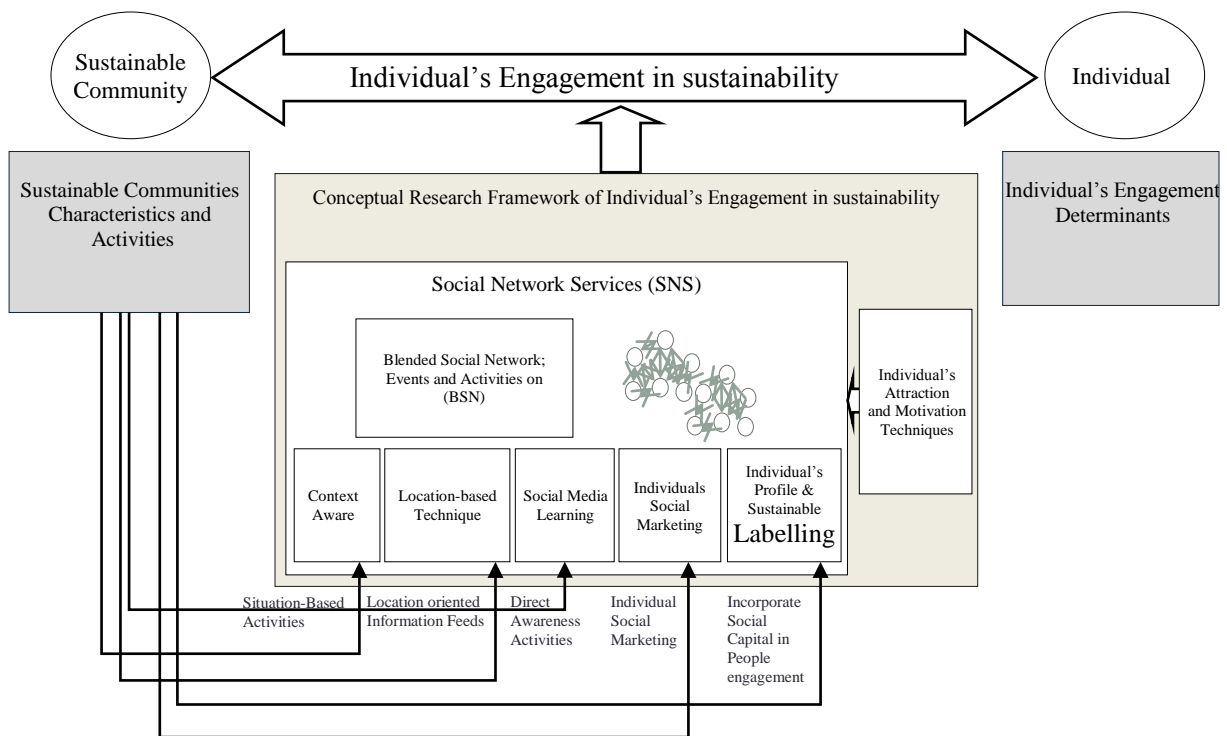


Figure 7.17: The final conceptual model components for Saudi context

7.4. Summary of Chapter Seven

This chapter presents the conclusions of the survey study including public perceptions of climate change and profiling Saudi citizens regards sustainability as well as shows analysis results of ascertaining the conceptual model constructs and relationships associated with them that confirm the level of effectiveness of the whole conceptual model, particularly its appropriateness for the Saudi context. Finally, it presents the revision of the conceptual model. The following chapter presents the development of prototype BSN platform and the discussion validating the conceptual model, followed by the data collection, data analysis including correlation matrices and multiple regression analysis for the sample were discussed. The validation of the impact of the ‘Blended Social Network’ and the ICT techniques on engagement factors are presented and discussed. The results and discussion of the hypothesis testing are provided and presented.

CHAPTER 8: Validating the Research Conceptual Model; Development of Prototype Platform and Data Analysis Results

Development of Prototype Platform, Implementation specification, Overview of Validation Empirical Work and Data Collection Method, Preliminary Data Analysis Results (Test of Reliability, Construct Validity and analysis of Multicollinearity), Analysis Results of Validating the Research Model components (The 'Blended Social Network' and The ICT techniques (Context-Aware, Location-based, Social Media Learning, Individual Social Marketing, Individual's profiling and Sustainable Labelling and Hook and Attraction Techniques)), Final Discussion of Findings and Chapter Summary

8.1 Introduction

This chapter aims to validate the research conceptual model. First, introduces the development of prototype platform which aid to validate the model followed by implementation specification. Next, it presents the analysis results of validating the research model components including the BSN and the ICT techniques included in the model: context-aware, location-based, social media learning, individual social marketing, individual's profiling and sustainable labelling and the hook and attraction techniques.

8.2 Part I: Development of Prototype Platform

The purpose of developing the software prototype platform in this study is to illustrate and evaluate the proposed model, which concerns engagement of the public towards sustainability. In particular, this study is intended to assess the capability of the blended integrated online social network system to engage people to adopt a new and sustainable lifestyle. It involves superior features that rely on context modelling to provide person-centric and tailored services.

The prototype was created for an online social network with context-aware, user profile, social learning and location-based modules. The prototype was applied to enhance public participation in coping with climate change, especially by stimulating people to change their anti-environmental behaviour and adopt a sustainable lifestyle by using wireless and personal computers (PCs), tablets and smartphone devices.

The system development method that mainly applied in this part of thesis was as follows: at the beginning, the intention was to explore the functionality of the system within a social network platform and investigate the method to ensure that the online social network system achieves acceptance of a sustainable lifestyle by ordinary people in real-world practice. Based on the result, the solution statements were formulated to present the motivations with a general concept. Then, further investigation was conducted to compose a comprehensive system framework. The framework was used to identify and extract the knowledge required and then to design the platform architecture applying the prototype solution. The system engineering methods were used to design and develop platform components following the prototype development method. The prototypes were tested in a real-world situation.

Functional View: Use-case Analysis and Package Diagram

The functional view represents how the viewer will view the functions of the system software. The functional view uses use-case diagrams to illustrate the overall functionality of system software and to describe what the system does from the perspective of the external observer. Booch et al. (2011) describe use-case diagrams as outlines of a set of serious activities that a system operates to deliver outcome results that have value to an actor (Booch et al., 2011). An actor includes different sets of coherent roles that are necessary to achieve the task and have direct association with the system; this can be human clients, hardware, equipment or devices, as well as different kinds of external systems that can interact with the system. Use-case diagrams offer a summary of situations regarding a single task by applying the notion of an actor. The analysis of the use-case diagrams can assist in determining the system requirements and specify the domain of the system. Figure 8.1 presents the main package diagram and user scenarios of interaction with the proposed engagement platform.

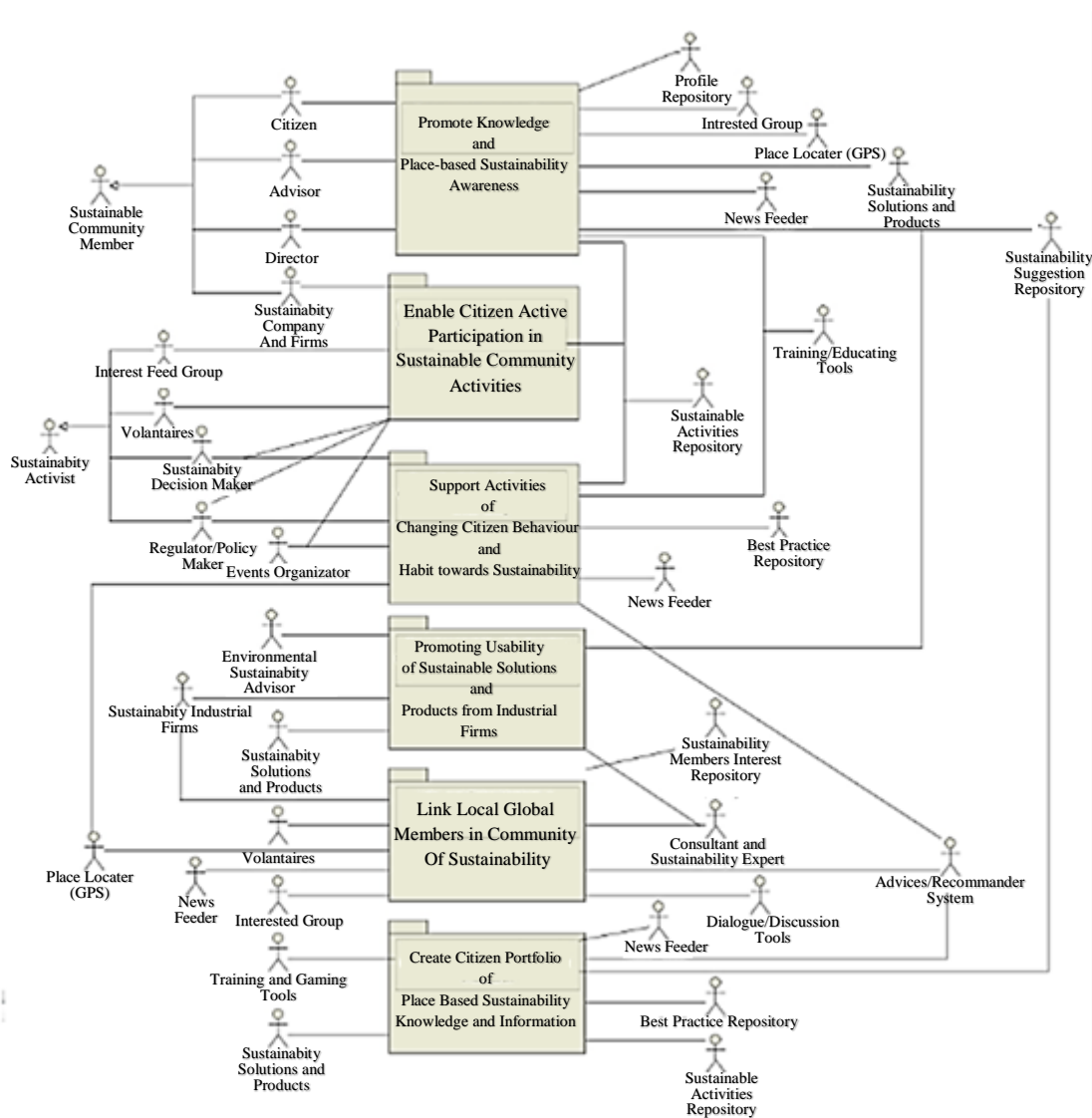


Figure 8.1: Overall package diagram of prototype BSN Platform

In the physical world, people practice and enjoy real sensory experiences. A person touches and feels physical objects, participates in natural activities and meets people face to face. Software applications provide digital services under classifications of the virtual digital world to improve services provided to online users by proactively applying personalized assistance to satisfy users' needs over time, but those services do not have a sense of the physical world. The attempts to link the physical world with the virtual world might lead to more positive advantages in regards to users' satisfaction.

The use-case diagram shown in Figure 8.2 of the prototype BSN Platform, attempts to capture future vision in sharing knowledge in innovative ways that generate the rich sensory experience of the physical world and ensure continuity, abundance, speed and low costs of information and communication via the Internet. The context-aware and location-based decision support mechanism is used to recommend tailored information

and semantic searches and to provide social learning and education tools. Furthermore, it is used to suggest nearby environmental aspects, including places, people, products, services and solutions. In addition, it is used to provide friendly environmental shops/stores nearby as well as the existing environmental events located in the physical proximity of a mobile human user.

As shown in Figure 8.2 and 8.3, the prototype BSN Platform involves application to contextual situation recognition. Environmental events and activities, and the user profile and user's situations, are used to form an appropriate semantic search and context to be retrieved from database knowledge. Situations and the semantic interpretations of context present a grounded base for guidance to select sustainable behaviours. The system attempts to recognize the person's activities and situations in detail. The mechanism used in the system leads to enhanced ability to recognise and monitor a person's situation efficiently so as to reduce intrusive interaction which occurs frequently in pervasive environments. For instance, the system recognizes the current user's situation and employs both the person's generic profile and his or her environmental profile to characterise, build and then support the person with appropriate contextual information in a timely manner as a recognised situation².

To recognize a person's activities and provide suitable and relevant suggestions or support, a reasoning process employs the primary data to deduce context information appropriate at a certain point in time. The conceptual model propose employs a semantic abstractions method using the person's information and activities to generate meaningful human knowledge which leads to an integrated interpretation of situations through the context information provided. Three techniques are involved: (i) a human specifies the occasions and his or her own relationships depending on the expertise throughout a specification process that relies on a rule-based or ontological method (Loke, 2006, Ranganathan and Campbell, 2003, Yau and Liu, 2006), (ii) knowledge is learned from training information by associating a human-defined scenario through learning methods (Van Kasteren et al., 2008, Modayil et al., 2008, Mckeever et al., 2010) and (iii) knowledge is produced from a mixture of both (Brdiczka et al., 2007, Jaroucheh, 2012).

This conceptual model also attempts to propose a new way of linking people with environmental products/services. By relying on this method, one can achieve mutual

² Situation recognition is related to a person's activities recognition, which has either a positive or negative effect on the environment.

benefits for buyers and sellers. The proposed solution can help buyers obtain needed goods immediately at a competitive cost and also help environmentally friendly businesses and firms increase their productivity. Actually, potential buyers and sellers must identify relative choices and allowable trade-offs alongside different attributes of the transaction partner. Impulse shopping, such as the spur-of-the-moment purchase of environmentally friendly products, usually necessitates that the products being purchased are offered to the buyer almost instantly. A buyer might not be willing or able to tolerate prolonged supply delays. In this study, the add module to match consumers with environmental firms located in their physical proximity can help to support sustainability products. The module can be viewed as an agglomeration of a set of entities: the mobile person, the person's aware module, the location-based module, the context-aware module, the seller module and the physical sellers. Using the context-aware module to extract utility functions and match buyers and sellers, in conjunction with the location module to provide geographic sellers, enables optimally matching consumers with products located in the same physical area. Integrated social network systems (ISNSs) can integrate a mobile device's location or position with other information so as to provide added environmental value to the public.

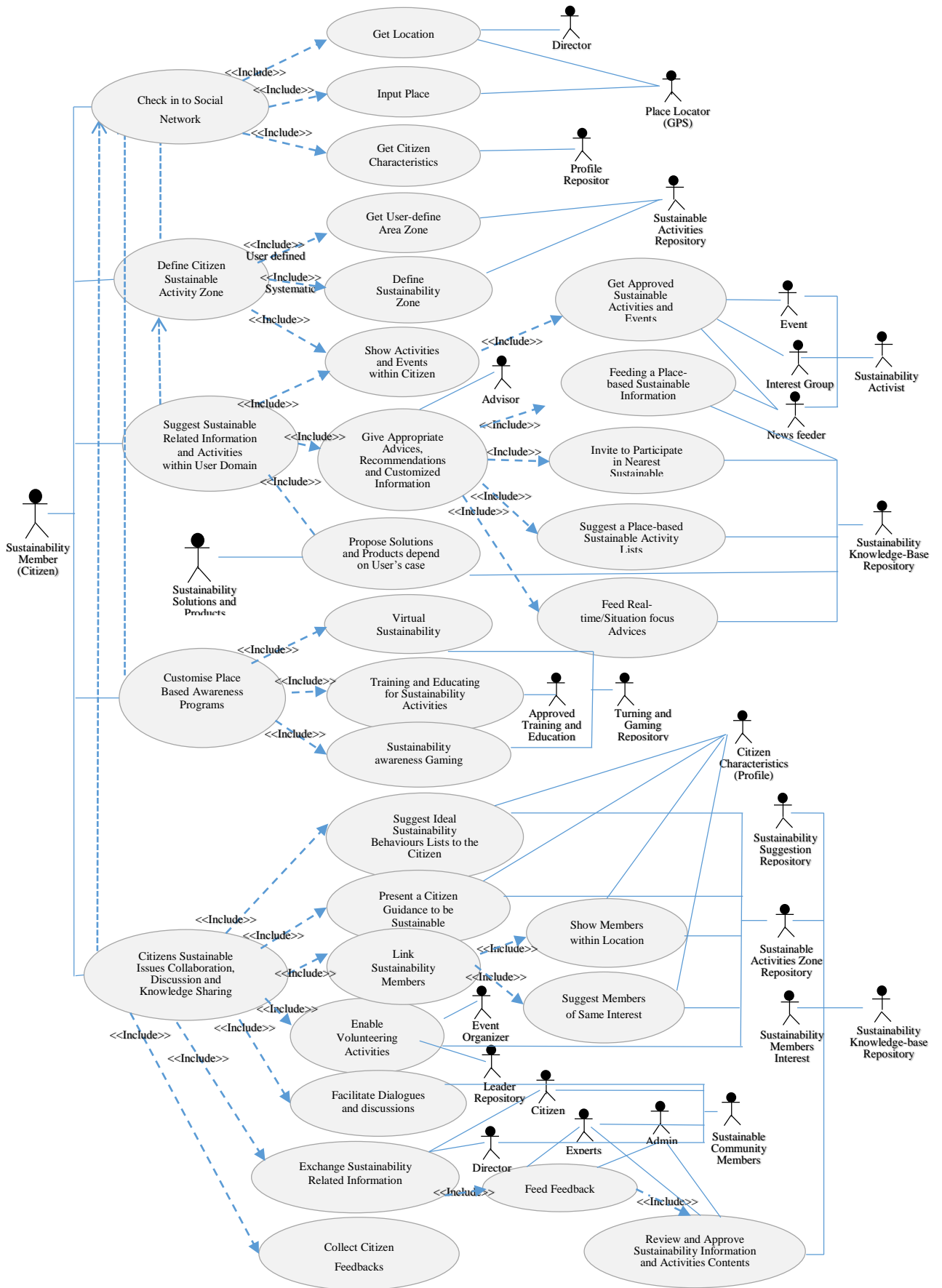


Figure 8.2: Domain analysis and knowledge representation of main prototype BSN Platform

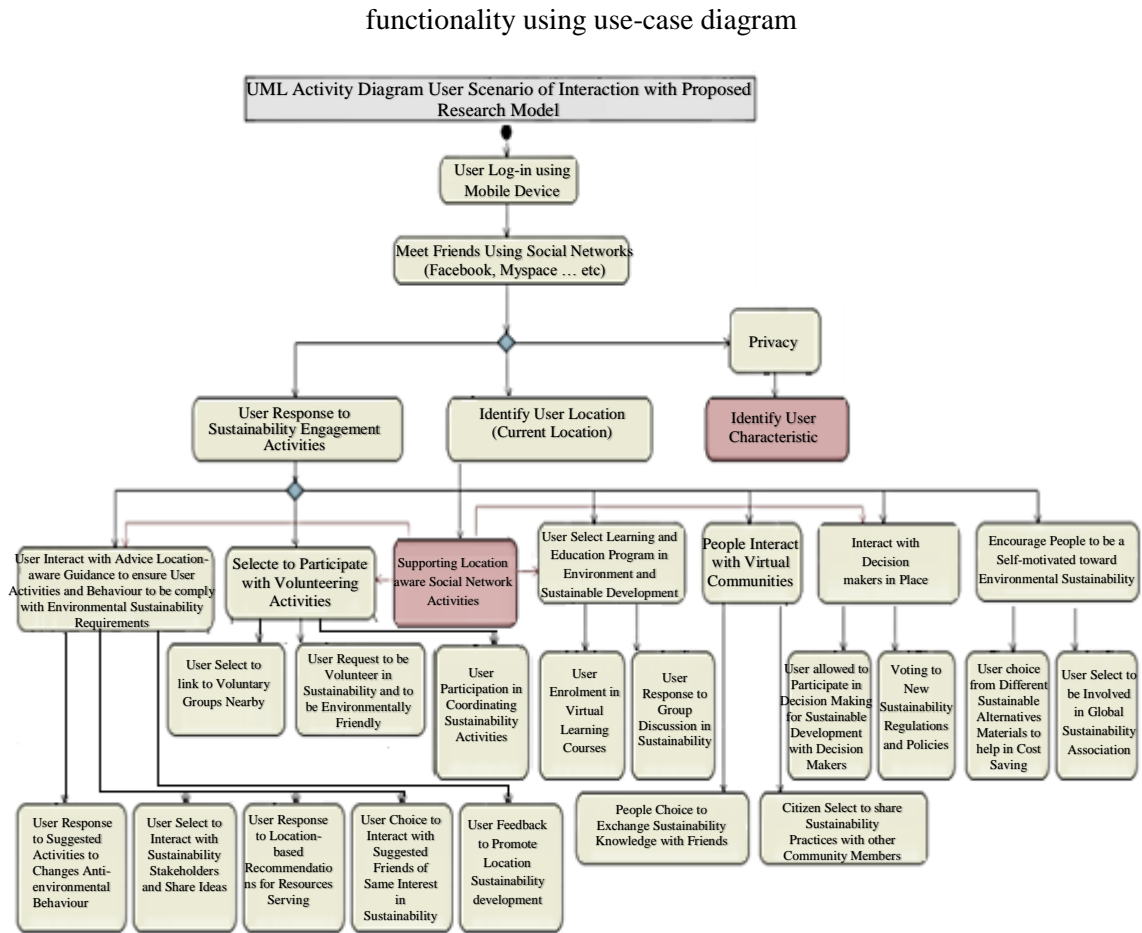


Figure 8.3: Prototype BSN Platform system activity diagram

8.2.1 The Implementation of Prototype BSN Platform

This section is devoted to present the logical architecture and development specification of the prototype BSN platform (mock-up prototype ‘BSN’ platform) designed to encourage individual engagement in sustainable lifestyle and to facilitate collective action and collaborative activities among sustainability stakeholders in order to achieve the goals of promoting pro-environmental sustainability.

The proposed conceptual engagement model with the associated BSN platform dimensions (Chapters 5) are the basis for developing the prototype BSN platform (prototype mock-up platform). It was implemented to validate the engagement conceptual model and has been validated using survey opinion polling and focus-group discussion with participants. The finding results are discussed in this chapter. During the validation phase, a demonstration session was conducted to describe the use of the prototype BSN platform by demonstrating the main functionalities of the platform components using

illustration examples. The prototype BSN platform developed for validating the research model is described in the following sections. Section 8.2.1.1, highlight the logical architecture of the prototype BSN platform and main module components, followed by specification of the prototype BSN platform (mock-up platform) development specification with sample of the prototype BSN platform screenshots including user interface.

8.2.1.1 Logical Architecture and Module Components

The main goal of the proposed model is to facilitate individual engagement in sustainability and to work as mediator to encourage sustainable lifestyles. The prototype platform is designed to present the user with unified and collaborative social network features linking all sustainability. The design of the 'Blended Social Network' platform (BSN) attempts to utilise the concepts of user-centric, engagement interventions, context-aware, location-based, individual social marketing, social media learning, and user profiling and sustainable labelling. It accommodates the individual's personal information, dynamic personal situations and the individual's current status through an integrated online social network platform that associates a number of ICT modules in addition to integrating with the existing social network systems. The prototype platform facilitates online engagement process where the individual can be influenced by different intervention techniques specifically designed at individual level and supported by the proposed BSN platform. The BSN social network service is the core feature and considered as the centrepiece of the research model. It is the platform where the main social network service is provided to the prospective individual. The BSN platform users use a web browser to access, interact and socialise with other parties online. The platform core services are dynamically integrated with other ICT techniques to enable individual engagement. The platform has the capacity to integrate with system that is composed of (i) location position provider, (ii) location-based service (LBS) presented through the LBS module, (iii) application servers, (iv) network infra-structure services, (v) member database that maintains members information and member profiles and (vi) common services such as authentication and management. Figure 8.4, shows an overall logical architecture of the platform modules composition and interactions.

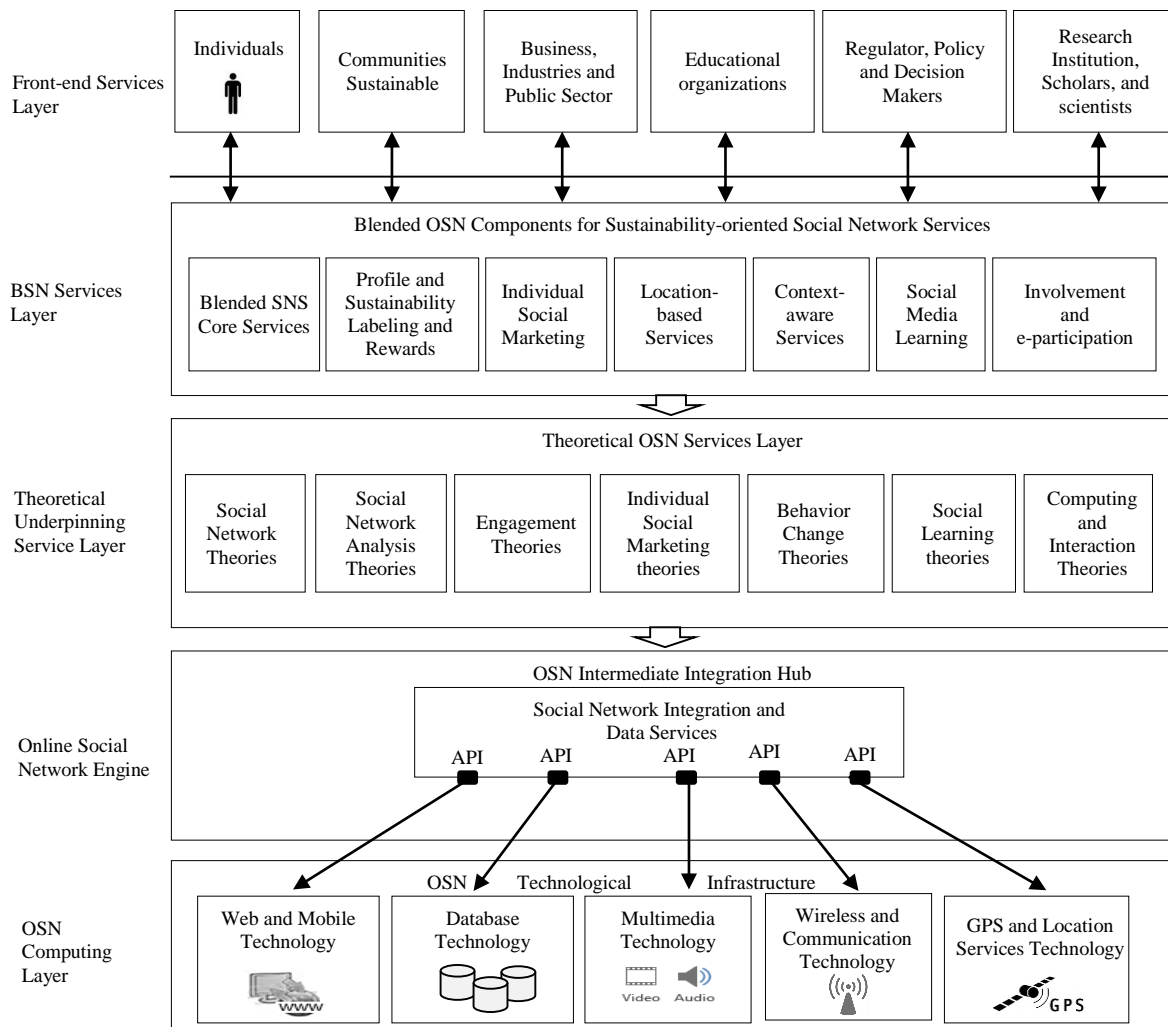


Figure 8.4: Overall logical architecture of the prototype ‘Blended Social Network’ (BSN) platform

The architecture of the prototype BSN engagement platform as shown in Figure 8.4 is composed of seven interrelated modules. The different platform modules can be outlined as follows:

Blended Social Network Core Services: the core services of this social network, can allow individuals to have a public or semi-public user profile within the social network platform and to socially communicate and share knowledge and interest with a list of other users of same platform. It also provides such core social network services as newsfeed, blogging, forum discussion, sharing social media contents, chatting, communicate/chat with other individuals or social groups and interact with industries, business firms, organizations for sustainability solution and products.

Context-aware Services: Within the ‘Blended Social Network’ platform, the context-aware module is embedded to provide remote-awareness for users through context ambient information and tailored services pertinent to the user’s situation and in some cases to help users by suggesting appropriate choices. The context information and services were formulated the user’s location and orientation; the surrounding environment; aspects of the current situation; the entire user environment and the environment surrounding the user; identities of both user and issue around the user including people and objects and the changes occurring to those objects in time; the current situations and time, e.g. actual date and time, and the user’s demographic and profile state. Thus, this module proposed in the BSN platform, can assist users with relevant information, services and guide them to resources nearby. Different types of information about the user and the environment around the user are employed to obtain on time decision to perform targeted tasks correctly. For instance, information regarding the user’s location, topics that might affect the user’s desire or interests, the quality of contents fed to the user, i.e. texts, reports, the aid of resources which include learning resources, recorded audio, video, games and the locations of other users or members likely contribute to integrate the knowledge, thus enhancing the quality of services provided. In this context-aware module, the users can be individuals or groups, either co-located or distributed.

Location-based Services: through location-based modules, the BSN platform users can have a detailed information and services in accordance to their physical location, such services include information about events, activities, members and anything of interest or related to the place or location. For instance, local awareness campaigns can invite members who are in a specific place to participate in local events or activities. This module is also used to enhance and enable people’s involvement in current events by informing members about the events and facilitating their participation in the events. It enables connections among people and recommendations for current physical activities or incidents nearby through, for example, podcasts. These connections are a means to enable individuals or even groups to find out what is going on around them and to draw people at both the micro and macro levels. The event-based approach grounds the social networks in specific locations that are linked to a unique composition of individuals who are engaged in protective or risk-exacerbating behaviours. The virtual communications that link people with physical events or are similar to face-to-face communication may

attract people to use them and consider then a foundation for location-based services. In addition, location-based services can also be used to involving local stakeholders, such as concerned businesses, industries, communities and individuals for participation in special events or local activities that are taking place, where such involvement considered useful for substantive and normative reasons. Stakeholders can be integrated locally by improving the quality of communication and relationship with local peoples; thus, such services can strengthen trust, ownership and learning among sustainability stockholders and local individual's.

Individual Social Marketing: This module is concerned with supporting sustainability behaviour change strategies at individual level through tailored campaigns. It provides an appropriate and effective tool for public engagement in sustainable lifestyle and supports behaviour change interventions. Experiences from variety of previous behaviour change studies, principles and theories were used to underpin the technique used within the individual social marketing module. Within the individual social marketing process, individual profile and sustainable performance information (sustainable labelling) are used to develop an individual-based tailored marketing intervention for marketing effective sustainability promotional campaigns.

Profiling, Sustainable Labelling and Rewards: This module uses personal identity, sustainability behaviour as well as other user information to build a person's sustainable labelling profile. Each person has a detailed profile in addition to labelling for pro-environmental activities which reflect the person's acts and behaviour towards participating and learning from the network to increase knowledge and serve the environment. The labelling and profile could be extremely important in promoting sustainability. Specific criteria are added to enable showing the current level of attraction to environmentally friendly activities and environmental behaviour for each member. This contributes to accurately identifying a person by demographic and behaviour determinant variables, which seems to strengthen the functionality of the proposed model in attracting people to use it; thus, it can help people and stimulate them to adopt pro-environmental behaviour. According to rational theory, the cost and benefits and moral incentives and awards may stimulate environmental behaviour if continuously applied. These and other factors proposed in this module might create systematic, permanent incentive stimulation which is fair and useful for people, attractive and acceptable to all

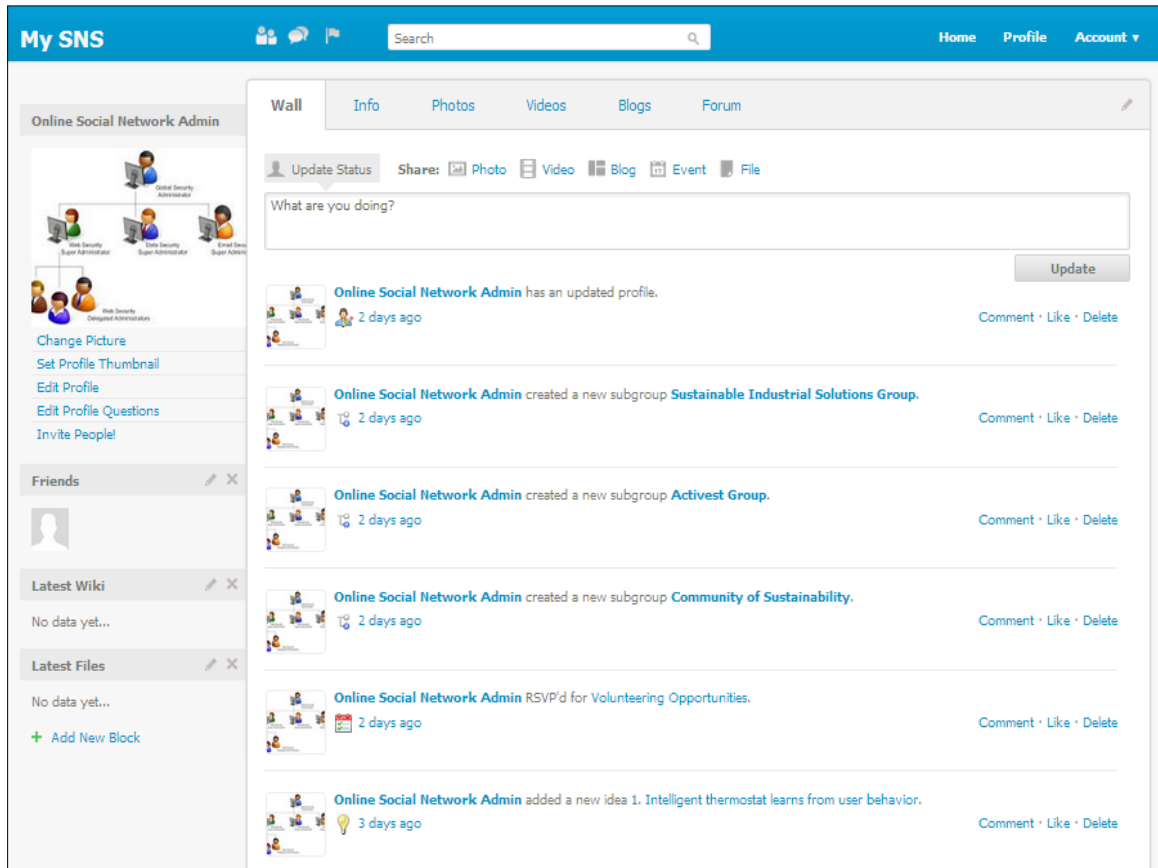
parties and applicable for all spectrums of society. This joined working might create a solid platform to serve the environment while stimulating users with permanent systematic incentives and activate the role of the private sector and business firms as well as associations, assemblies, government agencies and environmental organizations. This systematic stimulation module works by giving rewards, discounts and incentives to individuals; these incentives will vary depending on the pro-environmental person's behaviour, e.g. based on the position of the environmental label and points earned by the person. The incentives may include discounts from utility service providers, for example, electricity and water companies or energy suppliers; discounts for environmentally friendly products or devices; any other activities related to encouraging the user as well as in honouring, encouragement and courtesy incentives.

Social Media Learning: social learning is important for generating changes in behaviour in sustainability, in which might encourage individuals to engage in sustainability objectives. This module can provides immediate and systematic support to the public users in accordance to the user profile characteristics and their situations to deliver up-to-date learning information provision to promote people engagement in sustainable behaviour. Many methods can be used within this module to educate people to increase public knowledge and change behaviour. This includes, educational movies or environmental films or any learning materials that can develop individual social norms in society to face the challenges of climate change and increase public response to sustainability issues. The social media learning module has many properties that are superior to the existing models for social learning because it is concerned with affective factors; it takes into account personal characteristics, situational characteristics and location, event and time determinants to form appropriately oriented social learning which offers accuracy, quality and speed in investigation and response to the person's situation by depending on the nature of the factors influencing people's behaviour and care in a dynamic change in situation, including temporal and spatial events. Advantages of social media learning module include training and practice, help in decision-making, enhancement of skills and experience, increased awareness of consequences, interpretation and analysis of problems through simulations with real cases and contributions to building a cognitive framework.

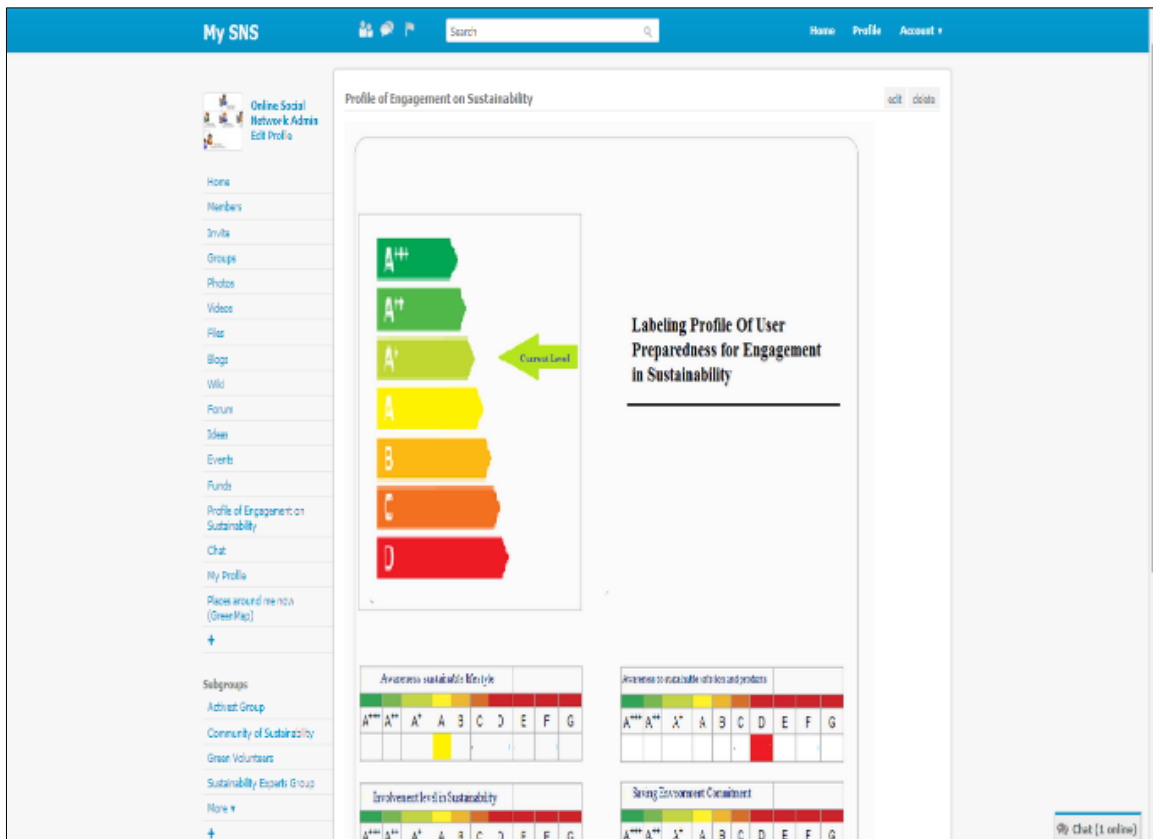
8.2.1.2 Implementation specification

Figure 8.4, shows the overall logical architecture of the prototype ‘Blended Social Network’ platform. This logical architecture was used as a base framework in developing the mock-up prototype platform using the Grou.ps social network development infrastructure. In other words, all prototype platform components have been prototyped entirely in the developed platform. The prototype platform is hosted online on the Internet using ‘Grou.ps’ services and the developed platform are available for individuals’ access through standalone authentication services as well as an integrated access with other online social networks (i.e. Facebook, Twitter .etc.). As depicted in Figure 8.4, the platform is designed to provide services for all sustainability parties, including individuals, community of sustainability, sustainability business firms, industries, the public sector, regulators, policy makers, research institutions, scholars, and scientists. The design of the prototype includes components that comprise a unified user interface and management dashboard for core BSN services and other associated ICT techniques. The unified user interface of the prototype can be accessed by different beneficiaries (individuals’ as well as other sustainability stockholders) using a unified authentication services. The platform management dashboard tools are made up of a set of engagement functionality that provides administrative functions of the BSN and the associated ICT techniques services. A sample screenshot of the prototype platform functions for different components are shown in Figure 8.5.

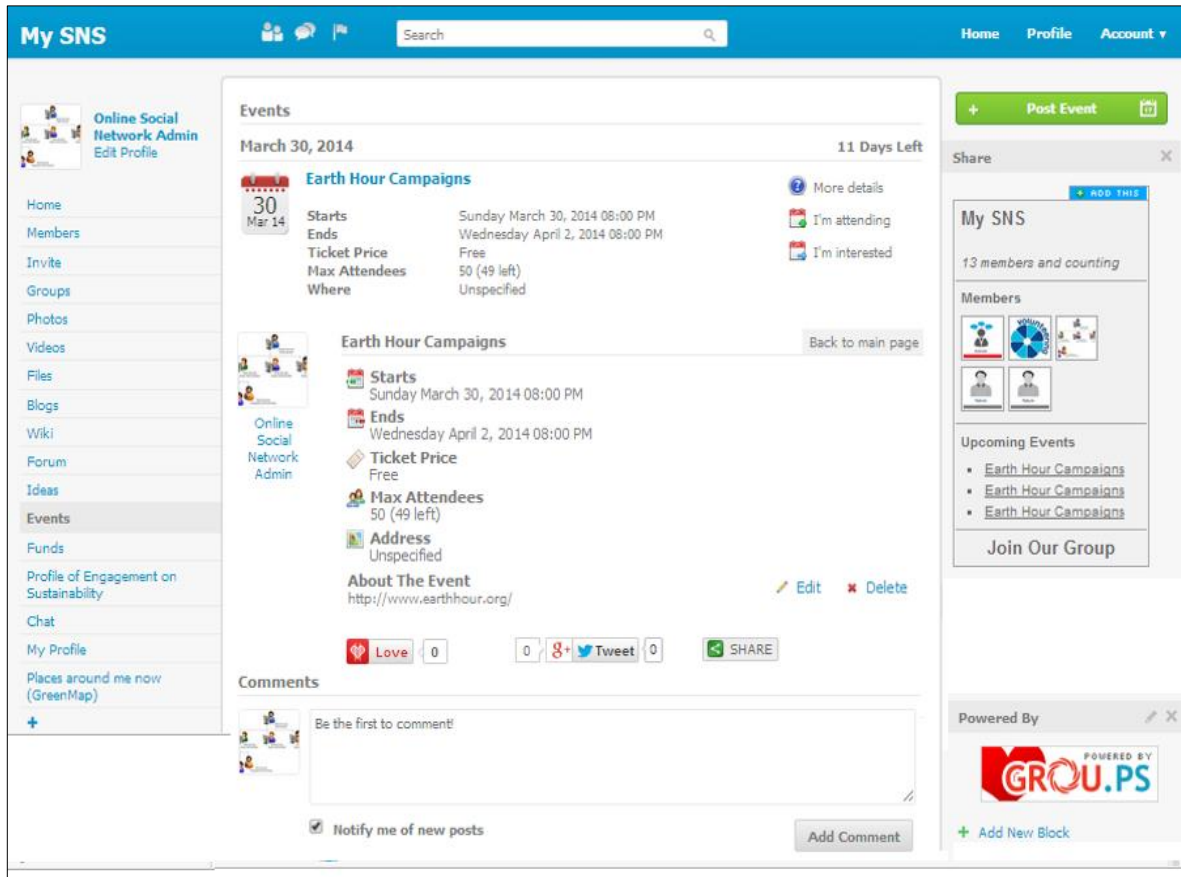
The platform design comprises a number of module components that assemble and connect together. Figure 8.5 ((a) and (e)), present the main user interface of the prototype platform and main BSN services. The platform has an authentication services that allow a standalone authentication in addition of the capacity of the integration with other online social network authentication system. Within the platform are core BSN services as well as seven more interrelated main sub-modules. These set of modules deals with providing a services such as context-aware, location-based, social media learning, an individual's social marketing, direct tailored supports and advice, and individual e-participation and involvement in sustainability issues. For instance, in the context-aware module, instead of purely applying the context information in the ‘Blended Social Network’ platform, the prototype platform has the capacity to provide personal context information services generated using individual profile and sustainable labelling information (Figure 8.5 (b)) and context-aware knowledge.



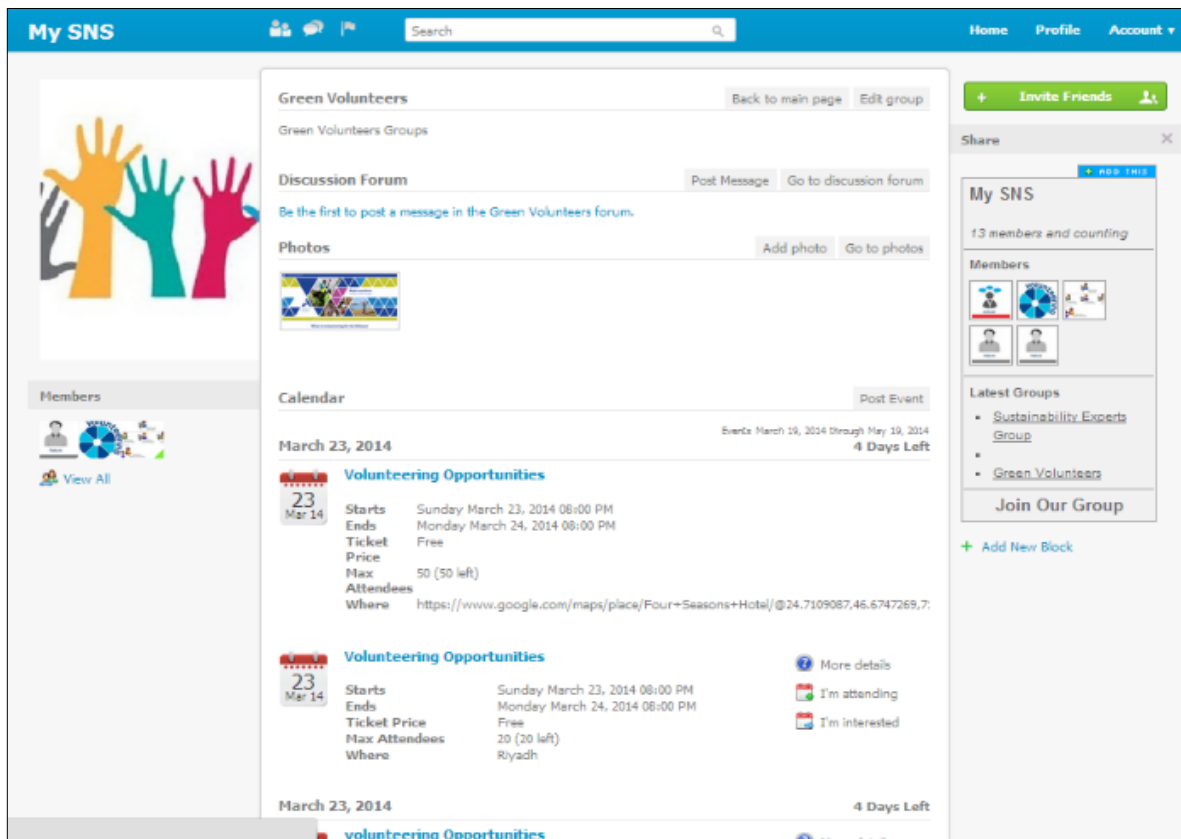
a) BSN core services, social networking, newsfeeds,



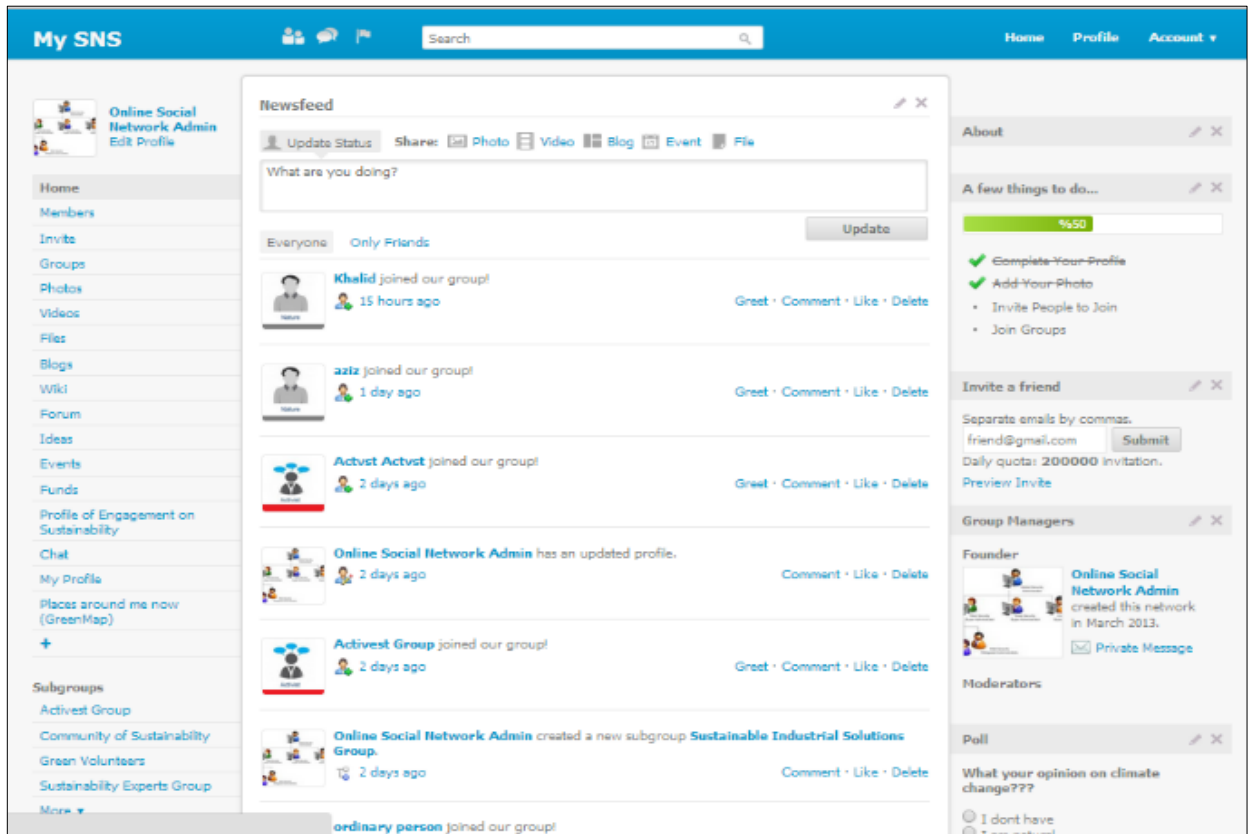
b) ICT techniques; Individual's profile and sustainable



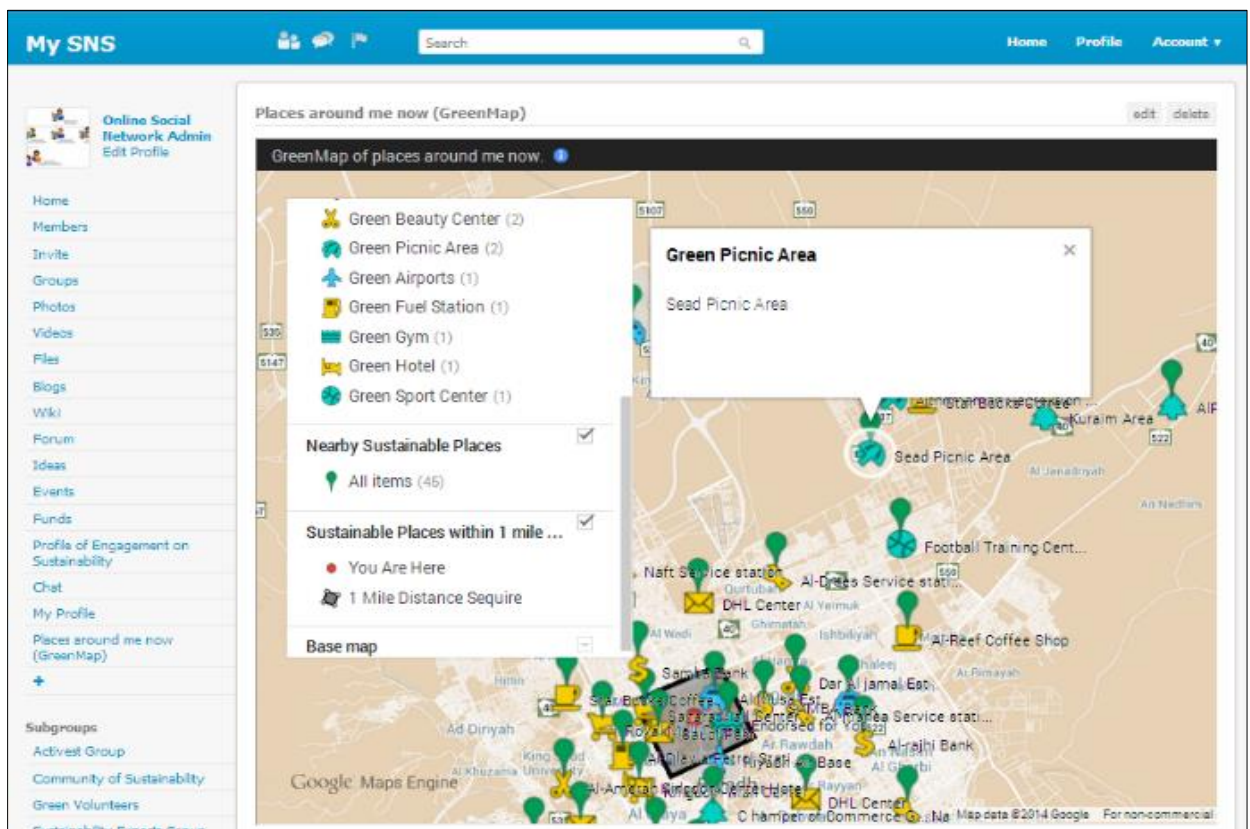
c) ICT techniques; individual social marketing campaign



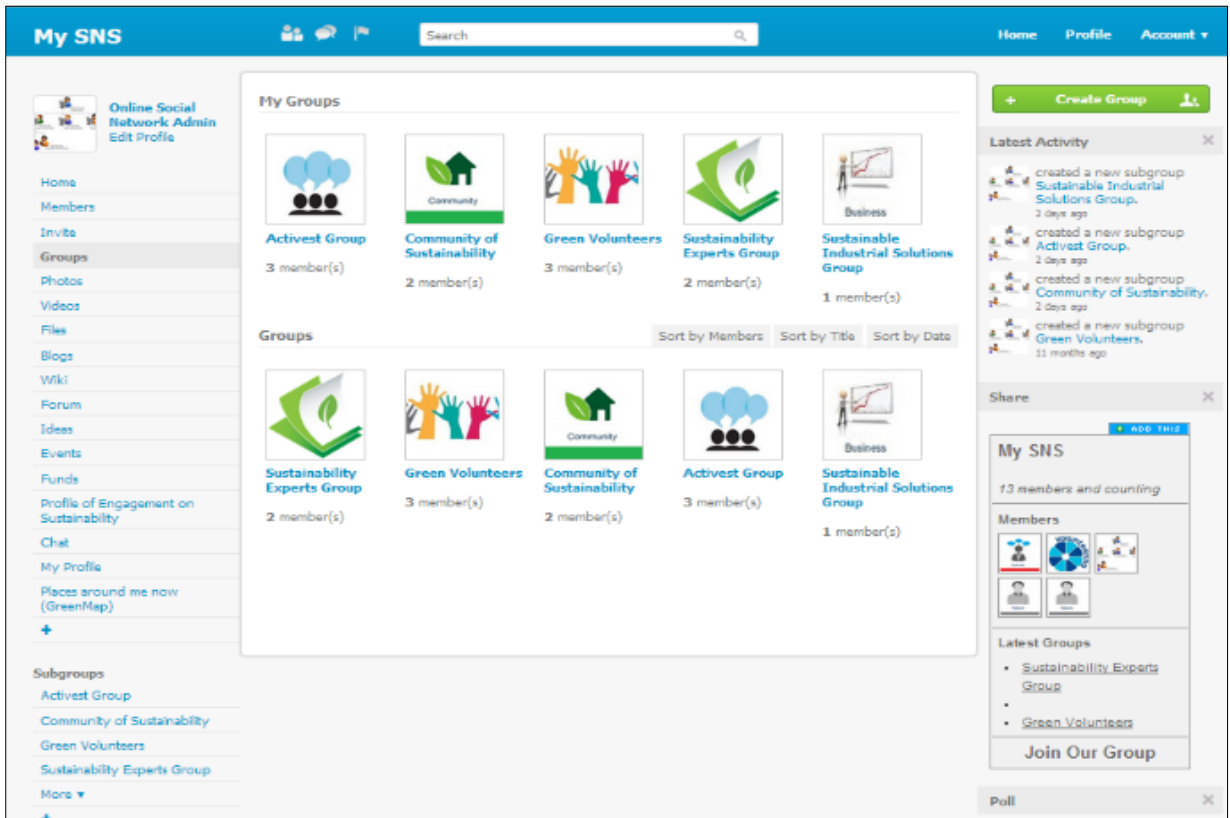
d) ICT techniques; Involvement in events and activities



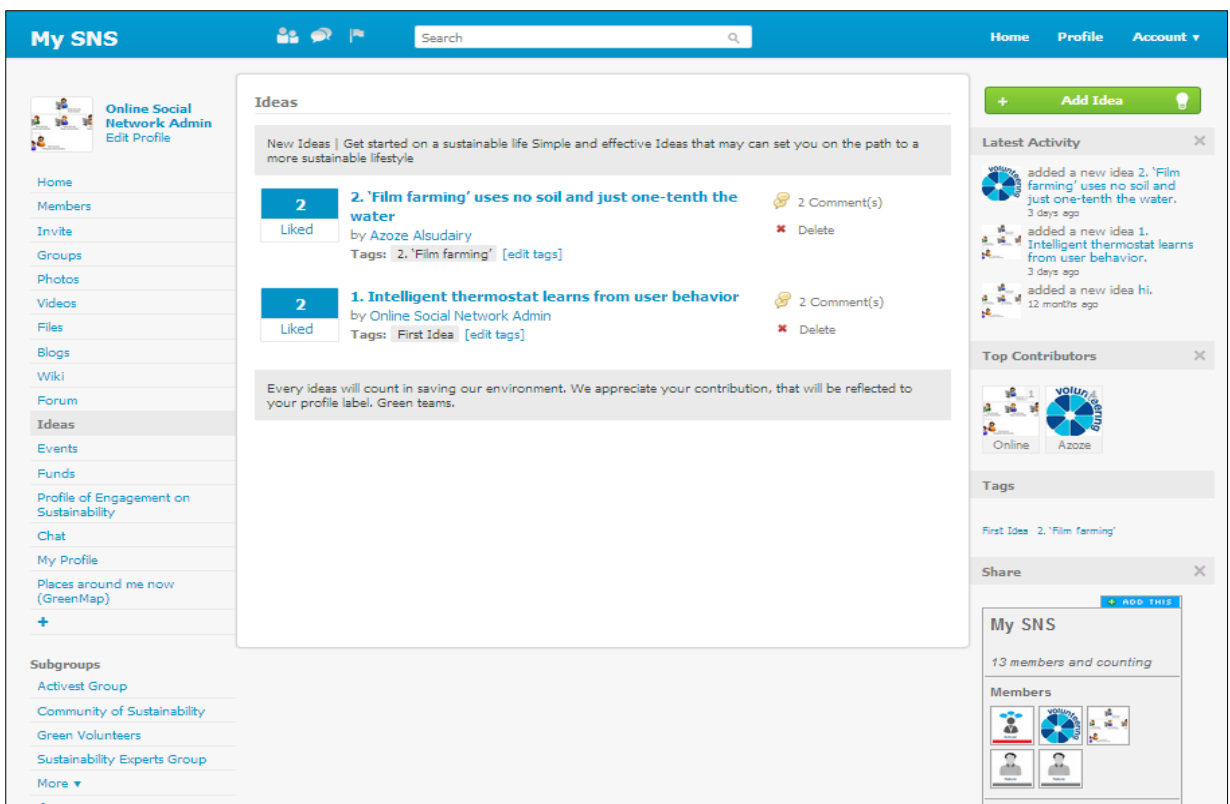
e) Sample of BSN Core services; newsfeed and sharing



f) ICT techniques; location-based services.



g) Membership and interaction with sustainability



h) ICT techniques; sharing innovative solutions and

Figure 8.5: Sample screenshots of the prototype 'BSN' platform including the associated ICT techniques functionality integrated within the platform

These component are associated with contextual information modelling related to building context knowledge and service provided through which suitable context information can be constructed, manipulated and viewed. A context-aware event program running on a local place is a task that reminds the person about things happening nearby to engage them to contribute to each event. Such a program is run in situations of subsets in the real world composed of the location of events and detailed information, as well as the current time and the opening times of events.

Another service provided by the platform (location-based services, Figure 8.5 (f)) is proximity searches with the system utilising 'Point-Of-Interest' (POI) database information to find the person's issues of interest and businesses or landmarks that are near a person's location. The person can search for certain locations, friend positions, community of sustainability, friendly products/solutions, environmental events (Figure 8.5 (d)) or activities or any interesting object nearby or in the city or various establishments. However, information services include location-sensitive knowledge which is associated with distributed information services for objects and their content includes time specificity and person behaviour which is based on location and received by mobile devices. Several types of location-based services are available (e.g. news and information dissemination based on the location of a user includes local news, events and other information). The prototype platform can have the ability to provide general services such as presenting points of interest near the person, identifying the optimum directions from a person's existing location to another location and providing the current location of members that shows on the map within the person's specific area. The platform can have a feature of displaying sustainability products/services and allows the user to select the nearest stores. The system provides tour services to guide persons using automated or operator-assisted information to generate notifications (for guidance of better sustainable behaviour should be taken in place), announcements and instructions regarding nearby sustainable places that offer events, activities, monuments, transportation services and other services that can be provided to persons moving around in a city. Infotainment services include knowledge about local events and location-specific multimedia content, for example, that takes into consideration the interests of a certain person. Infotainment services include all services that can meet user needs and requests to reach a given destination; they include, for example, where to find a particular service or object (e.g. friendly environmental places, members, events, or activities).

Other platform modules can support tailored social media learning, individual's social marketing, events and place-based-centric context, and can be used to provide potential users with various communication and tailored information support. Disseminated content includes context-aware information as well as announcements and advertisements. At one extreme, a certain person or all members entering the range of a specific dissemination source can receive notifications depending on a person's profile and the context-aware instructions. In other words, the platform would have the capacity to rely on performing highly correlated processes between a person's interests and the announcement or information content to select a targeted population. The platform also offers individual social marketing services Figure 8.5 (c); it provides new opportunities to the friendly environmental business sectors that can help them to place effective and efficient announcements regarding their products/solutions using a dynamic mechanism for mobile users. Different forms of individual social marketing materials can be used within the platform including movies, alerts as text messages and triggered announcements.

The platform has the capacity for providing a stakeholders interaction services that apply equally to individuals, scientists, activists, communities of sustainability, business firms, governments and global environmental communities Figure 8.5 (g). Interaction services can also be utilized to activate the interaction between users locally and globally as well as enable platform users exchange sustainability related information or share innovative solutions and ideas Figure 8.5 (h). Also, Interaction services can be applied in event situations as well. One example is communicating with local people or members with a community of sustainability so that the community knows where its members are at any given time and apply their local engagement programs at their local audience. It can also be applied for locating and dispatching digital or physical support closest to a given chat or call or for attending members physically to assist the person. The application allows communities of sustainability to locate their members, thus enabling a community of sustainability to dispatch the nearest supporter and provide accurate information to the concerned person with tailored personal information or services in a timely manner. It is another opportunity to reach individuals in place and provide accurate alternatives for environmentally friendly products and solutions.

8.3 Part II: Data Analysis Results

8.3.1 Overview, the Empirical Work, and Data Collection Method

This section focuses on exploring people's perceptions regarding the impact of the 'Blended Social Network' model on the determinants of individual's engagement, in particular the impact on a person's 'intention to change behaviour' and 'preparedness to engage' toward a sustainable lifestyle. For this purpose a portion of the respondents of the field survey were asked to participate in a poll survey. 176 respondents volunteered for this phase that involved utilising and evaluating the functionality of the BSN. The target population consisted of both male and female Saudi citizens. The data collected was concerned with describing the impact of the 'Blended Social Network' on participants' 'intention to change' anti-environmental behaviour and measure their 'preparedness to engage' with sustainable communities that would serve to support lifestyle change. The poll's questions were determined in order to measure the effect of this type of online social network on participant's 'cognitive', 'affective' and 'intentional behaviour' aspects with an end to then measuring the effect of these factors on 'preparedness to engage' toward sustainability. The self-assessment method was used to investigate and measure people's feelings and perceptions.

The validation process was also concerned with measuring the impact of adding the ICT techniques to the 'Blended Social Network' in order to enhance the quality of information and services provided to the users. In the last section of the survey, participants were asked to respond to questions regards their perceptions after the ICT techniques were added. Also, an investigation was conducted into the effect of integrating the techniques with the existing online social media; particularly in order to examine the effect these modules have in promoting sustainable lifestyles and encouraging people's 'preparedness to engaging' in sustainability.

In order to improve the quality and functionality of the 'Blended Social Network', ICT techniques were added to the conceptual model. The second research question of this study is concerned with the investigation of the role of ICT techniques on individual's 'preparedness to engage' with sustainable communities; in particular, 'What factors, techniques and functionality within online social networks contribute in encouraging individuals to engage in sustainability?'. The literature review as well as evidence emerging from 'phase two' of the current study, led to the recognition and identification

of six main motivational ICT modules, namely, 'context-aware', 'location-based', 'social learning', the 'individual's social marketing', 'profiling and sustainable labelling' techniques and the 'attraction module'. The techniques listed, aim to improve the quality and functionality of the online social network while the 'attraction module' mainly aims to support the model in becoming well-known and commonly used by increasing subscribing members and attracting the public. In addition, the module affects individual engagement by enhancing the advocacy of public contributions in current trending activities and environmental events as well as by creating permanent incentives for pro-environmental members by relying on their profiling and sustainable labelling. As it will be explained later in this chapter, the conceptual model was evaluated before and after the addition of the ICT modules, with the purpose of ascertaining the effect of the attraction module on the user.

Three variables that might affect individuals' 'preparedness to engage' were measured through the poll questionnaire method. The perceived effect of the 'Blended Social Network' on 'cognitive' and 'affective' aspects as well as respondent's 'intention to change behaviour' and their 'preparedness to engage' were measured by seventeen multiple-item measurements, using a 5-point Likert scale. A composite of 3 items pertaining to the perceived effect on the 'cognitive' aspect, 3 items for the 'affective' component, 8 items for individual's 'intention to change behaviour' and 3 items for their 'preparedness to engage' were measured.

Moreover, the multiple-item measurements associated with the four constructs were used to measure and test the ICT techniques. These items were used to examine impact of the ICT techniques on engagement factors, for example, the impact of the 'context-aware' technique on the 'cognitive' aspect was investigated, using the measurement item, [The information presented through the 'context-aware' were informational, useful and helpful?]; the 'affective' using measurement item, [The 'context-aware' technique enhance mentally and emotionally to be involved toward community of sustainability objectives, mission, and goal?]; the 'intention to change behaviour' using measurement item, [I thought that the 'context-aware' technique can assist me to change negative behaviour and habit towards sustainable lifestyle?]; and the 'preparedness to engage' using measurement item, [Rely on the 'context-aware' technique information and facts presented; in the future, I will actively seek and recommend pro-environmental action

and adopt sustainable lifestyle?]. The same measurements items were used to examine the other ICT Modules.

The poll survey also comprised detailed questions about participants' demographic characteristics including gender, age, education level and household income.

Prior to administering the poll survey, a pre-test took place with a small sample consisting of nine volunteers. The feedback comments considered the appropriateness of the items in the context of the questionnaire, the survey layout, time required to complete it and the clarity of word choice or phrases used in the survey items (Vijayasathy, 2004). The response validity check led to reverse coding for some measurement items in order for them to be appropriate and consistent with the relevant set of items that were determined to measure the given construct. The data collection of 176 samples was conducted through six 'seminar and data collection sessions', which were held to show and examine the effect of the system on determinants of individual's engagement.

The following sections introduce the research validation, give a detailed of data analysis and overview of poll sample profile, reliability and validity of the data, results of Exploratory Factor Analysis, Multicollinearity Analysis, sets out the results and discussion, highlights the results of Correlation Matrices and Multiple Regression Analysis and hypothesis testing for both the 'Blended Social Network' and the ICT techniques.

8.3.2 Preliminary Data Analysis Results

The collected data for this phase of study was analysed using SPSS software - Statistical package for social sciences, version 20. The SPSS tools present the results in terms of distribution of the respondents' demographic characteristic information and in this case, found that the collated percentages were representative of the populations. Table 8.1 summarises the demographic characteristics of the poll survey respondents. Respondent's ages ranged from 18 years old to 64 years old, with the average age of 34 years. Nearly 70% of the respondents were male. 87% of the sample was familiar with the Internet and using the Internet for social and informational purposes. The sample population was in general well educated. About 66% of the sample had attended some college, had an associate's degree or had a bachelor's degree; 9% had a master's or doctoral degree. Reported household incomes varied among the sample. About 9.8% of the sample reported no income; 18.5% of the sample preferred not to say; about 8.1% of the sample

reported a monthly household income of less than RS 3,000; nearly 14.5% reported a monthly household income of RS 3,001 to RS 6,000; close to 23.7% reported a monthly household income of RS 6,001 to RS 9,000; 7.5% reported a monthly household income of RS 9,001 to RS 12,000; 12.1% reported a monthly household income of RS 12,001 to RS 25,000 and about 5.8% reported a monthly household income more than RS 25,000.

Table 8.1: Demographic Characteristics of Survey Respondents (N=173).

Characteristics	Mean/Sample Percentage
Age	Range: 18 – 64 years old
Gender	
Male	69.9
Female	30.1
Education	
No formal qualifications	1.2
Primary school	1.7
Intermediate school	4.6
High school	22.5
Certificate/Diploma / Advanced Diploma	14.5
Bachelor's Degree or equivalent	42.8
Master's/Doctoral degree or equivalent	8.7
Still studying and other	4
Annual Household Income	
Less than 3,000 (Very low)	8.1
3,001 – 6,000 (Low)	14.5
6,001 – 9,000 (Medium)	23.7
9,001 – 12,000 (Above medium)	7.5
12,001– 25,000 (High)	12.1
More than 25,000 (Very high)	5.8
No income	9.8
Prefer not to say	18.5

At the initial phase of data analysis, the survey items were tested for both reliability and validity including multicollinearity. The Cronbach alpha coefficient and composite reliability (CR) for each construct were tested for reliability, while exploratory factor analysis was conducted to ensure construct validity, the convergent and discriminant validity tests were applied in order to check the model's constructs. Hypotheses were tested by utilising an advanced analysis which was conducted for validating the research model components and the related hypotheses. Furthermore, multiple linear regression

analyses, were also performed because of their capacities for predicting a person's 'intention to change behaviour' and 'preparedness to engage'. A detailed data analysis is presented in the following sections.

8.3.2.1 Reliability and Validity Analysis

8.3.2.1.1 Reliability Test

The reliability analysis is important for assessing research poll questionnaires and to verify the internal consistency of the variables (Chu and Murrmann, 2006). The reliability of the poll item's internal consistency and reliability was verified by calculating the Cronbach's alpha (Cronbach and Murphy, 1970). Typically, the Cronbach's alpha coefficient values are in the ranges of 0 to 1. A value closer to 1 shows more internal consistency and reliability. According to Nunnally Jum and Bernstein Ira (1978), 0.6 is considered a minimum acceptable value. Table 8.2 and 8.3 show the reliability analysis results for all items of the constructs of the survey instrument. The values of alpha of the instrument to measure the 'Blended Social Network' were in the range of 0.84–0.92, which confirmed that all multiple-items used have good reliability and internal consistency. Out of all the variables, the construct 'cognitive' has the highest alpha value at 0.92 and the 'intention to change behaviour' construct has the lowest value at 0.84. With regards to the reliability of the constructs used to measure the ICT techniques, the value of alpha confirmed that all multiple-items used have good reliability and are internally consistent, as shown in Table 8.3.

Table 8.2: Reliability Analysis for constructs used to measure the 'Blended Social Network' (Alpha Coefficients for Factors Resulting from Factor Analysis)

BSN Engagement Measurement Constructs	Items Code	No. of Items	Cronbach's alpha (α)
Cognitive	COG	3	0.92
Affective	AFC	2*	0.91
Intention to change behaviour	BHV	8**	0.84
Preparedness to engagement	ENG	3	0.88
* Originally this construct was measured with three items. One item was dropped to improve reliability.			
** Originally this construct was measured with ten items. Two item was dropped to improve reliability.			

Table 8.3: Reliability Analysis for the constructs used to measure the ‘Blended Social Network’ and the ICT techniques (Alpha Coefficients for Factors Resulting from Factor Analysis)

BSN and ICT Engagement Constructs	No. Items	Mean (S.D.)	Cronbach's Alpha (α)	Collinearity Statistics	
				Tolerance	VIF
<u>Blended Social Network (BSN) Measurement Constructs:</u>					
Cognitive (COG)	3	3.14 (2.13)	0.921	0.735	1.361
Affective (AFC)	2	2.94 (1.95)	0.913	0.684	1.462
Intention to change behaviour (BHV)	8	3.21 (1.74)	0.844	0.763	1.311
Preparedness to engagement (ENG)	3	3.13 (2.24)	0.889	0.822	1.217
<u>ICT Techniques Measurement Constructs:</u>					
Context-Aware Module (CAT)					
Cognitive (COG)	3	3.26 (1.76)	0.873	0.692	1.445
Affective (AFC)	2	3.16 (1.39)	0.915	0.791	1.264
Intention to change behaviour (BHV)	8	3.42 (1.83)	0.804	0.832	1.202
Preparedness to engagement (ENG)	3	2.98 (1.74)	0.821	0.813	1.230
Place-Based Techniques (PBT)					
Cognitive (COG)	3	2.89 (1.39)	0.866	0.791	1.264
Affective (AFC)	2	3.30 (1.57)	0.901	0.726	1.377
Intention to change behaviour (BHV)	8	3.22 (1.67)	0.779	0.798	1.253
Preparedness to engagement (ENG)	3	3.08 (1.90)	0.851	0.813	1.230
Social Learning Module (SLT)					
Cognitive (COG)	3	3.12 (1.32)	0.883	0.829	1.206
Affective (AFC)	2	3.31 (1.68)	0.895	0.732	1.366
Intention to change behaviour (BHV)	8	3.12 (1.31)	0.763	0.739	1.353
Preparedness to engagement (ENG)	3	3.12 (1.29)	0.876	0.737	1.357
Individual's Social Marketing Module (ISM)					
Cognitive (COG)	3	3.17 (1.38)	0.881	0.672	1.488
Affective (AFC)	2	3.31 (1.39)	0.895	0.893	1.119
Intention to change behaviour (BHV)	8	3.19 (2.01)	0.763	0.863	1.159
Preparedness to engagement (ENG)	3	3.27 (1.39)	0.877	0.856	1.168
Individuals Profile and Sustainable labelling (PSL)					
Cognitive (COG)	3	3.23 (1.24)	0.941	0.735	1.361
Affective (AFC)	2	3.24 (1.68)	0.931	0.756	1.322
Intention to change behaviour (BHV)	8	3.16 (1.39)	0.890	0.794	1.259
Preparedness to engagement (ENG)	3	3.24 (1.27)	0.890	0.729	1.372
Hook and Attractive Module (HOK); Participating in current trends events (PTE)					
Cognitive (COG)	3	3.19 (1.29)	0.887	0.721	1.387
Affective (AFC)	2	3.10 (1.71)	0.931	0.639	1.565
Intention to change behaviour (BHV)	8	3.32 (1.69)	0.891	0.594	1.684

Preparedness to engagement (ENG)	3	3.13 (1.75)	0.860	0.797	1.255
Hook and Attractive Module (HOK); Create permanent incentives (PIT)					
Cognitive (COG)	3	3.13 (1.39)	0.871	0.832	1.202
Affective (AFC)	2	3.26 (1.34)	0.915	0.731	1.368
Intention to change behaviour (BHV)	8	3.37 (1.27)	0.891	0.735	1.361
Preparedness to engagement (ENG)	3	3.20 (1.69)	0.860	0.794	1.259

8.3.2.1.2 Testing the Construct Validity

The aim of the validity analysis of the data is to ensure that the survey instrument is eligible and accurate for measuring the issues that it is intended to measure. To analyse the validity of the poll instrument, the four constructs of the validation model were measured for validity and reliability through an evaluation of the multiple-items they were associated with, by examining their factor loading values. The exploratory factor analysis was conducted prior to embarking on a full data analysis in order to determine all items that have poor psychometric properties and to clean out the instrument in order for it to be ready for future testing (Anderson and Gerbing, 1988). Exploratory factor analysis was applied for each multiple-item measurement scale related to the model constructs, namely, ‘cognitive’, ‘affective’, ‘intention to change behaviour’, and ‘preparedness to engage’ constructs, as a way to refine the measurement variables of the study.

Convergent validity: The outcome of factor loading analysis is provision of a measurement of the strength of the item’s relationship with its relevant constructs. The items with a high value of loading show significant correlation with the related constructs. The final factors loading for all items of this poll instrument are presented in table 8.4 and 8.5. The final item loading values ranged from (0.68 – 0.96), which shows that almost all of multiple-items were loaded very well with their own constructs.

Discriminate validity: Discriminate validity is applied to ensure that the item’s measure does not measure two distinct constructs at the same time (Messsick, 1995). An item’s loading factor for the item underneath certain constructs needs to be more highly correlated with the set of items related to the same construct rather than associated with other items of other constructs; thus, “the squared correlations between two different measures in any two constructs should be statistically lower than the variance shared by the measures of a construct” (Fornell et al., 1982).

Table 8.4: Final Results of Exploratory Factor Analysis for effect of the ‘Blended Social Network’ on engagement factors

Items	Engagement Measurements Dimensions	Factor Loading	Composite Reliability (CR)	Average Variance Extracted (AVE)
Effect of ‘Blended Social Network’ on:				
1. Cognitive			.94	.84
COG1	I am able to take positive decisions regarding the environment based on the information presented on this ‘Blended Social Network System’; it is useful and helpful information.[useful and helpful]	.91		
COG2	I feel like I learn and have a tremendous amount of information about the environment. [learning and full information]	.96		
COG3	The Blended System is informational which inform me about environmental issues in appropriate way. [inform]	.88		
2. *Affect			.90	.82
AFCT1	When I am using the Blended System I get mentally and emotionally involved in the community of sustainability objectives, mission, and goal. [mentality and emotionally effect]	.92		
AFCT2	The Blende System’s social network is satisfying and interesting. [satisfying and interesting]	.89		
AFCT3	The Blende System’s social network is exiting and enjoiment. [enjoiment, pleasure and exiting]	.58 Removed		
3. **Intention to change behaviour			.96	.71
BHV1	‘After using the Blended System I feel positive attitude towards sustainable lifestyle’. [Attitude]	.87		
BHV2	‘After using the Blended System I thought I ought to be conserving environment’. [Subjective norm (SN)]	.93		
BHV3	‘I know how I can save environment and able to do’. [Know and able to do].	.68		
BHV4	‘After using the Blended System I thought that it will be enhance my capability of conserving environment’. [Perceived behavioural control (PBC)]	.91		
BHV5	‘After using the Blended System I feel improve my values toward environmental issues’. [Values]	.79		
BHV5	‘The greenhouse effect is a problem for society’ [Awareness of Consequences (AC)]	.78		
BHV6	‘I take joint responsibility for the depletion of my impact on environment’. [Ascription of Responsibility (AR)]	.85		
BHV7	‘I feel morally obliged to participate with collective action to help environment’. [Personal Norm (PN), Obligation]	.94		
BHV8	‘To what extent you thought, the Blended System can assist people to change negative habit’. [Habit]	.82		

4. Preparedness to engagement			.91	.77
ENG1	'I would buy friendly environmental products/services utilise the assistance of the Blended System in the future'. [Using environmental choices and alternatives]	.82		
ENg2	'In the future, I will actively seek to take environmental action and adopt sustainable lifestyle'. [Doing action]	.91		
ENG3	'I will recommend the pro-environmental action to my family and friends'. [Recommending to friends]	.90		
* Originally this construct was measured with three items. One item was removed to improve reliability. ** Originally this construct was measured with ten items. Two items were removed to improve reliability.				

Table 8.5: Final results of Exploratory Factor Analysis (EFA) for effect of the ICT techniques on engagement factors

Items	Engagement Measurement Dimensions	Factor Loading						
		CAT	PBT	SLT	ISM	PSL	PCT	BIT
Effect of the ICT Techniques on;								
1. Cognitive								
COG1	'I am able to take positive decisions regarding the environment based on the information presented on this 'Blended Social Network System'; it is useful and helpful information'. [Useful, Helpful]	.92	.86	.79	.90	.92	.91	.86
COG2	'I feel like I learn and have a tremendous amount of information about the environment'. [Learning and full information]	.87	.81	.92	.86	.94	.93	.88
COG3	'The Blended System is informational which inform me about environmental issues in appropriate way'. [Inform]	.82	.93	.94	.88	.96	.82	.86
Composite Reliability (CR)		.90	.90	.92	.91	.96	.92	.90
Average Variance Extracted (AVE)		.76	.75	.78	.77	.88	.79	.75
2. Affect								
AFCT1	'When I am using the Blended System I get mentally and emotionally involved in the community of sustainability objectives, mission, and goal.' [Mentality and emotionally effect]	.87	.91	.92	.92	.92	.94	.92
AFCT2	'The Blende System's social network is satisfying and interesting.' [Satisfying and interesting]	.96	.89	.87	.84	.94	.92	.91
AFCT3	'The Blende System's social network is exiting and enjoiment.' [Enjoiment, pleasure and exiting]	RM	RM	RM	RM	RM	RM	RM
Composite Reliability (CR)		.91	.90	.89	.87	.93	.93	.91
Average Variance Extracted (AVE)		.84	.81	.80	.78	.87	.87	.84

Chapter 8: Data Analysis Results of Validating the Conceptual Model

3. Intention to change behaviour								
BHV1	'After using the Blended System I feel positive attitude towards sustainable lifestyle.' [Attitude]	.83	.78	.82	.86	.95	.93	.96
BHV2	After using the Blended System I thought I ought to be conserving environment. [Subjective Norm (SN)]	.79	.73	.70	.69	.92	.92	.89
BHV3	'After using the Blended System I thought that it will be enhance my capability of conserving environment.' [Perceived Behavioural Control (PBC)]	.94	.76	.72	.76	.78	.91	.86
BHV4	'I know how I can save environment and able to do.' [Know and able to do].	.89	.91	.90	.92	.92	.90	.91
BHV5	'After using the Blended System I feel improve my values toward environmental issues.' [Values]	.73	.81	.83	.77	.74	.72	.72
BHV6	'The greenhouse effect is a problem for society.' [Awareness of Consequences (AC)]	.76	.72	.73	.92	.94	.89	.88
BHV7	'I take joint responsibility for the depletion of my impact on environment.' [Ascription of Responsibility (AR)]	.78	.76	.73	.89	.91	.90	.93
BHV8	'I feel morally obliged to participate with collective action to help environment.' [Personal Norm (PN), Obligation]	.69	.76	.71	.88	.92	.90	.94
BHV9	'To what extent you thought, the Blended System can assist people to change negative habit.' [Habit]	.83	.78	.73	.89	.91	.92	.93
Composite Reliability (CR)		.94	.93	.93	.96	.97.	.97	.97
Average Variance Extracted (AVE)		.65	.61	.57	.72	.79	.79	.80
4. Preparedness to engagement								
ENG1	'I would buy friendly environmental products/services utilise the assistance of the Blended System in the future.' [Using environmental choices and alternatives]	.69	.93	.91	.78	.93	.83	.91
ENG2	'In the future, I will actively seek to take environmental action and adopt sustainable lifestyle.' [Doing action]	.91	.83	.84	.93	.88	.79	.88
ENG3	'I will recommend the pro-environmental action to my family and friends.' [Recommending to friends]	.86	.79	.88	.91	.86	.96	.79
Composite Reliability (CR)		.86	.89	.91	.91	.92	.90	.89
Average Variance Extracted (AVE)		.68	.73	.77	.77	.79	.74	.74
* RM: Item removed to improve the reliability.								

All shared variances between any two constructs were less than the amount of variance extracted by one of the two constructs. Therefore, the constructs of the survey for this study had sufficient discriminant validity and are considered as being valid for further analysis.

The final results of the discriminant validity are presented in table 8.6.

Table 8.6: Pearson correlation coefficients and discriminant validity test for the ‘Blended Social Network’ constructs (diagonal elements are a square root of the AVE)

Engagement Measurement Constructs	Code	COG	AFCT	BHV	ENG
Cognitive	COG	0.917	.		
Affective	AFC	0.142*	0.906		
Intention to change behaviour	BHV	0.211**	0.172*	0.843	
Preparedness to engagement	ENG	0.213**	0.165**	0.382*	0.877
Diagonal elements represent the average variance extracted, while the other matrix elements represent the shared variance. The correlations between any two distinct were lesser than 1.0 and AVE for diagonal elements are above cut-off value of 0.5 as recommended by (Hair, 2006, Fornell and Larcker, 1981).					

The possibility of the discriminant validity for the ICT techniques were also checked.

8.3.2.2 Multicollinearity Analysis

A multicollinearity test was conducted with the composite scores calculated for each factor in order to determine how correlated the variables were to one another (Hair, 2010). Multicollinearity exists when the overall p-value may be significant but the p-value for each predictor may not be significant and the correlation between the coefficients is very high (i.e. above 0.90). In this study, none of the correlation values are above 0.90. Using ‘preparedness to engage’ as a dependent variable and the proposed antecedents of online personal engagement, ‘cognitive’, ‘affective’, ‘intention to change behaviour’ factors as independent variables, the variance inflation factor (VIF) for the relevant regression models ranged between 1.1 and 1.6. Additionally, the tolerance values ranged between .59 and .89. The highest squared correlation among the independent variables was 0.19 between the measurement of ‘cognitive’ and ‘affective’ aspects of the ‘Blended Social Network’. None of the squared correlations was close to 0.80 to suggest a problem with multi-collinearity among the research variables (Hair Jr et al., 1995), Secondly, the p-value for each predictor is also significant. Given that the values of tolerance levels were all above 0.10 and variance inflation values (VIF) were below 10 for each predictor, it was confirmed that the multicollinearity did not exist and there was no evidence of significant multi-collinearity among the research variables (Hair, 2010, Hayes, 2010). Given this, the variables were unique and were not measuring the conceptually similar things. (Table 8.7 and 8.8).

Table 8.7: The Variance Inflation Factor (VIF) and correlation Matrix for integrated ‘Blended Social Network’ innovation

Engagement Measurement Constructs	No. Items	Collinearity Statistics		COG	AFCT	BHV	ENG
		Tolerance	VIF				
Cognitive (COG)	3	0.735	1.361	1.000	.		
Affective (AFCT)	2	0.684	1.462	0.142*	1.000		
Intent to change behaviour (BHV)	8	0.763	1.311	0.211**	0.172*	1.000	
Preparedness to engagement (ENG)	3	0.822	1.217	0.213**	0.165**	0.382*	1.000

- * $p < 0.05$; ** $p < 0.01$.
 - Values of tolerance for all predictors are > 0.1
 - Values of variance inflation factor for all predictors (VIF) are < 10 , (Hair, 2010, Hayes, 2010).

Table 8.8: The Variance Inflation Factor (VIF) and correlation Matrix for all the ICT techniques.

Engagement Measurement Constructs	Collinearity Statistics		COG	AFCT	BHV	ENG
	Tolerance	VIF				
Context-Aware Technique (CAT)						
Cognitive (COG)	0.791	1.264	1.000	.		
Affective (AFCT)	0.726	1.377	0.169**	1.000		
Intent to change behaviour (BHV)	0.798	1.253	0.173*	0.129**	1.000	
Preparedness to engagement (ENG)	0.813	1.230	0.219**	0.267*	0.191*	1.000
Location-Based Technique (LBT)						
Cognitive (COG)	0.829	1.206	1.000	.		
Affective (AFCT)	0.732	1.366	0.172*	1.000		
Intent to change behaviour (BHV)	0.739	1.353	0.176*	0.151**	1.000	
Preparedness to engagement (ENG)	0.737	1.357	0.227*	0.295*	0.389*	1.000
Social Learning Technique (SLT)						
Cognitive (COG)	0.692	1.445	1.000	.		
Affective (AFCT)	0.791	1.264	0.162*	1.000		
Intent to change behaviour (BHV)	0.832	1.202	0.137**	0.127*	1.000	
Preparedness to engagement (ENG)	0.813	1.230	0.218*	0.281*	0.372*	1.000
Individual’s Social Marketing (ISM)						
Cognitive (COG)	0.672	1.488	1.000	.		
Affective (AFCT)	0.893	1.119	0.172*	1.000		
Intent to change behaviour (BHV)	0.863	1.159	0.169**	0.119*	1.000	
Preparedness to engagement (ENG)	0.856	1.168	0.216*	0.273*	0.372*	1.000
Individuals Profile and Sustainable Labelling (PSL)						
Cognitive, (COG)	0.735	1.361	1.000	.		

Affective (AFCT)	0.756	1.322	0.169*	1.000		
Intent to change behaviour (BHV)	0.794	1.259	0.168**	0.118**	1.000	
Preparedness to engagement (ENG)	0.729	1.372	0.192**	0.267**	0.367*	1.000
Hook and Attraction Module (HOK); (participating in current trends events (PCT))						
Cognitive (COG)	0.721	1.387	1.000	.		
Affective (AFCT)	0.639	1.565	0.172**	1.000		
Intent to change behaviour (BHV)	0.594	1.684	0.179*	0.115**	1.000	
Preparedness to engagement (ENG)	0.797	1.255	0.273*	0.297*	0.356**	1.000
Hook and Attraction Module (HOK); (Create permanent incentives (PIT))						
Cognitive (COG)	0.832	1.202	1.000	.		
Affective (AFCT)	0.731	1.368	0.171**	1.000		
Intent to change behaviour (BHV)	0.735	1.361	0.183*	0.162**	1.000	
Preparedness to engagement (ENG)	0.794	1.259	0.261**	0.293**	0.327*	1.000
- * $p < 0.05$; ** $p < 0.01$. - Values of tolerance for all predictors are > 0.1 - Values of variance inflation factor for all predictors (VIF) are < 10						

8.3.3 Analysis Results of Validating the Model Effects on Individual Preparedness to Engagement in Sustainable lifestyle

This section discusses the results of Correlation Matrices and Multiple Regression Analysis and hypothesis testing for both the ‘Blended Social Network’ and the ICT techniques, and then presents a general discussion of the overall findings.

8.3.3.1 Validating the Effects of the Model Components on Citizen’s Engagement Determinants with Correlations Analysis

The correlation statistical technique was conducted in order to measure the association between two constructs. This technique can either be used independently or as a pre-analysis step for the regression analysis. The correlation analysis is not considered enough to describe the relationship between the determinants in depth, such as testing the cause and effect association but it can be taken as an indicator leading to further statistical analysis such as regression analysis.

An initial correlation analysis was conducted to examine the relationship between the model’s variables. It was used to explore the association between independent variables which have closer associations with the dependent one. In particular, the study conducted correlation analysis for the model’s variables relying on data collected concerning the effect of the ‘Blended Social Network’ and the set of selected ICT techniques, which are

embedded and integrated within the platform, on a person’s ‘preparedness to engage’ in sustainability.

8.3.3.1.1 The ‘Blended Social Network’

Correlation analysis was conducted for all the four model’s constructs with ‘cognitive’, ‘affective’ and ‘intention to change behaviour’ aspects as independent variables and ‘preparedness to engage’ as a dependent variable. The result of all independent variables showed statistically significant correlation with the dependent construct.

Table 8.9 shows the correlation matrix of the effect of the ‘Blended Social Network’ on ‘preparedness to engage’ in communities of sustainability. All the correlation outcomes supported the model’s hypotheses and all independent variables were expected to have a positive effect on the dependent variable.

Table 8.9: Correlation matrix for the association between the constructs of the ‘preparedness to engage’ toward sustainability through the ‘Blended Social Network’ model’

Engagement Measurement Constructs	COG	AFCT	BHV
Pearson Correlation	0.213**	0.165**	0.382*
Sig. (2-tailed)	0.000	0.000	0.063
N	173	173	173
** Correlation is significant at the 0.01 level (2-tailed).			
* Correlation is significant at the 0.05 level (2-tailed).			

8.3.3.1.2 The ICT techniques

Moreover, an initial correlation analysis was conducted to analyse the relationship between variables such as user perception of the impact of the ICT modules within the integrated ‘Blended Social Network’ innovation on the ‘preparedness to engage’ construct through the ‘cognitive’, ‘affective’ and ‘intention to change behaviour’ variables. All the three relationship constructs, ‘cognitive’, ‘affective’ and ‘intention to change behaviour’ showed statistically significant positive correlation with the construct of ‘preparedness to engage’ in sustainability through the ICT that applied within the ‘BSN’ platform.

Table 8.10 shows that the correlation matrices among the four perceived constructs of an individual’s ‘preparedness to engage’ rely on the ICT techniques, ‘individual’s social marketing’, ‘context-aware’, ‘location-based’, ‘social learning’, ‘hook and attraction module’ (HOK), ‘individual’s profile and sustainable labelling’ within the integrated

‘Blended Social Network’. All these correlations are in the expected directions and they provide support for the set of research hypotheses.

Table 8.10: Correlation matrix for ‘preparedness to engage’ toward community of sustainability relying on the IC techniques (N=173)

ICT Techniques	Engagement Measurement Constructs		
	COG	AFCT	BHV
Context-Aware Technique (CAT)			
Pearson Correlation	0.219**	0.267*	0.191*
Sig. (2-tailed)	0.001	0.074	0.053
Location-Based Technique (LBT)			
Pearson Correlation	0.227*	0.295**	0.389*
Sig. (2-tailed)	0.082	0.000	0.062
Social Learning Technique (SLT)			
Pearson Correlation	0.218**	0.281**	0.372*
Sig. (2-tailed)	0.001	0.000	0.063
Individual’s Social Marketing Technique (ISM)			
Pearson Correlation	0.216**	0.273*	0.372**
Sig. (2-tailed)	0.001	0.083	0.003
Individual’s profile and sustainable labelling Techniques (PSL)			
Pearson Correlation	0.192**	0.267**	0.367*
Sig. (2-tailed)	0.001	0.000	0.052
Hook and Attraction Module (HOK); (Participating in current trends events (PCT))			
Pearson Correlation	0.273**	0.297**	0.356**
Sig. (2-tailed)	0.001	0.000	0.009
Hook and Attraction Module’ (HOK); (Create permanent incentives (PIT))			
Pearson Correlation	0.261**	0.293**	0.327*
Sig. (2-tailed)	0.001	0.000	0.084
** Correlation is significant at the 0.01 level (2-tailed).			
* Correlation is significant at the 0.05 level (2-tailed).			

In conclusion, the results of the correlation matrices for both the ‘Blended Social Network’ platform and all modules of the ICT techniques applied in the research model indicate that, all independent variables were expected to show a significant positive correlation with the dependent variable and supported the model’s hypotheses.

The study also conducted regression analysis to evaluate the theoretical association between relevant factors and a person’s ‘preparedness to engage’ with sustainability. The next section provides the outcomes of the advanced analysis using multiple regression analysis regards predicting a person’s ‘preparedness to engage’ in communities of

sustainability through the ‘Blended Social Network’ model and the multiple regression analysis for the ICT techniques within the ‘Blended Social Network’ platform.

8.3.3.2 Validation the Effects of the Model Components on Citizen’s Engagement Determinants with Advanced Analysis

After confirming the structure of the various scales in terms of reliability, validity and dimensionality, as well as the correlation between model variables, the test of the research hypotheses was conducted in this chapter in order to explore factors affecting a person’s ‘preparedness to engage’ in communities of sustainability.

In order to relate a dependent variable to a set of independent variables, the multiple linear regression analysis was conducted (Mendenhall and Sincich, 1993). Regression analysis is seen as the most appropriate analytical technique to determine the relationship between variables and predict intention. In this study a regression analysis was conducted to predict the future impact of the integrated ‘Blended Social Network’ on engagement factors, which were represented in the theoretical framework model, before and after adding the ICT techniques. The following section provides detailed information about the results of the multiple regression analysis and research hypotheses testing.

8.3.3.2.1 The Effects of the ‘Blended Social Network’ Platform

The regression analysis was conducted on the dependent variable, ‘preparedness to engage’ and three independent variables, ‘cognitive’, ‘affective’ and ‘intention to change behaviour’.

Figure 8.6 and Table 8.11, present the theoretical framework for the validation of individual engagement in sustainability, including the multiple regression analysis results, of the hypothesis (H A. (a), H A. (b), H A. (c) as described in chapter 5) and the research model and path-relationship between variables.

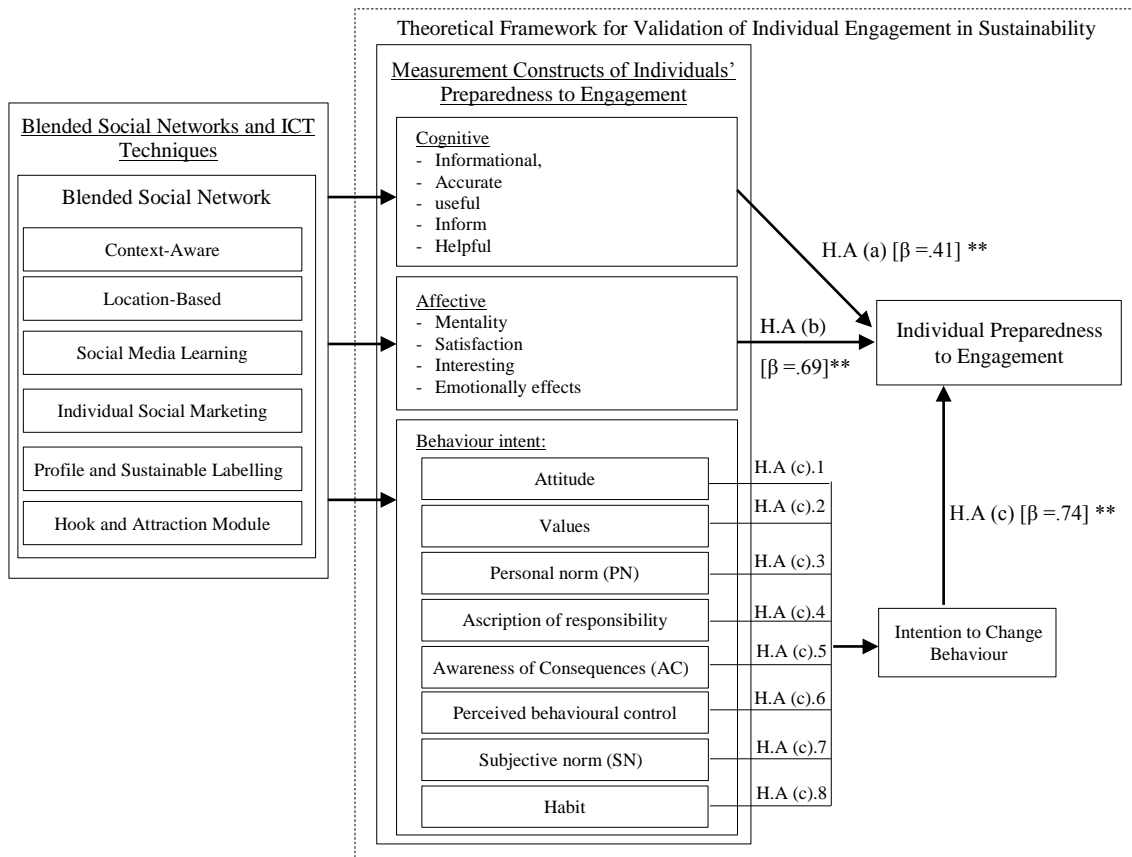


Figure 8.6: Predicted model for person’s ‘preparedness to engage’ with the objectives of communities of sustainability relying on the integrated ‘Blended Social Network’ innovation.

Table 8.11: Hypothesis testing and multiple regression coefficients predicting a person’s preparedness to engagement by relying on the ‘Blended Social Network’ platform

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H A. (a)	Cognitive (COG)	0.412	2.731	0.003	YES
H A. (b)	Affective (AFCT)	0.692	1.894	0.005	YES
H A. (c)	Intent to change behaviour (BHV)	0.739	2.373	0.003	YES

Dependent variable ‘preparedness to engage’ relying on the ‘Blended Social Network’ innovation; R = 0. 843; R² = 0.710; F = 0.052; Sig. = 0.001

The following section is concerned with the research hypothesis testing and discussion.

- *Impact of BSN on people’s ‘cognition’*

Hypothesis A. (a): The ‘Blended Social Network’ has a positive relationship with people’s ‘preparedness to engage’ towards sustainability through effects on people’s ‘Cognition’.

The first Hypothesis A. (a): examining the expected positive relationship between ‘cognitive’ variable and citizen ‘preparedness to engage’, through the ‘Blended Social Network’. The results obtained (as illustrated in Figure 8.6 and Table 8.11) show that although the parameter sign obtained was as expected, results based on the validation research model indicated a significant path between the ‘cognitive’ factor and ‘preparedness to engage’ in community of sustainability objectives ($\beta = .412$, $t = 2.73$, $p < .003$); the significance reaching high levels ($p = 0.003$). For this reason, hypothesis A. (a) had to be accepted. On the other hand, both the sign and the explanatory capacity of the parameter relating to a ‘cognitive’ effect through the ‘Blended Social Network’ with the dependent variable ‘preparedness to engage’ attained significant levels. Based on this, it could be assumed that a person who perceives a ‘Blended Social Network’ as possessing information that is relevant, accurate and helpful, is likely to become cognitively engaged, which leads to a significant positive effect on their ‘preparedness to engage’. This finding is in alignment with prior research which states the significant link between ‘cognitive’ factors and an individual’s ‘preparedness to engage’ (O’Brien & Toms, 2008).

- Impact of BSN on people’s ‘affective’

Hypothesis A. (b): The ‘Blended Social Network’ has a positive relationship with people’s ‘preparedness to engage’ toward sustainability through its effect on people’s ‘affective’ emotions.

Hypothesis A. (b): A person’s positive perception of the ‘Blended Social Network’ influences the ‘affective’ aspect and that will in turn affect their ‘preparedness to engage’ toward sustainable communities and encourage them to adopt a sustainable lifestyle. According to the statistical results, the using BSN proved to have an emotional effect of the user leading him/her to be more prepared to engage in sustainability. The validation research model showed a significant positive path ($\beta = .692$, $t = 1.82$, $p < .005$) for the hypothesised relationship of the ‘affective’ effect of the ‘Blended Social Network’ on ‘preparedness to engage’ in sustainable community objectives, so hypothesis A. (b), was supported. The beta value of 0.692 shows that a one unit increase in user perceived ‘Blended Social Network’ on the ‘affective’ aspect, may result in a 69.2% unit increase in a person’s ‘preparedness to engage’ with a sustainable community and encourage them to adopt a sustainable lifestyle. This suggests that if the integrated ‘Blended Social Network’ innovation is applied as a design function then the users will perceive it to be

of superior added-value and the effect on their ‘preparedness to engage’ with a sustainable community and adopt a sustainable lifestyle will be high. Thus hypothesis A. (b) is accepted. The notion that the affective leads to ‘preparedness to engage’ is congruent with several past studies.

- Impact of BSN on people’s ‘intention to change behaviour’

Hypothesis A. (c): The ‘Blended Social Network’ has a positive relationship with people’s ‘preparedness to engage’ towards sustainability through its effect on people’s ‘intention to change anti-environment behaviour’.

Hypothesis A. (c): The ‘Blended Social Network’ positively affects person’s ‘intention to change behaviour’ which will effect a person’s ‘preparedness to engage’ in a community of sustainability and encourage him/her to adopt a sustainable lifestyle. In order to examine this Hypothesis the study conducted two types of multiple regression analyses: (i) between ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN), and ‘habit’ as independent variables and the ‘intention to change behaviour’ as dependent variable; and (ii) between the ‘intention to change behaviour’ as independent variable and ‘preparedness to engage’ as dependent variable. The following section presents the results:

Firstly, the eight independent aforementioned variables, which the study concluded from literature as perhaps affecting the dependent variable ‘intention to change behaviour’ were analysed; namely, ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’ and the results are shown in Figure 8.7 and Table 8.12. The beta value for ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’ are ($\beta = .634, t = 2.82, p < .01$), ($\beta = .727, t = 1.96, p < .006$), ($\beta = .579, t = 2.39, p < .009$), ($\beta = .639, t = 2.89, p < .019$), ($\beta = .735, t = 1.81, p < .017$), ($\beta = .579, t = 2.39, p < .008$), ($\beta = .624, t = 2.37, p < .018$) and ($\beta = .521, t = 2.42, p < .013$) respectively with regards to their effect on ‘intention to change behaviour’. The validation research model showed that there was a significant positive path relationship between all proposed independent variables with the dependent variable, the ‘intention to change behaviour’.

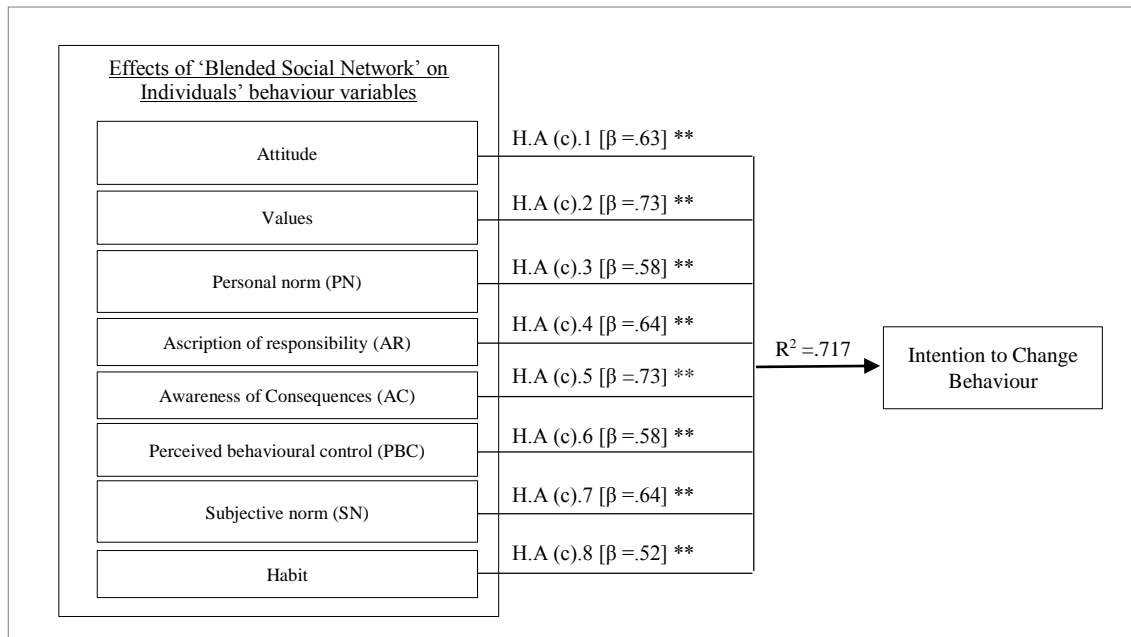


Figure 8.7: Predicted model for person's 'intention to change behaviour' toward sustainable lifestyle relying on the integrated 'Blended Social Network' platform.

Table 8.12: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the integrated 'Blended Social Network' platform

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.634	2.82	0.012	YES
H (c2)	Value	0.727	1.964	0.006	YES
H (c3)	Personal Norm	0.579	2.394	0.009	YES
H (c4)	Ascription of Responsibility	0.639	2.897	0.019	YES
H (c5)	Awareness of Consequences	0.735	1.813	0.017	YES
H (c6)	Perceived Behavioural Control	0.579	2.396	0.008	YES
H (c7)	Subjective Norm	0.624	2.373	0.018	YES
H (c8)	Habit	0.521	2.429	0.013	YES

Dependent variable 'intention to change behaviour' relying on the 'Blended Social Network';
R = 0.847; R² = 0. 717; F = 0.042; Sig. = 0.000

For the dependent variable, 'intention to change behaviour' the value of R² of the model in which all independent variables are included is 0.717. This value of R² provides a measure of how well 'intention to change behaviour' can be predicted from the set of independent variable scores. The positive value of R² confirms that all eight independent variables in the research model can best predict the person's 'intention to change behaviour' towards a sustainable lifestyle by relying on use of the integrated 'Blended Social Network'. The R² of 0.717, moreover, indicates that the eight independent variables account for 71.7% of the variation in the 'intention to change behaviour' dependent variable.

The other multiple regression analysis between the ‘intention to change behaviour’ and ‘preparedness to engage’ was also conducted in this study to examine the expected positive relationship between the two variables. The results obtained (as illustrated in Figure. 8.6 and Table 8.11) show that a significant path between ‘intention to change behaviour’ and ‘preparedness to engage’ in community of sustainability objectives ($\beta = 0.739$, $t = 2.37$, $p < .01$); the significance having a high level ($p = 0.004$). For this reason, hypothesis A. (c) has been accepted. On the other hand, both the sign and the explanatory capacity of the parameter relating to the effect on an ‘intention to change behaviour’ through the ‘Blended Social Network’ with the dependent variable ‘preparedness to engage’ attained significant levels. Based on this, it could be assumed that a person who perceives their own ‘intention to change behaviour’ is likely to be significantly prepared to engage in sustainability. This finding is consistent with several past studies that have found a person’s ‘intention to change behaviour’ having a bond with ‘preparedness to engage’.

- Effect of the BSN on people’s ‘preparedness to engaging’ in sustainability

In this study, the value of R^2 is 0.710, which indicates that the three independent variables account for almost 71% of the variation in a person’s ‘preparedness to engage’ dependent variable. The F statistic for the regression equation is significant, at $p < 0.001$, indicating that at least one of the coefficients corresponding to an independent variable is not equal to zero and the overall model is significant. The ‘intention to change behaviour’ and ‘affective’ variables have the highest influential effects on people’s ‘preparedness to engage’ in Saudi Arabia, although the ‘cognitive’ variable also has a significant positive effect and will increase the ‘preparedness to engage’.

The results show that the independent variables adequately explain the variation in the user’s ‘preparedness to engage’ with sustainable communities through the integrated ‘Blended Social Network’ innovation.

This finding provides an answer to the first research question and is consistent with prior studies that have found that social networks have a positive effect on people’s ‘preparedness to engage’ (Haythornthwaite, 1996, Valente and Pumpuang, 2007, Fell et al., 2009, Rabinovich et al., 2010, Rowson et al., 2010, Whitmarsh and Lorenzoni, 2010, Corner and Randall, 2011, Whitmarsh et al., 2011, Schultz et al., 2007, Wilsdon et al., 2004).

In the relevant literature, there are two main opinions on the effect of social networking on public engagement with pro-environmental behaviours. Some refer to the fact that there is no evidence that social networks can affect pro-environmental behaviour (Olli et al., 2001, Nye and Burgess, 2008), while the majority of studies emphasise the role of social networks in changing individual's behaviour to be more pro-environmental in general (Haythornthwaite, 1996, Valente and Pumpuang, 2007, Fell et al., 2009, Rabinovich et al., 2010, Rowson et al., 2010, Whitmarsh and Lorenzoni, 2010, Corner and Randall, 2011, Whitmarsh et al., 2011, Schultz et al., 2007, Wilsdon et al., 2004), and in conserving energy in particular (Capstick and Lewis, 2008, Nye and Burgess, 2008). The results collated in this study, the case specifically in Saudi Arabia, support the second opinion and present evidence of the significant role of social networks in encouraging the public to engage in sustainable communities and in supporting their pro-environmental behaviours.

8.3.3.2.2 The Effects of the ICT Techniques

A regression analysis was also conducted to predict the impact of the ICT techniques, namely, the 'context-aware', 'Location-based', 'education and social media learning', 'individual social marketing', 'individual profile and sustainable labelling', 'hook and attraction' module ('participation in current trends', and 'permanent incentive' techniques), on engagement factors and a person's 'preparedness to engage' in sustainability. The following section provides the results of the multiple regression analysis conducted for each ICT technique as well as the hypothesis testing. Figure 8.8 shows a predicted model of the theoretical validation of the effects of the ICT techniques within the 'Blended Social Network' on an individuals' 'preparedness to engage' with a community of sustainability.

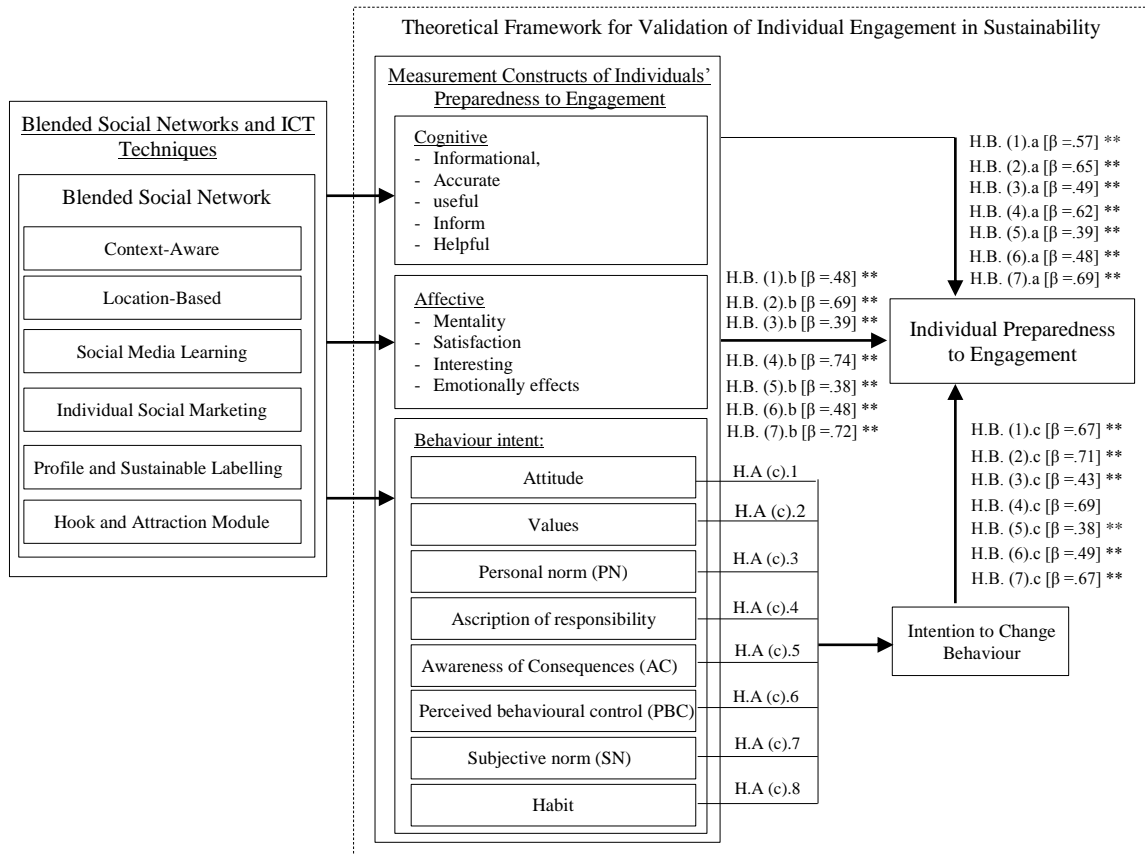


Figure 8.8: Predicted model of the theoretical validation of the effects of the ICT techniques used within the 'Blended Social Network' platform on an individual's 'preparedness to engage' with a sustainable community.

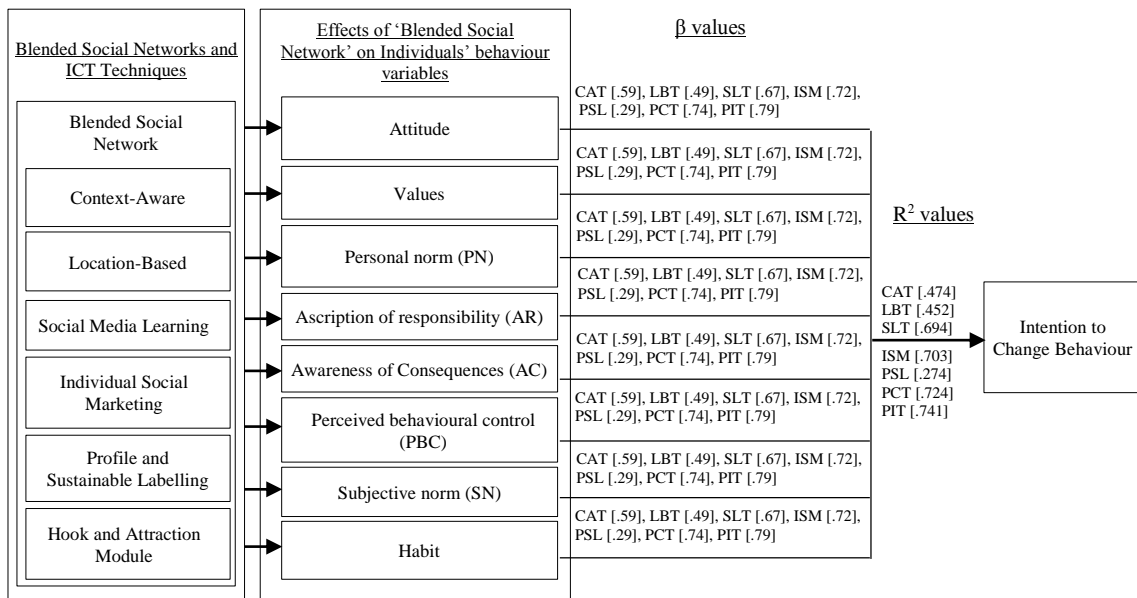


Figure 8.9: Predicted model of the theoretical validation illustrating the effects of the ICT techniques used within the 'Blended Social Network' model on an individual's 'intention to change behaviour' toward a sustainable lifestyle.

8.3.3.2.2.1 The Context-Aware Technique

Table 8.13: Regression coefficients predicting a person's 'preparedness to engage' by relying on ICT techniques: the 'Context-aware' technique (CAT) within the integrated 'Blended Social Network' platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (1).a	Cognitive (COG)	0.571	2.839	0.013	YES
H B. (1).b	Affective (AFCT)	0.483	2.683	0.009	YES
H B. (1).c	Intention to change behaviour (BHV)	0.672	2.374	0.002	YES
Dependent variable 'preparedness to engage' relying on CAT within the 'Blended Social Network'; R = 0.831; R ² = 0.690; F = 0.015; Sig. = 0.000					

- *Impact of CAT on people's 'preparedness to engage' factors:*

Hypothesis B. (1): The 'context-aware' technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

With respect to the cognitive effects of CAT, the analysis indicates a positive beta value 0.571 and therefore a positive relation between the two variables. A one point increase in the standard deviation of the cognitive variable will result in a .571 unit increase in the standard deviations of user's future preparedness to engage.

The analysis shows a similar positive relation between emotional effects and COG within the CAT. The beta value is 0.483 which means that a one point change in emotional variable will result in a change of 48.3% in the standard deviation of preparedness to engage variable which shows that if users perceive the 'context-aware' module within the 'Blended Social Network' as having an impact on their 'affective' aspects, then they are more likely to have positive 'preparedness to engage' with a community of sustainability. (See Figure 8.8 and Table 8.13).

According to the statistical analysis, the variable 'intention to change behaviour' significantly affects user perceptions about their 'preparedness to engage' with a community of sustainability, having a beta value of 0.672. The beta value shows that a one unit increase in the variable 'intention to change behaviour' will show an increase in 0.67.2% units of user perceptions towards their 'preparedness to engage'. The direction of this effect is positive. (Figure 8.7 and Table 8.13 illustrate this finding). Thus

hypothesis of impact of CAT on people's 'intention to change behaviour' is supported and through the integration of the 'context-aware' module with the 'Blended Social Network' innovation, people perceive the positive effect of their 'intention to change behaviour' on their 'preparedness to engage' in a community of sustainability.

In addition, in terms of examining the 'intention to change behaviour', the study conducted a multiple regression analysis between 'attitude', 'values', 'personal norm' (PN), 'ascription of responsibility' (AR), 'awareness of consequences' (AC), 'perceived behavioural control' (PBC), 'subjective norm' (SN) and 'habit' as independent variables and the 'intention to change behaviour' as the dependent variable. Figure 8.9 and table 8.14 show the result of the multiple regression analysis of these independent variables with the 'intention to change behaviour' dependent variable through the CAT within the 'Blended Social Network'. The beta values for 'attitude', 'values', 'personal norm' (PN), 'ascription of responsibility' (AR), 'awareness of consequences' (AC), 'perceived behavioural control' (PBC), 'subjective norm' (SN) and 'habit' are ($\beta = .595$, $t = 2.39$, $p < .018$), ($\beta = .647$, $t = 2.833$, $p < .009$), ($\beta = .621$, $t = 2.821$, $p < .003$), ($\beta = .608$, $t = 2.73$, $p < .021$), ($\beta = .701$, $t = 2.79$, $p < .013$), ($\beta = .627$, $t = 2.28$, $p < .007$), ($\beta = .592$, $t = 2.273$, $p < .015$) and ($\beta = .493$, $t = 2.557$, $p < .018$) respectively with regards to 'intention to change behaviour'. The validation research model showed that all eight independent variables had a significant positive path relationship with the dependent variable, 'intention to change behaviour'.

Table 8.14: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' relying on the 'context-aware' technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.595	2.391	0.018	YES
H (c2)	Value	0.647	2.833	0.009	YES
H (c3)	Personal Norm	0.621	2.821	0.003	YES
H (c4)	Ascription of Responsibility	0.608	2.735	0.021	YES
H (c5)	Awareness of Consequences	0.701	2.797	0.013	YES
H (c6)	Perceived Behavioural Control	0.627	2.289	0.007	YES
H (c7)	Subjective Norm	0.592	2.273	0.015	YES
H (c8)	Habit	0.493	2.557	0.018	YES

Dependent variable 'intention to change behaviour' relying on the 'context-aware' technique; $R = 0.689$; $R^2 = 0.474$; $F = 0.087$; $Sig. = 0.000$

The beta weight indicated that ‘awareness of consequences’, ‘value’ and ‘personal norm’ were the strongest predictors with a level of significance (0.701), (0.647), and (0.621) which shows that these independent variables play a significant positive role in predicting the dependent variable. The lowest predictor is ‘habit’ with a level of positive significance at 0.493. The beta values of all variables show their significant positive relationship with the dependent variable, ‘preparedness to engage’.

For the dependent variable, ‘intention to change behaviour’ the value of R^2 of the model in which all independent variables are included is 0.474. This value of R^2 provides a measure of how well ‘intention to change behaviour’ can be predicted from the set of independent variable scores. The positive value of R^2 confirms that all eight independent variables in the research model can best predict the person’s ‘intention to change behaviour’ towards a sustainable lifestyle by relying on the use of CAT within the ‘Blended Social Network’ which accounts for 47.4% of the variation in ‘intention to change behaviour’ as a dependent variable.

The beta weight indicated that ‘intention to change behaviour’, was the strongest predictor preparedness to engage with a level of significance at 0.672, which shows that this independent variable plays a significant role in predicting the dependent variable. The ‘cognitive’ aspect follows this in terms of its predictive role, with a level of significance at 0.571. Overall the collated results show that the beta values of all variables have a significant positive influence on the dependent variable, ‘preparedness to engage’. (Figure 8.8 and Table 8.13 illustrate this point).

The value of R^2 in the model in which all independent variables are included is 0.690. This value of R^2 provides a measure of how well a person’s ‘preparedness to engage’ can be predicted from the set of independent variable scores. The positive value of R^2 confirms that all three independent variables in the research model can best predict the person’s ‘preparedness to engage’ in sustainable communities and adopt a sustainable lifestyle by relying on the use of the CAT technique within the ‘Blended Social Network’ innovation. This value of R^2 indicates that the three independent variables account for almost 69% of variation in the person ‘preparedness to engage’. The value of F is significant (since it is smaller than 0.05), showing that the independent variables do a good job explaining the variation in the user perception using the CAT technique within the ‘Blended Social Network’.

8.3.3.2.2.2 The Location-based Technique

This technique is concerned with local conditions linking local with global, location-based and event-based variables, as well as hypotheses about enabling communication with business and stakeholders.

Table 8.15: Regression coefficients predicting a person's 'preparedness to engage' relying on ICT techniques: the 'location-based' technique within the integrated 'Blended Social Network' platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (2).a	Cognitive (COG)	0.645	2.732	0.016	YES
H B. (2).b	Affective (AFCT)	0.693	2.681	0.007	YES
H B. (2).c	Intention to change behaviour (BHV)	0.712	2.782	0.009	YES
Dependent variable 'preparedness to engage' relying on LBT within the 'Blended Social Network'; R = 0.853; R ² = 0.728; F = 0.030; Sig. = 0.000					

- *Impact of LBT on people's 'preparedness to engage' factors:*

Hypothesis B.(2): 'Location-based', 'location environmental events', 'environmental activities', 'link local to global' and 'enable communication with business and stakeholders' have a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

Figure 8.8 and Table 8.15 show that the independent variable 'cognitive' has a significant positive beta value of (0.645) leading to the prediction that the 'cognitive' variable will increase standard deviations concerning the dependent variable of a person's 'preparedness to engage' by 64.5%. Thus, 'cognitive' experience obtained from the integrated 'location-based' technique within the 'Blended Social Network' will positively influence the person's 'preparedness to engage' in the objectives of sustainable communities. Thus, the hypothesis is supported.

According to the multiple analysis regression statistical results, as shown in Figure 8.8 and Table 8.15, the 'affective' variable is the second predictor with a beta value of (0.693) and a person's perception of the 'affective' aspect obtained from the 'location-based' technique, significantly affects their 'preparedness to engage' in sustainable community objectives. This beta value shows that a one unit increase in user perceptions of the 'affective' proponent may result in a 0.693 unit increase in 'preparedness to engage'. The hypothesis is then accepted.

For this technique, the statistical result shows that influence of the ‘intention to change behaviour’ on the user’s ‘preparedness to engage’ has a high level of significance. The beta values indicated that this variable has the strongest predictive value with a beta value of 0.712 as presented in Figure 8.8 and Table 8.15. The direction of this effect is positive. The prediction is that the ‘intention to change behaviour’ variable will lead to a 71.2% increase on standard deviations concerning the dependent variable of a person’s ‘preparedness to engage’. Thus, the ‘intention to change behaviour’ derived from the integrated ‘location-based’ technique within the ‘Blended Social Network’ innovation will positively influence the person’s ‘preparedness to engage’ with a community of sustainability. Thus, this hypothesis is supported.

Table 8.16: Hypothesis testing and regression coefficients predicting a person’s ‘intention to change behaviour’ by relying on the ‘location-based’ technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.492	2.64	0.011	YES
H (c2)	Value	0.683	2.79	0.005	YES
H (c3)	Personal Norm	0.478	2.468	0.002	YES
H (c4)	Ascription of Responsibility	0.738	2.397	0.016	YES
H (c5)	Awareness of Consequences	0.674	1.91	0.013	YES
H (c6)	Perceived Behavioural Control	0.562	2.593	0.002	YES
H (c7)	Subjective Norm	0.721	2.467	0.015	YES
H (c8)	Habit	0.397	2.738	0.017	YES

Dependent variable ‘intention to change behaviour’ relying on the ‘location-based’ technique;
 $R = 0.672$; $R^2 = 0.452$; $F = 0.048$; $Sig. = 0.000$

Moreover, for the LBT module, all determinants that can affect a person’s ‘intention to change behaviour’ were examined using another multiple regression analysis. The results were collated between ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’ as independent variables and the ‘intention to change behaviour’ as the dependent variable are ($\beta = .492$, $t = 2.64$, $p < .01$), ($\beta = .683$, $t = 2.79$, $p < .005$), ($\beta = .478$, $t = 2.47$, $p < .002$), ($\beta = .738$, $t = 2.39$, $p < .016$), ($\beta = .674$, $t = 1.91$, $p < .013$), ($\beta = .562$, $t = 2.59$, $p < .002$), ($\beta = .721$, $t = 2.47$, $p < .015$), ($\beta = .397$, $t = 2.73$, $p < .017$), respectively on ‘intention to change behaviour’.

The validation research model showed that there was a significant positive path relationship between the independent variables and dependent variable ‘intention to change behaviour’ and the value of R^2 of the model in which all independent variables are included is 0.452; thus, the ‘intention to change behaviour’ can be predicted from the eight set of independent variables relying on use of LBT within the ‘Blended Social Network’ innovation and showing that a one unit increase in independent variables ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’ will account for a 0.452 unit increase in positive perception towards ‘intentions to change behaviour’. Figure 8.9 and Table 8.16, represent a measure of how well a person’s ‘intention to change behaviour’ can be predicted from the set of independent variables.

Table 8.15, represents a measure of the engagement model and how well a person ‘preparedness to engage’ can be predicted from the set of independent variables.

For the engagement model of the LBT technique, the value of R^2 in which all independent variables are included is 0.728, which indicates that the three independent variables account for almost 72.8% of variation in the person’s ‘preparedness to engage’ dependant variable. The significant positive value of R^2 confirms that all the three independent variables in the research model can best predict the person’s ‘preparedness to engage’ in a community of sustainability and a sustainable lifestyle by relying on use of the LBT within the ‘Blended Social Network.’ The value of F is significant (being smaller than 0.05), which shows that the independent variables confirm the significant good fit of the model.

Overall results collated support all LBT Hypothesis, thus the use of the LBT technique will affect people’s ‘preparedness to engage’ in sustainability. This supports the findings of prior studies that see location as having an effect on people’s engagement with pro-environmental behaviour and the conclusion presents evidence of the effect of location on people’s engagement and an exploration of the vital role of the locality dimension in incentivising the public to engage with sustainability (Bickerstaff et al., 2006, Larsen et al., 2011, Larson et al., 2011, Corner and Randall, 2011, Hassol and Udall, 2003, Rayner and Malone, 1997, Lorenzoni and Pidgeon, 2006).

8.3.3.2.2.3 The Social Media Learning Technique

This section is concerned with education and social learning including the ‘game-based’ technique Hypothesis.

Table 8.17 shows the regression coefficients predicting a person’s ‘preparedness to engage’ by relying on the ‘social learning’ technique (SLT) within the integrated ‘Blended Social Network’.

Table 8.17: Regression coefficients predicting a person’s ‘preparedness to engage’ by relying on the ICT techniques: the ‘social media learning’ technique (SLT) within the integrated ‘Blended Social Network’ platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (3).a	Cognitive (COG)	0.485	2.634	0.017	YES
H B. (3).b	Affective (AFCT)	0.394	1.826	0.008	YES
H B. (3).c	Intention to change behaviour (BHV)	0.428	1.978	0.001	YES
Dependent variable ‘preparedness to engage’ relying on SLT within the ‘Blended Social Network’; R = 0.716; R ² = 0.513; F = 0.018; Sig. = 0.000					

- *Impact of SLT on people’s ‘preparedness to engage’ factors:*

Hypothesis B. (3): ‘Social learning’ technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people’s intention to change anti-environmental behaviour.

According to the statistical results, a person’s perceived ‘cognitive’ effects obtained from the ‘social learning’ technique within the ‘Blended Social Network’ significantly affects people ‘preparedness to engage’ in the objectives of sustainable communities. The beta value 0.485 shows that a one unit increase in the user’s perceived ‘cognitive’ aspect may result in a 0.485 unit increase in their ‘preparedness to engage’. Thus hypothesis is accepted. It follows that a person’s positive perception of the ‘cognitive’ aspect obtained through the ‘social learning’ technique within the ‘Blended Social Network’ will affect people’s ‘preparedness to engage’ with a community of sustainability.

The statistical results show that the influence of the ‘affective’ aspect on people’s ‘preparedness to engage’ in sustainable communities has a significant beta value of 0.394, indicating its significant predictive value as a variable. A change of one standard deviation in the variable will result in a positive change of 0.394 on standard deviations in the dependent variable ‘preparedness to engage’. Thus, Hypothesis is supported and the influence of the ‘affective’ aspect derived from the ‘social learning’ technique within

the ‘Blended Social Network’ will have a positive effect on a person’s ‘preparedness to engage’ in sustainability objectives.

The statistical results show that the influence of the ‘intention to change behaviour’ on the user’s ‘preparedness to engage’ has a high beta value of 0.428, which indicates that a change of one standard deviation in the variable will result in a change of 0.428 on standard deviations in the dependent variable ‘preparedness to engage’. That indicates that the variable is a significant predictor of people’s perceptions about their ‘preparedness to engage’ with a sustainable community. Thus, hypothesis is supported.

The findings of the multiple regression analysis for the dependent variable ‘intention to change behaviour’ relying on independent variables: ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’ indicate that all these independent variables have a positive effect on the ‘intention to change behaviour’. The beta values for ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’ are ($\beta = .672$, $t = 1.94$, $p < .009$), ($\beta = .689$, $t = 1.79$, $p < .012$), ($\beta = .623$, $t = 2.92$, $p < .003$), ($\beta = .732$, $t = 1.81$, $p < .004$), ($\beta = .821$, $t = 1.93$, $p < .015$), ($\beta = .523$, $t = 2.15$, $p < .003$), ($\beta = .732$, $t = 1.89$, $p < .007$), ($\beta = .372$, $t = 1.92$, $p < .014$) respectively in relation to a person’s ‘intention to change behaviour’. Table 8.18 shows the results of the validation research model’s multiple regression analysis of these independent variables on the ‘intention to change behaviour’ as a dependent variable through the SLT within the ‘Blended Social Network’.

Table 8.18: Hypothesis testing and regression coefficients predicting a person ‘intention to change behaviour’ by relying on the ‘social media learning’ technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.672	1.936	0.009	YES
H (c2)	Value	0.689	1.797	0.012	YES
H (c3)	Personal Norm	0.623	2.918	0.003	YES
H (c4)	Ascription of Responsibility	0.732	1.804	0.004	YES
H (c5)	Awareness of Consequences	0.821	1.933	0.015	YES
H (c6)	Perceived Behavioural Control	0.523	2.152	0.003	YES
H (c7)	Subjective Norm	0.732	1.893	0.007	YES
H (c8)	Habit	0.372	1.920	0.014	YES

Dependent variable ‘intention to change behaviour’ relying on the ‘social learning’ technique;
 $R = 0.725$; $R^2 = 0.526$; $F = 0.073$; $Sig. = 0.000$

For the dependent variable, ‘intention to change behaviour’ the value of R^2 of model in which all independent variables are included is 0.526. This value of R^2 confirms that all eight independent variables in the research model can best predict the person’s ‘intention to change behaviour’ towards sustainable living by relying on use of the SLT within the ‘Blended Social Network’ and accounts for 52.6% of the variation in ‘intention to change behaviour’ as a dependent variable.

The beta values of all variables are positive, showing their significant influence on the dependent variable, individual’s ‘preparedness to engage’. Thus, when a person felt cognitively and emotionally involved and has the intention to change their own anti-environmental behaviour, they will be more likely to be ‘preparedness to engage’ with the objectives of communities of sustainability.

Table 8.17, in the validation model shows how well a person’s ‘preparedness to engage’ can be predicted from the set of independent variables, the values of models ability to calculate the outcome value of R^2 for the model, the value of R^2 in which all independent variables are included is 0.513. This value of R^2 provides evidence of the impact of the three independent variables, which accounts for almost 51.3% of the variations in a person’s ‘preparedness to engage’. The value of F is significant (being smaller than 0.05), which shows that the independent variables do a good job explaining the variation in individual’s preparedness to engagement toward a sustainable lifestyle using the SLT technique.

The results of this study support those of previous related studies (Ockwell et al., 2009, e.g., Keen et al., 2005, The Social Learning, 2001, Steyaert and Jiggins, 2007, Nye and Burgess, 2008, Hogg and Shah, 2010) and show that education and social learning are important in engaging the public with sustainability.

8.3.3.2.2.4 The Individual Social Marketing Technique

Table 8.19 shows regression coefficients predicting people’s ‘preparedness to engaging’ in sustainability by relying on the ‘individual’s social marketing’ technique (ISM).

Table 8.19: Regression coefficients predicting a person's 'preparedness to engage' by relying on ICT techniques: the 'individual's social marketing' technique (ISM) within the integrated 'Blended Social Network' platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (4).a	Cognitive (COG)	0.621	2.873	0.012	YES
H B. (4).b	Affective (AFCT)	0.743	2.672	0.007	YES
H B. (4).c	Intention to change behaviour (BHV)	0.687	2.386	0.004	YES
Dependent variable 'preparedness to engage' relying on ISM within the 'Blended Social Network'; R = 0.856; R ² = 0.732; F = 0.030; Sig. = 0.000					

- *Impact of ISM on people's 'preparedness to engage' factors:*

Hypothesis B. (4): The 'individual's social marketing' technique has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

According to the statistical results, a person's perceived 'cognitive' responses derived from the 'individual's social marketing' technique within the 'Blended Social Network', significantly affects people's 'preparedness to engage' in sustainable community objectives. The significance of the positive beta value, 0.621 shows that a one unit increase in user perceived 'cognitive' proponent may result in a 0.621 unit increase in their 'preparedness to engage'. Thus a person's positive perception of the 'cognitive' aspect obtained through the 'individual's social marketing' technique within the 'Blended Social Network' will affect their 'preparedness to engaging' in sustainability, and then Hypothesis is accepted.

The statistical results show that the influence of the 'affective' aspect on the user's 'preparedness to engage' with sustainable communities, has a beta value of 0.743, which indicates that a change of one standard deviation in the variable will result in a change of 0.743 on standard deviations in the dependent variable 'preparedness to engage'. Thus, hypothesis is supported and the 'affective' experience obtained from the 'individual social marketing' technique within the 'Blended Social Network' will positively influence the person's 'preparedness to engage' in the objectives of sustainable communities.

The statistical results show that the influence of the 'intention to change behaviour' has a significant beta value of 0.687, which indicates that a change of one standard deviation in the variable will result in a change of 0.687 on standard deviations in the dependent variable 'preparedness to engage'. Thus, Hypothesis is supported and the 'intention to change behaviour' derived from the 'individual social marketing' technique within the 'Blended Social Network' will positively influence the person's 'preparedness to engage' in a sustainable community.

The multiple regression analysis conducted between 'attitude', 'values', 'personal norm' (PN), 'ascription of responsibility' (AR), 'awareness of consequences' (AC), 'perceived behavioural control' (PBC), 'subjective norm' (SN) and 'habit' as independent variables and the 'intention to change behaviour' as dependent variable, show that 'awareness of consequences' (AC), 'ascription responsibility' (AR), and 'personal norm' (PN) were have highest significant positive path relationship the beta value of ($\beta = .835$, $t = 1.95$, $p < .018$), ($\beta = .821$, $t = 2.36$, $p < .013$), and ($\beta = .732$, $t = 1.88$, $p < .007$) respectively, followed by 'attitude', 'values', the 'subjective norm' (SN) and 'perceived behavioural control' (PBC), with the beta value of ($\beta = .716$, $t = 1.99$, $p < .007$), ($\beta = .706$, $t = 1.86$, $p < .003$), ($\beta = .684$, $t = 2.48$, $p < .014$), and ($\beta = .583$, $t = 2.67$, $p < .019$), where the 'habit' was has weak positive beta value of ($\beta = .497$, $t = 2.38$, $p < .001$).

Table 8.20: Hypothesis testing and regression coefficients predicting a person's 'intention to change behaviour' by relying on the 'individual's social marketing' technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.716	1.996	0.007	YES
H (c2)	Value	0.706	1.865	0.003	YES
H (c3)	Personal Norm	0.732	1.879	0.007	YES
H (c4)	Ascription of Responsibility	0.821	2.357	0.013	YES
H (c5)	Awareness of Consequences	0.835	1.955	0.018	YES
H (c6)	Perceived Behavioural Control	0.583	2.672	0.019	YES
H (c7)	Subjective Norm	0.684	2.480	0.014	YES
H (c8)	Habit	0.497	2.376	0.001	YES

Dependent variable 'intention to change behaviour' relying on the 'individual's social marketing';
 $R = 0.833$; $R^2 = 0.694$; $F = 0.074$; $Sig. = 0.000$

Table 8.20 shows the results of the multiple regression analysis of these independent variables on the ‘intention to change behaviour’ as a dependent variable through the ISM within the ‘Blended Social Network’. The value of R^2 in the model for the dependent variable, ‘intention to change behaviour’ in which all independent variables are included is 0.694. This value of R^2 confirms that all eight independent variables in the research model can best predict the individual’s ‘intention to change behaviour’ towards a sustainable lifestyle by relying on the use of ISM within the ‘Blended Social Network’. Those variables account for 69.4% of the variation in the ‘intention to change behaviour’ dependent variable.

Overall, the beta value of all engagement model independent variables are positive, showing their significant influence on the dependent variable of an individual’s ‘preparedness to engage’ in sustainability.

Table 8.19, represents the values of R^2 for the model. The value of R^2 of model in which all independent variables are included is 0.732. This value indicates that all three independent variables in the research model can best predict the person’s ‘preparedness to engage’ in sustainable communities and a sustainable lifestyle by relying on use of the ISM technique within the ‘Blended Social Network’, accounting for almost 73.2% of the variations in people’s ‘preparedness to engage’. The value of F is significant, which shows that the independent variables do a good job explaining the variation in the user perception of the ISM.

The study presents evidence of the effect of ‘individual’s social marketing’ technique on their ‘preparedness to engage’ in sustainability. This ‘individual’s social marketing’ can be considered as an extension to the principle of social marketing, so the findings of the study support several studies which emphasize that social marketing strategies are useful in promoting pro-environmental behaviour (e.g., McKenzie, 2000, McKenzie-Mohr and Smith, 1999, Peattie and Peattie, 2009, Corner and Randall, 2011, McKenna et al., 2000, Pechmann and Reibling, 2000, Gordon et al., 2006, Hastings, 2007, National Social Marketing Centre, 2006). The individual social network is a new approach, which is proposed as a concept in this study in order to improve the quality of social marketing. This study disclosed evidence of the effect this strategy has on engaging people towards sustainability and might incentivise the creation of studies that explore the impact of this type of strategy in other contexts.

8.3.3.2.2.5 The Individual's Profiling and Sustainable Labelling Technique

Table 8.21 shows the 'individual's profile and sustainable labelling' (PSL) Hypothesis.

Table 8.21: Regression coefficients predicting a person's 'preparedness to engage' by relying on an 'individual profile, and sustainable labelling' within the 'Blended Social Network' platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (5).a	Cognitive (COG)	0.392	2.397	0.052	YES
H B. (5).b	Affective (AFCT)	0.379	2.678	0.013	YES
H B. (5).c	Intention to change behaviour (BHV)	0.376	2.397	0.001	YES
Dependent variable 'preparedness to engage' relying on PSL within the 'Blended Social Network'; R = 0.587; R ² = 0.345; F = 0.011; Sig. = 0.000					

- *Impact of PSL on people's 'preparedness to engage' factors:*

Hypothesis B.(5): The 'individual profile' and 'sustainable labelling' technique lead to increased social capital and social support, which in turn has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

According to the statistical results, a person's perceived 'cognitive' responses derived from the 'individual profile and sustainable labelling' technique within the 'Blended Social Network', significantly affects their 'preparedness to engage' in the objectives of sustainable communities. The beta value 0.392 shows that a one unit increase in a user's perceived 'cognitive' proponent may result in a 0.392 unit increase in 'preparedness to engage'. Thus, hypothesis is accepted. It confirms that an individual's positive perception of the 'cognitive' aspect deriving from the 'individual profile and the sustainable labelling' technique within the 'Blended Social Network', will affect their 'preparedness to engage' with sustainable communities.

The statistical results show that the influence of the 'affective' responses on the user's 'preparedness to engage' with sustainable communities has a significant beta value of 0.379, which indicates its significance as a predictor and a change of one standard deviation in the variable will result in a change of 0.379 on standard deviations in the dependent variable 'preparedness to engage'. The 'affective' response derived from the integrated 'individual profile and the sustainable labelling' technique within the 'Blended

Social Network’ will positively influence the person’s ‘preparedness to engage’ in the objectives of sustainable communities. Thus Hypothesis is supported.

The statistical results show that the influence of the ‘intention to change behaviour’ on the user’s ‘preparedness to engage’ has a high beta value of 0.376. This beta value indicates that a change of one standard deviation in the variable will result in a change of 0.376 on standard deviations in the dependent variable ‘preparedness to engage’. The beta value of the variable is positive showing their significant influence on the dependent variable of an individual’s ‘preparedness to engage’. It is thus a significant predictor of people’s perceptions about their ‘preparedness to engage’ with sustainable communities. Thus, hypothesis is supported.

The multiple regression analysis between ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN), and ‘habit’ as independent variables and the ‘intention to change behaviour’ as dependent variable presented in Table 6.22, which shows that significant bath of beta values, ($\beta = .294, t = 2.74, p < .004$), ($\beta = .382, t = 2.97, p < .008$), ($\beta = .523, t = 2.38, p < .003$), ($\beta = .486, t = 2.74, p < .012$), ($\beta = .438, t = 2.79, p < .015$), ($\beta = .293, t = 2.29, p < .004$), ($\beta = .389, t = 2.67, p < .012$) and ($\beta = .214, t = 2.35, p < .016$), respectively.

Table 8.22: Hypothesis testing and regression coefficients predicting a person’s ‘intention to change behaviour’ by relying on the ‘individual’s profiling and sustainable labelling’ technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.294	2.736	0.004	YES
H (c2)	Value	0.382	2.967	0.008	YES
H (c3)	Personal Norm	0.523	2.379	0.003	YES
H (c4)	Ascription of Responsibility	0.486	2.741	0.012	YES
H (c5)	Awareness of Consequences	0.438	2.791	0.015	YES
H (c6)	Perceived Behavioural Control	0.293	2.289	0.004	YES
H (c7)	Subjective Norm	0.389	2.672	0.012	YES
H (c8)	Habit	0.214	2.349	0.016	YES

Dependent variable ‘intention to change behaviour’ relying on the ‘individual’s profiling and sustainable labelling’ technique; $R = 0.523$; $R^2 = 0.274$; $F = 0.073$; $Sig. = 0.000$

The value of R^2 of the ‘intention to change behaviour’ in which all eight independent variables are included is 0.274. This value confirms that those independent variables can best predict the dependent variable relying on use of the PSL within the ‘Blended Social Network and account for 27.4% of the variation in user ‘intention to change behaviour’.

Table 8.21, represents the value of R^2 for this model in which all independent variables are included. The value of R^2 at 0.345 confirms that all three independent variables in the research model can best predict the person’s ‘preparedness to engage’ in a sustainable community and sustainable lifestyle by relying on use of the PSL within the ‘Blended Social Network’ and accounts for 34.5% of the variation in the ‘preparedness to engage’ dependent variable. The value of F is significant, which shows that the independent variables do a good job explaining the variation.

8.3.3.2.2.6 Hook and Attraction Module:

This introduces the findings validation for effect of the two attraction techniques a) The Participation in Current Trends Events Technique and b) The Permanent Incentive Technique. It gives a detailed of multiple data regression analysis and hypothesis testing for these techniques.

8.3.3.2.2.6.1 The Participation in Current Trends Events Technique

Table 8.23, shows the hook and attraction module (HOK) Hypothesis: in particular, the participating in current trends events (PCT) Hypothesis.

Table 8.23: Regression coefficients predicting a person’s ‘preparedness to engage’ by relying on the ‘Hook and Attraction Module (HOK) : a) ‘participating in current trend’s events’ within the ‘Blended Social Network’ platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (6).a	Cognitive (COG)	0.483	2.316	0.021	YES
H B. (6).b	Affective (AFCT)	0.479	2.192	0.001	YES
H B. (6).c	Intention to change behaviour (BHV)	0.492	2.341	0.013	YES
Dependent variable ‘preparedness to engage’ relying on PCT within the ‘Blended Social Network’; R = 0.832; $R^2 = 0.692$; F = 0.004; Sig. = 0.000					

- *Impact of PCT on people's 'preparedness to engage' factors:*

Hypothesis B. (6): Adding 'participating in current trends events/Event activities and trend' within the 'attraction module' has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

According to the statistical results, a person's perceived 'cognitive' influence derived from the 'participating in current trends events and activities' through the 'attraction module' within the 'Blended Social Network' significantly affects people 'preparedness to engage' in the objectives of sustainable communities. The beta value of 0.483 shows that a one unit increase in user perceived 'cognitive' proponent may result in a 0.483 unit increase in 'their preparedness to engage'. Thus hypothesis is accepted.

The statistical results show that the influence of the 'affective' proponent on the user's 'preparedness to engage' with sustainable communities has a significant and positive beta value of 0.479. This indicates that it is a significant predictor of people perceptions and will result in a change of 47.9% on standard deviations in the dependent variable 'preparedness to engage'. Thus, hypothesis is supported.

The statistical results show that the influence of the 'intention to change behaviour' on the user's 'preparedness to engage' has a high beta value of 0.492. This indicates that it is a significant predictor of people's perceptions regards their 'preparedness to engage' with a sustainable community. A change of one standard deviation in the variable will result in a change of 49.2% on standard deviations in the dependent variable 'preparedness to engage'. Thus, hypothesis is supported.

The 'intention to change behaviour' construct was subject to deeper investigation in this study. A multiple regression analysis between 'attitude', 'values', 'personal norm' (PN), 'ascription of responsibility' (AR), 'awareness of consequences' (AC), 'perceived behavioural control' (PBC), 'subjective norm' (SN) and 'habit' as independent variables and the 'intention to change behaviour' as a dependent variable was undertaken. Table 6.24 shows the results of the multiple regression analysis of these independent variables on the 'intention to change behaviour' dependent variable through the (PCT) within the 'Blended Social Network'. The beta value for 'attitude', 'values', 'personal norm' (PN),

‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN), and ‘habit’ are ($\beta = .739$, $t = 2.82$, $p < .012$), ($\beta = .818$, $t = 2.69$, $p < .006$), ($\beta = .821$, $t = 2.39$, $p < .009$), ($\beta = .837$, $t = 2.89$, $p < .019$), ($\beta = .836$, $t = 2.81$, $p < .017$), ($\beta = .691$, $t = 2.39$, $p < .008$), ($\beta = .724$, $t = 2.37$, $p < .018$), and ($\beta = .492$, $t = 2.43$, $p < .013$) respectively on ‘intention to change behaviour’; the validation research model showed that all eight dependent variable were significant and have positive path relationship with dependent variable ‘intention to change behaviour’. This value of R^2 provides a measure of how well the ‘intention to change behaviour’ can be predicted from the set of independent variable scores. The positive value of R^2 confirms that all eight independent variables in the research model can best predict the person’s ‘intention to change behaviour’ towards a sustainable lifestyle by relying on use of the PCT within the ‘Blended Social Network’.

Table 8.24: Hypothesis testing and regression coefficients predicting a person’s ‘intention to change behaviour’ by relying on the ‘participating in current trends events’ technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.739	2.82	0.012	YES
H (c2)	Value	0.818	2.692	0.006	YES
H (c3)	Personal Norm	0.821	2.394	0.009	YES
H (c4)	Ascription of Responsibility	0.837	2.897	0.019	YES
H (c5)	Awareness of Consequences	0.836	2.813	0.017	YES
H (c6)	Perceived Behavioural Control	0.691	2.396	0.008	YES
H (c7)	Subjective Norm	0.724	2.373	0.018	YES
H (c8)	Habit	0.492	2.429	0.013	YES

Dependent variable ‘intention to change behaviour’ relying on the ‘participating in current trends events’ technique; $R = 0.724$; $R^2 = 0.524$; $F = 0.043$; $Sig. = 0.000$

The value of R^2 in the model in which all independent variables are included is 0.524, which indicates that the eight independent variables account for 52.4% of the variation in the ‘intention to change behaviour’ as a dependent variable.

Overall, testing the engagement model with PCT gave positive beta values for all variables showing their significant influence on the dependent variable, individual ‘preparedness to engage’.

Table 8.23, represents the values of R^2 . For this model, the value of R^2 in which all independent variables are included is 0.692. This value of R^2 provides a measure of how well a person's 'preparedness to engage' can be predicted from the set of independent variable scores. The positive value of R^2 confirms that all three independent variables in the research model can best predict the person's 'preparedness to engage' in sustainable communities and a sustainable lifestyle by relying on use of the PCT within the 'Blended Social Network'. The R^2 value indicates that the three independent variables account for almost 69.2% of variations in the person's 'preparedness to engage'. The value of F is significant (< 0.01), which shows that the independent variables provide a good fit for the model.

The results conducted in this study indicate the significant effect of participation in current trends and physical activities on people's engagement toward sustainability, which supports the relevant literature and studies mentioning the positive relationship between participation in current activities and trends with an intention to engage in sustainability and leading to an increase in a person's supported pro-environmental behaviours, e.g. (Larson et al., 2011, Corner and Randall, 2011).

8.3.3.2.2.6.2 The Permanent Incentive Technique

Table 8.25 shows testing result of create 'permanent incentives' (PIT) Hypotheses.

Table 8.25: Regression coefficients predicting a person's 'preparedness to engage' by relying on using Hook and Attraction Module (HOK), in particular, the create 'permanent incentives' technique (PIT) within the 'Blended Social Network' platform.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic	P-value Sig.	Supported
H B. (7).a	Cognitive (COG)	0.691	2.37	0.001	YES
H B. (7).b	Affective (AFCT)	0.724	2.382	0.004	YES
H B. (7).c	Intention to change behaviour (BHV)	0.672	2.397	0.021	YES
Dependent variable 'preparedness to engage' relying on PIT within the 'Blended Social Network'; R = 0.873; $R^2 = 0.762$; F = 0.021; Sig. = 0.000					

- *Impact of PIT on people's 'preparedness to engage' factors:*

Hypothesis B. (7): The 'permanent incentives' created through the 'attraction module' within the 'Blended Social Network' has a positive relation to preparedness to engage through its cognitive and emotional effects and influence on people's intention to change anti-environmental behaviour.

For the PIT technique, according to the multiple regression analysis results showed that a person perceived 'cognitive' that obtained from the 'permanent incentives' that were created through the 'attraction module' within the 'Blended Social Network', significantly affect people's 'preparedness to engage' in the objectives of sustainable communities while stimulating people to learn and participate. The independent variable, 'cognitive' has a beta value of 0.691 indicating the contribution of the independent variable to the model. A change of one standard deviation in the variable will result in a change of 0.691 on standard deviations in the dependent variable 'preparedness to engage'. Hypothesis is therefore accepted.

The statistical results show that the influence of the 'affective' proponent on the user's 'preparedness to engage' with a sustainable community has a significant beta value of 0.724, indicating the significant contribution of this independent variable to the model. A change of one standard deviation in the variable will result in a change of 0.724 on standard deviations, in the dependent variable 'preparedness to engage'. The 'affective' aspect thus acts as a predictor, positively influencing people's 'preparedness to engage' with sustainability. Thus, Hypothesis is supported.

The statistical results show that influence of the 'intention to change behaviour' on the user 'preparedness to engage' has a high beta value of 0.672 indicating the contribution of this independent variable to the model. A change of one standard deviation in the variable will result in a change of 67.2% on standard deviations in the dependent variable 'preparedness to engage'. This indicates that the factor is a significant predictor of people perceptions about their 'preparedness to engage' with a sustainable community. Thus, Hypothesis is supported.

With regards the examination of the 'intention to change behaviour', the study conducted a multiple regression analysis between the independent variables, 'attitude', 'values', 'personal norm' (PN), 'ascription of responsibility' (AR), 'awareness of consequences' (AC), 'perceived behavioural control' (PBC), 'subjective norm' (SN) and 'habit' with the dependent variable 'intention to change behaviour'.

Eight of the hypothesized 'intention to change behaviour' dependent variables showed that all paths are significant supported at the 0.01 or 0.05 level. The hypothesised relationship results and their values being tested are illustrated in Figure 8.8 and Table 8.26. The results of the multiple regression analysis of these independent variables on the

‘intention to change behaviour’ dependent variable through the PIT within the ‘Blended Social Network’. The beta value of ($\beta = .795$, $t = 2.89$, $p < .014$), ($\beta = .824$, $t = 2.76$, $p < .012$), ($\beta = .683$, $t = 2.53$, $p < .002$), ($\beta = .649$, $t = 2.79$, $p < .014$), ($\beta = .634$, $t = 2.38$, $p < .012$), ($\beta = .397$, $t = 2.91$, $p < .003$), ($\beta = .521$, $t = 2.68$, $p < .091$), and ($\beta = .421$, $t = 2.35$, $p < .014$) for ‘attitude’, ‘values’, ‘personal norm’ (PN), ‘ascription of responsibility’ (AR), ‘awareness of consequences’ (AC), ‘perceived behavioural control’ (PBC), ‘subjective norm’ (SN) and ‘habit’, respectively with regards the ‘intention to change behaviour’. The significant positive path relationship between the independent variables and dependent variable ‘intention to change behaviour’ is confirmed as influential. These determinants correlate with a person’s ‘intention to change behaviour’ towards a sustainable lifestyle.

Table 8.26: Hypothesis testing and regression coefficients predicting a person’s ‘intention to change behaviour’ by relying on the ‘permanent incentives’ technique.

Hypothesis	Independent Variable	Standardized β coefficient	t-statistic value	P-value Sig.	Supported
H (c1)	Attitude	0.795	2.897	0.014	YES
H (c2)	Value	0.824	2.761	0.012	YES
H (c3)	Personal Norm	0.683	2.534	0.002	YES
H (c4)	Ascription of Responsibility	0.649	2.791	0.014	YES
H (c5)	Awareness of Consequences	0.634	2.379	0.012	YES
H (c6)	Perceived Behavioural Control	0.397	2.912	0.003	YES
H (c7)	Subjective Norm	0.521	2.679	0.091	YES
H (c8)	Habit	0.421	2.346	0.014	YES

Dependent variable ‘intention to change behaviour’ relying on the ‘permanent incentives technique’; $R = 0.861$; $R^2 = 0.741$; $F = 0.039$; $Sig. = 0.000$

For the dependent variable, ‘intention to change behaviour’ the model’s value of R^2 in which all independent variables are included is 0.741. This value of R^2 confirms that all eight independent variables in the research model can best predict the person’s ‘intention to change behaviour’ towards sustainable living by relying on use of the PIT within the ‘Blended Social Network’ and indicates that the eight independent variables account for 74.1% of the variation in ‘intention to change behaviour’ as a dependent variable.

For the 'permanent incentives technique', the regression analysis results revealed that all of the 'cognitive', 'affective' and 'intention to change behaviour' variables are significant factors that will positively affect people's 'preparedness to engage' with sustainability.

Table 6.25 also represents the values R^2 for this model. The value of R^2 in which all independent variables are included is 0.762. This value of R^2 provides positive confirmation that all three independent variables in the research model can best predict the person's 'preparedness to engage' in sustainable communities and a sustainable lifestyle by relying on use of the PIT within the 'Blended Social Network. This value indicates that the three independent variables account for almost 76.2% of variations in the person's 'preparedness to engage'. The value of F is significant (< 0.01), which shows that the independent variables do a good job explaining the variation in the user perception.

The study presents evidence that the incentives are an important strategy, which can help engage the public toward sustainability especially when it is continuous, systematic and permanent approach. This is in alignment with prior studies that underline the impact of incentives in engaging the public toward sustainability (Burgess et al., 1998, Stern, 2000, DEFRA, 2002, Loewenstein et al., 2001). Reliance on this module with other ICT techniques employed in this study can help to address other opinions found in the literature that see the provision of incentives to promote sustainability as not appropriate to all types of environmental actions, namely, the use of cars for driving or those claiming that financial incentives are often used particularly to underpin energy conservation (Brandon and Lewis, 1999, Whitmarsh, 2009b).

8.3.3.3 Results of Focus Group Discussion

In this study, the focus groups were conducted to explore participants' perception about the engagement platform and the ways in which such a platform will impact their engagement determinants, cultural beliefs and values as to be affected by the BSN core services and associated ICT techniques incorporated within the platform. This focus group discussion was employed as part of a qualitative analysis to validate the engagement model and the associated prototype platform to explore the implication of this platform and accompanying ICT techniques on public engagement in sustainability, which is presented as recommendations.

In this study, the focus groups are also used to discuss the proposed platform in real situations and to provide accurate information on their opinions about the elements that might influence the effectiveness of using the BSN platform in a Saudi context to engage the public in sustainability. In this study, the focus group method is employed to obtain qualitative information about participants' perception when trying to use the BSN platform. The emphasis on exploring the platform validity in Saudi Arabia context was important in determining needs in real-world situations while paying considerable attention to the existent cultural dimension. It also investigates the participants' feedback about the expected influence of the BSN platform that will be achieved if a new innovative online engagement platform were formulated. The focus group members discussed their expectations of such new platform capabilities to facilitate their preparedness to engage in sustainability and to enable collaboration, continuing engagement of the public, and creating a friendly environment with social capabilities.

As stated earlier, in this study, the validation stage was conducted after the development of a prototyping platform by conducting a poll survey followed by a focus group discussion. The focus group session was used as a qualitative analysis of the validation of the suitability of the BSN platforms with its ICT composite components on public engagement in a sustainable lifestyle. To assert the validity of the proposed platform from users' perspectives, the participants were involved in a group discussion to collect data about their acceptance and the feasibility of the platform services and techniques on their engagement and behaviour towards sustainability. The findings of the focus group discussions can be summarized as follows:

- Participants' perspectives of the platform

Q1 and Q2: What is your perception about the role of technology in environmental issues and the engagement of public toward sustainability in general? What was your first impression about the proposed engagement platform and what is your perception of its expected role to engage the public in sustainability? (Perception towards the platform affects engaging the public in sustainability)

The analysis results show a positive perception of the role of technology in general and the proposed platform on engaging the public in sustainability. The focus group member's discussion reveals that all of them agreed on technology's influence on achieving the engagement in sustainability objectives. The overall perception of the technology and proposed platform that such a social network serves can affect public engagement of a sustainable lifestyle at different levels. It has been confirmed that the prototyped online

engagement platform will be an effective platform that can be used as a technology means that will encourage different levels of the public towards sustainable lifestyles. Also the proposed platform can be seen as an online social network platform that can have effects on three main engagement determinants – cognitive, affective, and behaviour. Using such a platform, the user can also obtain knowledge that can contribute to increasing their awareness of sustainability.

They mentioned that using the BSN platform will be the proper platform upon which to socialize, share information, obtain knowledge, express opinions, and use such a social network platform for the sake of promoting pro-environmental sustainability. They report high interest in using the BSN platform to gain access to the functionality of those purposes, considering the modern style provided by the platform and its usefulness in fulfilling their desire for social networking online as well as being in line with achieving sustainability goals. The overall perception includes the advantage of having the new sustainability-oriented social networks platform, knowledge-based services online, information sharing and collaboration means between members using technology that can match new generation mindsets and save time and effort for its users.

- Exploring the platform services' effects on engaging the public in sustainability

Q3: What you think about the proposed platform services (i.e. the effect of BSN services and ICT techniques) on engaging public in sustainability? (Affects of platform components on public engagement)

In general, participants had high positive perception when discussing the feasibility of the BSN platform services. They used different expressions to describe their positive feelings about the BSN platform core services social and engagement benefits as well as other associated ICT techniques, which are Context-Aware, Location-based, Social Media Learning, Individual Social Marketing, Individual Profile and Sustainable Labelling and Individual Attraction and Motivation Techniques.

The overwhelming findings from the focus group discussion show positive participants' attribute towards the advantages of the BSN core services and ICT techniques.

“The BSN [makes it] so easy to link with friends and physical activities [and] helps you connect with local environment and neighbours with active issues, it encourages everybody to enjoy outside to participate great work to conserve environment. It makes me also feel like socialising with others and a sense of belonging too.”

“I value all the ICT techniques integrated within the BSN platform and its services provided for us. Such a platform with this techniques provides superior features, where you can interact with local and global people and then increase your awareness, and learn about the environment by yourself. It’s seems well designed. I value such components and feel comfortable with it.”

Other positives advantages include:

- User-friendly socialising services – *“It would be of interest to use such new innovative technology to socialize with others.”*
- Strong base for learning and increased knowledge – *“I feel motivated to use the platform to gain more knowledge and information about environmental aspects.”*
- A good communication medium environment with experts – *“The link with experts is very interesting, and such services are likely to encourage you to follow their advice about the environmental issues because they are considered more knowledgeable about it,”* and *“using such platform services can help in changing behaviour to a better sustainable lifestyle.”*
- Platform for supporting real-time advice from counsellors – *“This enables advisors and counsellors to know your certain needs to provide you with certain services.”*
- Involvement and e-participation in events and activities

It is obvious from the discussion findings that the focus group members were committed to engagement in the BSN platform and the associated ICT techniques as a potential user of that platform in the future. They stated that they desire a more service-oriented technology to support environmental-friendly behaviour, and they need to overcome the existing social technical barriers to achieve their goals and meet their needs. During the focus group discussion, members suggested a number of ideas that they believe will improve the features of the proposed platform to make it easier to obtain environmental information and make the platform more pleasant through which to participate and engage in environmental initiatives. The suggested improvements can be summarized into three categories: the development of an easy-to-use user-friendly interface with personalized high-quality information content, a moderated platform with the capacity for preventing individual services abuse and the inclusion of the security and privacy services within the feature of the platform.

All of the participants suggested that the BSN platform has two chances for improvements, including the development of an appropriate business model with

consideration for commercial cost-benefit and the availability to ordinary users at free cost. Other improvements suggested by two participants include the development of a robust security and privacy solution.

Q4: In what way do you expect such proposed platform services (the core BSN services and ICT techniques) to encourage public intention to change behaviour and preparedness to engage in sustainability (platform effects on preparedness to engage in sustainability).

The analysis results of the focus group discussions revealed that the main observation was the consensus between the focus groups members on the potential of the BSN platform to benefit changing public behaviour and engage them in sustainability while influencing engagement factors by disseminating knowledge, increasing awareness, supporting and facilitating conditions as well as learning and teaching how to deal with the environment and use natural resources. Emphasis was placed on the importance of the proposed platform in affecting the individual engagement factors. During the focus group discussion, the members highlighted the following potential effects of the platform on public behaviour throughout the following:

- The platform can enable individuals to develop new relationships with the environmentally related interest groups through social networks.
- The BSN platform can help increase individuals' awareness through exchange of information, knowledge, skills and learning content.
- Environmental organisation and governments can develop better behaviour change intervention using the mean of the social hubs of the BSN platforms.
- The BSN platform would make collaboration between various people easier, without making distinctions between genders or social norms.

There was consensus among the focus group members on the platform benefits. The key clear element agreed among all opinions was the potential advantage of the BSN platform in support of collaboration, developing relationships between sustainability parties (including sustainability-responsible organizations, policy making and governments) to keep the public constantly engaged.

Three of the focus group participants revealed the importance of giving care to the privacy and security of public information with regard to individuals' profile and their sustainable labelling. They were more concerned about protecting users' data and personalization content information.

In terms of facilitating access to eco-products/services and friendly alternative solutions, there was a clear agreement between the members on the potential advantage of the BSN platform in minimizing the required effort to search and get these alternative solutions because of the availability of the several supportive techniques integrated within the platform that facilitate the promotion of those products and services with personalized features applied in this platform.

The analysis of the focus group discussions confirms the power of the BSN platform in promoting public behaviour and engagement in a sustainable lifestyle. All of the participants stated that most people can use the BSN platform and it does not required much help or facilitating conditions to use that platform. They value the benefit that can be acquired from using the BSN platform while they can learn, share knowledge, and gain advantages of collaboration with other sustainability parties.

These focus group analysis results were integrated with the previous question findings as well to confirm participants' positive perception toward the effects of the BSN platform on changing individual behaviour and engaging the public in sustainability; it also confirms the user acceptance of the proposed prototype platform as a mean for successful translation toward a better sustainable lifestyle.

- User motivation to use the platform

Q5: In what way does the proposed platform motivate you to pursue pro-environmental behaviour?

Four of the seven participants present their insisting desire to use the BSN platform when it actually began running after development. The remaining three participants think they need three months at least to practice, then after trying this experience, they can later decide whether to use it or not. The participants stated several reasons that motivate them to use such a social network platform:

- To gain actual knowledge they need to deal with environmental issues.
- To gain support in continuing to use it from other members' and parties' contribution
- To gain skills practically with specific local issues
- To learn new ideas, techniques and advice related to promote change behaviour
- To have a wide range of social networking and have opportunities for socialising
- To get help, support and encouragement from peers, members and friends

- To get help, support and encouragement from the community of sustainability, governments, NGO, scientists, activists and all other parties including scholars or experts.

Five out of seven of the focus group members report that their attitudes have been affected by the services demonstrated in this session and feel motivated to use such a platform in the future, because of the BSN core services and its ICT techniques associated with the prototype platform. One focus group member said that:

“I do not know exactly my willingness to use this platform in the future! But now I am interested [in going] further to support any environmental efforts.”

- Expected platform affects on people’s lifestyle

Q6 and Q7: In what way do you expect the use of such a platform to affect or change your existing lifestyle? Is there something else you want to mention about the proposed platform and the associated BSN and ICT techniques?

The last part of the focus group discussion involved asking the members what the expected effects of the proposed BSN platform were on their cognitive and effective processes and behaviour regarding engaging in a more sustainable lifestyle.

The focus group members mentioned that the services and resource needs are available within the platform and confirm that such services will facilitate a change in their lifestyle towards better sustainable behaviour. The focus groups confirmed acceptance of the platform and seemed satisfied with its functionalities. All of the participants expressed their desire to use this platform to cope with environmental issues and learn using a social environment in an e-society context.

One of the focus group members noted that:

“The adoption of the BSN platform will help me to change my lifestyle, the individuals lack knowledge and awareness; this helps them to understand environment needs and what they need from the environment too. I like the contribution here. It’s informative and helpful and helps me to interact with other people in a supportive environment. I wish we could meet activists to deploy and sell this technique now instead of waiting for the environment [to deteriorate]. This helps us get friendly environmental solutions, eco-products and eco-services in easy and appropriate ways. I am motivated now to take a step further to change my anti-environmental behaviour based on what I see in this platform.”

Also, other member noted that:

“I appreciate the services of the BSN platform shown in this session. Also I feel without such an innovative user-friendly socialization platform, we will not have an effective means for changing our sustainable lifestyle. We believe that the availability of such a BSN platform is very important in assist me to change my life.”

8.4 Summary of Chapter Eight

This chapter has included information and results of the validation of the conceptual model. It presented methods of data collection, data analysis and the poll sample profile, tests of reliability and validity as well as results of exploratory factor analysis including the multicollinearity analysis. This chapter also provides the results of the correlation matrices of the 'Blended Social Network' and ICT techniques, in addition to exploring the results of the multiple regression analysis and those collated in the testing of the research hypothesis. It discussed the hypothesis testing of the 'Blended Social Network' and the ICT techniques including the 'context-aware', the 'place-based', 'education and social learning', the 'individual social marketing technique', the 'individual profile and sustainable labelling technique', as well as offering results and discussion of the hook and attraction module (HOK) hypothesis testing conducted in two parts: the 'participation in current trends events technique' and the 'permanent incentive technique'. Finally, this chapter provides the findings of focus group discussion.

The overall summary of the multiple regression analyses conducted indicate that all three independent constructs, 'cognitive', 'affective' and 'intention to change behaviour', on dependent construct 'preparedness to engage' were statistically significant. With a 5% significance level (2-tailed), the results indicate that the three engagement constructs considered in the model account for 71% of the dependent variable of user's 'preparedness to engage' relying on use of the BSN itself, 69% for the dependent variable of user's 'preparedness to engage' rely on CAT techniques, 72.8% rely on PBT techniques, 51.3% rely on SLT techniques, 73.2% rely on ISM techniques, 34.5% rely on PSL techniques, 69.2% rely on PCT techniques, 76.2% rely on the PIT technique within the integrated 'Blended Social Network' (see Figure 8.6, 8 and Table 8.9-24).

The figures indicate that the model explains the range (34.5% to 76.2%) of variance in a person's perceptions of their 'preparedness to engage' in sustainable communities and a sustainable lifestyle through the use of the integrated 'Blended Social Network' and ICT techniques. Variance in a person's perceptions towards the effect of innovation on 'preparedness to engage' was entirely explained by 'cognitive' (ranging between 39.2% and 69.1%), 'affective' factors (ranging between 37.9% and 72.0%) and the 'intention to change behaviour' (ranging between 37.6% and 73.9%).

Thus, all hypotheses have significant positive levels of support in terms of individual's 'preparedness to engage' toward sustainability. This suggests a positive appraisal of the research model and the significant role of the 'Blended Social Network' in encouraging people to engage with sustainability. In addition, it provides evidence of the significant role of the ICT technique in engagement. All hypotheses have significant positive levels on individual 'preparedness to engage' toward sustainability. This suggests that the conceptual engagement model provided positive results and shows the significant role of the 'Blended Social Network' in encouraging people to engagement toward sustainability. In addition, it provides evidence of the significant role of the proposed ICT techniques in engaging people toward sustainability.

The next chapter will provide a conclusion and the findings of the study, including recommendations for future studies.

CHAPTER 9: Conclusion

The Thesis and Research Model Overview, Addressing the Research Objectives, Summary of Finding and Conclusion, Contribution to the body of the Knowledge, Recommendation, Direction for Future Research, and Final Comment.

9.1 The Thesis and Research Model Overview

The research aim is to develop a Conceptual Model to address environmental issues. The study began with a Literature Review to identify the preliminary components of the Model. Then conducted a field survey, the findings of which used to adjust the content of the model and ascertain that it accurately reflects the Saudi context. In order to validate the Conceptual Model, the study incorporated its components into the Blended Social Network platform, the design of which was moreover, informed by a further review of research on social networks. Finally, the study sought to assess the Network's potential to encourage people to engage in sustainability. For this purpose the study relied on a theoretical framework and conducted a poll survey and focus groups and the findings were statically analysed. The results confirmed the potential of the BSN to encourage people engage in sustainability and by extension confirmed the validity of the Conceptual Model.

The Conceptual Model

The research aims, objectives and model of the study aim to address the dilemma of climate change by activating the role of environmental communication management by means of innovative persuasive solutions. The intent of the model is not to suggest that human activity should quickly diminish in order to protect the natural environment but to advocate the systemic monitoring of human activity and to seek people's assistance, advice and guidance in developing best practice procedures in an acceptable manner so as to minimise environmental degradation. The conceptual basis for this study is the building of a holistic effective engagement communication model that can link and enable organisations, governments, businesses, societies and individuals to share knowledge and exchange skills and to participate through efficient communication channels that are well

managed and monitored. Moreover, through the creation of a systematic approach with a framework for remote automated environmental monitoring (individual sustainability labelling) and control, legislators and decision-makers are enabled to implement the environmental policies and solutions in an acceptable manner for users.

Four main parties are involved in the formation of the model: communities of sustainability, individuals, social relations and information communication technologies. In terms of activating the role of social relations to make a positive change towards environmental issues, the model utilises the online social network by facilitating a bundle of selective ICT techniques. The online social network and the bundled ICT techniques are used to generate structural change in an individual's determinants (Attitude, Values, Personal Norm (PN), Ascription of Responsibility (AR), Awareness of Consequences (AC), Perceived Behavioural Control (PBC), Subjective Norm (SN) and Habit (H)) towards promoting sustainability. Thus, the research model consists of (i) 'the online social network/Blended Social Network', (ii) six modules of 'ICT techniques', (iii) 'individual determinants' that might affect individuals' engagement towards a sustainable lifestyle, and (iv) 'the communities of sustainability' (characteristics and activities).

However, there are three main components of engagement, and each have been addressed to ensure individual engagement. Those components come from engagement theories: (i) the 'Cognitive' (e.g. understanding/knowledge), (ii) the 'Affective' (e.g. emotions/interests and concerns), and (iii) 'Behavioural' (e.g. action) (Lorenzoni et al., 2007). This study investigates the ability of the proposed conceptual model to affect these three factors influencing a person's engagement. Thus, the proposed approach encourages people towards preparedness to engage by changing a negative lifestyle and adopting a sustainable lifestyle. (Chapter Three, Section 3.6.2.1), presents details of these factors of engagement.

The proposed model of the study focuses on a new type of social networks ('Blended Social Network'); and to achieve the aim and objectives of this study, two main related research question and were developed and presented in Chapter One.

A summary of research process for addressing the main research questions is outlined in the following:

Main RQ1: What is the role of online social networks, i.e. the 'Blended Social Network' (BSN), in promoting individual 'preparedness to engage' in a sustainable lifestyle?

To answer this research question, the research conduct intensive literature review of related aspects from different domain of interest, and a number of related subjects were identified and analysed by the researcher (Chapter 2, 3 and Chapter 4). As an outcome, a well-defined conceptual engagement model exploiting the role of (BSN) was formulated, then analysed and presented in Chapter 5. The empirical data were collected from the respondents for investigating their initial perception about the role of online social networks as well as other dimensions of 'BSN on their 'preparedness to engage' in a sustainable lifestyle and how such model can bridge the gap. The validity of BSN in promoting individual 'preparedness to engage' in a sustainable lifestyle in Saudi context was evaluated and the analysis results is presented in Chapter 8.

Main RQ2: What factors, techniques and functionality within online social networks contribute to 'encourage individual engagement' with sustainability?

Based on the literature review, a number of factors, techniques and functionality (ICT techniques) were identified to be an effective supplemented techniques within the BSN proposed in the engagement model of the study. These ICT techniques includes; (context-aware, location-based, individual social marketing, social learning, profile and sustainable labelling, and attraction modules) and their feasibility were analysed by surveying the public perception towards the effectiveness of such techniques in influencing their behaviour and engagement determinants (Chapters 7). Then, the empirical data were collected from Saudi context to examine its validity for encourage individual engagement in sustainability and the detailed analysis results is presented in Chapter 8.

A summary of research findings on addressing the aims, objectives and outline of the thesis final conclusion is presented in the following section.

9.2 Addressing the Research Objectives, Summary of Finding and Conclusion

9.2.1 *Objective (a); is to explore the academic literature to discover related aspects of individual engagement in sustainability.*

A literature review constituted the first stage of this study and provided (i) a theoretical background on the issue of public engagement and intention to change behaviour and (ii) a preliminary formulation of the conceptual model and its components. Objective (b and c); are: to capture and explicate the public attitudes, actions and perceptions about environmental sustainability in relation to climate change phenomena as well as identify

and investigate existing challenges, barriers and factors that affect an individual's engagement with sustainable living.

The literature review also provided the aspects and elements of public perceptions about environmental issues as well as the common barriers preventing public engagement with sustainability. The results indicated that the lack of an effective communication channel, low awareness especially among people with low income and education, lack of trust in governments, lack of an adequate reward system and incentives and culture in general are the main factors preventing public engagement in sustainability.

These findings were incorporated into the questionnaire of a public survey which aimed to investigate citizens' perceptions of climate change for two purposes: (i) profiling Saudi citizens regarding sustainability, and (ii) ascertaining that the constructs comprising the conceptual model and their inter-relationships were accurate. The objective was to check the level of effectiveness of the whole conceptual model, particularly its appropriateness in the Saudi context. In addition, ascertaining the role of sustainable communities in the engagement process was a priority. In particular, the survey explores: (i) the public's general perceptions regards climate change, perceived localized risks and willingness to change daily lifestyles or negative behaviour, (ii) the role played by socio-emotional factors such as location loyalty, personal responsibility, (iii) the level of trust and acceptance of external intervention, at local, national and international levels and regards the sources of information, as well as (iv) ways in which these aspects translate into sustainable lifestyles.

With regards the results obtained regarding citizen perceptions about sustainability general outcomes of this field study show weak knowledge, awareness as well as poor performance and actions. Poor performance was attributed to a multitude factors, including a lack of: (i) legislative framework, (ii) ability and access to appropriate environmentally friendly technology, (iii) general awareness, (iv) attention to the emotional dimension, and (v) lack of motivational programs. The combination of these factors point to the fact that the process of engaging people with environmental concerns faces significant difficulty and barriers.

Individuals vary in their views about environmental issues when they are from different cultures but even within the same culture and geographical locations; they have different levels of knowledge, attitudes, norms, beliefs and levels of trust in scientists, governments

and international organizations. Their views also depend on the nature of their thinking, habits and behaviours. These variants affect citizens' perceptions and behaviours to the extent that we may view multiple shades of behaviours within a single society, making the design of a comprehensive engagement model rather difficult and complex. The study investigates the means of increasing concern and pro-environmental activity as well as providing an examination of the issues that prevent involvement for the spectrum of individuals and variety of social groups allowing them to contribute towards a better environmental future.

Trust in the source of information, the nature of the current sustainability infrastructure, facilitating conditions and perceived control, cost and affordability of products and services, levels of awareness and knowledge, lack of skills and support and other obstacles that make it difficult to change habits; lack of collective actions, coordination, co-operation and lack of persuasive initiatives are all considered important factors in the engagement of the public in sustainability issues.

The survey also investigated public perceptions of climate change and the effect of location factor in people perceptions. More specifically it investigated: (i) the link between the impact of noticed signs of climate change and perceived importance of climate change, (ii) perceived concerns and ways these translate into obligations in collective actions and responsibility.

Three factors emerge from the study as key determinants in Saudi's ability to engage with mitigating actions against climate change, namely: locality, humanity and integration. In terms of locality, this study demonstrates the effects of geography on people's behaviour and considers it as one of the determinants, which must be addressed. Different people behave differently as a result of the location in which they live. The design of campaigns must focus on promoting environmental awareness and on introducing people to environmental and health issues both locally and internationally as well as must instil in the public a spirit of volunteerism and take account of individual differences when formulating initiatives. Through direct communication with different groups in society, locally and internationally, the deployment of knowledge about local environmental issues, the dissemination and highlighting of local issues and the promotion and strengthening of current positive environmental behaviours, it is possible to develop people's thinking skills and creativity and to provide them with various life skills that serve environmental ends. From a humanitarian perspective, environmental solutions

must take into account the welfare and well being of humans; they must consider the individual's basic requirements for a good life; they must take account of health factors and avoid harming the social relationships between individuals, their social security or their freedom of choice and action. In terms of integration and involvement, it is necessary to intensify and expand the participation of all concerned by means of adopting a direct participatory approach, inviting the interactive contribution of all stakeholders in the preparation, approval, design and implementation of programmes of action. This study shows that the skill levels of organisations and individuals alike are very low at local and national levels and must be supported and strengthened by developing interactive and attractive plans, which follow a more effective approach to climate change adaptation. This means that it is necessary to raise environmental awareness among people and policymakers, making them aware of the extent and nature of the risks associated with climate change. Governments require various methods to help to rebuild confidence with individuals and this leads to a sharing of responsibility at all levels of society by activating the role of communities.

9.2.2 Objective (d); is the development of a conceptual model that captures factors influencing individual engagement in a sustainable lifestyle, and the formulation of the associated engagement platform using online social networks and ICT techniques and functionality.

The sustainable engagement model proposed in this study incorporates features from various disciplines such as environmental science, psychology, computer engineering, information systems, and information communication technology. Several steps were taken to restructure this engagement conceptual model, taking into account both short-term and long-term objectives. The model proposes some aid factors in order to overcome the limitations of previous initiatives and adds some extra dimensions related to encouraging people to engage in pro-environmental actions.

The intention is to create the optimal engagement model assist the action plan for dealing with environmental issues. The process of designing the engagement model and associated platform focuses on conceptual scientific foundations working alongside actual people needs. In addition it aspires to assist policy makers to use a holistic perspective of accountability and responsibility for human action in justice, equality and fairness. This lends to the creation of an effective approach that might attract individual's to act pro-environmentally and willingly embrace sustainable lifestyles.

In summary, the objective of this research is to propose a conceptual model that would inform an interactive engagement platform capable of supporting and facilitating behaviour change and environmental management. Through an investigation into the role of social norms, social networking and information science on public adoption of a sustainable lifestyle and participation in environmental activities, This study identified three categories of factors ‘cognitive’, ‘affective’ and ‘behavioural’. The effect of each of these categories, however, depends on further parameters. Attitudes, values, beliefs, personal and subjective or social norms, ascription of responsibility, awareness of consequences, perceived behavioural control, and habits are all parameters that collectively affect one’s intention to change behaviour and engage in a sustainable lifestyle.

Social and behavioural patterns are the main determinants of efficiency improvements in resource use serving the environment and creating stable sustainability. The involvement of a diverse spectrum of stakeholders in a systematic engagement approach has salient and mutual benefits and contributes significantly to local community and national support at multiple development levels, economic and social, as well as the support it provides to the government's spending on this issue. The systems approach within the development model for citizen engagement in environmental issues provides a context in which all aspects of the actors are accounted for, including design strategies and economic, social and environmental factors. This proposed model is comprehensive and open to all concerned parties. It can be used to organize, empower and regulate the contribution of all beneficiaries and others concerned. It is this focus on the involvement of all interested and directly or indirectly related partners, in this collaborative approach that will enable direct and online support in addition to the provision of information accuracy and easy accessibility to the beneficiaries.

As the literature review and consequently, the field study concludes, the new type of integrated online social network platform (formulated in this study) is effective in engaging the public in sustainability. This model relies on a new type of online social networks (‘Blended-Social-Network’) which are able to support a bottom-up approach through the adoption of persuasive techniques which likely lead to the enhanced public acceptance of environmental policies and regulation and may stimulate a person’s cognition and affective tendencies in order to affect their attitude and intention to adopt a sustainable lifestyle.

This integrated approach assists people in their involvement in the process of applying sustainability related behaviours through integrated online social networks and associated ICT techniques. The comprehensive review of the relevant literature regarding the ICT techniques that may help to facilitate engagement, adoption and diffusion of sustainability awareness in differing cultural contexts disclosed seven ICT techniques that were most directly pertinent, which were then included in the research conceptual engagement model employed in this study.

The integrated social network and the ICT techniques proposed in this study are context-aware, location-based, individual social marketing, social learning, profile and sustainable labelling, and attraction modules.

Taking into account the humanity factor, the design of the engagement model focuses on structural change relying on a bottom-up approach rather than top-down or by force by law. It suggests solutions that align with people needs and do not harm people's well-being. With regards locality, the model suggests utilising context-aware (CAT) and place-based (PBT) techniques to link the local to global and activate the role of individual participation in local environmental events and activities through proposed events-based and current-trends techniques to support local activities technically, logistically, and financially. To strengthen trust between the public and decision makers, the model focuses on the role of sustainable communities, friends and social relations, by utilising existing social networks, social capital through the proposed 'Blended Social Network' (BSN) and the ICT techniques that accompany this network. The model focuses on methods that lead to facilitating conditions, perceived control and support affordability of environmental alternatives as well as reduce the cost of environmentally friendly products and services. The model focuses on increasing people integration, linking stockholders, linking local to global and integrating with existing online social networks such as Twitter and Facebook to facilitate communications between people and all partners. The model gives focus to the issues related to environmental education through the creation of a practical support system for formal and social learning, allowing the dissemination of knowledge and increasing individual awareness, which is considered a fundamental construct in this model that utilises the proposed social learning technique (SLT).

9.2.3 *Objective (e, f and g); The validation of the conceptual model involved (i) the development of a theoretical framework to examine the influence of BSN on personal engagement characteristics, (ii) develop the prototype validation engagement platform to evaluate empirically the validity of the conceptual model, and (iii) assess the conceptual model's ability to enable an individual's intention to engage in a sustainable life style.*

For validation purposes, this study employed a comprehensive theoretical framework by combining the factors that influence people's intention to change behaviour and adopt a sustainable lifestyle.

Afterwards, this study developed a prototype platform of the proposed 'Blended Social Networks' and associated ICT techniques reflecting the theoretical framework of the conceptual model, which was used to facilitate the empirical validation and assist the research conceptual model in real situation. All components of the model including the 'Blended Social Network', the integration with existing social network, context-aware, place-based, individual social marketing, social media learning, and the 'Hook and attraction' modules including participation in current trends technique, profiling and sustainable labelling, and incentives techniques, were represented and practically examined. This development of engagement platform is considered an intermediate step to theoretically testing and measuring the effect of the conceptual model on encouraging people to engage in sustainability.

The actual thesis hypotheses with regards the conceptual model and its components were assessed and validated using both qualitative and quantitative approaches. The focus-group interviews and the poll questioners during the discussion question sessions were applied to gather primary data. The final revised conceptual model is suggested as the findings of hypotheses testing. The quantitative and qualitative validation presents prove statistically the credibility and faithfulness of the conceptual model. Chapter 8 gives detailed about this objective.

9.2.4 Final Conclusion of the Study

Throughout the study, from the initial realisation of the problem and then extensive review of the literature to create the proposed conceptual model to the development of the prototype platform and theoretical validation framework and finally revision of the conceptual model, the focus has been on ultimately testing the hypothesis that related to measuring the effect of the BSN with its ICT techniques on engaging people in

sustainability. Whilst reviewing the history of the current government initiatives, it was noted that there is a marked lack of acceptance on behalf of the public, as a result of which it has become important to establish which conditions will assist in the successful outcome of an increase in the number of people engaging in environmental initiatives. This research disclosed that sustainability in Saudi Arabia currently remains a somewhat problematic issue; there is certainly a perceived lack of public cognition and awareness, eco-products and services remain expensive and many people either ignore or are beyond adaptation to a sustainable lifestyle.

Furthermore, this is occurring where ICT is available, and information via smart phones, PDAs or PCs is for a large proportion of the Saudi population obtainable. This is clearly evident from the field study and the fact that the Internet and smart mobile phones in currently penetrate Saudi Arabian society. Over 85% of the population has a mobile device, and subscriber numbers are continually on the increase. The current network infrastructure covers all parts of the country. It can therefore be argued that it is better for sustainable communities to develop their communication style utilising the BSN, including ICT techniques, and utilising the existing communication and wireless infrastructure which facilitates the accessibility of all computer networks, including the mobile network services, to allow the entire spectrum of citizens who currently use those computers, wired technologies, smart phones, tablets, and wireless devices. By adopting this conceptual model, support and tailored services can easily be delivered to all users at any time and any place. One of the major advantages of the conceptual model is that it allows people to access free-of-charge services timely without the necessity of visiting services providers face to face in their environment. This also serves disabled people and those who live in remote areas and helps to bridge the equality divide between people and the sexes.

The findings of this study reveal that the conceptual engagement model, which makes use of social networks as well as ICT factors, techniques and functionality in order to promote individuals' intentions to engage in a sustainable lifestyle is preliminarily accepted by the respondents and has potential positive effects to bridge most of the apparent barriers. For instance, online social networks, the semantic search, context-aware and the individual's environmental social marketing methods proposed in this research model may assist

people in overcoming most of the obstacles regarding cognition, affective attributes, facilitating conditions and perceived control.

The proposed BSN and the set of ICT techniques in this study, from the empirical study, are suitable to support all initiatives, depending on the cultural context and local circumstances. Communication via the BSN is easy, requires little or no special training, is used by all age groups and both sexes, supports educational learning and training and can be employed anywhere and at any time to disseminate initiatives, enhance cognition and skills, thus providing an efficient means to support and encourage people to engage in sustainability objectives.

The validation finding results reveal a high percentage (34.5% to 76.2%) of people's perceptions towards the model effects on their preparedness to engage in sustainable communities and a sustainable lifestyle through the use of the integrated BSN and ICT techniques. Variance in a person's perceptions towards the overall effect of innovation on preparedness to engage was entirely explained by cognitive (ranging between 39.2% and 69.1%), affective factors (ranging between 37.9% and 72.0%) and the intention to change behaviour (ranging between 37.6% and 73.9%).

Thus, the overall findings show significant positive levels of support in terms of individuals' preparedness to engage in sustainability. This suggests the positive effects of the research model and the significant role of the BSN platform in encouraging people to engage in sustainability. In addition, it provides evidence of the significant role of the proposed ICT techniques in engaging people toward sustainability. (See Section 8.3.2).

The detailed validation results of this study show that the three engagement constructs considered in the model account for 71% of the dependent variable of users' preparedness to engage, relying on the use of the BSN itself, 69% for the dependent variable of users' preparedness to engage relying on CAT techniques, 72.8% rely on PBT techniques, 51.3% rely on SLT techniques, 73.2% rely on ISM techniques, 34.5% rely on PSL techniques, 69.2% rely on PCT techniques and 76.2% rely on the PIT technique within the integrated BSN.

It can be concluded that the ICT techniques are considered a complementary sub-set of the BSN, and various respondents believe that these factors might have a significant effect on changing their future behaviour. Therefore, the employment of these ICT techniques

can support efforts to engage people towards pro-environmental action. In terms of ICT techniques serving as a complementary aspect of online social networks, the validation study concludes that there is great potential benefit for use of these tools that goes beyond those aspects listed in this study. They provide an outlet for the engagement services, and the two are complementary to each other.

All of the ICT techniques employed in the conceptual model, including the context-aware, location-based, individual's social marketing, social media learning, participation in currently trending events, profiling and sustainable labelling as well as attraction technique, have a direct effect on cognition, the affective capacity, citizen awareness and attitudes by facilitating the dissemination and quality of information, skills, and support available. In this respect, the conclusions of the validation survey draw attention to the high degree of influence these techniques have on engaging people with sustainability. Some ICT techniques assume a more prominent role in encouraging engagement than others (See Chapter 8 for a comparison of the effects of the various factors on people's engagement). The context-aware, location-based and participation in currently trending events emerged as the most important ICT techniques, while the individual's social marketing and social media learning techniques emerged as the second.

The ICT technologies can facilitate communication and integration, aid in the improvement of the quality of engagement services provided and exploit the role of online social networks in promoting pro-environmental actions and assist people in adopting a sustainable lifestyle. These ICT features facilitate a link between individuals and physical events or activities that are occurring near a user's locality. These modules enable individuals to adopt sustainable lifestyles by re-establishing the users' ability to control their behaviour to serve the environment. The powerful addition of these dynamic techniques to the online social network helps to improve the e-interventions by tailoring them rather than relying on static or generalised processes.

This study concludes that the new platform of BSN can help with the success of strategies that aim to motivate the public to embrace supported sustainability. Notably, the BSN with the seven ICT techniques proposed in this study should be accompanied with the relevant information in order to facilitate the success of the approach. Thus the proposed model, working hand in hand with a suitable interventions strategy approach, can serve to efficiently engage the public in sustainability.

The proposed platform can stimulate direct human interaction, which is required to achieve the change from displaying anti-environmental behaviours to the adoption of a sustainable lifestyle. This contributes to raising awareness, motivating pro-environmental action and providing a space for people to discuss and suggest means of mitigating environmental problems. Beyond this, the model seems to influence the activation of moral and social responsibilities to address environmental issues. Therefore, it leads to a sense of responsibility, which is fundamental and core to environmental citizenship. This proposed model could be seen as a basis for systematic preparation for citizen engagement, which might be gradual over time, to satisfy the full spectrum of environmental citizenship objectives. This covers the three factors upon which environmental citizenship is based: (i) The provision of environmental solutions and products, (ii) citizen support and (iii) the empowerment to participate in sustainability policy and decision making (Dobson, 2010).

The entire social spectrum and all organisations can participate in management and planning to protect and serve the environment through this proposed platform. It facilitates connectivity and communication between people. Large segments of people can be reached on time at low or no cost.

The model takes into consideration the multi-dimensions and diverse characteristics including individual and social attributes, economic issues, technological and technical utilisation aspects, and community aspects. It also provides insight into the individual, environmental, organisational and societal levels to assist decision and policy makers in building strategic plans for sustainability as well as improve public acceptance of sustainability regulations.

Through the model, individuals are encouraged to participate in addressing climate change, creatively plan processes and assess their daily activities together with experts. Participants in this engagement model can use peer skills, environmental activities and events, workshops, lectures and individual coaching in addition to easy access to eco-products/service alternatives and guidance on the right way to deal with the environment and natural resources. This contributes to the success of this model in achieving acceptance and having an effect on public engagement in sustainability.

The existence of such a platform can also support expanding the use and development of environmental products/services by supporting and encouraging environmentally friendly business sectors and firms. Governments can develop environmental legislation and encourage the public to use the best practical environmental options by supporting people and facilitating consumer choices regarding eco-products/services.

This platform can be considered as a co-operation platform for empowerment and facilitate conditions to individual and social pro-environmental act. This increased capability and capacity builds and affects individual perceptions and emotions to support environmental issues with effectiveness in spreading knowledge and offering friendly environmental alternatives, eco-products and services, with the aim to assist in changing citizens' behaviour and encourage their willingness to engage in sustainability-related issues.

The acknowledged superior features within the proposed platform, such as ease of accessibility, overcoming spatial and temporal barriers, access of information 24/7 on time and on location, all lead to the benefits of the innovation. The behaviour change strategies can rely on such interactive technology and online communications provided by this platform, which seem to enhance the effectiveness of the solutions provided, and promote public engagement with sustainability. It has the capacity to work as an interface between the public, communities, governments, ecologists and activists at the local, national and global levels, as well as serve as an incentive for industrial and business firms to contribute to the issue of climate change, and it affects people's intention to change behaviour and preparedness to engage in sustainability.

The formulation of such a BSN platform can provide ordinary people with an opportunity to communicate and create links with sustainability stakeholders like global communities, activists, governments, the United Nations, international climate policy and other interested people or communities, businesses and private investment sector alike to make a significant contribution to the goals of promoting public preparedness to engage in sustainability. These social networks, which activate the role of people and their pro-environmental behaviour via online social networks by encouraging online peers to engage in solutions, will have an effect on people's preparedness to engage in sustainability through building relationships with citizens through social networks that pay attention to the role of trust and citizen satisfaction.

Furthermore, the proposed engagement model and associated platform can assist in understanding what factors and aspects should be the focus of future initiatives and whom to support, when and where. It also has the capacity to bring together potential innovative ideas, ecologists, cooperative partnerships and ordinary members of the public in a common action plan. The model facilitates monitoring and analysis of people's activities and their behavioural reliance on integrated online communication via social networks. The existence of this platform can assist in the enhancement of people's willingness to engage and help the community and the targeted population alike by recognising environmental problems and achieving balance in the focus and re-enhancement process. Finally, joining this model with extra features to enhance the effectiveness of interventions such as those enabling interactive strategies, goal setting and tailored feedbacks can also aid in applying effective strategies to engage people in sustainable lifestyle.

9.3 Contributions to the Body of Knowledge

This research makes several contributions to the body of knowledge on the engagement of individuals in pro-environmental actions in general and on the adoption of sustainable lifestyles by Saudi citizens in particular. Its theoretical and practical contributions are:

Contribution 1: The study develops a comprehensive theory-based engagement model that encourages people's intention to adopt lifestyle changes through an integrated online social network and ICT techniques. This inclusive model with associated platform enables categorisation and treats the various behavioural roles played by members of the online social network on the individual level. Because of the building-block nature of the model it can be easily transferred in other environments in different cultures and countries. In this way, the proposed general conceptual model will allow researchers to extend its use to future related research.

Contribution 2: This study contributes to the body of knowledge by building a sustainability profile of Saudi citizens by examining the social and cultural determinants of attitude and behaviour regarding climate change. It also investigates the effects of the attitudinal determinants on people's intentions to participate in an online social network, and in turn the influence of these intentions on users' behaviour. This research contributes to existing knowledge since perceptions of climate change in a developing country are examined for the first time in the Saudi context. Based on the results of this study, decision

makers and practitioners of climate change and environmental policies will be in a better position to understand the current situation of public awareness and perceptions regarding climate change in the Saudi context and in similar developing countries. The variables and prototype moreover, are accurate and representative of the Saudi context because they are the result of analysis of real primary data. In addition, this study is the first to use primary data based on a field study technique to analyse and identify variables that actually affect public perception, engagement and adoption of a sustainable lifestyle.

Contribution 3: At the second stage of this research, which was conducted in the UK and Saudi Arabia, the researcher developed a consensus prototyping software, called ‘the Blended Social Network’ platform, to identify the variables that should constitute the components of the conceptual model of engagement. The study employed an empirical study to develop prototyping platform for the first time to analyse and identify variables that affect public intention to tackle climate change. Employing the focus group process, which is common in the development of software tools to validate conceptual models in the real world, provided significant input for the conceptual engagement model. This tool might also be used to validate the model in other countries.

Contribution 4: To the best of the researcher’s knowledge, the use of three research techniques (a theory-based technique, a field survey of perceptions and development platform that rely on IS) can be considered unique in research into public engagement in a community of sustainability. These techniques, which have not been used before in public engagement studies, enable the evaluation, selection of appropriate engagement strategies and support eco-solutions, products and services.

This combination provides for critical analysis of the engagement constructs, which can be used to improve the overall functionality of sustainability decision making. This research contributes to existing knowledge by: i) building a generic model of climate change engagement and adoption and, ii) validating the model for the first time in the context of Saudi Arabia. Based on the results of this study, the practitioners will be in a better position to cope with climate change by relying on the adoption model in similar developing countries. This study provides valuable information and solutions for the environmental community and for addressing climate change. Its value lies in offering practical support as well as a channel through which communicators and policymakers can involve the public in the development of sustainability and of workable mitigation policies and actions.

Contribution 5: The design of an engagement approach or adoption model is problematic because engagement is not stable and might vary as circumstances change; thus, it must involve continuous evaluation and monitoring of situations over time. However, coping with the rapidly changing environment and various fluctuating situations is not easy. This is recognised as a critical issue in engaging people in sustainability development. Thus, the development of this flexible model is valuable in that it may encourage governments and concerned organisations to use this approach to implement new engagement practices. This research formulates a dynamic engagement model that comprises tailored engagement services based on individual circumstances and characteristics.

Contribution 6: This research is intended to build a new practical engagement model for climate change. This will help to expose existing problems and potentially provide insight into problems which specific people face and which prevent them from engaging in the community of sustainability. The model incorporates different techniques to present new concepts, including the individual social network and tailored social learning, which overcome the drawbacks mentioned and address the criticism of social marketing theory. Most existing engagement research simply considers traditional education and campaigns strategies as beneficial for government, disregarding evidence of the downside related to climate change and ignoring evidence of the widespread costs of the failure of campaigns, which may occur because of the limited availability of effective solutions.

Contribution 7: Theories related to the topic and linking appropriate factors in the comprehensive validation framework were employed to validate this study can be perceived as significant in generating a broader theoretical framework that can be used to validate other studies.

Contribution 8: In addition to the theoretical contributions, this study can also serve the purposes of business and industry. First, environmentally friendly products have suffered from poor market penetration and their producers have complained of an inability to reach targeted customers. The concept of individual online engagement proposed in this study includes elements that lead to increased opportunities to use alternative environmentally friendly products and solutions. By recognising the impact of cognitive and affective factors, practitioners can view engagement as a richer marketing opportunity. This in turn may increase the engagement of and the appreciation of affordable alternatives by the public, thus, providing a return on investment in social media and specifically in social networking. Additionally, practitioners can create cognitively stimulating and

emotionally satisfying online social networks that are both educationally and financially valuable to the public. People can build a business within this virtual world and can also take it out to the real world.

Contribution 9: The means of attracting people used in this study have not been used before. In fact, social networks have strongly penetrated the community, so people are attracted and tend to use online social networks for various reasons. These networks have special characteristics that distinguish them. They offer a sense of presence, sociability and usability, a sense of belonging, a space for discussion and dialogue, and the satisfaction of user needs, such as transactions, interest, enjoyment, hedonic pleasure and relationships (Blanchard, 2008, Blanchard and Markus, 2004, Koh and Kim, 2004, Sangwan et al., 2009, Tonteri et al., 2011, Moon and Kim, 2001, Koh and Kim, 2003, Hagel and Armstrong, 1996, Hsu and Lu, 2007). In addition, social networks can link friends and members who share concerns (Chiu et al., 2006, Ley, 2007, Miyata, 2008, Tu, 2002). They also overcome spatial and temporal boundaries by offering 24/7 availability everywhere. The conceptual model proposed in this study is intended to provide more effective and efficient solutions to attract people than the current online social networks, by means of an innovation called the 'attraction module'. The novelty of attraction techniques ('participating in current trends and events' and 'create permanent incentives') within the proposed research model make a significant contribution by facilitating the penetration of the online social network into public community. This has two functions: (i) to support and enable members to follow and participate in current activities and events, locally, nationally and globally, as well as virtually and physically, and (ii) to create permanent incentives for members. In this technique, spatial presence is salient, with a clear definition of identity for members, who can benefit from both physical and virtual social relationships. This enables link with physical objects, activities and events, in addition, communication with recognised people, which in turn enhances the level of trust among members (Eiser et al., 2002, Poortinga and Pidgeon, 2003b, Poortinga and Pidgeon, 2004, Hoffman et al., 1999, Climate Change Communication Advisory Group, 2010, Blok, 2007). Communication here is physical (off-line) and cyber-physical which is similar to face-to-face communication.

9.4 Recommendations

The final objective (h) is to develop a set of recommendations for further study into individual engagement in the sustainable lifestyle field.

These suggestions and recommendations are conclusions of this study, which provides a comprehensive examination of the relationship between the online social network, the ICT techniques determined from literature and the field of study on the one hand and the particular situation of engaging the public with sustainability on the other. These recommendations are crucial for the success of engagement initiatives and hence, for the successful adaptation to a sustainable lifestyle.

All sustainability stakeholders, decision makers, researchers and those to whom the research is of practical interest can benefit from several recommendations concluded in this study. This research provides suggestions for social progress in the following ways:

- This study recommends the use of the ICT techniques proposed in the conceptual model to assist in the promotion of citizen's willingness to engage with sustainability. The results highlight the need to apply these techniques in the early stages of development of the environmental regulations and policies in order to ensure the prompt removal of any obstacles that might hinder the success of government interventions and initiatives. The ICT techniques are also useful for the successful integration of business and governmental initiatives.
- The awareness of people in general as the study concluded is low. The recommendation is to use this model in order to profit from the expected effect of the locality factor helping to raise cognition and awareness in people locally to ensure their participation in the rehabilitation process, linking them to local, national and international initiatives and informing them of local, national and global solutions that may encourage them to engage in sustainability. This also helps to guide them through the rational use of resources and other solutions offering suitable alternatives. The direction of this help is channelled towards an emphasis on taking optimal advantage of the region's natural resources, encouraging and supporting local initiatives and programmes and linking them with global objectives. This model focuses on the idea of acting locally whilst thinking internationally and links local and national initiatives with those of a global scale providing support both technically and financially.

- Use of this model is recommended to increase people's cognition and awareness: People need to be aware of the social, environmental and financial benefits that they or society will accrue by adopting a more environmentally friendly lifestyle.
- The coordination of the subjects, collaboration between experts and linking of all stakeholders are factors missing or non-existent in current initiatives. This is particularly clear with respect to environmental issues, thus utilise of this model is recommended to help bridge this obstacle that citizens traditionally face.
- Legislators and decision makers would find great benefit in utilising the conceptual model proposed in this study to enhance their communications with the public, which is currently facing some barriers and challenges with regards to acceptance and adoption of environmental policy and legislation.
- The concepts comprising the model inform decision makers and policy adopters as well as sustainability organisations, providing them with greater insight into appropriate strategies and plans that can be used to engage the public with sustainability. The model is thus recommended for their use as an optimal flexible approach ultimately serving the environment.
- This study constitutes valuable contribution for the sustainable community in the specified region of study. It also proposes a general engagement conceptual model as a basic framework that can then be tested on a wider national scale. The study therefore concludes that use of the model is recommended as a general platform for engaging the public in sustainability.
- The study shows that the sustainable community requires an innovative collaborative engagement platform that is able to encourage the public, governments, communities, institutions and the private sector to work together in the promotion of sustainability through improvements in the communication established between them. An enhanced method of knowledge, skills, resource and support exchange is also necessary between stakeholders, thus, there is essential needs for providing an effective means of interchange for the provision, manipulation and storing of information.
- Given the outcomes and advantages observed in this model, which are led to understand the need for the creation and adoption of a business model allying partnerships in a single unified platform that is concerned with connecting all relevant parties and administering the communications, ultimately allowing them to work towards a common goal of environmental investment where the intersection of interests is clear. This platform can facilitate the connection between the commercial

sector, environmental specialists and decision-makers from governments and environmental associations as well as others interested in environmental matters, in an efficient and effective way.

- A number of determinants have emerged from this research, namely, locality, humanity, integration and involvement. These will inform the Saudi government when addressing the issue of public engagement with climate change mitigation.
- The individual's social marketing technique examined in this study, is a new perspective that suggests expanding current campaigns to include attraction modules, directing public attention toward sustainability and supporting their adaptation to sustainable living.
- This study recommends support for the business and firms sector that offer environmental products/services by providing advertising and connecting people in a timely manner to these environmental alternative solutions.
- The involvement of local communities in environmental solutions and decision-making is a powerful tool and so one suggestion is to support this community technically and financially whilst linking their efforts with wider global solutions.
- Social learning at different levels including formal and informal education is an important issue as the study concluded and so decision makers need to pay more attention to this factor when seeking to engage people in sustainability.
- The researchers and decision makers can use this model to measure the level of awareness and impact of their initiatives on citizen's engagement. The real and active knowledge provided by this basic method enables them to access necessary information immediately.
- It can be used as an effective communication and cooperation channel between all related stakeholders to serve the environment.

9.5 Directions for Future Research

The outcomes and findings of this thesis put forward future research considerations.

- The BSN platform and the ICT techniques were proposed in this study to encourage people to engage in sustainability. During this study, the focus was on formulating an appropriate engagement platform that exploits the relationship between online social networks and ICT techniques and the concept of engagement in facilitating the collective actions to the adoption of a sustainable lifestyle in the Saudi context. In order to successfully implement the engagement initiative projects at the global level, it

requires an evaluation of the suitability of the proposed model components to form a global engagement model. Future work might investigate the model constructs and relationship in other contexts on a larger scale to investigate this model on people's preparedness to engage in sustainability with a global vision and to adopt a global model valid for all countries of the world. In addition, the scope of this thesis will lead to further research on expanding the evaluation of this approach into different cultural contexts to evaluate this conceptual model and investigate the model to overcome the challenges in the context of engaging people in sustainable lifestyles, both in developed and developing countries.

- In regard to future work within the Saudi context, the other extension is the empirical evaluation of the proposed platform in the domain of risk/disaster management by testing the appropriateness of the model to engage the public (at the individual level) to contribute to collective actions through exploiting the platform capacity to support and adapt online interventions services, which can enable active/real-time risk management within the co-operative communication platform as defined in this study.
- Future research could investigate ICT techniques by integrating cyber-physical systems including extra-smart real-time sustainability informational, monitoring and control services, such as smart home devices, seniors, and intelligent systems which are used to monitor and control the environment by running command on behalf of the client. These smart services, systems and devices are becoming increasingly popular. The integration of these services within the platform might contribute to increased comfort and promote energy conservation efforts. By adapting these services, people can easily handle their daily tasks and remotely control these tasks, even in different areas.
- The outcomes and results achieved in this study relate to users' labelling and profiling and suggest the need to expand research to investigate these techniques to design attractive and incentive solutions in greater detail.
- In regard to the theoretical aspect, this study used the individual and interpersonal theories and models with self-reporting measures as dimensions to develop and evaluate the proposed model. Future work could be apply the proposed model and associated platform to evaluate theoretically the effects of using such a platform on individual actual behaviour through measuring behaviour in the local context by employing long-term theoretical-based measurement; for example, with the system theories and transactional change theories.

- Future development of an appropriate business model and production strategy for deploying the platform in a friendly environmental (products/services) could promote these solutions locally and globally using a suitable business model that considers examining the model from the perspective of the business firm sector. A further step is to focus on designing an appropriate business model to test and measure its competency and efficiency to achieve the desired common goals for all stakeholders. In addition, future study could identify the related management rules and policies to governing relationships accurately and the owner of such model, which includes consideration for the administration aspects of both technical and commercial issues, and defines a suitable partnership between the government, associations, and the private sector. The successful business model can be applied to achieve better environmental contributions through common objectives for all related parties.

Appendix A:

Focus groups discussions

The discussion was designed to collect data from participants in regard to the evaluation of the proposed platform from the users' perspectives. The focus group discussion was designed to answer the following questions:

Engagement questions: These were used to help group members start conversations and feel more comfortable about the research topic discussed during the focus group discussion. It was designed to be easy to answer, with no focus on the differences among participants. Also, it was used to inspire the members to begin thinking about the proposed platform. It was intended to make group members start emphasizing the topic of the conversation.

Q1: What is your perception about the role of technology in environmental issues and the engagement of public toward sustainability in general?

Q2: What was your first impression about the proposed engagement platform, and what is your perception of its expected role on engaging the public in sustainability?

Exploration questions: These were used to link between the engagement questions and the key exploration questions. Afterwards, they were used to ask participants to discuss the topic in greater depth than engagement questions. They were used to gain focus on the main topic areas of concern. The majority of the group discussion time was dedicated to discussion of these questions.

Q3: What do you think about the proposed platform services (i.e. the effect of BSN services and ICT techniques) on engaging the public in sustainability?

Okay, let's begin the conversation. I will start asking questions about BSN services and ICT techniques presented in the prototype platform. What do you think about the role of each of these services/techniques in engaging the public in sustainability?

Make a checklist as they are ready to note it (if they don't discuss it, ask follow-up questions to induce greater discussion):

___ CAT ___ LBT ___ SLT ___ ISM,
___ PCT ___ PIT ___ PSL

*after discussion circulate handout on "What is BSN?" with a brief review

Q4: In what ways do you expect such proposed platform services (the core BSN services and ICT techniques) will encourage public intention to change behaviour and preparedness to engage in sustainability? (Platform effects on preparedness to engage in sustainability).

Q5: In what way will the proposed platform motivate you to pursue pro-environmental behaviour?

The ending question was given to bring the session to a close.

Q6: In what way do you expect the use of such a platform to affect or change your existing lifestyle?

Q7: Is there something else you want to mention about the proposed platform and the associated BSN and ICT techniques?



Appendix B:

Ethical approval letter

Page 1 of 1

From: Aderyn Reid/scear3/CardiffUniversity
To: Abdulrahman Alsuliman/c1111130/CardiffUniversity@CARDIFFUNIVERSITY

Date: Friday, April 27, 2012 06:39PM
Subject: Ethical Review Application

Ref: RC12-014

Dear Abdulrahman,

I am pleased to inform you that your Ethical review application "Survey about citizen perception of climate change in Saudi Arabia" has, on the recommendations of the Ethical Approval Committee, been approved by the Research Committee.

You may now begin work on your project

Regards

Aderyn Reid
on behalf of the Research Committee, ENGIN

Research Office

[https://cardiffmail17.cf.ac.uk/mail11/c1111130.nsf/\(%24Inbox\)/D86DCEF011A0816...](https://cardiffmail17.cf.ac.uk/mail11/c1111130.nsf/(%24Inbox)/D86DCEF011A0816...) 09/05/2012

Cardiff School of Engineering

Professor Yacine Rezgui

Professor of Engineering Informatics
Director BRE Research Institute in Sustainable Engineering
Dipl. Arch, MSc, PhD, MBCS



Cardiff University
Queen's Buildings
The Parade
Cardiff CF24 3AA
Wales UK

Tel +44(0)29 2087 5719
Fax +44(0)29 2087 4716
www.cardiff.ac.uk
Email RezguiY@cardiff.ac.uk

To whom it may concern :

Saudi Arabian Cultural Bureau
630 Cheswick High Road, London W4 5RY
Tel: +44 (0) 2032497000
Fax: +44 (0) 2032497100

Dear Sir / Madam:

This is to confirm that I have allowed my PhD student Mr. Abdulrahman Alsuliman to travel to Saudi Arabia to conduct his field work. This will take the form of a national survey targeting a population of about one thousand respondents.

Mr Alsuliman research will explore citizens' perceptions towards climate change and sustainability in Saudi Arabia. I would appreciate if you could support him in his research.

Please feel free to contact me shall you have any query.

Your sincerely,

Prof Yacine Rezgui

Appendix C:



دراسة حول مفهوم التغير المناخي

27.2.2012

اخي المواطن االمقيم العزيز

السلام عليكم ورحمة الله وبركاته،

هذا الاستبيان خاص بقياس وجهة نظر المواطنين حيال تغير المناخ والجوانب البيئية واثر ذلك على مواطني المملكة العربية السعودية. وهو عبارة عن جزء من خطة بحث الدكتوراه المقترح والمقدم من عبد الرحمن عبدالله السليمان ،

ويجري تنفيذ معظم هذه الدراسة في المملكة العربية السعودية، وتم اختياركم عشوائيا كوسيلة من وسائل أخذ العينات للاطلاع على وجهات النظر المختلفة للمواطنين عن ظاهرة تغير المناخ او الاحتباس الحراري.

ومساعدتك في تحبئة هذا الاستبيان لا تقدر بثمن بالنسبة لهذا البحث ولك جزيل الشكر.

الاستبيان يبدأ بالسؤال عن مجموعة من القضايا البيئية التي قد تؤثر عليك. ويطلب منك اعطاء التصور الخاص بك، وكيف تتسر حيال تغير المناخ والمشاكل البيئية. قد لا تستغرق من وقتك طويلا لملئها وإكمالها.

في نهاية هذا البحث، سوف يتم تقديم النتائج الرئيسية من خلال الاستطلاع إلى الجامعة كخطوة اولى من منهجية البحث. وسوف توفر هذه الدراسة معلومات قيمة حول كيفية تصور الناس وتصورهم حيال قضية تغير المناخ والمشاكل البيئية المصاحبة له ومن تم وضع الحلول والتصدي لهذه المشكلة العالمية الخطيرة وللمشاكل البيئية المصاحبة.

ارجوا عدم التردد في الاتصال بي في حال وجود أي استفسار او سؤال بشأن هذا المسح على العنوان البريدي المذكور في الاسفل.

شكرا جزيلاً لمساعدتكم ولكم منى فائق التحية والتقدير،

عبد الرحمن السليمان

مرشح دكتوراه من جامعة كارديف- المملكة المتحدة

جامعة كارديف ، قسم الهندسة

Cardiff University, School of Engineering

Tel: +44(07)405909442

Email: AALSULIMAN@cardiff.ac.uk

Office #: S 3.18

Queen's Building, Cardiff

CF24 3AA



دراسة حول مفهوم التغير المناخي

27.2.2012

اولا المتغيرات الديموغرافية:

1. العمر:	
<input type="checkbox"/> <18	<input type="checkbox"/> 19-24
<input type="checkbox"/> 25-35	<input type="checkbox"/> 35-44
<input type="checkbox"/> 45-54	<input type="checkbox"/> 55-59
<input type="checkbox"/> 65 +	<input type="checkbox"/> 60-64
2. الجنس:	
<input type="checkbox"/> ذكر	<input type="checkbox"/> أنثى
3. المؤهلات:	
ما هو أعلى مؤهل تعليمي أو مهني حصلت عليه؟	
<input type="checkbox"/> ابتدائي	<input type="checkbox"/> المتوسطة
<input type="checkbox"/> ثانوي	<input type="checkbox"/> دبلوم
<input type="checkbox"/> بكالوريوس أو ما يعادلها	<input type="checkbox"/> ماجستير / دكتوراه أو ما يعادلها
<input type="checkbox"/> ليس لدي مؤهلات رسمية	<input type="checkbox"/> لا ازال ادرس
<input type="checkbox"/> لا أعرف	<input type="checkbox"/> أخرى، يرجى ذكرها _____
4. ما هي وظيفتك الحالية؟ _____	
5. حالة العمل:	
<input type="checkbox"/> اعمل - دوام كامل (30 + ساعة في الأسبوع)	<input type="checkbox"/> اعمل - بدوام جزئي
<input type="checkbox"/> طالب ولا زلت ادرس	<input type="checkbox"/> لا اعمل
<input type="checkbox"/> لا أعمل - معاق	<input type="checkbox"/> لا أعمل - متقاعد
<input type="checkbox"/> أخرى، يرجى التحديد _____	
6. الدخل:	
<input type="checkbox"/> اكثر من 3000 (منخفض للغاية)	<input type="checkbox"/> من 3000 الى 6000 (منخفض)
<input type="checkbox"/> من 6001 الى 9000 (متوسط)	<input type="checkbox"/> من 9001 الى 12000 (فوق متوسط)
<input type="checkbox"/> من 12001 الى 25000 (مرتفع)	<input type="checkbox"/> اكثر من 25000 (مرتفع جدا)
<input type="checkbox"/> ليس لي دخل ثابت	<input type="checkbox"/> لا ارجب ذكره
7. عدد الأطفال الساكنين معك في المنزل الذين تقل أعمارهم عن 16 سنة؟	
<input type="checkbox"/> لا يوجد	<input type="checkbox"/> 1
<input type="checkbox"/> 2	<input type="checkbox"/> 3
<input type="checkbox"/> 4 أو أكثر	
8. منذ متى وأنت تسكن في هذا الحي / المنطقة؟	
<input type="checkbox"/> أقل من 6 أشهر	<input type="checkbox"/> 6 أشهر، أي أقل من 1 سنة
<input type="checkbox"/> سنة - أقل من 3 سنوات	<input type="checkbox"/> 3 - أقل من 5 سنوات
<input type="checkbox"/> 5- أقل من 7 سنوات	<input type="checkbox"/> 7 - أقل من 10 سنوات
<input type="checkbox"/> 10 سنوات أو أكثر	<input type="checkbox"/> غير محدد



دراسة حول مفهوم التغير المناخي

27.2.2012

ثانيا التصورات تجاه تغير المناخ :

<p>1. هل أنت عضوا في أي من المنظمات البيئية (أصدقاء الأرض على سبيل المثال، الصندوق العالمي للطبيعة)؟</p> <p>نعم <input type="checkbox"/></p> <p>لا <input type="checkbox"/></p>																																									
<p>2. هل سمعت عن "تغير المناخ" من قبل؟</p> <p>نعم <input type="checkbox"/></p> <p>لا <input type="checkbox"/></p>																																									
<p>3. ماذا تعرف عن ذلك؟</p> <p>_____</p> <p>_____</p> <p>_____</p>																																									
<p>4. ما مدى أهمية قضية تغير المناخ لكم شخصيا؟</p> <p>مهم للغاية <input type="checkbox"/></p> <p>مهم إلى حد ما <input type="checkbox"/></p> <p>ليست مهمة على الإطلاق <input type="checkbox"/></p> <p>مهم جدا <input type="checkbox"/></p> <p>ليست مهمة جدا <input type="checkbox"/></p>																																									
<p>5. هل لاحظت شخصا أي علامة تدل على تغير المناخ خلال حياتك؟</p> <p>نعم <input type="checkbox"/></p> <p>لا <input type="checkbox"/></p> <p>إذا كانت الإجابة بنعم، يرجى ذكرها _____</p>																																									
<p>6. هل تشعر أن نمط الطقس أخذ في التغير بشكل عام؟</p> <p>نعم <input type="checkbox"/></p> <p>لا <input type="checkbox"/></p> <p>إذا كانت الإجابة بنعم، يرجى توضيح ذلك _____</p>																																									
<p>7. من وجهة نظرك من سيتأثر من ظاهرة تغير المناخ؟</p> <table border="1"> <thead> <tr> <th>أوافق بشدة</th> <th>أوافق إلى حد ما</th> <th>لا أوافق بشدة</th> <th>لا أعلم</th> </tr> </thead> <tbody> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> <tr> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> <td><input type="checkbox"/></td> </tr> </tbody> </table>						أوافق بشدة	أوافق إلى حد ما	لا أوافق بشدة	لا أعلم	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
أوافق بشدة	أوافق إلى حد ما	لا أوافق بشدة	لا أعلم																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																						

دراسة حول مفهوم التغير المناخي

27.2.2012

8. هل تعتقد أن تغير المناخ هو أمر يؤثر أو سوف يؤثر عليك شخصياً؟

نعم
 لا
 لا أعرف

إذا كانت الإجابة بنعم، يرجى ذكر ذلك _____

9. ما هو مستوى القلق والاهتمام الذي تشعر به في كل من الحالات التالية:

لا أعرف	ليست قلنا على الإطلاق	ليست قلنا للغاية	قلنا	قلنا إلى حد ما	شعر بقلق بالغ
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

أ. إذا علمت أن تغير المناخ من المحتمل أن يكون له أثر عليك شخصياً
ب. إذا كان تغير المناخ من المحتمل أن يكون له أثر على المجتمع الذي تعيش فيه بشكل عام
ج. إذا ما علمت أن تغير المناخ أو ما يشار إليه الاحتمال الحراري له أثر على العالم

10. متى من وجهة نظرك تعتقد أن المملكة العربية السعودية سوف تبدأ تشعر بأثار تغير المناخ؟

أ. بالفعل تلك الآثار بدأت ونحن نشعر بها
 ب. في السنوات ال 10 القادمة
 ج. في السنوات ال 25 المقبلة
 د. في السنوات ال 50 القادمة
 هـ. في السنوات ال 100 المقبلة
 و. وراء ال 100 سنة القادمة
 ز. لن يكون هناك اثار على المملكة من تغير المناخ
 ح. لا أعرف
 ط. ليس لي رأي في هذا

11. فيما يتعلق بميزات منزلك أو منطقتك، إلى أي مدى توافق أو لا توافق على العبارات التالية؟ (يمكن اختيار أكثر من خيار)

لا أعلم	لاوافق بشدة	أميل إلى عدم الموافقة	لا أوافق ولا أختلف	أميل إلى الموافقة	أوافق بشدة
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

أ. بالنسبة لي المكان الذي أعيش فيه فريد ومميز
ب. أشعر أنني أُنتمي إلى هذا الحي وإلى جيرانه
ج. إذا قدر لي أن انتقل من منزلي فاني أود أن أعيش في مكان مماثل لهذا الحي
د. أنا فخور للحي الذي أعيش فيه الآن.
هـ. الذين يعيشون هنا يساعدونني على أن أعيش حياتي بالطريقة التي أُرغبها.
و. هذا المكان يذكرني بأيام طفولتي.

12. هل سبق لك أن اتخذت أي من الإجراءات التالية لحل مشكلة ترى أنها تؤثر على منطقتك أو الحي الذي تنتمي إليه؟

لا يوجد اجابه	أبدا	أحيانا	بانتظام
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

أ. الاتصال بالبلدية المحلية
ب. حضور جلسة علنية
ج. الاتصال بالمنظمة المعنية للتعامل مع المشكلة
د. الاتصال بعضو في الجمعية
هـ. حضور اجتماعات الاحتجاج أو انضم إلى مجموعة عمل معنية
و. اساعد في تنظيم العرائض
ز. اتصل بمحطات إذاعية محلية، محطة تلفزيون أو صحيفة

دراسة حول مفهوم التغير المناخي

27.2.2012

13. إلى أي مدى توافق أو لا توافق مع كل عبارة من العبارات التالية حول تغير المناخ؟

أوافق بشدة	أميل إلى الموافقة	لا أوافق ولا أختلف	أميل إلى عدم الموافقة	لا أوافق بشدة	لا أعلم
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

- أ. هناك مخاطر على الناس في المملكة العربية السعودية من تغير المناخ
 ب. لدي مشاعر مختلطة حول تغير المناخ
 ج. لدي آراء قوية حول تغير المناخ
 د. وأنا على ثقة بالحكومة السعودية لاتخاذ الإجراءات المناسبة ضد تغير المناخ
 هـ. لست متأكدًا أن تغير المناخ يحدث بالفعل
 و. أفكر في نفسي كشخص قلق جدا من تغير المناخ والتضايك البيئية
 ز. أنا مع أهداف هذه الجماعات المدافعة عن البيئة كمنظمة السلام الأخضر وأصدقاء الأرض

14. أي مما يلي في رأيك يمكن أن تكون سببا لتغير المناخ؟ (يمكنك اختيار أكثر من خيار)

- أ. انبعاثات الكربون أو ما يطلق عليه ثاني أكسيد الكربون CO2
 ب. الانبعاثات الضارة / الأبخرة / النفايات الغازية
 ج. غازات الدفيئة أو الناتجة من المكيفات واجهزة المنازل
 د. السيارات / حركة السير ووسائل النقل / أبخرة العوادم المختلفة
 هـ. القطاع الصناعي / انبعاثات المصانع
 و. الكلور و فلورو كربون / الهباء
 ز. استهلاك الوقود الأحفوري / النفط
 ح. النفايات المشعة ومخلفات الحروب والابحاث النووية
 ط. المواد الكيميائية
 ي. الاستخدام الجائر لموارد الأرض والتراكم الطبيعية
 ك. تقب طبقة الأوزون
 ل. التقلبات الطبيعية للكون- دورات الأرض / تغير طبيعي لأتماط الطقس
 م. تدمير وتقطيع أشجار الغابات المطيرة

 ن. إذا كنت ترى اسباب اخرى، من فضلك اذكرها

اسباب تغير المناخ او ظاهرة الاحتباس الحراري ما يلي:

- أ. ناتج فقط بسبب العمليات الطبيعية التي تحدث للأرض : مثل سرعة دوران الارض، دوران البراكين
 ب. هناك مسببات اخرى ولكن السبب الرئيسي لتغير المناخ هو العمليات الطبيعية التي تحدث للأرض
 ج. العمليات الطبيعية تتسبب جزئيا بالتغير المناخي ، ويتسبب كذلك جزئيا النشاط البشري(مثل استخدام النفط والغازات المنبعثة من المنازل والسيارات)
 د. السبب الرئيسي لتغير المناخ النشاط البشري وجزئيا الطبيعة
 هـ. تغير المناخ او الاحتباس الحراري ينتج فقط بسبب النشاط البشري
 و. في اعتقادي لا وجود لتغير المناخ ولا يوجد ظاهرة احتباس حراري
 ز. لا أعرف
 ح. ليس لي رأي في ذلك

15. من وجهة نظرك من هي الجهات المسؤولة بشكل أساسي ويجب عليها اتخاذ اجراءات عاجلة للحد من ظاهرة تغير المناخ؟

- أ. الأفراد وأسرهم
 ب. الجماعات البيئية
 ج. السلطات المحلية
 د. الحكومات الوطنية
 هـ. المجتمع الدولي
 و. المنظمات الدولية (مثل الأمم المتحدة)
 ز. قطاع الأعمال والصناعة
 ح. لا أعرف

 ط. أخرى، يرجى تحديدها



دراسة حول مفهوم التغير المناخي

27.2.2012

16. إلى أي مدى توافقك مع كل عبارة من العبارات التالية حول تغير المناخ؟

لا أعلم	لا أوافق بشدة	أميل إلى عدم الموافقة	لا أوافق ولا أختلف	أميل إلى الموافقة	أوافق بشدة
---------	---------------	-----------------------	--------------------	-------------------	------------

- أ. من خلال تغيير سلوكي أستطيع أن أساعد شخصيا في الحد من تغير المناخ
- ب. من الصعب اتخاذ إجراءات ضد تغير المناخ حتى لو كنت أريد ذلك
- ج. أرى من واجبي المساعدة والقيام بشيء ما للحد من التغير المناخي
- د. أشعر بحاجة ملحة لتغيير سلوكي بما يتلاءم مع الحلول المقترحة للحد من تغير المناخ

17. كم نسبة الزيادة في تكاليف المعيشة التي انت مستعد لتحملها، إذا كانت ستساعد في الحد من تغير المناخ.
 2% 5% 10% 15% 20% أكثر من 20% لا شيء

18. من وجهة نظرك ماهي أفضل وسيلة تساعدك في الحصول على المصادر التي تحتاجها وتزيد مستوى المعرفة لديك لمساعدتك في التعامل مع برامج تغير المناخ؟ (يمكن اختيار أكثر من خيار)

- أ. الإنترنت – لتحميل المصادر المتاحة
- ب. البرامج التلفزيونية
- ج. البرامج الإذاعية (الراديو)
- د. المطويات ونشرات المعلومات والكتيبات
- هـ. الأفلام وأشرطة الفيديو المحتوية على المعلومات
- و. مسابقات الطلاب
- ز. قائمة مواقع الإنترنت التعليمية
- ح. البريد الإلكتروني
- ط. البريد ونسخ من المصادر الورقية

ز. أخرى، يرجى تحديدها _____

19. ماهي وسائل الإعلام التي تعتقد انها مناسبة وجيدة لتوفر لك المعرفة الضرورية حول تغير المناخ؟

- أ. الإنترنت
- ب. التلفزيون او القنوات الفضائية
- ج. الراديو
- د. الصحف والمجلات
- هـ. المنتديات المتخصصة / المجلات الأكاديمية
- و. المراجع المهمة بالبيئية (مثل الصندوق العالمي للطبيعة)
- ز. المدارس / المعاهد/ الكليات / الجامعات
- ح. الوكالات الحكومية / مصادر المعلومات الحكومية
- ط. المكتبات العامة
- ي. الأصدقاء / افراد الأسرة
- ك. المجالس المحلية أو البلديات
- ل. القطاع الصناعي او التجاري او الزراعي
- م. موردي ومزودي الطاقة
- ن. أخرى، يرجى تحديد ذلك _____



دراسة حول مفهوم التغير المناخي

27.2.2012

20. ما مدى ثقتك في المعلومات الواردة حول تغير المناخ اذا كنت قد سمعت بذلك سابقا لكل من...

لا يوجد خيار	لا اتق مطلقا	قليل جدا من الثقة	ثقة نوعا ما	ثقة كبيرة مطلقة
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

أ. أحد أفراد العائلة أو الأصدقاء

ب. مقالات علمية أو العلماء

ج. الحكومة

د. شركات توريد وتوزيع الطاقة

هـ. المنظمات البيئية (على سبيل المثال الصندوق العالمي للطبيعة)

و. وسائل الإعلام المختلفة: (التلفزيون أو الراديو أو الصحف)

21. هل هناك عوائق او معوقات تحد من مشاركتك في البرامج المقترحة للحد من اسباب وتخفيف الاثار الناتجة من التغير المناخي؟

نعم لا

22. ما هي طبيعة هذه العقبات إن وجدت؟

أ. نقص الموارد المالية أو ارتفاع تكلفة الحلول البيئية ب. عدم توفر بدائل في الوقت الحالي ج. ضعف القوانين البيئية د. عدم توفر الوقت لدي هـ. نقص المعرفة لدي في هذا بالموضوع و. ليست جزء من المنهج الدراسي الحالي ز. من الصعب علي تغيير عاداتي وسلوكي ح. أخرى، يرجى ذكرها

23. هل لديك اية اضافات او تعليقات. من فضلك اذكرها:

شكرا لكم



Survey about citizen perception of climate change

27.2.2012

Survey about citizen perception regard climate change

Dear Citizen \ Resident

My name is Abdulrahman Alsuliman and I am currently working on a PhD research about Climate Change and environmental aspects funded by Cardiff University. Most of this study is being carried out in Saudi Arabia, and you randomly selected as a sampling method to ensure a representative picture of citizen's views. Your help and assistance in completing this questionnaire will be invaluable for the study.

If you agree to participate, all the information you provide will be completely anonymous and confidential.

The questionnaire starts by asking you about a range of environmental issues that may affect you. Your perception and how you feel about climate change and the environmental problems is important to this study. It shouldn't take long to complete, and I hope you'll enjoy it.

Once you've completed the questionnaire, please could you return it to me in the enclosed stamped, addressed envelope.

At the end of this research, key findings from the survey will be submitted to the university. This survey will provide a valuable insight into how people like you feel about climate change and environmental problems and how you feel they should be tackled.

Should you have any queries or concerns about the survey, please do not hesitate to contact me on the address below.

Thank you very much for your help.

Yours faithfully,

Abdulrahman Alsuliman
Candidate PhD in Cardiff University

Cardiff University, School of Engineering

Tel: +44(07)405909442

Email: ALSULIMANAA@cardiff.ac.uk

Office #: S 3.18

Queen's Building, Cardiff

CF24 3AA



Survey about citizen perception of climate change

27.2.2012

Section 1: Demographic variables:

1. Age:	
<input type="checkbox"/> <18	<input type="checkbox"/> 45-54
<input type="checkbox"/> 19-24	<input type="checkbox"/> 55-59
<input type="checkbox"/> 25-35	<input type="checkbox"/> 60-64
<input type="checkbox"/> 35-44	<input type="checkbox"/> 65+
2. Gender	
<input type="checkbox"/> Female	<input type="checkbox"/> Male
3. Highest qualification Please tell me which, if any, is the highest educational or professional qualification you have obtained.	
<input type="checkbox"/> Primary school	<input type="checkbox"/> Intermediate school
<input type="checkbox"/> High school	<input type="checkbox"/> Certificate/Diploma
<input type="checkbox"/> Advanced Diploma	<input type="checkbox"/> Bachelor Degree or equivalent (=NVQ4)
<input type="checkbox"/> Masters/PhD or equivalent	<input type="checkbox"/> No formal qualifications
<input type="checkbox"/> Still studying	<input type="checkbox"/> Don't know
<input type="checkbox"/> Other, please specify: _____	
4. What is your occupation? _____	
5. Working status	
<input type="checkbox"/> Working – full time (30+ hours per week)	<input type="checkbox"/> Working – part time
<input type="checkbox"/> Student	<input type="checkbox"/> Not working
<input type="checkbox"/> Not working – disabled	<input type="checkbox"/> Not working – retired
<input type="checkbox"/> Other, please specify: _____	
6. Please indicate your approximate income per month?	
<input type="checkbox"/> Up to 3,000 (Very low)	<input type="checkbox"/> 3,001 – 6,000 (Low)
<input type="checkbox"/> 6,001 – 9,000 (Medium)	<input type="checkbox"/> 9,001 – 12,000 (Above medium)
<input type="checkbox"/> 12,000- 25,000 (High)	<input type="checkbox"/> More than 25,000 (Very high)
<input type="checkbox"/> No income	<input type="checkbox"/> Prefer not to say
7. Number of children under 16 years of age in the household?	
<input type="checkbox"/> None	<input type="checkbox"/> 1
<input type="checkbox"/> 2	<input type="checkbox"/> 3
<input type="checkbox"/> 4 or more	
8. How long have you lived in the area?	
<input type="checkbox"/> Less than 6 months	<input type="checkbox"/> 6 months –less than 1 year
<input type="checkbox"/> 1 year – less than 3 years	<input type="checkbox"/> 3 – less than 5 years
<input type="checkbox"/> 5 – less than 7 years	<input type="checkbox"/> 7 – less than 10 years
<input type="checkbox"/> 10 years or more	<input type="checkbox"/> N/A



Survey about citizen perception of climate change

27.2.2012

Section2. Climate Change Citizen Perception

1. Are you a member of any environmental organisations (e.g. Friends of the Earth, Worldwide Fund for Nature)?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Yes</td> <td style="width: 20%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>																																																				
Yes	<input type="checkbox"/>																																																								
No	<input type="checkbox"/>																																																								
2. Have you heard of "climate change"?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Yes</td> <td style="width: 20%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>																																																				
Yes	<input type="checkbox"/>																																																								
No	<input type="checkbox"/>																																																								
3. What do you know about it? _____ _____ _____																																																									
4. How important is the issue of climate change to you personally? <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/> Extremely important <input type="checkbox"/> Very important </div> <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/> Fairly important <input type="checkbox"/> Not very important </div> <div style="display: flex; justify-content: space-around;"> <input type="checkbox"/> Not at all important </div>																																																									
5. Have you personally noticed any signs of climate change during your lifetime?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Yes</td> <td style="width: 20%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>																																																				
Yes	<input type="checkbox"/>																																																								
No	<input type="checkbox"/>																																																								
If yes, please specify _____																																																									
6. Do you feel the pattern of weather is generally changing?	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Yes</td> <td style="width: 20%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>																																																				
Yes	<input type="checkbox"/>																																																								
No	<input type="checkbox"/>																																																								
If yes, please specify _____																																																									
7. Who do you think is affected by the climate change?																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="width: 70%;"></th> <th style="width: 7.5%;">Strongly agree</th> <th style="width: 7.5%;">Tend to agree</th> <th style="width: 7.5%;">Neither agree nor disagree</th> <th style="width: 7.5%;">Tend to disagree</th> <th style="width: 7.5%;">Strongly disagree</th> <th style="width: 7.5%;">Don't know</th> </tr> </thead> <tbody> <tr> <td>a. My local area is likely to be affected by climate change</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>b. Climate change will mostly affect developing countries</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>c. Climate change is likely to have a big impact on people like me</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>d. Saudi Arabia region could be affected by a climate change?</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>e. Climate change effect only developed countries</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>f. Climate change is global problem and will affect all countries of the world</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>g. Climate change will mostly affect areas that are far away from here</td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </tbody> </table>		Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	Don't know	a. My local area is likely to be affected by climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	b. Climate change will mostly affect developing countries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	c. Climate change is likely to have a big impact on people like me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	d. Saudi Arabia region could be affected by a climate change?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	e. Climate change effect only developed countries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	f. Climate change is global problem and will affect all countries of the world	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	g. Climate change will mostly affect areas that are far away from here	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	Don't know																																																			
a. My local area is likely to be affected by climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
b. Climate change will mostly affect developing countries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
c. Climate change is likely to have a big impact on people like me	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
d. Saudi Arabia region could be affected by a climate change?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
e. Climate change effect only developed countries	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
f. Climate change is global problem and will affect all countries of the world	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
g. Climate change will mostly affect areas that are far away from here	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>																																																			
8. Do you think climate change is something that is affecting or is going to affect you, personally?																																																									
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 80%;">Yes</td> <td style="width: 20%; text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>No</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> <tr> <td>I don't know</td> <td style="text-align: center;"><input type="checkbox"/></td> </tr> </table>		Yes	<input type="checkbox"/>	No	<input type="checkbox"/>	I don't know	<input type="checkbox"/>																																																		
Yes	<input type="checkbox"/>																																																								
No	<input type="checkbox"/>																																																								
I don't know	<input type="checkbox"/>																																																								
If yes , please specify _____																																																									



Survey about citizen perception of climate change

27.2.2012

9. How concerned, if at all, are you about climate change in each following case:

Very concerned	Fairly concerned	Concerned	Not very concerned	Not at all concerned	Don't know
----------------	------------------	-----------	--------------------	----------------------	------------

- a. Considering any potential effects of climate Change which there might be on you personally
- b. Considering any potential effects of climate Change there might be on society in general
- c. How concerned, if at all, are you about climate change, sometimes referred to as 'global warming'

10. When, if at all, do you think Saudi Arabia will start feeling the effects of climate change?

- a. We are already feeling the effects
- b. In the next 10 years
- c. In the next 25 years
- d. In the next 50 years
- e. In the next 100 years
- f. Beyond the next 100 years
- g. Never
- h. Don't know
- i. No Opinion

11. With regards to your home and your local area, to what extent do you agree or disagree with the following statements?

Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	Don't know
----------------	---------------	----------------------------	------------------	-------------------	------------

- a. The place where I live is unique and distinctive
- b. I feel like I belong to the community here
- c. If I were to move I would like to live in a similar place to where I live now
- d. I am proud to live in this area
- e. Living here helps me to live my life the way I want to
- f. This place reminds me of my childhood

12. Have you undertaken any of the following actions in an attempt to solve a problem affecting your local area?

Regularly	Occasionally	Never	N/A
-----------	--------------	-------	-----

- a. Contacted a local Municipality
- b. Attended a public meeting
- c. Contacted the appropriate organisation to deal with the problem
- d. Contact an Assembly Member (AM)
- e. Attended a protest meeting or joined an action group
- f. Helped organise a petition
- g. Contacted a local radio station, television station or newspaper



Survey about citizen perception of climate change

27.2.2012

13. To what extent do you agree or disagree with each of the following statements about Climate change?

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	Don't know
a. There are risks to people in Saudi Arabia from climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. I have mixed feelings about climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. I have strong opinions about climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I trust Saudi Government to take appropriate action against climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. I am uncertain that climate change are really happening	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. I think of myself as someone who is very concerned with environmental issues	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. I identify with the aims of environmental groups such as Greenpeace and Friends of the Earth	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

14. Which of the following do you think can be cause of climate change? (You may choose as many as you like)

- a. CO2/carbon emissions
- b. Emissions/fumes/waste gases
- c. Greenhouse gases
- d. Cars/traffic/exhaust fumes
- e. Industry/factory emissions
- f. CFCs/aerosols
- g. Fossil fuel consumption/burning
- h. Radioactive waste
- i. Chemicals
- j. Using up the earth's resources
- k. The hole in the ozone layer
- l. Natural - earth's cycles/weather patterns
- m. Destruction of rainforest/trees
- n. Others, please specify _____

The climate change/ global warming in general causes by:

- a. Climate change is entirely caused by natural processes: earth quake, volcano eruption.....
- b. Climate change is mainly caused by natural processes
- c. Climate change is partly caused by natural processes and partly caused by human activity: fossil fuel energy use
- d. Climate change is mainly caused by human activity
- e. Climate change is entirely caused by human activity
- f. I think there is no such thing as climate change
- g. Don't know
- h. No opinion

15. Which one, if any, of these do you think should be mainly responsible for taking action against climate change?

- a. Individuals and their families
- b. Environmental groups
- c. Local authorities
- d. National Governments
- e. The international community
- f. International organisations (e.g. the UN)
- g. Business and industry
- h. Don't know
- i. Other, please specify _____



Survey about citizen perception of climate change

27.2.2012

16. To what extent do you agree or disagree with each of the following statements about climate change?

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree	Don't know
a. I can personally help to reduce climate change by changing my behaviour	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. It is hard to take action against climate change even if you want to	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. It is my responsibility to help to do something about climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. I feel a sense of urgency to change my behaviour to help to reduce climate change	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

17. What is the portion that you willing to pay more on cost of living if that help to tackle climate change?

- 2% More
 5% More
 10% More
 15% More
 20% More
 More than 20%
 None

18. Please tick the best method and teaching aids would assist you in dealing with climate change program and make this resource available to you?

- a. Internet – material available to be downloaded
 b. TV programs
 c. Radios
 d. Information brochures
 e. An education and information movies and videos
 f. Student Quizzes
 g. List of education websites
 h. email
 i. Mailing a hard copy
 g. Other, please specify _____

19. Which the media you think appropriate and good to provide you by the necessarily knowledge about climate change? Tick as many as you feel apply:

- a. Internet
 b. Television
 c. Radio
 d. Newspaper
 e. Specialist publications/academic journals
 f. Environmental groups (e.g. Worldwide Fund for Nature)
 g. School/ college/ university
 h. Government agencies/ information
 i. Public libraries
 j. Friends/ family
 k. Local council or municipality
 l. business or industry farms
 m. energy suppliers
 n. Other, please specify _____



Survey about citizen perception of climate change

27.2.2012

20. By ticking one box on each row please indicate how much you would trust information about climate change if you heard it from...

	A lot	A little	Not very much	Not at all	Can't choose
a. A family member or a friend	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. A scientist	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. The government	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. An energy supplier	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. An environmental organisation (e.g. Worldwide Fund for Nature)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. The media: (i.e. television, radio, newspapers)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

21. Are there barriers to you regards climate change programs?

Yes	<input type="checkbox"/>
No	<input type="checkbox"/>

22. What is the nature of these barriers if found?

- a. Lack of financial resources or rise up cost
- b. lack of alternatives
- c. Lack of political laws
- c. Time pressure
- d. My knowledge of the subject matter
- e. Not part of the current curriculum
- f. is difficult to change habit and my behaviour
- g. Other, *please specify* _____

Q23 Please add below any more information or quires you would like to give:

Thanks



Survey user evaluation of the innovative online social networks model
to encourage individual engagement in sustainable lifestyle

28.12.2013

Survey about citizen opinion about the innovative online social networks model

Dear Citizen \ Resident

My name is Abdulrahman Alsuliman and the second part of this study regards to have citizen opinions about the research model, "the innovative online social networks model" to encourage individual engagement in sustainable lifestyle act, which is funded by Cardiff University.

Your participation as a volunteer is appreciated were you randomly selected as a sampling method to ensure a representative picture of citizen's views. Your help and assistance in completing this questionnaire will be invaluable for the study.

If you agree to participate, all the information you provide will be completely anonymous and confidential.

The questionnaire starts by asking you about a range of questions related to validate the deferent aspects regards using this model to assist you to engage in sustainability issues and help you to adopt sustainable lifestyle to serve environment.

Your opinion and how you feel about the functionality of the framework and the system is important to this study. It shouldn't take long to complete, and I hope you'll enjoy it.

At the end of this research, key findings from the survey will be submitted to the university. This survey will provide a valuable insight into how people like you feel about the validity of the model to cope climate change and environmental problems.

Should you have any queries or concerns about the survey, please do not hesitate to contact me on the address below.

Thank you very much for your help.

Yours faithfully,

Abdulrahman Alsuliman
Candidate PhD in Cardiff University

Cardiff University, School of Engineering

Tel: +44(07)405909442

Email: ALSULIMANAA@cardiff.ac.uk

Office #: S 3.18

Queen's Building, Cardiff

CF24 3AA



Survey user evaluation of the innovative online social networks model
to encourage individual engagement in sustainable lifestyle

28.12.2013

Section1: Demographic variables:

<p>1. Age:</p> <p><input type="checkbox"/> <18 <input type="checkbox"/> 19-24 <input type="checkbox"/> 25-35 <input type="checkbox"/> 35-44 <input type="checkbox"/> 45-54 <input type="checkbox"/> 55-59 <input type="checkbox"/> 60-64 <input type="checkbox"/> 65+</p>
<p>2. Gender</p> <p><input type="checkbox"/> Female <input type="checkbox"/> Male</p>
<p>3. Highest qualification</p> <p>Please tell me which, if any, is the highest educational or professional qualification, you have obtained.</p> <p><input type="checkbox"/> Primary school <input type="checkbox"/> Intermediate school</p> <p><input type="checkbox"/> High school <input type="checkbox"/> Certificate/Diploma</p> <p><input type="checkbox"/> Advanced Diploma <input type="checkbox"/> Bachelor's Degree or equivalent (=NVQ4)</p> <p><input type="checkbox"/> Master's/Doctoral degree or equivalent <input type="checkbox"/> No formal qualifications</p> <p><input type="checkbox"/> Still studying <input type="checkbox"/> Don't know</p> <p><input type="checkbox"/> Other, please specify: _____</p>
<p>4. What is your occupation? _____</p>
<p>5. Working status</p> <p><input type="checkbox"/> Working – full time (30+ hours per week) <input type="checkbox"/> Working – part time</p> <p><input type="checkbox"/> Student <input type="checkbox"/> Not working</p> <p><input type="checkbox"/> Not working – disabled <input type="checkbox"/> Not working – retired</p> <p><input type="checkbox"/> Other, please specify: _____</p>
<p>6. Please indicate your approximate income per month?</p> <p><input type="checkbox"/> Less than 3,000 (Very low) <input type="checkbox"/> 3,001 – 6,000 (Low)</p> <p><input type="checkbox"/> 6,001 – 9,000 (Medium) <input type="checkbox"/> 9,001 – 12,000 (Above medium)</p> <p><input type="checkbox"/> 12,001– 25,000 (High) <input type="checkbox"/> More than 25,000 (Very high)</p> <p><input type="checkbox"/> No income <input type="checkbox"/> Prefer not to say</p>
<p>7. Number of children under 16 years of age in the household?</p> <p><input type="checkbox"/> None <input type="checkbox"/> 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 or more</p>
<p>8. How long have you lived in the area?</p> <p><input type="checkbox"/> Less than 6 months <input type="checkbox"/> 6 months –less than 1 year</p> <p><input type="checkbox"/> 1 year – less than 3 years <input type="checkbox"/> 3 – less than 5 years</p> <p><input type="checkbox"/> 5 – less than 7 years <input type="checkbox"/> 7 – less than 10 years</p> <p><input type="checkbox"/> 10 years or more <input type="checkbox"/> N/A</p>



Survey user evaluation of the innovative online social networks model to encourage individual engagement in sustainable lifestyle

28.12.2013

Section2. Role of Social Network System

1. With regards to your cognitive, to what extent do you agree with the following statement?					
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
a. Useful, Helpful: I am able to take positive decisions regarding the environment based on the information presented on this 'Blended Social Network System'; it is useful and helpful information.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Learning and full information: I feel like I learn and have a tremendous amount of information about the environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Inform: The Blended System is informational which inform me about environmental issues in appropriate way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. With regards to your affective, to what extent do you agree with the following statement?					
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
a. Mentality and emotionally effect: When I am using the Blended System I get mentally and emotionally involved in the community of sustainability objectives, mission, and goal.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Satisfying and interesting: The Blende System's social network is satisfying and interesting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Enjoyment, pleasure and exiting: The Blende System's social network is exiting and enjoyment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. With regards to your Change behaviour Intent, to what extent do you agree or disagree with the following statements?					
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
a. Attitude: After using the Blended System I feel positive attitude towards sustainable lifestyle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Subjective Norm (SN): After using the Blended System I thought I ought to be conserving environment.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Perceived Behavioural Control (PBC): - After using the Blended System I thought that it will be enhance my capability of conserving environment. [Behavioural control]. - "I know how I can save environment and able to do". [Know and able to do].	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Values: After using the Blended System I feel improve my values toward environmental issues.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
e. Awareness of Consequences (AC): "The greenhouse effect is a problem for society".	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
f. Ascription of Responsibility (AR): "I take joint responsibility for the depletion of my impact on environment"	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
g. Personal Norm (PN), Obligation: "I feel morally obliged to participate with collective action to help environment".	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
h. Habit: To what extent you thought, "the Blended System can assist people to change negative habit".	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Survey user evaluation of the innovative online social networks model to encourage individual engagement in sustainable lifestyle

28.12.2013

4. To what extent do you agree or disagree with each of the following statements about effect Social Network System on your Intent to engage in community of sustainability?					
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
a. Using environmental choices and alternatives: I would buy friendly environmental products/services utilise the assistance of the Blended System in the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Doing action: In the future, I will actively seek to take environmental action and adopt sustainable lifestyle.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Recommending to friends: I will recommend the pro-environmental action to my family and friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Section3. Role of Information Communication Technology, ICT

ICT: Role of Context-Aware Technique, CAT					
3.1. With regards to your cognitive, Affective, intent to change behaviour and preparedness to engagement toward community of sustainability to what extent do you agree with the following statement?					
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
a. Cognitive:[Informational; Useful; Helpful] The information presented through the Context-Aware Technique were informational, useful and helpful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Affective: [Mentality and emotionally effect] The Context-Aware Technique enhance mentally and emotionally to be involved toward community of sustainability objectives, mission, and goal?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Intent to change behaviour: I thought that the Context-Aware Technique can assist me to change negative behaviour and habit towards sustainable lifestyle?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
d. Preparedness to engagement: Rely on the Context-Aware Technique information and facts presented; in the future, I will actively seek and recommend pro-environmental action and adopt sustainable lifestyle?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ICT: Role of Location-Based Technique, LBT					
3.2. With regards to your cognitive, Affective, intent to change behaviour and preparedness to engagement toward community of sustainability to what extent do you agree with the following statement?					
	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
a. Cognitive:[Informational; Useful; Helpful] The information presented through the Location-Based Technique were informational, useful and helpful?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
b. Affective: [Mentality and emotionally effect] The Location-Based Technique enhance mentally and emotionally to be involved toward community of sustainability objectives, mission, and goal?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
c. Intent to change behaviour: I thought that the Location-Based Technique can assist me to change negative behaviour and habit towards sustainable lifestyle?	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>



Survey user evaluation of the innovative online social networks model to encourage individual engagement in sustainable lifestyle

28.12.2013

<p>d. Preparedness to engagement: Rely on the Location-Based Technique information and facts presented; In the future, I will actively seek and recommend pro-environmental action and adopt sustainable lifestyle?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
--	--------------------------	--------------------------	--------------------------	--------------------------	--------------------------

ICT: Role of Individual's Social Marketing, ISM

3.3. With regards to your cognitive, Affective, intent to change behaviour and preparedness to engagement toward community of sustainability to what extent do you agree with the following statement?

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
<p>a. Cognitive:[Informational; Useful; Helpful] The information presented through the Individual's Social Marketing Module were informational, useful and helpful?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>b. Affective: [Mentality and emotionally effect] The Individual's Social Marketing Module enhance mentally and emotionally to be involved toward community of sustainability objectives, mission, and goal?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>c. Intent to change behaviour: I thought that the Individual's Social Marketing Module can assist me to change negative behaviour and habit towards sustainable lifestyle?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>d. Preparedness to engagement: Rely on the Individual's Social Marketing Module information and facts presented; In the future, I will actively seek and recommend pro-environmental action and adopt sustainable lifestyle?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

ICT: Role of Social Learning Technique, SLT

3.4. With regards to your cognitive, Affective, intent to change behaviour and preparedness to engagement toward community of sustainability to what extent do you agree with the following statement?

	Strongly agree	Tend to agree	Neither agree nor disagree	Tend to disagree	Strongly disagree
<p>a. Cognitive:[Informational; Useful; Helpful] The information presented through the Social Learning Technique were informational, useful and helpful?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>b. Affective: [Mentality and emotionally effect] The Social Learning Technique enhance mentally and emotionally to be involved toward community of sustainability objectives, mission, and goal?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>c. Intent to change behaviour: [Change behaviour] I thought that the Social Learning Technique can assist me to change negative behaviour and habit towards sustainable lifestyle?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
<p>d. Preparedness to engagement: Rely on the Social Learning Technique information and facts presented; In the future, I will actively seek and recommend pro-environmental action and adopt sustainable lifestyle?</p>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Thanks

References

- AAHEIM, A., AMUNDSEN, H., DOKKEN, T. & WEI, T. 2012. Impacts and adaptation to climate change in European economies. *Global Environmental Change*, 22, 959-968.
- AARTS, H. & DIJKSTERHUIS, A. 2000. Habits as knowledge structures: automaticity in goal-directed behavior. *Journal of personality and social psychology*, 78, 53.
- ABOWD, G. D., DEY, A. K., BROWN, P. J., DAVIES, N., SMITH, M. & STEGGLES, P. Towards a better understanding of context and context-awareness. *Handheld and ubiquitous computing*, 1999. Springer, 304-307.
- ADGER, W. N. & KELLY, P. M. 1999. Social vulnerability to climate change and the architecture of entitlements. *Mitigation and Adaptation Strategies for Global Change*, 4, 253-266.
- ADOMSSANT, M., GODEMANN, J. & MICHELSEN, G. 2007. Transferability of approaches to sustainable development at universities as a challenge. *International Journal of Sustainability in Higher Education*, 8, 385-402.
- AGARWAL, R. & PRASAD, J. 1999. Are individual differences germane to the acceptance of new information technologies? *Decision sciences*, 30, 361-391.
- AGRESTI, A. & FINLAY, B. 1997. *Statistical methods for the social sciences*, Upper Saddle River, N.J., Prentice Hall.
- AIELLO-LAMMENS, M. E., CHU-AGOR, M. L., CONVERTINO, M., FISCHER, R. A., LINKOV, I. & RESIT AKÇAKAYA, H. 2011. The impact of sea-level rise on Snowy Plovers in Florida: integrating geomorphological, habitat, and metapopulation models. *Global Change Biology*, 17, 3644-3654.
- AJZEN, I. 1985. *From intentions to actions: A theory of planned behavior*, Springer.
- AJZEN, I. 1991. The theory of planned behavior. *Organizational behavior and human decision processes*, 50, 179-211.
- AJZEN, I. & FISHBEIN, M. 1980. Understanding attitudes and predicting social behaviour.
- AL ZAWAD, F. M. 2008. Impacts of Climate Change on Water Resources in Saudi Arabia. *The 3rd International Conference on Water Resources and Arid Environments (2008) and the 1st Arab Water Forum*.
- ALEQTESADAH. 2011. *Per capita, Saudi Arabia's carbon emissions .. Fourth in the world* [Online]. Riyadh: Aleqtesadah Press. Available: http://www.aleqt.com/2011/12/14/article_606960.html [Accessed 19-6-2012 2012].
- ALMAZROUI, M. 2011. Sensitivity of a regional climate model on the simulation of high intensity rainfall events over the Arabian Peninsula and around Jeddah (Saudi Arabia). *Theoretical and Applied Climatology*, 104, 261-276.
- ALMAZROUI, M. 2012. The lifecycle of extreme rainfall events over western Saudi Arabia simulated by regional climate model: case study of November 1996. *Atmosfera* 25.
- ALMAZROUI, M., ISLAM, M. N., JONES, P. D., ATHAR, H. & RAHMAN, M. A. 2012. Recent climate change in the Arabian Peninsula: Seasonal rainfall and temperature climatology of Saudi Arabia for 1979–2009. *Atmospheric Research*, 111, 29-45.
- ALPERT, P., OSETINSKY, I., ZIV, B. & SHAFIR, H. 2004. Semi-objective classification for daily synoptic systems: application to the eastern Mediterranean climate change. *International Journal of Climatology*, 24, 1001-1011.
- ALRASHIDI, M., LONG, P. R., O'CONNELL, M., SHOBRAK, M. & SZE'KELY, T. 2011. Use of remote sensing to identify suitable breeding habitat for the Kentish plover and estimate population size along the western coast of Saudi Arabia. *Wader Study Group Bull.*, 111, 32–39.
- ALTERNATIVE AND RENEWABLE ENERGY. 2011. *The concentration of greenhouse gas in the atmosphere continues to grow* [Online]. Alternative and renewable energy website. Available: <http://www.mojtamai.com/taqa/-الحرار ي-مستوى-تركيز-الغازات-المسببة-للاحتباس-الحراري-في-الجو-في-ارتفاع-مستمر> [Accessed 12-9-2012].
- AME. 2013. *Modern tech helps raise internet use in Saudi Arabia* [Online]. Available: <http://www.ameinfo.com/modern-tech-helps-raise-internet-saudi-343033> [Accessed 6-6-2013].
- AMERICAN PSYCHOLOGICAL ASSOCIATION 2010. Psychology and Global Climate Change. APA; addressing a multifaceted phenomenon and set of challenges; A Report of the American Psychological Association
- Task Force on the Interface Between Psychology & Global Climate Change. APA.
- AMERICAN PSYCHOLOGICAL ASSOCIATION, T. F. O. T. I. B., PSYCHOLOGY GLOBAL CLIMATE, CHANGE, SWIM, JANET. 2009. *Psychology and global climate change addressing a multi-faceted phenomenon and set of challenges* [Online]. Washington, DC: American

- Psychological Association]. Available: <http://www.apa.org/releases/climate-change.pdf> [Accessed 11 2012].
- ANABLE, J., LANE, B. & KELAY, T. 2006. An evidence base review of public attitudes to climate change and transport behaviour. *London, Department for Transport*.
- ANDERSON, J. C. & GERBING, D. W. 1988. Structural equation modeling in practice: A review and recommended two-step approach. *Psychological bulletin*, 103, 411.
- ANDREASEN, A. 1995. Marketing social change. *San Francisco*.
- ANDREASEN, A. R. 2002. Marketing social marketing in the social change marketplace. *Journal of Public Policy & Marketing*, 21, 3-13.
- ANDREWS, D., PREECE, J. & TUROFF, M. 2002. A Conceptual Framework for Demographic Groups Resistant to On-line Community Interaction. *International Journal of Electronic Commerce*, 9-24.
- ANDREWS, D. C. 2002. Audience-Specific Online Community Design. *COMMUNICATIONS- ACM*, 45, 64-68.
- ANGUELOVSKI, I. & CARMIN, J. 2011. Something borrowed, everything new: innovation and institutionalization in urban climate governance. *Current Opinion in Environmental Sustainability*, 3, 169-175.
- ARDICHVILI, A., VAUGHN, P. & WENTLING, T. 2003. Motivation and barriers to participation in virtual knowledge-sharing communities of practice. *Journal of Knowledge Management*, 7, 64-77.
- ARMITAGE, C. J. & CONNER, M. 2001. Efficacy of the theory of planned behaviour: A meta-analytic review. *British Journal of Social Psychology*, 40, 471-499.
- ARROW KENNETH, J. 2007. Global Climate Change: A Challenge to Policy. *The Economists' Voice*.
- ASMAR, S. 2009. Culture of sustainability: measuring sustainable lifestyles at the college level. *Santa Clara, California: Markkula Center for Applied Ethics*.
- ASRAR, G. R., RYABININ, V. & DETEMMERMAN, V. 2012. Climate science and services: Providing climate information for adaptation, sustainable development and risk management. *Current Opinion in Environmental Sustainability*, 4, 88-100.
- ASSAEL, H. & KEON, J. 1982. Nonsampling vs. sampling errors in survey research. *The Journal of Marketing*, 114-123.
- AVISON, D. E. & PRIES-HEJE, J. 2005. *Research in information systems : a handbook for research supervisors and their students*, Amsterdam, Elsevier/Butterworth-Heinemann.
- AXELROD, L. J. & LEHMAN, D. R. 1993. Responding to environmental concerns: What factors guide individual action? *Journal of Environmental Psychology*, 13, 149-159.
- BAGOZZI, R. P. 1984. A Prospectus for Theory Construction in Marketing. *Journal of Marketing*, 48.
- BAKER, J. D., LITTNAN, C. L. & JOHNSTON, D. W. 2006. Potential effects of sea level rise on the terrestrial habitats of endangered and endemic megafauna in the Northwestern Hawaiian Islands. *Endangered Species Research*, 2, 21-30.
- BAKER, T. L. 1999. *Doing social research*, Boston, McGraw-Hill College.
- BALASUBRAMANIAN, S. & MAHAJAN, V. 2001. The Economic Leverage of the Virtual Community. *Int. J. Electron. Commerce*, 5, 103-138.
- BALL-ROKEACH, S. J. & DEFLEUR, M. L. 1976. A dependency model of mass-media effects. *Communication research*, 3, 3-21.
- BAMBERG, S. 2006. Is a Residential Relocation a Good Opportunity to Change People's Travel Behavior? Results From a Theory-Driven Intervention Study. *Environment and Behavior*, 38, 820-840.
- BAMBERG, S., AJZEN, I. & SCHMIDT, P. 2003. Choice of travel mode in the theory of planned behavior: The roles of past behavior, habit, and reasoned action. *Basic and applied social psychology*, 25, 175-187.
- BAMBERG, S., FUJII, S., FRIMAN, M. & GÄRLING, T. 2009. Evaluation of soft transport policy measures based on behavioural theory. *Manuscript submitted for publication*.
- BAMBERG, S. & MÖSER, G. 2007. Twenty years after Hines, Hungerford, and Tomera: A new meta-analysis of psycho-social determinants of pro-environmental behaviour. *Journal of Environmental Psychology*, 27, 14-25.
- BAMBERG, S. & SCHMIDT, P. 2003. Incentives, morality, or habit? Predicting students' car use for university routes with the models of Ajzen, Schwartz, and Triandis. *Environment and Behavior*, 35, 264-285.
- BANDURA, A. & MCCLELLAND, D. C. 1977. Social learning theory.
- BARCLAY, D., HIGGINS, C. & THOMPSON, R. 1995. The partial least squares (PLS) approach to causal modeling: personal computer adoption and use as an illustration. *Technology studies*, 2, 285-309.

- BARR, S. 2003. Strategies for sustainability: citizens and responsible environmental behaviour. *Area*, 35, 227-240.
- BARR, S., GILG, A. & SHAW, G. 2006. Promoting Sustainable Lifestyles: a social marketing approach. Final Summary Report.
- BARR, S., GILG, A. & SHAW, G. 2011. Citizens, consumers and sustainability: (Re)Framing environmental practice in an age of climate change. *Global Environmental Change*, 21, 1224-1233.
- BASKERVILLE, R. & WOOD-HARPER, A. T. 1998. Diversity in information systems action research methods. *European Journal of Information Systems*, 7, 90-107.
- BAYM, N. K. 1997. Interpreting soap operas and creating community: Inside an electronic fan culture. In: KIESLER, S. (ed.) *Culture of the Internet*. Mahwah, N.J.: Lawrence Erlbaum Associates, Publishers.
- BBC NEWS. 2012. *Carbon emissions are 'too high' to curb climate change* [Online]. BBC. Available: <http://www.bbc.co.uk/news/science-environment-20556703> [Accessed 4-12-2012].
- BEM, D. J. 1972. Self-perception theory. In: Berkowitz, L. (Ed.), *Advances in experimental social psychology*. Volume 6. New York: Academic Press.
- BERG, B. L. & LUNE, H. 2004. *Qualitative research methods for the social sciences*, Pearson Boston.
- BERNARD, H. R. 2011. *Research methods in anthropology*, Rowman Altamira.
- BETSILL, M. 2001. Mitigating Climate Change in US Cities: Opportunities and obstacles. *Local Environment*, 6, 393-406.
- BIBBINGS, J. 2004. A High Price to Pay? . Cardiff: Welsh Consumer Council.
- BICKERSTAFF, K., SIMMONS, P. & PIDGEON, N. 2006. Public perceptions of risk, science and governance: main findings of a qualitative study of six risk cases. Technical Report 06.
- BIEMER, P. P. & LYBERG, L. E. 2003. *Introduction to survey quality*, John Wiley & Sons.
- BIRKMANN, J. 2011. First- and second-order adaptation to natural hazards and extreme events in the context of climate change. *Natural Hazards*, 58, 811-840.
- BLACK, J. S., STERN, P. C. & ELWORTH, J. T. 1985. Personal and contextual influences on household energy adaptations. *Journal of Applied Psychology*, 70, 3.
- BLACK, R. 2006. *Climate change 'real and severe'* [Online]. London: BBC news. Available: <http://news.bbc.co.uk/1/hi/sci/tech/5150816.stm> [Accessed 11 2012 11 2012].
- BLAKE, J. 1999. Overcoming the 'Value-Action Gap' in Environmental Policy: tensions between national policy and local experience. *Local Environment*, 4, 257-278.
- BLANCHARD, A. L. 2008. Testing a model of sense of virtual community. *Comput. Hum. Behav. Computers in Human Behavior*, 24, 2107-2123.
- BLANCHARD, A. L. & MARKUS, M. L. 2004. The experienced "sense" of a virtual community: characteristics and processes. *SIGMIS Database*, 35, 64-79.
- BLASS, E., JASMAN, A. & SHELLEY, S. 2010. Visioning 2035: The future of the higher education sector in the UK. *Futures*, 42, 445-453.
- BLOK, A. 2007. Experts on public trial: on democratizing expertise through a Danish consensus conference. *Public Understanding of Science*, 16, 163-182.
- BOARDMAN, B. & DARBY, S. J. 2000. *Effective advice : energy efficiency and the disadvantaged*, Oxford, Environmental Change Institute, University of Oxford.
- BODEN, T. A., MARLAND, G., ANDRES, R.J., 2009. Global, regional, and national fossil fuel CO2 emissions. *TN: Carbondioxide Information Analysis Center, Oak Ridge, Oak*.
- BOLLEN, K. A. 1989. *Structural equations with latent variables*, New York, Wiley.
- BONAIUTO, M. & BONNES, M. 2002. Residential satisfaction in the urban environment within the UNESCO-MAB Rome Project. *Jl Aragonés, G. Francescato, T. Garling*, Residential Environments. Choice Satisfaction and Behavior., 101-133.
- BOOCH, G., RUMBAUGH, J. & JACOBSON, I. 2011. *The unified modeling language user guide*, Upper Saddle River, N.J. [etc.], Addison-Wesley.
- BORD, R. J., FISHER, A. & O'CONNOR, R. E. 1998. Public perceptions of global warming: United States and international perspectives. *Climate Research*, 11, 75-84.
- BORD, R. J., O'CONNOR, R. E. & FISCHER, A. 2000. In what sense does the public need to understand global climate change? *Public Understanding of Science*, 9, 205-218.
- BORN, A. C. I. 2010. Eco-Products. *A Simple Path to Sustainability: Green Business Strategies for Small and Medium-sized Businesses*, 35.
- BOSTROM, A., MORGAN, M. G., FISCHHOFF, B. & READ, D. 1994. What Do People Know About Global Climate Change? 1. Mental Models. *Risk Analysis*, 14, 959-970.
- BOSTROM, R. N. 1998. *Communication research*, Prospect Heights, Ill., Waveland Press.
- BOURDIEU, P. 1993. *Sociology in question*, Sage.

- BOYD, D. M. & ELLISON, N. B. 2007. Social Network Sites: Definition, History, and Scholarship. *Journal of Computer-Mediated Communication*, 13, 210-230.
- BOYD, E., GRIST, N., JUHOLA, S. & NELSON, V. 2009. Exploring Development Futures in a Changing Climate: Frontiers for Development Policy and Practice. *Development Policy Review*, 27, 659-674.
- BRANDON, G. & LEWIS, A. 1999. REDUCING HOUSEHOLD ENERGY CONSUMPTION: A QUALITATIVE AND QUANTITATIVE FIELD STUDY. *Journal of Environmental Psychology*, 19, 75.
- BRDICZKA, O., CROWLEY, J. L., REIGNIER, P. & INSTITUT NATIONAL POLYTECHNIQUE. 2007. *Learning situation models for providing context-aware services*. [s. n.].
- BREAKWELL, G. M. 1993. Social representations and social identity. *Papers on social representations*, 2, 198-217.
- BRECHIN, S. R. 2003. Comparative public opinion and knowledge on global climatic change and the Kyoto Protocol: the US versus the world? *International Journal of Sociology and Social Policy*, 23, 106-134.
- BRIFFA, K. R., JONES, P. D., SCHWEINGRUBER, F. H., SHIYATOV, S. G. & COOK, E. R. 1995. Unusual twentieth-century summer warmth in a 1,000-year temperature record from Siberia. *Nature*, 376, 156-159.
- BROHAN, P., KENNEDY, J. J., HARRIS, I., TETT, S. F. B. & JONES, P. D. 2006. Uncertainty estimates in regional and global observed temperature changes: A new data set from 1850. *J. Geophys. Res.*, 111, D12106.
- BROOKS, N., GRIST, N. & BROWN, K. 2009. Development Futures in the Context of Climate Change: Challenging the Present and Learning from the Past. *Development Policy Review*, 27, 741-765.
- BROUWER, W., KROEZE, W., CRUTZEN, R., DE NOOIJER, J., DE VRIES, N. K., BRUG, J. & OENEMA, A. 2011. Which intervention characteristics are related to more exposure to internet-delivered healthy lifestyle promotion interventions? A systematic review. *Journal of medical Internet research*, 13.
- BROUWER, W., OENEMA, A., CRUTZEN, R., DE NOOIJER, J., DE VRIES, N. K. & BRUG, J. 2008. An exploration of factors related to dissemination of and exposure to internet-delivered behavior change interventions aimed at adults: a Delphi study approach. *Journal of medical Internet research*, 10.
- BROWN, H. C. P., NKEM, J. N., SONWA, D. J. & BELE, Y. 2010. Institutional adaptive capacity and climate change response in the Congo Basin forests of Cameroon. *Mitigation and Adaptation Strategies for Global Change*, 15, 263-282.
- BROWN, J. S. & DUGUID, P. 2000. *The social life of information*, Boston, Harvard Business School Press.
- BROWN, J. S. & DUGUID, P. 2001. Knowledge and Organization: A Social-Practice Perspective. *Organization Science*, 12, 198-213.
- BROWN, J. S. & DUGUID, P. 2002. *The social life of information*, Harvard Business Press.
- BRULLE, R. J. 2010. From environmental campaigns to advancing the public dialog: Environmental communication for civic engagement. *Env. Commun. Environmental Communication*, 4, 82-98.
- BRYMAN, A. 2012. *Social research methods*, Oxford [etc.], Oxford University Press.
- BRYMAN, A. & BELL, E. 2003. *Business research methods*, Oxford; New York, Oxford University Press.
- BÜCHEL, B. & RAUB, S. 2002. Building Knowledge-creating Value Networks. *European Management Journal*, 20, 587-596.
- BURGESS, J., HARRISON, C. M. & FILIUS, P. 1998. Environmental communication and the cultural politics of environmental citizenship.
- BURNEY, S. A. & MAHMOOD, N. 2006. A brief History of Mathematical Logic and Applications of Logic in CS/IT. *Karachi University Journal of Science*, 34, 61-75.
- BURRELL, G. & MORGAN, G. 2011. *Sociological paradigms and organisational analysis : elements of the sociology of corporate life*, Farnham, Surrey, England; Burlington, Vt., U.S.A., Ashgate.
- BURSTEIN, F. & GREGOR, S. The systems development or engineering approach to research in information systems: An action research perspective. 1999.
- BURTON-JONES, A. & MESO, P. 2002. How good are these UML diagrams? An empirical test of the Wand and Weber good decomposition model. *Proceedings of the Twenty-Third International Conference on Information Systems*. Barcelona.
- BUTTLE, F. A. 1998. Word of mouth: understanding and managing referral marketing. *Journal of strategic marketing*, 6, 241-254.
- BYG, A. & SALICK, J. 2009. Local perspectives on a global phenomenon—Climate change in Eastern Tibetan villages. *Global Environmental Change*, 19, 156-166.
- CAMBRIDGE DICTIONARY 2008. *Cambridge advanced learner's dictionary*, Ernst Klett Sprachen.

- CAMPBELL, M. K., TESSARO, I., DEVELLIS, B., BENEDICT, S., KELSEY, K., BELTON, L. & SANHUEZA, A. 2002. Effects of a tailored health promotion program for female blue-collar workers: health works for women. *Preventive Medicine*, 34, 313-323.
- CANTIN, N. E., COHEN, A. L., KARNAUSKAS, K. B., TARRANT, A. M. & MCCORKLE, D. C. 2010. Ocean Warming Slows Coral Growth in the Central Red Sea. *Science*, 329, 322-325.
- CAPSTICK, S. & LEWIS, A. 2008. Personal carbon trading: perspectives from psychology and behavioural economics. *Institute for Public Policy Research, London*.
- CARMEN, T. 1999. CONSTRAINTS ON ENVIRONMENTAL BEHAVIOUR. *Journal of Environmental Psychology*, 19, 145-157.
- CARPENTER, S. R., FOLKE, C., NORSTRÖM, A., OLSSON, O., SCHULTZ, L., AGARWAL, B., BALVANERA, P., CAMPBELL, B., CASTILLA, J. C., CRAMER, W., DEFRIES, R., EYZAGUIRRE, P., HUGHES, T. P., POLASKY, S., SANUSI, Z., SCHOLLES, R. & SPIERENBURG, M. 2012. Program on ecosystem change and society: an international research strategy for integrated social-ecological systems. *Current Opinion in Environmental Sustainability*, 4, 134-138.
- CASALÓ, L., FLAVIÁN, C. & GUINALÍU, M. 2007. The impact of participation in virtual brand communities on consumer trust and loyalty: The case of free software. *ONLINE INFORMATION REVIEW*, 31, 775-792.
- CAVANA, R., DELAHAYE, B. L. & SEKERAN, U. 2001. *Applied business research: Qualitative and quantitative methods*, John Wiley & Sons Australia.
- CECEZ-KECMANOVIC, D. Engineering type information systems research: a discussion on its position and quality. Proceedings of the 5th Australian Information Systems Conference, 1994. 767-770.
- CENTRAL DEPARTMENT OF STATISTICS AND INFORMATION. 2011. *Total population according to 2011 Census (people)* [Online]. Riyadh: Central Department Of statistics & Information. Available: <http://www.cdsi.gov.sa/english/> [Accessed 12-9-2012].
- CENTRAL DEPARTMENT OF STATISTICS AND INFORMATION. 2012. *Key indicators* [Online]. Riyadh: Central Department Of statistics & Information. Available: <http://www.cdsi.gov.sa/english/> [Accessed 10-9-2012].
- CHANDLER, W., SECREST, T. J., LOGAN, J., SCHAEFFER, R., SZKLO, A. S., SCHULER, M. E., DADI, Z., KEJUN, Z., YUEZHONG, Z., HUAQING, X., SHUKLA, P. R., TUDELA, F., DAVIDSON, O., MWAKASONDA, S., SPALDING-FECHER, R., WINKLER, H., MUKHEIBIR, P. & ALPAN-ATAMER, S. 2002. Climate change mitigation in developing countries. Brazil, China, India, Mexico, South Africa, and Turkey.
- CHAWLA, L. 1999. Life Paths Into Effective Environmental Action. *The Journal of Environmental Education The Journal of Environmental Education* [Online], 31. Available: <http://www.ucdenver.edu/academics/colleges/ArchitecturePlanning/discover/centers/CYE/Publications/Documents/chawla%20-Life%20Paths%20Into%20Effective%20Environmental%20Action.pdf>.
- CHEN, W. & HIRSCHHEIM, R. 2004. A paradigmatic and methodological examination of information systems research from 1991 to 2001. *Information Systems Journal*, 14, 197-235.
- CHESTNEY, N. 2012. *Global Warming Report: Governments Not Meeting Emissions Reductions Pledges* [Online]. Reuters. Available: <http://blog.planetupads.com/tag/economic-systems/> [Accessed 4-9-2012].
- CHIN, W. W. 1998. Commentary: Issues and opinion on structural equation modeling. JSTOR.
- CHIU, C.-M., HSU, M.-H. & WANG, E. T. G. 2006. Understanding knowledge sharing in virtual communities: An integration of social capital and social cognitive theories. *Decision Support Systems*, 42, 1872-1888.
- CHOUDRIE, J. & DWIVEDI, Y. K. 2005. THE DEMOGRAPHICS OF BROADBAND RESIDENTIAL CONSUMERS IN A BRITISH LOCAL COMMUNITY: THE LONDON BOROUGH OF HILLINGDON. *The journal of computer information systems.*, 45, 93-101.
- CHU-AGOR, M. L., MUÑOZ-CARPENA, R., KIKER, G., EMANUELSSON, A. & LINKOV, I. 2011. Exploring vulnerability of coastal habitats to sea level rise through global sensitivity and uncertainty analyses. *Environmental Modelling & Software*, 26, 593-604.
- CHU, K. H.-L. & MURRMANN, S. K. 2006. Development and validation of the hospitality emotional labor scale. *Tourism Management*, 27, 1181-1191.
- CHUA, W. F. 1986. Radical Developments in Accounting Thought, 61.
- CHURCHILL, G. A. 2007. *Basic marketing research*, Australia; Brazil; Canada, Thomson South-Western.
- CHURCHILL, G. A. & IACOBUCCI, D. 2009. *Marketing research: methodological foundations*, Cengage Learning.

- CLARK, C. F., KOTCHEN, M. J. & MOORE, M. R. 2003. Internal and external influences on pro-environmental behavior: Participation in a green electricity program. *Journal of Environmental Psychology*, 23, 237-246.
- CLIMATE CHANGE. 2010. Communication Advisory Group Communicating climate change to mass public audiences. *Public Interest Research Centre* [Online]. Available: <http://psych.cf.ac.uk/understandingrisk/docs/cccag.pdf> [Accessed 1 11 2011].
- CLIMATE CHANGE COMMUNICATION ADVISORY GROUP 2010. Communicating climate change to mass public audiences. Public Interest Research Centre.
- CNN NEWS. 2011. *Warning: the emissions of carbon dioxides on the highest rates* [Online]. Dubai: CNN Press. Available: <http://arabic.cnn.com/2011/scitech/5/31/carbon.record/index.html> [Accessed 19-6-2012 2012].
- COHEN, D. & PRUSAK, L. 2001. *In good company how social capital makes organizations work* [Online]. Boston: Harvard Business School Press. Available: <http://www.books24x7.com/marc.asp?bookid=7655> [Accessed 1 11 2011].
- COHEN, L., MANION, L. & MORRISON, K. 2013. *Research methods in education*, Routledge.
- COLE, D. 2007. Climate change and collective action. Available at SSRN 1069906.
- COLEMAN, J. S. 1988. Social capital in the creation of human capital. *American journal of sociology*, S95-S120.
- COLLIS, J. & HUSSEY, R. 2014. *Business research : A practical guide for undergraduate and postgraduate students*, Basingstoke, Hampshire, Palgrave Macmillan.
- COOPER, A. & EMORY, C. W. 1995. *Business Research Methods*, Chicago, Irwin.
- CORNER, A. & RANDALL, A. 2011. Selling climate change? The limitations of social marketing as a strategy for climate change public engagement. *Global Environmental Change*, 21, 1005-1014.
- CORNFORD, T. & SMITHSON, S. 1996. *Project research in information systems : a student's guide*, Basingstoke, Macmillan.
- CORRELJE, A. & VERBONG, G. 2004. *The transition from coal to gas : radical change of the Dutch gas system* [Online]. Edward Elgar. Available: <http://library.tue.nl/csp/dare/LinkToRepository.csp?recordnumber=654961>.
- CORTESE, A. D. 2003. The critical role of higher education in creating a sustainable future. *Planning for higher education*, 31, 15-22.
- CRAMER, J. C., HACKETT, B., CRAIG, P. P., VINE, E., LEVINE, M., DIETZ, T. M. & KOWALCZYK, D. 1984. Structural-behavioral determinants of residential energy use: Summer electricity use in Davis. *Energy*, 9, 207-216.
- CRESWELL, J. W. 2013. *Research design: Qualitative, quantitative, and mixed methods approaches*, Sage.
- CRESWELL, J. W. & CLARK, V. L. P. 2007. *Designing and conducting mixed methods research*, Wiley Online Library.
- CRESWELL, J. W. & PLANO, C. V. L. 2011. *Designing and conducting mixed methods research*, Los Angeles, CA, SAGE Publications.
- CROMPTON, T. 2008. *Viewpoint: Begging for more than small change* [Online]. BBC News Online. Available: <http://news.bbc.co.uk/1/hi/sci/tech/7359018.stm> [Accessed 1 1 2012 2012].
- CROMPTON, T. 2010. Common Cause: The case for working with our cultural values. *Surrey* [Online]. Available: http://www.foe.co.uk/resource/reports/common_cause_report.pdf [Accessed 1 1 2012].
- CROMPTON, T. & KASSER, T. 2009. *Meeting environmental challenges: The role of human identity*, WWF-UK Godalming, UK.
- CRONBACH, L. J. 1951. Coefficient alpha and the internal structure of tests. *Psychometrika*, 16, 297-334.
- CRONBACH, L. J. & MURPHY, G. 1970. *Essentials of psychological testing*.
- CROWLEY, T. J. & LOWERY, T. S. 2000. How Warm Was the Medieval Warm Period? *AMBIO: A Journal of the Human Environment*, 29, 51-54.
- CVETKOVICH, G. & LÖFSTEDT, R. E. 1999. *Social trust and the management of risk*, London, Earthscan.
- DALE, A. & NEWMAN, L. 2008. Social capital: a necessary and sufficient condition for sustainable community development? *Community Development Journal*, 45, 5-21.
- DANAHER, B. G., MCKAY, H. G. & SEELEY, J. R. 2005. The information architecture of behavior change websites. *Journal of medical Internet research*, 7.
- DARFAOUI, E. & ASSIRI, A. 2011. *RESPONSE TO CLIMATE CHANGE IN THE KINGDOM OF SAUDI ARABIA* [Online]. Ryadh. Available: <http://www.fao.org/forestry/29157-0d03d7abbb7f341972e8c6ebd2b25a181.pdf> [Accessed 19-6-2012].

- DARNTON, A. 2008. GSR Behaviour Change Knowledge Review: Reference Report: An overview of behaviour change models and their uses.
- DAUGHERTY, P. J., ELLINGER, A. E. & ROGERS, D. S. 1995. Information accessibility: Customer responsiveness and enhanced performance. *International Journal of Physical Distribution & Logistics Management*, 25, 4-17.
- DAVENPORT, T. H. & PROBST, G. 2002. *Knowledge management case book : Siemens best practises*, Erlangen; [New York], Publicis Corporate Pub. ; Wiley.
- DAVIDSON, D. J. & FREUDENBURG, W. R. 1996. *Gender and environmental risk concerns : a review and analysis of available research*, Emmitsburg, MD, National Emergency Training Center].
- DAVIES, D. G., HALLIDAY, M. E., MAYES, M. & TRANSPORT RESEARCH, L. 1997. *Attitudes to cycling : a qualitative study and conceptual framework*, Transport Research Laboratory.
- DAWES, J. 2008. Do data characteristics change according to the number of scale points used? An experiment using 5 point, 7 point and 10 point scales. *International Journal of Market Research*, 51.
- DAWSON, T. P., JACKSON, S. T., HOUSE, J. I., PRENTICE, I. C. & MACE, G. M. 2011. Beyond Predictions: Biodiversity Conservation in a Changing Climate. *Science*, 332, 53-58.
- DE VAUS, D. A. 1993. *Surveys in social research*, UCL Press.
- DE VAUS, D. A. 2014. *Surveys in social research*, London ; New York, NY, Routledge.
- DEFRA & GREAT BRITAIN, P. 2006. *Climate change : the UK programme 2006*, London, TSO].
- DEFRA, N., STATISTICS GREAT BRITAIN. DEPT. FOR ENVIRONMENT, FOOD RURAL, AFFAIRS. 2002. *Survey of public attitudes to quality of life and to the environment 2001* [Online]. London: DEFRA. Available: <http://www.defra.gov.uk/environment/statistics/pubatt/content.htm>
<http://www.defra.gov.uk/statistics/environment/public-attitude/>
<http://www.defra.gov.uk/statistics/files/pas-survey2001.pdf>.
- DENG, M., ZHANG, H., MAO, W. & WANG, Y. 2011. Public perceptions of cryosphere change and the selection of adaptation measures in the Urumqi River Basin. *Advances in Climate Change Research*, 2, 149-158.
- DENZIN, N. K. & LINCOLN, Y. S. 1998. *Collecting and interpreting qualitative materials*, Thousand Oaks, Calif., Sage Publications.
- DENZIN, N. K. & LINCOLN, Y. S. 2003. *Strategies of qualitative inquiry*, Sage.
- DEPARTMENT FOR ENVIRONMENT AND RURAL AFFAIRS. 2008. A framework for pro-environmental behaviours. Available: <http://www.defra.gov.uk/publications/files/pb13574-behaviours-annexes-080110.pdf> [Accessed 1 1 2012].
- DEPARTMENT OF ENVIRONMENT, D. 1994. *Climate change : the UK programme : United Kingdom's report under the Framework Convention on Climate Change*, London, HMSO.
- DEPPISCH, S. & HASIBOVIC, S. 2011. Social-ecological resilience thinking as a bridging concept in transdisciplinary research on climate-change adaptation. *Natural Hazards*, 1-11.
- DEROIAN, F. 2002. Formation of social networks and diffusion of innovations. *Research Policy*, 31, 835-846.
- DESANCTISA, G., MARSHALL SCOTT POOLEA, DICKSONA, G. W. & JACKSONB, B. M. 1993. Interpretive analysis of team use of group technologies. 3. Available: <http://www.tandfonline.com/doi/abs/10.1080/10919399309540193> [Accessed 1 1 2012].
- DETR 2000. *Climate Change: The UK Programme*. HMSO, Norwich.
- DEY, A. K., ABOWD, G. D. & SALBER, D. 2001. A conceptual framework and a toolkit for supporting the rapid prototyping of context-aware applications. *Human-computer interaction*, 16, 97-166.
- DFT. Exploring public attitudes to personal carbon dioxide emission information. In: TRANSPORT, D. F., ed., 2007 2007. Department for Transport.
- DHOLAKIA, U. M., BAGOZZI, R. P. & PEARO, L. K. 2004. A social influence model of consumer participation in network- and small-group-based virtual communities. *International Journal of Research in Marketing*, 21, 241-263.
- DILLMAN, D. A. D. D. A. 2000. *Mail and internet surveys : the tailored design method*, New York, Wiley.
- DILLON, W. R., J., M. T. & H., F. N. 1990. *Marketing research in a marketing environment*, Homewood, IL, Irwin.
- DOBSON, A. 2003. *Citizenship and the environment*, Oxford, Oxford University Press.
- DOBSON, A. 2010. Environmental Citizenship and Pro-environmental Behaviour, Rapid Research and Evidence Review. Keele University. Available: <http://www.sd-research.org.uk/post.php?p=1229> [Accessed 1 1 2012].
- DORAN, P. T. & ZIMMERMAN, M. K. 2009. Examining the scientific consensus on climate change. *Eos*, 90, 22-23.

- DUBÉ, L., BOURHIS, A., JACOB, R. & D'INFORMATION, H. E. C. M. G. D. R. E. S. 2005. *The impact of structural characteristics on the launching of intentionally formed virtual communities of practice*, Montréal, École des hautes études commerciales, Groupe de recherche en systèmes d'information.
- DUCHIN, F. 1998. *Structural Economics: Measuring Changes in Technology. Lifestyle and the Environment* Washington, Island Press.
- DUNLAP, R. E. & SCARCE, R. 1991. Poll trends: Environmental problems and protection. *The public opinion quarterly*, 55, 651-672.
- DUNLAP, R. E., VAN LIERE, K. D., MERTIG, A. G. & JONES, R. E. 2000. New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale. *Journal of Social Issues*, 56, 425-442.
- DURELL, S. E. A. L. V. D., STILLMAN, R. A., CALDOW, R. W. G., MCGRORTY, S., WEST, A. D. & HUMPHREYS, J. 2006. Modelling the effect of environmental change on shorebirds: A case study on Poole Harbour, UK. *Biological Conservation*, 131, 459-473.
- EHRHARDT-MARTINEZ, K., DONNELLY, K. A. & SKIP LAITNER, J. A. 2010. Advanced Metering Initiatives and residential feedback programs, a meta review household electricity saving opportunities. Available: <http://www.energycollection.us/Energy-Metering/Advanced-Metering-Initiatives.pdf> [Accessed 12-9-2012].
- EISER, J. R., MILES, S. & FREWER, L. J. 2002. Trust, Perceived Risk, and Attitudes Toward Food Technologies1. *Journal of Applied Social Psychology*, 32, 2423-2433.
- ELAGIB, N. A. & MANSELL, M. G. 2000. Recent trends and anomalies in mean seasonal and annual temperatures over Sudan. *Journal of Arid Environments*, 45, 263-288.
- ELLISON, N. B. 2007. Social network sites: Definition, history, and scholarship. *Journal of Computer-Mediated Communication*, 13, 210-230.
- ELLONEN, H. K., KOSONEN, M. & HENTTONEN, K. 2007. The development of a sense of virtual community. *INTERNATIONAL JOURNAL OF WEB BASED COMMUNITIES*, 3, 114-130.
- EPSTEIN, M. J. & BUHOVAC, A. R. 2014. *Making sustainability work: Best practices in managing and measuring corporate social, environmental, and economic impacts*, Berrett-Koehler Publishers.
- ERIKSSON, H.-E. & PENKER, M. 2000. *De UML toolkit*, Schoonhoven, Academic Service informatica.
- EST. 1999. *The Case for the Climate Change Levy* [Online]. LONDON: EST. Available: <http://www.energysavingtrust.org.uk/england> [Accessed 10 1 2012 2012].
- EVANS, G. & DURANT, J. 1995. The relationship between knowledge and attitudes in the public understanding of science in Britain. *Public Understanding of Science*, 4, 57-74.
- EYSENBACH, G. 2005. The law of attrition. *Journal of medical Internet research*, 7.
- FEATHERMAN, M. S. & PAVLOU, P. A. 2003. Predicting e-services adoption: a perceived risk facets perspective. *International Journal of Human-Computer Studies International Journal of Human-Computer Studies*, 59, 451-474.
- FELL, D., AUSTIN, A., KIVINEN, E. & WILKINS, C. 2009. The Diffusion of Environmental Behaviours; The Role of Influential Individuals in Social Networks. *Brook Lyndhurst* [Online]. Available: <http://www.brooklyndhurst.co.uk/media/3b1ffea0/Mavens%20summary.pdf>
<http://www.brooklyndhurst.co.uk/the-diffusion-of-environmental-behaviours-the-role-of-influential-individuals-in-social-networks-110/>.
- FERNEY, S. L., MARSHALL, A. L., EAKIN, E. G. & OWEN, N. 2009. Randomized trial of a neighborhood environment-focused physical activity website intervention. *Preventive medicine*, 48, 144-150.
- FEW, R., BROWN, K. & TOMPKINS, E. L. 2007. Public participation and climate change adaptation: avoiding the illusion of inclusion. *Climate Policy*, 7, 46-59.
- FIELD, A. P. 2005. *Discovering statistics using SPSS : (and sex, drugs and rock 'n' roll)*, London; Thousand Oaks, Calif., Sage Publications.
- FINGER, M. 1994. From Knowledge to Action? Exploring the Relationships Between Environmental Experiences, Learning, and Behavior. *Journal of Social Issues*, 50, 141-160.
- FINK, A. 1995. *How to sample in surveys*, Thousand Oaks; London, Sage.
- FINK, A. 2013. *How to conduct surveys : a step-by-step guide*, Thousand Oaks, Calif.; London, SAGE.
- FINLAYSON, C. M., GITAY, H., BELLIO, M.G., VAN DAM, R.A., TAYLOR, I. 2006. Climate variability and change and other pressures on wetlands and waterbirds: impacts and adaptation. In: Boere, G.C., Galbraith C.A., Stroud, D.A. (eds.), *Waterbirds around the world. The Stationery Office, Edinburgh, UK.*, 88-97.
- FIORINO, D. J. 1990. Citizen Participation and Environmental Risk: A Survey of Institutional Mechanisms. *Science, Technology, & Human Values*, 15, 226-243.
- FLICK, U. 2014. *An introduction to qualitative research*, Sage.

- FLOYD, S. & LANE, P. 2000. Strategizing throughout the Organization: Managing Role Conflict in Strategic Renewal. *The Academy of Management Review*, 25, 154-177.
- FOOD AND AGRICULTURE ORGANIZATION OF THE UNITED NATIONS, F. 2010. Forests and climate change in the near east region. Rome, Italy: Research and Extension.
- FORNELL, C. & LARCKER, D. F. 1981. Evaluating structural equation models with unobservable variables and measurement error. *Journal of Marketing Research (JMR)*, 18.
- FORNELL, C., TELLIS, G. J. & ZINKHAN, G. M. 1982. Validity assessment: A structural equations approach using partial least squares. *AMA Chicago*, 405-409.
- FRANSSON, N. & GÄRLING, T. 1999. Environmental concern: Conceptual definitions, measurement methods, and research findings. *Journal of environmental psychology*, 19, 369-382.
- FREITAS, S. D., MAHARG, P. & JENKINS, H. 2011. *Digital Games and Learning*, Continuum International Publishing Group, Limited.
- FREY, B. S. & STUTZER, A. 2006. *Environmental morale and motivation*, Zurich, Institute for Empirical Research in Economics, University of Zurich.
- FUJII, S., GARLING, T. & KITAMURA, R. 2001. Changes in Drivers' Perceptions and Use of Public Transport during a Freeway Closure: Effects of Temporary Structural Change on Cooperation in a Real-Life Social Dilemma. *Environment and Behavior*, 33, 796-808.
- FUJII, T. & RAFFAELLI D. 2008. Sea-level rise, expected environmental changes, and responses of intertidal benthic macrofauna in the Humber estuary, UK. *Marine Ecology Progress Series*, 371, 23-35.
- GALBRAITH, H. J., R.; PARK, R.; CLOUGH, J.; HERROD-JULIUS, S.; HARRINGTON, B.; PAGE, G. 2002. Global climate change and sea level rise: potential losses of intertidal habitat for shorebirds. *Waterbirds*, 2 Gen, 173-183 p. 1119-1122.
- GALLIERS, R. 1994. *Information systems research : issues, methods and practical guidelines*, Henley on Thames, Waller.
- GALLIERS, R. D. 1992. Choosing Appropriate Information Systems Research Approaches: A Revised Taxonomy. In: GALLIERS, R. D. (ed.) *Information Systems Research: issues, methods and practical guidelines*. Blackwell Scientific.
- GALLUP. 2012. *Environment* [Online]. Gallup. Available: <http://www.gallup.com/poll/1615/environment.aspx> [Accessed 12-9-2012].
- GARDINER, S. M. 2004. Ethics and Global Climate Change. *Ethics*, 114, 555-600.
- GÄRLING, T., FUJII, S., GÄRLING, A. & JAKOBSSON, C. 2003. Moderating effects of social value orientation on determinants of proenvironmental behavior intention. *Journal of Environmental Psychology*, 23, 1-9.
- GATERSLEBEN, B., STEG, L. & VLEK, C. 2002. Measurement and Determinants of Environmentally Significant Consumer Behavior. *Environment and Behavior*, 34, 335-362.
- GEE, J. P. 2007. *Good video-games + good learning : collected essays on video-games, learning and literacy*, New York; Washington, DC/Baltimore; Bern; Frankfurt, M; Berlin; Brussels; Vienna; Oxford, Lang.
- GELIL, I. P., ECONOMIC AND SOCIAL LEAGUE OF ARAB STATES, MINISTERS, C. F. W. A. J. T. S. O. T. C. O. A. & ENVIRONMENT, R. F. T. 2007. *Arab Region State of Implementation on Climate Change* [Online]. Cairo. Available: http://www.un.org/esa/sustdev/csd/csd14/escwaRIM_bp2.pdf [Accessed 19-6-2012].
- GEORGE, J. F., BATRA, D., VALACICH, J. S. & HOFFER, J. A. 2007. *Object-Oriented Systems Analysis and Design*, Upper Saddle River, N.J., Pearson Prentice Hall.
- GERBING, D. W. & ANDERSON, J. C. 1984. On the meaning of within-factor correlated measurement errors. *Journal of Consumer Research*.
- GHAURI, P. N. & GRØNHAUG, K. 2005. *Research methods in business studies: A practical guide*, Pearson Education.
- GIDDENS, A. 1984. *The constitution of society : outline of the theory of structuration*, Berkeley, University of California Press.
- GIDDENS, A. 1990. The Consequences of Modernity (Cambridge. *Polity*, 53, 245-260.
- GILL, J. & JOHNSON, P. 2010. *Research Methods for Managers*, SAGE Publications.
- GIOIA, D. A. & PITRE, E. 1990. Multiparadigm perspectives on theory building. *Academy of management review*, 15, 584-602.
- GLASGOW, R. E. 2007. eHealth evaluation and dissemination research. *American Journal of Preventive Medicine*, 32, S119-S126.
- GLASGOW, R. E., NELSON, C. C., KEARNEY, K. A., REID, R., RITZWOLLER, D. P., STRECHER, V. J., COUPER, M. P., GREEN, B. & WILDENHAUS, K. 2007. Reach, engagement, and

- retention in an Internet-based weight loss program in a multi-site randomized controlled trial. *Journal of medical Internet research*, 9.
- GLICKSMAN, R. L. 2011. Climate Change Adaptation: A Collective Action Perspective on Federalism Considerations. *Environmental Law*, 41.
- GOMBERT-COURVOISIER, S., SENNES, V., RICARD, M. & RIBEYRE, F. 2014. Higher Education for Sustainable Consumption: case report on the Human Ecology Master's course (University of Bordeaux, France). *Journal of Cleaner Production*, 62, 82-88.
- GOODWIN, N. 2008. An Overview of Climate Change, what does it mean for our way of life, what is the best future we can hope for. Working Paper No. 08-01. Available: <http://www.ase.tufts.edu/gdae/Pubs/wp/08-01OverviewOfClimateChange.pdf>.
- GORDON, R., MCDERMOTT, L., STEAD, M. & ANGUS, K. 2006. The effectiveness of social marketing interventions for health improvement: What's the evidence? *Public Health*, 120, 1133-1139.
- GRANOVETTER, M. 2005. The impact of social structure on economic outcomes. *Journal of economic perspectives*, 33-50.
- GRANT, R., M 1996b. Toward a knowledge-based theory of the firm. *Strategic Management Journal*, 17, 109-122.
- GRAY, D., SHAW, J. & FARRINGTON, J. 2006. Community transport, social capital and social exclusion in rural areas. *Area*, 38, 89-98.
- GUAGNANO, G. A., STERN, P. C. & DIETZ, T. 1995. Influences on attitude-behavior relationships a natural experiment with curbside recycling. *Environment and behavior*, 27, 699-718.
- GUBA, E. G. & LINCOLN, Y. S. 1994. Competing paradigms in qualitative research. *Handbook of qualitative research*, 2.
- GUISAN, A. 2014. Biodiversity: Predictive traits to the rescue. *Nature Climate Change*, 4, 175-176.
- GUNAWARDENA, C. N., LOWE, C. A. & ANDERSON, T. 1997. Analysis of a global online debate and the development of an interaction analysis model for examining social construction of knowledge in computer conferencing. *Journal of educational computing research*, 17, 397-431.
- HAGEL, J. & ARMSTRONG, A. 1996. *The real value of online communities*, Boston, Harvard Business Review.
- HAGEL, J. & ARMSTRONG, A. 1997. *Net gain : expanding markets through virtual communities*, Boston, Harvard Business School Press.
- HAIR, J., ANDERSON, R., TATHAM, R. & BLACK, W. 1995. *Multivariate data analysis with readings*, Englewood Cliffs, N.J., Prentice Hall.
- HAIR, J., BLACK, W., BABIN, B., ANDERSON, R. & TATHAM, R. 2006a. *Multivariate Data Analysis*. Upper Saddle River, NJ: Prentice-Hall.
- HAIR, J. F. 2006. *Multivariate data analysis with readings*, Upper Saddle River, NJ, Pearson Prentice Hall.
- HAIR, J. F. 2010. *Multivariate data analysis*, Upper Saddle River, N.J.; London, Pearson.
- HAIR, J. F., ANDERSON, R. E., TATHAM, R. L. & BLACK, W. C. 1992. *Multivariate data analysis*, New York, Macmillan.
- HAIR, J. F., BUSH, R. P. & ORTINAU, D. J. 2003. *Marketing research : within a changing information environment*, Boston, MA; Bogotá, McGraw-Hill : Irwin.
- HAIR, J. F., BUSH, R. P. & ORTINAU, D. J. 2006b. *Marketing research : within a changing information environment*, Boston, Mass., McGraw-Hill/Irwin.
- HAIR JR, J. F., ANDERSON, R. E., TATHAM, R. L. & WILLIAM, C. 1995. Black (1995), *Multivariate data analysis with readings*. New Jersey: Prentice Hall.
- HALL, D. J. & HALL, I. M. 1996. *Practical social research : project work in the community*, Basingstoke; London, Macmillan.
- HALLIN, P. O. 1995. Environmental Concern and Environmental Behavior in Foley, a Small Town in Minnesota. *Environment and Behavior Environment and Behavior*, 27, 558-578.
- HALPENNY, E. A. 2010. Pro-environmental behaviours and park visitors: The effect of place attachment. *Journal of Environmental Psychology*, 30, 409-421.
- HALPERN, D., BATES, C., MULGAN, G. & ALDRIDGE, S. 2004. Personal Responsibility and Changing Behaviour: the state of knowledge and its implications for public policy.
- HANSEN, A., COTTLE, S., NEGRINE, R., NEWBOLD, C. & HALLORAN, J. D. 1998. *Mass communication research methods*, New York, New York University Press.
- HARDY, J. 2003. *Climate Change: Causes, Effects and Solutions*, New York, USA, John Wiley and Sons,
- HARGREAVES, I., LEWIS, J. & SPEERS, T. 2003. Towards a Better Map: Science, the Public and the Media. Available: http://www.esrc.ac.uk/images/towards_a_better_map_tcm8-13558.pdf [Accessed 11 2012].

- HARGREAVES, T. 2010. The Visible Energy Trial: Insights from Qualitative Interviews | Tyndall°Centre for Climate Change Research ®.
- HARLAND, P., STAATS, H. & WILKE, H. A. M. 1999. Explaining Proenvironmental Intention and Behavior by Personal Norms and the Theory of Planned Behavior1. *Journal of Applied Social Psychology*, 29, 2505-2528.
- HARS, A. & OU, S. 2002. Working for Free? Motivations for Participating in Open-Source Projects. *INTERNATIONAL JOURNAL OF ELECTRONIC COMMERCE*, 6, 25-40.
- HASSAD, R. A. 2010. Development and validation of a teaching practice scale (TISS) for Instructors of Introductory Statistics at the College Level. *arXiv preprint arXiv:1007.3654*.
- HASSOL, S. J. & UDALL, R. A. 2003. A Change of Climate. 19(3). Available: http://climatecommunication.org/wp-content/uploads/2011/08/issues_science_tech.pdf [Accessed 12-9-2012].
- HASTINGS, G. 2007. *Social Marketing : Why Should the Devil Have All the Best Tunes* / G. Hastings [Online]. Oxford: Oxford, Inglaterra : Butterworth-Heinemann. Available: <http://quijote.biblio.iteso.mx/dc/ver.aspx?ns=000287804>
<http://books.google.co.uk/books?id=MbvqeuzyJuEC&pg=PA15&lpg=PA15&dq=Hastings,+G.,+2007.+Social+Marketing:+Why+Should+the+Devil+have+all+the+Best+Tunes?+Elsevier,+Oxford,+UK.&source=bl&ots=EC3a7hvfcn&sig=oycRa1LBuDNBOK40iiVxTnt-f04&hl=en&sa=X&ei=p48IT5fRN8P18QOKp5ivBw&ved=0CDwQ6AEwBA#v=onepage&q&f=false>.
- HAYES, A. F. 2005. *Statistical methods for communication science*, Mahwah, N.J., Lawrence Erlbaum Associates.
- HAYES, A. F. 2010. *Statistical methods for communication science*, New York [u.a.], Routledge.
- HAYTHORNTHWAITE, C. 1996. Social Network Analysis: An Approach and Technique for the Study of Information Exchange. *Library & Information Science Research*, 18, 323-42.
- HEATH, Y. & GIFFORD, R. 2002. Extending the theory of planned behavior: predicting the use of public transportation1. *Journal of Applied Social Psychology*, 32, 2154-2189.
- HENDRIKS, C. M., DRYZEK, J. S. & HUNOLD, C. 2007. Turning Up the Heat: Partisanship in Deliberative Innovation. *Political Studies*, 55, 362-383.
- HENRIKSEN, E. K. & JORDE, D. 2001. High school students' understanding of radiation and the environment: Can museums play a role? *Science Education*, 85, 189-206.
- HEPBASLI, A. & ALSUHAIBANI, Z. 2011. A key review on present status and future directions of solar energy studies and applications in Saudi Arabia. *Renewable and Sustainable Energy Reviews*, 15, 5021-5050.
- HERRMANN, C., SUH, S.-H., BOGDANSKI, G., ZEIN, A., CHA, J.-M., UM, J., JEONG, S. & GUZMAN, A. 2011. Context-Aware Analysis Approach to Enhance Industrial Smart Metering. *Glocalized Solutions for Sustainability in Manufacturing*, 323-328.
- HIGNITE, K. 2006. Will Sustainability Take Root? *BUSINESS OFFICER-WASHINGTON-NACUBO-*, 39, 12.
- HIMMA, K. E. & TAVANI, H. T. 2008. *The handbook of information and computer ethics*, John Wiley & Sons.
- HINCHLIFFE, S. 1996. Helping the earth begins at home. The social construction of socio-environmental responsibilities. *GLOBAL ENVIRONMENTAL CHANGE -GUILDFORD-*, 6, 53-62.
- HINES, J., HUNGERFORD, H. & TOMERA, A. 1987. Analysis and Synthesis of Research on Responsible Environmental Behavior: A Meta-Analysis. *The J. of Env. Educ. The Journal of Environmental Education*, 18, 1-8.
- HINKIN, T. R. 1998. A brief tutorial on the development of measures for use in survey questionnaires. *Organizational research methods*, 1, 104-121.
- HIRSCH HADORN, G., BRADLEY, D., POHL, C., RIST, S. & WIESMANN, U. 2006. Implications of transdisciplinarity for sustainability research. *Ecological Economics*, 60, 119-128.
- HIRST, E., BERRY, L. & SODERSTROM, J. 1981. Review of utility home energy audit programs. *Energy*, 6, 621-630.
- HM GOVERNMENT 2006. Climate Change: The UK Programme 2006. *HMSO, London*.
- HM GOVERNMENT 2009. *The UK low carbon transition plan : national strategy for climate and energy*, London, Stationery Office.
- HOBSON, K. 2006. Environmental psychology and the geographies of ethical and sustainable consumption: aligning, triangulating, challenging? *Area*, 38, 292-300.
- HOF, R., BROWDER, S. & ELESTROM, P. 1997. Elstrom, Internet communities-forget surfers. A new class of netizen is settling right. *Business Week* 5, 38-45.

- HOFFMAN, D. L., NOVAK, T. P. & PERALTA, M. 1999. Building consumer trust online. *Communications of the ACM*, 42, 80-85.
- HOFMAN, P., ELZEN, B. & F, G. 2004. Socio-technical scenarios as a new policy tool to explore system innovations: co-evolution of technology and society in The Netherland's electricity domain. *Innovation: Management, Policy and Practice* 6, 344- 360
- HOGG, M. & SHAH, H. 2010. The Impact of Global Learning on Public Attitudes and Behaviours Towards International Development and Sustainability. Available: http://www.google.co.uk/url?sa=t&rct=j&q=the%20impact%20of%20global%20learning%20on%20public%20attitudes%20and%20behaviours%20towards%20international%20development%20and%20sustainability.&source=web&cd=1&ved=0CCIOFjAA&url=http%3A%2F%2Fwww.tlink-global.org.uk%2Fresources%2Fitem.asp%3Fd%3D2076&ei=oCAnT_vnK4bA8QPMg9yyBw&usg=AFQjCNHiCwfiCKBFbY8bgqc5YdK5hQ4vg [Accessed 1 1 2012].
- HOMANS, G. C. 1961. *Social Behaviour: Its Elementary Forms*, New York : Harcourt, Brace & World.
- HÖÖK, K. 1997. Evaluating the utility and usability of an adaptive hypermedia system. *Knowledge-Based Systems*, 10, 311-319.
- HOPKINS, C. & MCKEOWN, R. 2002. Education for sustainable development: an international perspective. *Education and sustainability: Responding to the global challenge*, 13.
- HOPPER, J. R. & NIELSEN, J. M. 1991. Recycling as altruistic behavior normative and behavioral strategies to expand participation in a community recycling program. *Environment and Behavior*, 23, 195-220.
- HOUGHTON, S. J. 1994. *Global Warming: The Complete Briefing*, Cambridge UK, Cambridge University Press.
- HOUNSHAM, S. 2006. Painting the town green. *First Group, UK*.
- HOUSE, J. S. 1981. *Work stress and social support*, Addison-Wesley Publishing Company Reading, MA.
- HOWELL, S. E. & LASKA, S. B. 1992. The Changing Face of the Environmental Coalition A Research Note. *Environment and Behavior*, 24, 134-144.
- HSU, C.-L. & LU, H.-P. 2007. Consumer behavior in online game communities: A motivational factor perspective. *Computers in Human Behavior*, 23, 1642-1659.
- HUCKLE, J. & STERLING, S. R. 1996. *Education for sustainability*, Earthscan.
- HUGHES, R. G. 2004. Climate change and loss of saltmarshes: consequences for birds. *Ibis*, 146, 21-28.
- HULME, M. & DESSAI, S. 2008. Negotiating future climates for public policy: a critical assessment of the development of climate scenarios for the UK. *Environmental Science & Policy*, 11, 54-70.
- HUMMEL, J. & LECHNER, U. Social profiles of virtual communities. 2013 46th Hawaii International Conference on System Sciences, 2002. IEEE Computer Society, 172b-172b.
- HUNT, S. D., SPARKMAN JR, R. D. & WILCOX, J. B. 1982. The pretest in survey research: issues and preliminary findings. *Journal of Marketing Research*, 269-273.
- HUSTAD, E. & TEIGLAND, R. 2005. Taking a Differentiated View of Intra-organizational Distributed Networks of Practice Communities and Technologies 2005. In: BESSELAAR, P., MICHELIS, G., PREECE, J. & SIMONE, C. (eds.). Springer Netherlands.
- HYAT, L. G. L. 2010. *Global Warming* [Online]. Kuwait. Available: <http://www.greenline.com.kw/ArticleDetails.aspx?tp=349> [Accessed 19-6-2012].
- IMMERWAHR, J. 1999. Waiting for a signal, public attitudes toward global warming, the environment and geophysical research. Available: <http://www.policyarchive.org/handle/10207/bitstreams/5662.pdf> [Accessed 12-9-2012].
- INDEXMUNDI. 2012. *Country Comparison Electricity production* [Online]. US: IndexMundi. Available: <http://www.indexmundi.com/g/r.aspx?t=100&v=79#> [Accessed 10-9-2012].
- INTERNET WORLD STATS. 2013. *Top 50 countries with highest Internet penetration rates* [Online]. website Available: <http://www.internetworldstats.com/top25.htm> [Accessed 1-11-2013].
- IPCC. 2001. *Climate Change 2001: The Scientific Basis* [Online]. Cambridge: Cambridge University Press. Available: http://www.csun.edu/~hmc60533/CSUN_630E_S2004/climate%20change/climate_change_2001_tech_summary.pdf [Accessed 12-9-2012].
- IPCC. 2003. *Third Assessment Report "Climate Change 2001" and the Synthesis Report*. [Online]. UNEP & GRIDA ARENDAL,. Available: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/vol4/english/figspm-10b.htm [Accessed 12-9-2012].

- IPCC, I. P. O. C. C. 2007. *Climate Change 2001: Impacts, Adaptation, and Vulnerability. Summary for Policymakers.*, Cambridge; New York, Cambridge University Press.
- IRWIN, A. & WYNNE, B. 1996. *Misunderstanding science? : the public reconstruction of science and technology*, Cambridge; New York, Cambridge University Press.
- ISHAK, I. S. & ALIAS, R. 2005. Designing a Strategic Information System Planning Methodology For Malaysian Institutes Of Higher Learning (ISP-IPTA). *IIS Volo VI*.
- ISLAM, M. N. 2009. Rainfall and Temperature Scenario for Bangladesh. *The Open Atmospheric Science Journal*, 3, 93–103.
- ISLAM, M. N., DAS, S., UYEDA, H., 2010. Calibration of TRMM derived rainfall over Nepal during 1998–2007. *The Open Atmospheric Science Journal*, 4, 12-23.
- JACKSON, T. 2005. *Motivating sustainable consumption : a review of evidence on consumer behaviour and behavioural change : a report to the sustainable development research network* [Online]. Surrey. Available: <http://portal.surrey.ac.uk/pls/portal/docs/PAGE/ENG/STAFF/STAFFAC/JACKSON/PUBLICATIONS/JACKSONSDRN-REVIEW.PDF>.
- JAEGER, C. C., O'RIORDAN, T. & STOLL-KLEEMANN, S. 2001. The psychology of denial concerning climate mitigation measures : evidence from Swiss focus groups. *Global Environmental Change*.
- JAMIESON, D., VANDERWERF, K., UNITED, S., ENVIRONMENTAL PROTECTION, A., CENTER FOR, V. & SOCIAL, P. 1993. *Cultural barriers to behavioral change : general recommendations and resources for state pollution prevention programs*, Boulder, Colo., Center for Values and Social Policy, University of Colorado.
- JAROUCHEH, Z. 2012. *An approach to cross-domain situation-based context management and highly adaptive services in pervasive environments*. Edinburgh Napier University.
- JCC. 2012. *Climate Change Over Saudi Arabia* [Online]. Jeddah: Jeddah Regional Climate Center South West Asia Available: http://jrcc.sa/Climate_Change.php [Accessed 19-6-2012 2012].
- JEPPESEN, L. B. & FREDERIKSEN, L. 2006. Why Do Users Contribute to Firm-Hosted User Communities? The Case of Computer-Controlled Music Instruments. *Organization science : a journal of the Institute of Management Sciences.*, 17, 45.
- JOIREMAN, J. A., LASANE, T. P., BENNETT, J., RICHARDS, D. & SOLAIMANI, S. 2001. Integrating social value orientation and the consideration of future consequences within the extended norm activation model of proenvironmental behaviour. *British Journal of Social Psychology*, 40, 133-155.
- JONES, N. 2010. Environmental activation of citizens in the context of policy agenda formation and the influence of social capital. *The Social Science Journal*, 47, 121-136.
- JONGMAN, B., WARD, P. J. & AERTS, J. C. J. H. 2012. Global exposure to river and coastal flooding: Long term trends and changes. *Global Environmental Change*, 22, 823-835.
- JOSEPH P. RESER, N. P., ALEXA SPENCE, GRAHAM BRADLEY, & A. IAN GLENDON & MICHELLE ELLUL. 2010. Public Risk Perceptions, Understandings, and Responses to Climate Change in Australia and Great Britain: Interim Report. *Griffith University, Climate Change Response Program, Queensland, Australia, and Understanding Risk Centre, Cardiff University, Wales* [Online]. Available: [http://media.emergencymanagement.org.au/uploads/interim_report_-_final_document_-18-04-2011-2_30pm\(1\).pdf](http://media.emergencymanagement.org.au/uploads/interim_report_-_final_document_-18-04-2011-2_30pm(1).pdf) [Accessed 2012].
- JRC. 2011. *Emission Database for Global Atmospheric Research (EDGAR), release version 4.2 of 11 November 2011*. [Online]. JRC/PBL European Commission, Joint Research Centre (JRC) and PBL Netherlands Environmental Assessment Agency. Available: <http://edgar.jrc.ec.europa.eu>. [Accessed 1-10-2012].
- K. LARSEN & PERSSON, L.-O. 2005. Innovation Systems and the Periphery, ISP—Final report to the Nordic Innovation Centre—Case Studies from Region Dalarna in Sweden. *Final report* [Online]. Available: <http://www.rha.is/static/files/Rannsoknir/2005/ISP-final-report2.pdf> [Accessed 1 1 2012].
- KAHAN, D. M., BRAMAN, D., GASTIL, J., SLOVIC, P. & MERTZ, C. K. 2007. Culture and Identity-Protective Cognition: Explaining the White-Male Effect in Risk Perception. *Journal of Empirical Legal Studies*, 4, 465-505.
- KAHAN, D. M., JENKINS-SMITH, H. & BRAMAN, D. 2010. Cultural Cognition of Scientific Consensus *Journal of Risk Research* [Online], 14. Available: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1549444 <http://ssrn.com/abstract=1549444> [Accessed 1 1 2012].
- KAISER, F. G. & SHIMODA, T. A. 1999. RESPONSIBILITY AS A PREDICTOR OF ECOLOGICAL BEHAVIOUR. *Journal of Environmental Psychology*, 19, 243-253.

- KAPLAN, B. & DUCHON, D. 1988. Combining qualitative and quantitative methods in information systems research: a case study. *MIS quarterly*, 571-586.
- KARATZOGLOU, B. 2013. An in-depth literature review of the evolving roles and contributions of universities to education for sustainable development. *Journal of Cleaner Production*, 49, 44-53.
- KARDARAS, D., KARAKOSTAS, B. & PAPATHANASSIOU, E. 2003. The potential of virtual communities in the insurance industry in the UK and Greece. *International Journal of Information Management*, 23, 41-53.
- KARP, D. G. 1996. Values and their effect on pro-environmental behavior. *Environment and Behavior*, 28, 111-133.
- KASSER, T., COHN, S., KANNER, A. & RYAN, R. 2007. Some Costs of American Corporate Capitalism: A Psychological Exploration of Value and Goal Conflicts. *Psychological Inquiry*, 18, 1-22.
- KASSIRER, J. 2012. *Tools of Change, Proven Method for Promoting Health, Safety, and Environmental Citizenship* [Online]. Available: www.toolsofchange.com [Accessed 24-6-2014].
- KATES, R. W. & WILBANKS, T. J. 2003. Making the global local: Responding to climate change concerns from the ground. *Environment*, 45, 12-23.
- KAUFMAN, D. M. 2003. Applying educational theory in practice. *BMJ: British Medical Journal*, 326, 213.
- KEEN, M., BROWN, V. A. & DYBALL, R. 2005. *Social learning in environmental management towards a sustainable future* [Online]. London; Sterling, VA: Earthscan. Available: <http://public.eblib.com/EBLPublic/PublicView.do?ptiID=429935>.
- KEEN, P. G. 1987. MIS research: Current status, trends and needs. *Information Systems Education: Recommendations and Implementation*, Cambridge University Press, Cambridge, 1-13.
- KELLEY, H. H. & THIBAUT, J. W. 1978. *Interpersonal relations: A theory of interdependence*, Wiley New York.
- KEMPTON, W. 1991. Lay perspectives on global climate change. *Global Environmental Change*, 1, 183-208.
- KEMPTON, W. 1997. How the public views climate change. *Environment*, 39(9), 41.
- KEMPTON, W., DARLEY, J. M., STERN, P. C. & AMERICAN PSYCHOLOGICAL ASSOCIATION, T. F. O. T. I. B., PSYCHOLOGY GLOBAL CLIMATE, CHANGE, SWIM, JANET. 1992. Psychological Research for the New Energy Problems. 47.
- KEMPTON, W. & LAYNE, L. L. 1994. The consumer's energy analysis environment. *Energy Policy*, 22, 857-866.
- KERKHOF, M. 2006. Making a difference: On the constraints of consensus building and the relevance of deliberation in stakeholder dialogues. *Policy Sci Policy Sciences*, 39, 279-299.
- KHAN, S. & KELMAN, I. 2012. Progressive climate change and disasters: connections and metrics. *Natural Hazards*, 61, 1477-1481.
- KI-MOON, S.-G. B. 2009. *Collective action must be at heart of climate change response – Ban Ki-moon* [Online]. UN news centre. Available: <http://www.un.org/apps/news/story.asp?NewsID=32132&Cr=climate+change&Cr1#.UEq3obLiYRU> [Accessed 8-9-2012].
- KIRBY, A. 2004. *Britons unsure of climate costs* [Online]. UK: BBC News Online environment correspondent Available: <http://news.bbc.co.uk/1/hi/sci/tech/3934363.stm> [Accessed 12-9-2012].
- KLEIN, H. K. & HIRSCHHEIM, R. 2001. Choosing between competing design ideals in information systems development. *Information Systems Frontiers*, 3, 75-90.
- KLEIN, H. K. & MYERS, M. D. 1999. A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS quarterly*, 67-93.
- KLINE, R. B. 2005. *Principles and practice of structural equation modeling*, New York, Guilford Press.
- KOGUT, P., CRANFIELD, S., HART, L., DUTRA, M., BACLAWSKI, K., KOKAR, M. & SMITH, J. 2002. UML for ontology development. *The Knowledge Engineering Review*, 17, 61-64.
- KOH, J. & KIM, Y.-G. 2003. Sense of Virtual Community: A Conceptual Framework and Empirical Validation. 8. Available: <http://mesharpe.metapress.com/openurl.asp?genre=article&issn=1086-4415&volume=8&issue=2&page=75>.
- KOH, J., KIM, Y.-G. & KIM, Y.-G. 2003. Sense of virtual community: A conceptual framework and empirical validation. *International Journal of Electronic Commerce*, 8, 75-94.
- KOH, J. & KIM, Y. G. 2004. Knowledge sharing in virtual communities: an e-business perspective. *Expert Systems with Applications*, 26, 155-166.
- KÖHLER, J. 2006. Transport and the environment: the need for policy for long-term radical change. *IEE Proc. Intell. Trans. Syst. IEE Proceedings - Intelligent Transport Systems*, 153.
- KOLLMUSS, A. & AGYEMAN, J. 2002. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8, 239-260.

- KOLLOCK, P. 1999. The Economies of Online Cooperation: Gifts and Public Goods in Cyberspace. In: KOLLOCK, P. & SMITH, M. (eds.) *Communities in cyberspace*. Routledge.
- KOSONEN, M. 2008. *Knowledge sharing in virtual communities*, Lappeenranta, Lappeenrannan Teknillinen Yliopisto.
- KOTLER, P. & ZALTMAN, G. 1971. Social marketing: an approach to planned social change. *The Journal of Marketing*, 3-12.
- KOUFTEROS, X. A. 1999. Testing a model of pull production: a paradigm for manufacturing research using structural equation modeling. *Journal of Operations Management Journal of Operations Management*, 17, 467-488.
- KRICHAK, S. O., ALPERT, P. & KRISHNAMURTI, T. N. 1997. Interaction of topography and tropospheric flow — A possible generator for the Red Sea Trough? *Meteorology and Atmospheric Physics*, 63, 149-158.
- KRISHNA, A. 2012. *Active Social Capital Tracing the Roots of Development and Democracy* [Online]. New York: Columbia University Press. Available: <http://grail.eblib.com.au/patron/FullRecord.aspx?p=909031>.
- KUMAR, P. 1996. *Research Methodology: A Step-by-step Guide for Research*.
- KUMART, R. 2011. *Research methodology: A step-by-step guide for beginners*. Thousands Oaks. CA: Sage.
- KUNDA, Z. 1990. The case for motivated reasoning. *Psychological bulletin*, 108, 480-98.
- KURANI, T. S. & TURRENTINE, T. S. 2002. *Marketing Clean and Efficient Vehicles: A Review of Social Marketing and Social Science Approaches*, Institute of Transportation Studies, University of California at Davis.
- LANCASTER, G. A., DODD, S. & WILLIAMSON, P. R. 2004. Design and analysis of pilot studies: recommendations for good practice. *Journal of Evaluation in Clinical Practice*, 10, 307-312.
- LANE, P. J. & LUBATKIN, M. 1998. Relative absorptive capacity and interorganizational learning. *Strategic Management Journal*, 19, 461-477.
- LARSEN, K., GUNNARSSON-ÖSTLING, U. & WESTHOLM, E. 2011. Environmental scenarios and local-global level of community engagement: Environmental justice, jams, institutions and innovation. *Futures*, 43, 413-423.
- LARSON, L. R., WHITING, J. W. & GREEN, G. T. 2011. Exploring the influence of outdoor recreation participation on pro-environmental behaviour in a demographically diverse population. *Local Environment Local Environment* [Online], 16. Available: http://lrlarson.myweb.uga.edu/Larsonetal2011_OutdoorRecandPEB.pdf.
- LATANÉ, B. & DARLEY, J. M. 1970. *The unresponsive bystander: why doesn't he help?*, New York, Appleton-Century Crofts.
- LAVE, J. & WENGER, E. (eds.) 1991. *Situated Learning: Legitimate Peripheral Learning*, Cambridge: Cambridge University Press.
- LAWRENCE, M. & LOW, G. 1993. Exploring individual user satisfaction within user-led development. *MIS quarterly*, 17, 195-208.
- LÁZARO, R., RODRIGO, F. S., GUTIÉRREZ, L., DOMINGO, F. & PUIGDEFÁBREGAS, J. 2001. Analysis of a 30-year rainfall record (1967–1997) in semi-arid SE Spain for implications on vegetation. *Journal of Arid Environments*, 48, 373-395.
- LAZER, W. & KELLEY, E. J. 1973. *Social marketing: perspectives and viewpoints*, Homewood, Ill., R.D. Irwin.
- LEAHY, K. B. & YERMISH, I. 2003. Information and communication technology: Gender issues in developing nations. *Informing Science*, 6, 143-155.
- LEEDY, P. D. & ORMROD, J. E. 2014. *Practical research : planning and design*, Harlow, Pearson.
- LEEMANS, R. & PATWARDHAN, A. 2009. The inaugural issue of Current Opinion in Environmental Sustainability. *Current Opinion in Environmental Sustainability*, 1, 1-3.
- LEISEROWITZ, A. 2006. CLIMATE CHANGE RISK PERCEPTION AND POLICY PREFERENCES: THE ROLE OF AFFECT, IMAGERY, AND VALUES. *Climatic Change*, 77, 45-72.
- LEISEROWITZ, A. 2007, 2008. *Public Perception, Opinion and Understanding of Climate Change – Current Patterns, Trends and Limitations* [Online]. Human Development Report Office; OCCASIONAL PAPER. Available: <http://hdr.undp.org/en/reports/global/hdr2007-2008/> [Accessed 5-7-2012].
- LEISEROWITZ, A. A. 2005. American risk perceptions: Is climate change dangerous? *Risk Analysis*, 25, 1433-1442.
- LERTZMAN, R. 2008. The myth of apathy. *Ecologist Ecologist*, 38, 16-17.
- LESLIE, E., MARSHALL, A., OWEN, N. & BAUMAN, A. 2005. Engagement and retention of participants in a physical activity website. *Preventive Medicine*, 40, 54-59.

- LESSER, E. & EVEREST, K. 2001. USING COMMUNITIES OF PRACTICE TO MANAGE INTELLECTUAL CAPITAL Improving an organization's use of knowledge assets. *IVEY BUSINESS JOURNAL*, 65, 37-47.
- LESSER, E. L. & STORCK, J. 2001. Communities-of-practice and organizational performance. *IBM Systems Journal*, 40, 831-841.
- LETHBRIDGE, N. 2001. *Understanding attitudes to transport policy* [Online]. Available: www.dft.gov.uk/pgr/statistics/datatablespublications/trends/2001/articles/article2understandingattitud5436
<http://trid.trb.org/view.aspx?id=685446>.
- LEUNG, L. 2001. College student motives for chatting on ICQ. *New Media & Society*, 3, 483-500.
- LEWIS, M. & INSTITUTE FOR PUBLIC POLICY, R. 2007. *States of reason : freedom, responsibility, and the governing of behaviour change*, [London], Institute for Public Policy Research.
- LEWIS, M. W. & GRIMES, A. I. 1999. Metatriangulation: Building theory from multiple paradigms. *Academy of Management Review*, 24, 672-690.
- LEY, B. 2007. Vive Les Roses!: The Architecture of Commitment in an Online Pregnancy and Mothering Group *Journal of Computer-Mediated Communication*, 4.
- LIN, H.-F. 2007. The role of online and offline features in sustaining virtual communities: an empirical study. *Internet Research*, 17, 119-138.
- LINDENBERG, S. & STEG, L. 2007. Normative, Gain and Hedonic Goal Frames Guiding Environmental Behavior. *Journal of Social Issues*, 63, 117-137.
- LINDLOF, T. R. & TAYLOR, B. C. 2011. *Qualitative communication research methods*, London, SAGE.
- LINDNER, M. 2006. *How to adapt forest management in response to the challenges of climate change? In : IPGRI-IUFRO Workshop*, Paris, France.
- LOEWENSTEIN, G. F., WEBER, E. U., HSEE, C. K. & WELCH, N. 2001. Risk as feelings. *Psychological bulletin*, 127, 267.
- LOKE, S. W. On representing situations for context-aware pervasive computing: six ways to tell if you are in a meeting. Pervasive Computing and Communications Workshops, 2006. PerCom Workshops 2006. Fourth Annual IEEE International Conference on, 2006. IEEE, 5 pp.-39.
- LONDON 2012 SUSTAINABILITY PLAN. 2009. *Towards a one planet 2012* [Online]. London: London2012.com. Available: <http://www.london2012.com/documents/locog-publications/london-2012-sustainability-plan.pdf> [Accessed 12 1 2012 2012].
- LORD, C. G., ROSS, L. & LEPPER, M. R. 1979. Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology Journal of Personality and Social Psychology*, 37, 2098-2109.
- LORENZONI, I., NICHOLSON-COLE, S. & WHITMARSH, L. 2007. Barriers perceived to engaging with climate change among the UK public and their policy implications. *GLOBAL ENVIRONMENTAL CHANGE -GUILDFORD-*, 17, 445-459.
- LORENZONI, I. & PIDGEON, N. 2006. Public Views on Climate Change: European and USA Perspectives. *CLIMATIC CHANGE*, 77, 73-95.
- LORENZONI, I., PIDGEON, N. F. & O'CONNOR, R. E. 2005. Dangerous Climate Change: The Role for Risk Research. *Risk Analysis*, 25, 1387-1398.
- LORRAINE, W. 2009. Behavioural responses to climate change: Asymmetry of intentions and impacts. *Journal of Environmental Psychology*, 29, 13-23.
- LOVELOCK, C. H., STIFF, R., CULLWICK, D. & KAUFMAN, I. M. 1976. An Evaluation of the Effectiveness of Drop-Off Questionnaire Delivery. *Journal of Marketing Research (JMR)*, 13.
- LOVELOCK, J. 2006. *The revenge of Gaia: Earth's climate in crisis and the fate of humanity*, Basic Books.
- LUNT, P. & LIVINGSTONE, S. 1996. Rethinking the focus group in media and communications research. *Journal of communication*, 46, 79-98.
- LUTZENHISER, L. 1994. Innovation and organizational networks Barriers to energy efficiency in the US housing industry. *Energy Policy*, 22, 867-876.
- LUTZENHISER, L. & GOSSARD, M. H. 2000. *Lifestyle, status and energy consumption*. [Online]. Pacific Grove, CA: 8. Available: <http://eec.ucdavis.edu/aceee/2000/pdfs/panel08/450.pdf> [Accessed 12-9-2012].
- LUTZENHISER, L. & HACKETT, B., G. 1993. Social stratification and environmental degradation: understanding household CO₂ production. Berkeley, CA, ETATS-UNIS: University of California Press.
- MACEY, W. H. & SCHNEIDER, B. 2008. The Meaning of Employee Engagement. *Industrial and Organizational Psychology*, 1, 3-30.

- MAIBACH, E. W., ROSER-RENOUF, C. & LEISEROWITZ, A. 2008. Communication and Marketing As Climate Change-Intervention Assets. A Public Health Perspective. *Am. J. Prev. Med. American Journal of Preventive Medicine*, 35, 488-500.
- MAIO, G. R., CHEUNG, W. Y., PAKIZEH, A. & REES, K. J. 2009. Changing, Priming, and Acting on Values: Effects via Motivational Relations in a Circular Model. *J. Pers. Soc. Psychol. Journal of Personality and Social Psychology*, 97, 699-715.
- MAIO, G. R., VERPLANKEN, B., MANSTEAD, A. S. R., STROEBE, W., ABRAHAM, C., SHEERAN, P. & CONNER, M. 2007. Social Psychological Factors in Lifestyle Change and Their Relevance to Policy. *Social Issues and Policy Review*, 1, 99-137.
- MALHOTRA, N. K., HALL, J., SHAW, M. & CRISP, M. 1996. *Market research : an applied orientation*, Sydney, Prentice Hall Australia.
- MALHOTRA, N. K. & PETERSON, M. 2006. *Basic marketing research : a decision-making approach*, Upper Saddle River, N.J., Pearson/Prentice Hall.
- MANSBRIDGE, J. 1999. Everyday talk in the deliberative system, . In S. Macedo (Ed.), *Deliberative politics - essays on democracy and disagreement* 211-239.
- MARCEL, S. 2006. Function and use of technical artefacts: social conditions of function ascription. *Studies In History and Philosophy of Science Part A*, 37, 23-36.
- MARRIS, C., LANGFORD, I. H. & O'RIORDAN, T. 1998. A Quantitative Test of the Cultural Theory of Risk Perceptions: Comparison with the Psychometric Paradigm. *Risk Analysis*, 18, 635-647.
- MARSDEN, P. V. & WRIGHT, J. D. 2010. *Handbook of survey research*, Bingley, UK, Emerald.
- MARTIN, B. R. 2012. Are universities and university research under threat? Towards an evolutionary model of university speciation. *Cambridge journal of economics*, 36, 543-565.
- MASON, P. 2005. *In the environment*, London, Chrysalis Children's.
- MAZAR, N. & ZHONG, C. B. 2010. Do green products make us better people? *Psychol. Sci. Psychological Science*, 21, 494-498.
- MAZUR, A. & ROSA, E. 1974. Energy and life-style. *Science (New York, NY)*, 186, 607-610.
- MCCARTHY, J. J. & IPCC II 2001. *Climate change 2001 : impacts, adaptation, and vulnerability : contribution of Working Group II to the third assessment report of the Intergovernmental Panel on Climate Change*, Cambridge, UK; New York, Cambridge University Press.
- MCDERMOTT, R. 1999. Nurturing Three-Dimensional Communities of Practice. *KNOWLEDGE MANAGEMENT REVIEW*, 26-29.
- MCFARLANE, B. L. & BOXALL, P. C. 2000. Factors Influencing Forest Values and Attitudes of Two Stakeholder Groups: The Case of the Foothills Model Forest, Alberta, Canada. *Society & Natural Resources*, 13, 649-661.
- MCKEEVER, S., YE, J., COYLE, L., BLEAKLEY, C. & DOBSON, S. 2010. Activity recognition using temporal evidence theory. *Journal of Ambient Intelligence and Smart Environments*, 2, 253-269.
- MCKENNA, J., GUTIERREZ, K. & MCCALL, K. 2000. Strategies for an effective youth counter-marketing program: recommendations from commercial marketing experts. *Journal of public health management and practice*, 6, 7-13.
- MCKENNA, K. Y. A. & GREEN, A. S. 2002. Virtual group dynamics. *Group Dynamics: Theory, Research, and Practice Group Dynamics: Theory, Research, and Practice*, 6, 116-127.
- MCKENZIE-MOHR, D. 2010. *Fostering Sustainable Behavior, Community-Based Social Marketing* [Online]. Available: <http://www.cbsm.com> [Accessed 24-6-2014].
- MCKENZIE-MOHR, D. 2011. *Fostering sustainable behavior: An introduction to community-based social marketing*, New Society Publishers.
- MCKENZIE-MOHR, D. & SMITH, W. A. 1999. *Fostering sustainable behavior : an introduction to community-based social marketing*, Gabriola Island, BC, New Society Publishers.
- MCKENZIE-MOHR, D. 2000. New Ways to Promote Proenvironmental Behavior: Promoting Sustainable Behavior: An Introduction to Community-Based Social Marketing. *Journal of Social Issues*, 56, 543-554.
- MCKENZIE-MOHR, D., NEMIROFF, L. S., BEERS, L. & DESMARAIS, S. 1995. Determinants of responsible environmental behavior. *Journal of Social Issues*, 51, 139-156.
- MCKENZIE, M., DOUG 2000. Promoting sustainable behaviour: an introduction to community based social marketing. *Journal of Social Issues*, 56, 543-554.
- MCLURE WASKO, M. & FARAJ, S. 2000. "It is what one does": why people participate and help others in electronic communities of practice. *The Journal of Strategic Information Systems*, 9, 155-173.
- MCWILLIAM, G. 2000. Building Stronger Brands through Online Communities. *SLOAN MANAGEMENT REVIEW*, 41, 43-54.

- MEEHL, G. A., WASHINGTON, W. M., COLLINS, W. D., ARBLASTER, J. M., HU, A., BUJA, L. E., STRAND, W. G. & TENG, H. 2005. How Much More Global Warming and Sea Level Rise? *Science*, 307, 1769-1772.
- MENDENHAL, W. & SINCICH, T. 1993. *A Second Course in Business Statistics*. Dellen. Macmillian, New York.
- MESSICK, S. 1995. Validity of psychological assessment. *American Psychologist*.
- MIDDEN, C. J., KAISER, F. G. & TEDDY MCCALLEY, L. 2007. Technology's four roles in understanding individuals' conservation of natural resources. *Journal of Social Issues*, 63, 155-174.
- MIGUEL, A., ANA, I. & VICTOR, M. 2003. Context-aware mobile communication in hospitals.
- MINGERS, J. 2003. The paucity of multimethod research: a review of the information systems literature. *Information Systems Journal*, 13, 233-249.
- MIYATA, K. 2008. Social Support for Japanese Mothers Online and Offline. *The Internet in Everyday Life*. Blackwell Publishers Ltd.
- MOBERG, A., SONECHKIN, D. M., HOLMGREN, K., DATSENKO, N. M., KARLEN, W. & LAURITZEN, S. E. 2005. Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data. *Nature*, 433, 613-7.
- MODAYIL, J., BAI, T. & KAUTZ, H. Improving the recognition of interleaved activities. Proceedings of the 10th international conference on Ubiquitous computing, 2008. ACM, 40-43.
- MOEP. 2012. The development plan, Ministry of Economy and Planning, Riyadh, Saudi Arabia. Available: <http://www.mep.gov.sa/themes/GoldenCarpet/index.jsp;jsessionid=9044B68748EE3F9B7BD4BA4F65C8B239.alfa> [Accessed 10-12-2013].
- MOFLEH, S. I. 2008. Developing countries and ICT initiatives: lessons learnt from Jordan's experience. *The Electronic Journal of Information Systems in Developing Countries*, 34.
- MOHAI, P. 1992. Men, women, and the environment: An examination of the gender gap in environmental concern and activism. *Society & Natural Resources*, 5, 1-19.
- MOODY, D. & BUIST, A. Improving Links Between Information Systems Research and Practice—Lessons from the Medical Profession. Proceedings of the 10th Australasian Conference on Information Systems, 1999. Citeseer, 645-659.
- MOON, J. W. & KIM, Y. G. 2001. Extending the TAM for a World-Wide-Web context. *INFORMATION AND MANAGEMENT*, 38, 217-230.
- MOONEN, A. C., ERCOLI, L., MARIOTTI, M. & MASONI, A. 2002. Climate change in Italy indicated by agrometeorological indices over 122 years. *Agricultural and Forest Meteorology*, 111, 13-27.
- MOSCOVICI, S. & DUVEEN, G. 2000. *Social representations: Explorations in social psychology*, Polity Press Cambridge.
- MOSER, S. C. & DILLING, L. 2007. *Creating a climate for change : communicating climate change and facilitating social change*, Cambridge; New York, Cambridge University Press.
- MUNIZ, A. M. & O'GUINN, T. C. 2001. *Brand community*.
- MVF, G. C. A. 2013. Lead Generation and Internet Marketing in Saudi Arabia.
- MYERS, M. D. 1997. Qualitative research in information systems. *Management Information Systems Quarterly*, 21, 241-242.
- MYERS, M. D. & AVISON, D. 2002. *Qualitative Research in Information Systems: A Reader*, SAGE Publications.
- MYNATT, E. D., O, V. L., DAY, ADLER, A. & ITO, M. 1998. Network Communities: Something Old, Something New, Something Borrowed &hellip. *Comput. Supported Coop. Work*, 7, 123-156.
- NADER, L. & BECKERMAN, S. 1978. Energy as it Relates to the Quality and Style of Life. *Annual Review of Energy*, 3, 1-28.
- NAHAPIET, J. & GHOSHAL, S. 1998. Social Capital, Intellectual Capital, and the Organizational Advantage. *ACADEMY OF MANAGEMENT REVIEW*, 23, 242-266.
- NAMBISAN, S. 2002. Designing Virtual Customer Environments for New Product Development: Toward a Theory. *ACADEMY OF MANAGEMENT REVIEW*, 27, 392-413.
- NAMBISAN, S. & BARON, R. A. 2007. Interactions in virtual customer environments: Implications for product support and customer relationship management. *Journal of Interactive Marketing*, 21, 42-62.
- NANDHAKUMAR, J. & JONES, M. 1997. Too close for comfort? Distance and engagement in interpretive information systems research. *Information Systems Journal*, 7, 109-131.
- NATIONAL SOCIAL MARKETING CENTRE. 2006. It's Our Health! Realising the Potential of Effective Social Marketing NSMC. Available: <http://www.thensmc.com/sites/default/files/ItsOurHealthJune2006.pdf>.

- NEF 2007. Civil society and climate change. *London; New Economics Foundation.*
- NEJATI, M. & NEJATI, M. 2012. Assessment of sustainable university factors from the perspective of university students. *Journal of Cleaner Production.*
- NEUMAN, W. L. 2014. *Social research methods : qualitative and quantitative approaches*, Harlow, Pearson Education.
- NEWHOUSE, N. 1990. Implications of Attitude and Behavior Research for Environmental Conservation. *Journal of Environmental Education*, 22, 26-32.
- NICHOLLS, R. J., WOODROFFE, C. & BURKETT, V. 2009. Chapter 24 - Coastline Degradation as an Indicator of Global Change. *In: TREVOR, M. L. (ed.) Climate Change.* Amsterdam: Elsevier.
- NOLAN, J. M., SCHULTZ, P. W., CIALDINI, R. B., GOLDSTEIN, N. J. & GRISKEVICIUS, V. 2008. Normative social influence is underdetected. *Personality and social psychology bulletin*, 34, 913-923.
- NONNECKE, B., ANDREWS, D. & PREECE, J. 2006. Non-public and public online community participation: Needs, attitudes and behavior. *Electronic Commerce Research*, 6, 7-20.
- NOORMAN, K. J., BIESIOT, W. & MOLL, H. C. 1999. Changing lifestyles in transition routes towards sustainable household consumption patterns. *International Journal of Sustainable Development*, 2, 231-244.
- NORDLUND, A. M. & GARVILL, J. 2003. Effects of values, problem awareness, and personal norm on willingness to reduce personal car use. *Journal of Environmental Psychology*, 23, 339-347.
- NORMAN, G. J., ZABINSKI, M. F., ADAMS, M. A., ROSENBERG, D. E., YAROCH, A. L. & ATIENZA, A. A. 2007. A review of eHealth interventions for physical activity and dietary behavior change. *American journal of preventive medicine*, 33, 336-345. e16.
- NORTON, A. & LEAMAN, J. 2004. *The Day After Tomorrow: Public Opinion on Climate Change.* MORI Social Research Institute. 2004 ed. London: MORI Social Research Institute.
- NOWOTNY, H. 1981. Women in public life in Austria. *Access to power: Cross-national studies of women and elites*, 145-158.
- NUNNALLY, J. 1978. *Psychometric theory.* New York: McGraw-Hill.
- NUNNALLY JUM, C. & BERNSTEIN IRA, H. 1978. *Psychometric theory.* New York: McGraw-Hill.
- NYE, M. & BURGESS, J. 2008. *Promoting durable change in household waste and energy use behaviour.* [Online]. London: Department for Environment, Food & Rural Affairs, UK. Available: <https://ueaeprints.uea.ac.uk/25463/> Technical Report. DEFRA].
- NYE, M., WHITMARSH, L. & FOXON, T. 2010. Sociopsychological perspectives on the active roles of domestic actors in transition to a lower carbon electricity economy. *Environ. Plann. A Environment and Planning A*, 42, 697-714.
- O'CONNOR, R. E., BARD, R. J. & FISHER, A. 1999. Risk Perceptions, General Environmental Beliefs, and Willingness to Address Climate Change. *Risk Analysis*, 19, 461-471.
- O'NEILL, S. & NICHOLSON-COLE, S. 2009. "Fear Won't Do It". *Science Communication*, 30, 355-379.
- O'NEILL, S. J., BOYKOFF, M., NIEMEYER, S. & DAY, S. A. 2013. On the use of imagery for climate change engagement. *Global Environmental Change*, 23, 413-421.
- O'NEILL, S. J. & HULME, M. 2009. An iconic approach for representing climate change. *Global Environmental Change*, 19, 402-410.
- OBAID, R. R. & MUFTI, A. H. 2008. Present state, challenges, and future of power generation in Saudi Arabia., IEEE Energy 2030 Conference, 17-18. Available: <http://ipac.kacst.edu.sa/eDoc/eBook/3654.pdf> [Accessed 10-9-2012].
- OCKWELL, D., LORRAINE, W. & SAFFRON, O. N. 2009. Reorienting climate change communication for effective mitigation: Forcing people to be green or fostering grass-roots engagement? *Science Communication*, 30, 305-327.
- OECD 2002. *Towards Sustainable Household Consumption? Trends and Policies in OECD Countries.* OECD Publishing
- OERLEMANS, J. 2005. Extracting a climate signal from 169 glacier records. *Science*, 308, 675-7.
- OFWAT. 2008. *Preparing for the future –Ofwat's climate change policy statement Ofwat – Protecting consumers, promoting value and safeguarding the future, Ofwat's climate cahnge policy statement* [Online]. Birmingham. Available: http://www.ofwat.gov.uk/sustainability/climatechange/pap_pos_climatechange.pdf [Accessed 10-9-2012].
- OLIVIER, M. S. 2009. *Information technology research : a practical guide for computer science and informatics*, Pretoria, Van Schaik.
- OLLI, E., GRENDSTAD, G. & WOLLEBAEK, D. 2001. Correlates of Environmental Behaviors: Bringing Back Social Context. *Environment and Behavior*, 33, 181-208.

- ORESZCZYN, S., LANE, A. & CARR, S. 2010. The role of networks of practice and webs of influencers on farmers' engagement with and learning about agricultural innovations. *Journal of Rural Studies*, 26, 404-417.
- ORGANISATION FOR ECONOMIC, C.-O. & DEVELOPMENT 2001. *Improving the Environmental Performance of Agriculture Policy options and market approaches*, Paris, OECD Publishing.
- ORLIKOWSKI, W. J. & BAROUDI, J. J. 1991. Studying information technology in organizations: Research approaches and assumptions. *Information systems research*, 2, 1-28.
- OSTROM, E. 2009. A polycentric approach for coping with climate change. *World Bank Policy Research Working Paper Series, Vol.*
- OTTO, J., ZERNER, C., ROBINSON, J., DONOVAN, R., LYNCH, O., LAVELLE, M., VILLARREAL, R., SALAFSKY, N., ALCORN, J. & SEYMOUR, F. 1994. *Natural connections: perspectives in community-based conservation*, Island Press.
- OWENS, S. 2000. 'Engaging the public': information and deliberation in environmental policy. *Environment & planning A.*, 32, 1141-1148.
- PAAVOLA, J. & ADGER, W. N. 2006. Fair adaptation to climate change. *Ecological Economics*, 56, 594-609.
- PAHL-WOSTL, C. 2006. The Importance of Social Learning in Restoring the Multifunctionality of Rivers and Floodplains.
- PALM, B. 2012. *International Geothermal Days Romania 2012 Groundmed Workshop* [Online]. European. Available: http://www.energy-cie.ro/archives/2012/nr_2/v3-n2-11.pdf [Accessed 26-6-2012].
- PALVIA, P., EN MAO, P., SALAM, A. & SOLIMAN, K. S. 2003. Management information systems research: what's there in a methodology? *Communications of the Association for Information Systems*, 11.
- PALVIA, P., LEARY, D., MAO, E., MIDHA, V., PINJANI, P. & SALAM, A. 2004. RESEARCH METHODOLOGIES IN MIS: AN UPDATE. *Communications of the Association for Information Systems*, 14.
- PARASURAMAN, A., GREWAL, D. & KRISHNAN, R. 2006. *Marketing research*, Cengage Learning.
- PARKER, C. M., WAFULA, E. N., SWATMAN, P. M. & SWATMAN, P. A. Information systems research methods: The technology transfer problem. Proceedings of the 5th Australian Conference on Information System, 1994. 197-208.
- PARKER, D., WEST, R., STRADLING, S. & MANSTEAD, A. S. R. 1995. Behavioural characteristics and involvement in different types of traffic accident. *Accident Analysis & Prevention*, 27, 571-581.
- PARKINSON, J. 2004. Why Deliberate? The Encounter Between Deliberation and New Public Managers. *Public Administration*, 82, 377-395.
- PASCOE, J. Adding generic contextual capabilities to wearable computers. *Wearable Computers*, 1998. Digest of Papers. Second International Symposium on, 1998. IEEE, 92-99.
- PATHER, S. & REMENYI, D. 2005. Some of the philosophical issues underpinning research in information systems - from positivism to critical realism : reviewed article. *comp South African Computer Journal*, 76-83.
- PEATTIE, K. & PEATTIE, S. 2009. Social marketing: A pathway to consumption reduction? *J. Bus. Res. Journal of Business Research*, 62, 260-268.
- PECHMANN, C. & REIBLING, E. T. 2000. Planning an effective anti-smoking mass media campaign targeting adolescents. *Journal of public health management and practice*, 6, 80-94.
- PERUGINI, M. & BAGOZZI, R. P. 2001. The role of desires and anticipated emotions in goal-directed behaviours: broadening and deepening the theory of planned behaviour. *The British journal of social psychology / the British Psychological Society*, 40, 79-98.
- PERVAN, G. A case for more case study research in group support systems. Proceedings of the IFIP TC8 Open Conference on Business Process Re-engineering: Information Systems Opportunities and Challenges, 1994. Elsevier Science Inc., 469-479.
- PETER, J. P. & OLSON, J. C. 1983. Is science marketing? *Journal of Marketing*, 47.
- PFLEEGER, S. L. & ATLEE, J. M. 2010. *Software engineering : theory and practice*, Upper Saddle River, N.J., Pearson Prentice Hall.
- PFLEEGER, S. L. & KITCHENHAM, B. A. 2001. Principles of survey research: part 1: turning lemons into lemonade. *ACM SIGSOFT Software Engineering Notes*, 26, 16-18.
- PHILLIPS, B. S. 1971. *Social research: strategy and tactics. Second edition*, New York, Macmillan Co.; London: Collier-Macmillan.
- PHILLIPS, B. S. 1976. *Social research : strategy and tactics*, [S.l.], [s.n.].

- PICKETT-BAKER, J. & OZAKI, R. 2008. Pro-environmental products: marketing influence on consumer purchase decision. *Journal of Consumer Marketing*, 25, 281-293.
- PIDGEON, N. F., LORENZONI, I. & POORTINGA, W. 2008. Climate change or nuclear power—No thanks! A quantitative study of public perceptions and risk framing in Britain. *Global Environmental Change*, 18, 69-85.
- PINTO, H. S. & MARTINS, J. P. 2004. Ontologies: How can they be built? *Knowledge and Information Systems*, 6, 441-464.
- PLIGT, J. V. D. 1985. Energy Conservation: Two Easy Ways Out1. *Journal of Applied Social Psychology*, 15, 3-15.
- PLUMMER, J. T. 1974. The concept and application of lifestyle segmentation. *Journal of Marketing*, 38, 33-37.
- POLLARD, E. & LIEBECK, H. 1994. *The Oxford paperback dictionary*, Oxford University Press London.
- POORTINGA, W., NICK, P. & IRENE, L. 2006. Public Perceptions of Nuclear Power, Climate Change and Energy Options in Britain: Summary Findings of a Survey Conducted during October and November 2005. *Technical Report (Understanding Risk Working Paper 06-02)*. Norwich: Centre for Environmental Risk.
- POORTINGA, W. & PIDGEON, N. 2003a. Public perceptions of risk, science and governance: Main findings of a British survey of five risk cases. *Norwich: University of East Anglia and MORI*.
- POORTINGA, W. & PIDGEON, N. F. 2003b. Exploring the Dimensionality of Trust in Risk Regulation. *Risk Analysis*, 23, 961-972.
- POORTINGA, W. & PIDGEON, N. F. 2004. Trust, the Asymmetry Principle, and the Role of Prior Beliefs. *Risk Analysis*, 24, 1475-1486.
- POORTINGA, W., STEG, L. & VLEK, C. 2004. Values, environmental concern, and environmental behavior: a study into household energy use. *Sage Urban Studies Abstracts*, 32.
- POTOSKI, M. & PRAKASH, A. 2004. The regulation dilemma: Cooperation and conflict in environmental governance. *Public Administration Review*, 64, 152-163.
- POWDERMAKER, H. 1966. *Stranger and friend: The way of an anthropologist*, WW Norton & Company.
- PRA BHAKAR, S. V., SRINIVASAN, A. & SHAW, R. 2009. Climate change and local level disaster risk reduction planning: need, opportunities and challenges. *Mitigation and Adaptation Strategies for Global Change*, 14, 7-33.
- PRAHALAD, C. K. & DOZ, Y. L. 1987. *The multinational mission : balancing local demands and global vision*, New York; London, Free Press ; Collier Macmillan.
- PREECE, J. 2001. *The life and work of Günter Grass : literature, history, politics*, Houndmills, Basingstoke; New York, Palgrave.
- PREECE, J., NONNECKE, B. & ANDREWS, D. 2004. The top five reasons for lurking: improving community experiences for everyone. *Computers in Human Behavior*, 20, 201-223.
- PRESIDENCY OF METEOROLOGY ENVIRONMENT (PME) 2005. First national communication of the kingdom of Saudi Arabia.
- PRETTY, J. 2003. Social capital and the collective management of resources. *Science*, 302, 1912-1914.
- PRETTY, J. & SMITH, D. 2004. Social capital in biodiversity conservation and management. *Conservation biology*, 18, 631-638.
- PROBST, G. & BORZILLO, S. 2008. Why communities of practice succeed and why they fail. *European Management Journal*, 26, 335-347.
- PUNCH, K. 2014. *Introduction to social research : Quantitative & qualitative approaches*, Los Angeles, Calif, SAGE.
- PUTNAM, R. D., LEONARDI, R. & NANETTI, R. Y. 1994. *Making democracy work: Civic traditions in modern Italy*, Princeton university press.
- QADER, M. R. 2009. Electricity Consumption and GHG Emissions in GCC Countries. *Energies*, 2, 1201-1213.
- QUERCIA, D., LATHIA, N., CALABRESE, F., DI LORENZO, G. & CROWCROFT, J. Recommending social events from mobile phone location data. Data Mining (ICDM), 2010 IEEE 10th International Conference on, 2010. IEEE, 971-976.
- R. T. WATSON & TEAM, C. W. 2001. Climate Change 2001: Synthesis Report Summary for policymakers. Contributions of Working Groups I, II and III to the Third Assessment Report of the Intergovernmental Panel on Climate Change. 2001 ed. Cambridge, UK: Cambridge University Press.
- RABINOVICH, A., MORTON, T. A. & DUKE, C. C. 2010. Collective self and individual choice: the role of social comparisons in promoting climate change. In: WHITMARSH, L., O'NEILL, S., LORENZONI, I. (ed.) *Engaging the Public with Climate Change: Behaviour Change and Communication*. London: Earthscan.

- RAHMAN, S. M. & KHONDAKER, A. N. 2012. Mitigation measures to reduce greenhouse gas emissions and enhance carbon capture and storage in Saudi Arabia. *Renewable and Sustainable Energy Reviews*, 16, 2446-2460.
- RAHMSTORF, S., CAZENAVE, A., CHURCH, J. A., HANSEN, J. E., KEELING, R. F., PARKER, D. E. & SOMERVILLE, R. C. J. 2007. Recent Climate Observations Compared to Projections. *Science*, 316, 709.
- RANDALL, R. 2009. Loss and Climate Change: The Cost of Parallel Narratives. *Ecopsychology* *Ecopsychology*, 1, 118-129.
- RANGANATHAN, A. & CAMPBELL, R. H. 2003. An infrastructure for context-awareness based on first order logic. *Personal and Ubiquitous Computing*, 7, 353-364.
- RÄTHZEL, N. & UZZELL, D. 2009. Changing relations in global environmental change. *Global Environmental Change*, 19, 326-335.
- RAYNER, S. & MALONE, E. L. 1997. Zen and the art of climate maintenance. *Nature*, 390, 332-334.
- READ, D., BOSTROM, A., MORGAN, M. G., FISCHHOFF, B. & SMUTS, T. 1994. What Do People Know About Global Climate Change? 2. Survey Studies of Educated Laypeople. *Risk Analysis*, 14, 971-982.
- REAGAN, J. 2006. *Applied research methods for mass communicators*, Spokane, Wash., Marquette Books.
- REGION, D. 1997. Durham region outdoor water conservation pilot study. *Durham Region, Ontario, Canada: Author*.
- RENKEN, J. & MOSWETSI, W. 2006. Experiences in Interpretative Information Systems Research: Investigating E-commerce Adoption in the Botswana Defence Force. *Quality and Impact of Qualitative Research*, 104.
- RENN, O. & LEVINE, L. 1991. Credibility and trust in risk communication. In: (EDS.), I. R. E. K. A. P. J. M. S. (ed.). *Communicating Risks to the Public International perspectives*.
- RENN, O. & ROHRMANN, B. 2000. *Cross-Cultural Risk Perception: A Survey of Empirical Studies*, The Netherlands, Kluwer Academic Publishers.
- REPORT, S. A. E. E. 2012. Saudi Arabia, Energy efficiency report.
- REUTERS & MIDDLE EAST ONLINE. 2011. *The United Nations has shown its inability within two weeks of talks on a sweeping change to avoid disasters, weather events*. [Online]. Durban (South Africa) - John Hrkovic.: Middle east online., Available: <http://middle-east-online.com/?id=121972> [Accessed 19-6-2012].
- RHEINGOLD, H. 1993. *The virtual community : homesteading on the electronic frontier*, Reading, Mass., Addison-Wesley Pub. Co.
- RICE, R. E. & ATKIN, C. K. 2012. *Public communication campaigns*, Sage.
- ROBSON, C. 2011. *Real world research : a resource for users of social research methods in applied settings*, Chichester, West Sussex, Wiley.
- ROBSON, W. & HALL, P. 1997. Strategic management and information systems: an integrated approach.
- ROGERS, E. M. 2010. *Diffusion of innovations*, Simon and Schuster.
- ROKEACH, M. 1973. *The nature of human values*, New York, NY, US, Free press.
- ROKEACH, M. 2008. *Understanding human values*, SimonandSchuster. com.
- ROMM, C., PLISKIN, N. & CLARKE, R. 1997. Virtual communities and society: Toward an integrative three phase model. *International Journal of Information Management*, 17, 261-270.
- ROTHAERMEL, F. T. & SUGIYAMA, S. 2001. Virtual internet communities and commercial success: individual and community-level theory grounded in the atypical case of TimeZone. com. *Journal of Management*, 27, 297-312.
- ROUSE, A., WATSON, D., GILBERT, A. & DILNUTT, R. Systems development practices: A comparison of the experience of Australians and United States. Proc. of 1995 Pan Pacific Conference on Information Systems, 1995. 46-56.
- ROWSON, J., BROOME, S. & JONES, A. 2010. Connected Communities: How Social Networks Power and Sustain the Big Society. *Royal Society of Arts, London*.
- ROY, J. & PAL, S. 2009. Lifestyles and climate change: link awaiting activation. *Current Opinion in Environmental Sustainability*, 1, 192-200.
- ROYCE, W. W. Managing the development of large software systems. proceedings of IEEE WESCON, 1970. Los Angeles.
- RUTTER, R. A. C., ABRAHAM, C. & KOK, G. 2001. SCARY WARNINGS AND RATIONAL PRECAUTIONS: A REVIEW OF THE PSYCHOLOGY OF FEAR APPEALS. *PSYCHOLOGY AND HEALTH*, 16, 613-630.
- SABINE, C. L., HEIMANN, M., ARTAXO, P., BAKKER, D. C. E., CHEN, C. T. A., FIELD, C. B., GRUBER, N., LE QUÉRÉ, C., PRINN, R., RICHEY, J. E., LANKAO, P. R., SATHAYE, J. A. & VALENTINI, R. 2004. Current status and past trends of the global carbon cycle. Island Press.

- SAM & WRI 2003. *Changing drivers : the impact of climate change on competitiveness and value creation in the automotive industry*, Washington, World Resources Institute.
- SÁNCHEZ-CORTÉS, M. & CHAVERO, E. 2011. Indigenous perception of changes in climate variability and its relationship with agriculture in a Zoque community of Chiapas, Mexico. *CLIMATIC CHANGE*, 107, 363-389.
- SANGWAN, S., GUAN, C. & SIGUAW, J. A. 2009. Virtual Social Networks: Toward A Research Agenda. *International Journal of Virtual Communities and Social Networking*, 1, 1-13.
- SANQUIST, T. F., ORR, H., SHUI, B. & BITTNER, A. C. 2012. Lifestyle factors in U.S. residential electricity consumption. *Energy Policy*, 42, 354-364.
- SATZINGER, J. W., JACKSON, R. B. & BURD, S. D. 2012. *Systems analysis and design in a changing world*, Boston, MA, Course Technology, Cengage Learning.
- SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2009. Research methods for business students.
- SAUNDERS, M. N., SAUNDERS, M., LEWIS, P. & THORNHILL, A. 2011. *Research methods for business students, 5/e*, Pearson Education India.
- SCHIPPER, L. 1991. Life-styles and Energy: A New Perspective. *Lawrence Berkley Lab., Berkley, CA*.
- SCHIPPER, L., BARTLETT, S., HAWK, D. & VINE, E. 1989. Linking Life-Styles and Energy Use: A Matter of Time? *Annual Review of Energy*, 14, 273-320.
- SCHULTZ, P. W., NOLAN, J. M., CIALDINI, R. B., GOLDSTEIN, N. J. & GRISKEVICIUS, V. 2007. The Constructive, Destructive, and Reconstructive Power of Social Norms. *Psychological Science*, 18, 429-434.
- SCHULTZ, P. W., OSKAMP, S. & MAINIERI, T. 1995. Who Recycles and When? A Review of Personal and Situational Factors. *Journal of environmental psychology*, 15, 105.
- SCHULTZ, P. W. & ZELEZNY, L. C. 1998. Values and Proenvironmental Behavior A Five-Country Survey. *Journal of Cross-cultural psychology*, 29, 540-558.
- SCHWARTZ, B., MIDDLESTADT, S. & VERZOSA, C. 1994. Social Marketing for Gender Equity in Bangladesh. *Social Marketing Quarterly*, 1, 3-3.
- SCHWARTZ, S. H. 1977. Normative Influences on Altruism. In: LEONARD, B. (ed.) *Advances in experimental social psychology*. Academic Press.
- SCHWARTZ, S. H. 1992. Universals in the content and structure of values: Theoretical advances and empirical tests in 20 countries. *Advances in experimental social psychology*, 25, 1-65.
- SCHWARTZ, S. H. 1994. Are there universal aspects in the structure and contents of human values? *Journal of Social Issues*, 50, 19-45.
- SCHWARTZ, S. H. & HOWARD, J. A. 1981. A normative decision-making model of altruism. *Altruism and helping behavior*, 189-211.
- SCOTT, D. & WILLITS, F. K. 1994. Environmental Attitudes and Behavior: A Pennsylvania Survey. *Environment and Behavior*, 26, 239.
- SCOTT, W. R. 2001. *Institutions and organizations*, Thousand Oaks, SAGE.
- SEKARAN, U. 2003. *Research methods for business : a skill-building approach*, New York, John Wiley & Sons.
- SEKARAN, U. 2006. *Research methods for business: A skill building approach*, John Wiley & Sons.
- SEKARAN, U. 2013. *Research methods for business : a skill-building approach*, Hoboken, N.J; Chichester, Wiley.
- SELLTIZ, C., WRIGHTSMAN, L. S., COOK, S. W., BALCH, G. I., HOFSTETTER, R. & BICKMAN, L. 1976. *Research methods in social relations*, New York, Holt, Rinehart and Winston.
- SEMENZA, J. C., HALL, D. E., WILSON, D. J., BONTEMPO, B. D., SAILOR, D. J. & GEORGE, L. A. 2008. Public Perception of Climate Change: Voluntary Mitigation and Barriers to Behavior Change. *American Journal of Preventive Medicine*, 35, 479-487.
- SESAN, O. 2001. Information and Communication Technology: Development Opportunities and the Role of Youth. *This Day Newspaper*, 7, 25.
- SEVERSON, H. H., GORDON, J. S., DANAHER, B. G. & AKERS, L. 2008. ChewFree. com: evaluation of a Web-based cessation program for smokeless tobacco users. *Nicotine & Tobacco Research*, 10, 381-391.
- SEYFANG, G. & SMITH, A. 2005. Community action: A neglected site of innovation for sustainable development?
- SHAFFER, D. W. & GEE, J. P. 2007. Epistemic games as education for innovation. *BJEP Monograph Series II, Number 5-Learning through Digital Technologies*. British Psychological Society.
- SHAH, R. & GOLDSTEIN, S. M. 2006. Use of structural equation modeling in operations management research: Looking back and forward. *Journal of Operations Management*, 24, 148-169.
- SHAO, G. 2009. Understanding the appeal of user-generated media: a uses and gratification perspective. *INTERNET RESEARCH -WESTPORT THEN BRADFORD-*, 19, 7-25.

- SHEPPARD, S. R. J. 2005. Landscape visualisation and climate change: the potential for influencing perceptions and behaviour. *Environmental Science & Policy*, 8, 637-654.
- SHORT, J., WILLIAMS, E. & CHRISTIE, B. 1976. The social psychology of telecommunications.
- SHUE, H. 1999. Global Environment and International Inequality. *International Affairs*, 75, 531-545.
- SHUMAKER, S. A. & BROWNELL, A. 1984. Toward a theory of social support: Closing conceptual gaps. *Journal of Social Issues*, 40, 11-36.
- SIEGRIST, M., CVETKOVICH, G. & ROTH, C. 2000. Salient Value Similarity, Social Trust, and Risk/Benefit Perception. *Risk Analysis*, 20, 353-362.
- SILVERMAN, D. 2013. *Doing qualitative research*.
- SLOCUM, R. 2004. Consumer citizens and the Cities for Climate Protection campaign. *Environment and Planning A*, 36, 763-782.
- SMITH, A. 2007. Translating Sustainabilities between Green Niches and Socio-Technical Regimes. *TECHNOLOGY ANALYSIS & STRATEGIC MANAGEMENT*, 19, 427-450.
- SMITH, H. W. 1991. *Strategies of social research*, Orlando, FL, Holt, Rinehart, and Winston.
- SOBEL, M. E. 1981. *Lifestyle and social structure: Concepts, definitions, analyses* New York, Academic Press.
- SOLOMON, S., INTERGOVERNMENTAL PANEL ON CLIMATE, C. & INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE. WORKING GROUP, I. 2007. *Climate change 2007 : the physical science basis : contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change*, Cambridge; New York, Cambridge University Press.
- SPEARS, R. & LEA, M. 1992. *Social influence and the influence of the 'social' in computer-mediated communication*.
- SPENCE, A. & PIDGEON, N. 2009. Psychology, Climate Change & Sustainable Behaviour. *Environment: Science and Policy for Sustainable Development*. Routledge.
- SPENCE, A., POORTINGA, W., BUTLER, C. & PIDGEON, N. F. 2011. Perceptions of climate change and willingness to save energy related to flood experience. *Nature Clim. Change*, 1, 46-49.
- SPENCE, A., VENABLES, D., PIDGEON, N., POORTINGA, W. & DEMSKI, C. 2010. Public perceptions of climate change and energy futures in Britain: Summary Findings of a Survey Conducted from January to March 2010. Available: <http://www.ipsos-mori.com/Assets/Docs/Polls/climate-change-public-perceptions-of-climate-change-report.pdf> [Accessed 12-9-2012].
- SPRATT, D. & SUTTON, P. 2008. *Climate Code Red: The Case for Emergency Action*
- SQUIRE, K. D. & JAN, M. 2007. Mad City Mystery: Developing scientific argumentation skills with a place-based augmented reality game on handheld computers. *Journal of Science Education and Technology*, 16, 5-29.
- SRINIVASAN, S. S., ANDERSON, R. & PONNAVOLU, K. 2002. Customer loyalty in e-commerce: an exploration of its antecedents and consequences. *Journal of Retailing*, 78, 41-50.
- STANNARD, S., HALL, S. & YOUNG, J. 1998. Social marketing as a tool to stop child abuse. *Social Marketing Quarterly*, 4, 64-68.
- STEEL, B. S., LIST, P. & SHINDLER, B. 1994. Conflicting values about federal forests: A comparison of national and Oregon publics. *Society & Natural Resources*, 7, 137-153.
- STEENKAMP, J.-B. E. & VAN TRIJP, H. 1991. The use of LISREL in validating marketing constructs. *International Journal of Research in marketing*, 8, 283-299.
- STEG, L., DREIJERINK, L. & ABRAHAMSE, W. 2005. Factors influencing the acceptability of energy policies: A test of VBN theory. *Journal of Environmental Psychology*, 25, 415-425.
- STEG, L. & VLEK, C. 2009. Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29, 309-317.
- STEINIGER, S., NEUN, M. & EDWARDES, A. 2006. Foundations of location based services. *Lecture Notes on LBS*, 1.
- STERN, N. H. & GREAT BRITAIN, T. 2007. *The economics of climate change : the Stern review*, Cambridge, UK; New York, Cambridge University Press.
- STERN, P. C. 2000. Toward a Coherent Theory of Environmentally Significant Behavior. *Journal of Social Issues*, [Online], 56. Available: http://www.stanford.edu/~kcarmel/CC_BehavChange_Course/readings/Additional%20Resource/s/J%20Soc%20Issues%202000/stern_2000_4_metareview_a.pdf [Accessed 2011].
- STERN, P. C., ARONSON, E., DARLEY, J. M., HILL, D. H., HIRST, E., KEMPTON, W. & WILBANKS, T. J. 1986. The Effectiveness of Incentives for Residential Energy Conservation. *Evaluation Review*, 10, 147-176.

- STERN, P. C. & DIETZ, T. 1994. The value basis of environmental concern. *Journal of Social Issues*, 50, 65-84.
- STERN, P. C., DIETZ, T., ABEL, T., GUAGNANO, G. A. & KALOF, L. 1999. A value-belief-norm theory of support for social movements: The case of environmentalism. *Human ecology review*, 6, 81-98.
- STERN, P. C., DIETZ, T. & GUAGNANO, G. A. 1995. The new ecological paradigm in social-psychological context. *Environment and Behavior*, 27, 723-743.
- STERN, P. C. & OSKAMP, S. 1987. Managing scarce environmental resources. *Handbook of environmental psychology*, 2, 1043-1088.
- STEYAERT, P. & JIGGINS, J. 2007. Governance of complex environmental situations through social learning: a synthesis of SLIM's lessons for research, policy and practice. *Environmental Science and Policy*, 10, 575-586.
- STORY, P. A. & FORSYTH, D. R. 2008. Watershed conservation and preservation: Environmental engagement as helping behavior. *Journal of Environmental Psychology*, 28, 305-317.
- STRAUB, D., GEFEN, D. & BOUDREAU, M. 2005. *Research in information systems : a handbook for research supervisors and their students*, Amsterdam, Elsevier/Butterworth-Heinemann.
- STRAUB, D. W. 1989. Validating instruments in MIS research. *MIS quarterly*, 147-169.
- STRAUB, D. W. 1994. The Effect of Culture on IT Diffusion: E-Mail and FAX in Japan and the US. *Information Systems Research*, 5, 23-47.
- STRECK, C. 2002. Global public policy networks as coalitions for change. *Global environmental governance: options and opportunities*, 121-140.
- SULER, J. 1996. *Psychology of Cyberspace* [Online]. John Suler. Available: <http://www1.rider.edu/~7Esuler/psycyber/psycyber.html> [Accessed 1 11 2011].
- SUTTON, S. G. & TOBIN, R. C. 2011. Constraints on community engagement with Great Barrier Reef climate change reduction and mitigation. *Global Environmental Change*, 21, 894-905.
- SYAL, S. S., WILSON, R. S., CRAWFORD, J. M. & LUTZ, J. 2011. Climate change and human health—what influences the adoption of adaptation programming in the United States public health system? *Mitigation and Adaptation Strategies for Global Change*, 16, 911-924.
- TARRANT, M. A. & CORDELL, H. K. 1997. The effect of respondent characteristics on general environmental attitude-behavior correspondence. *Environment and Behavior*, 29, 618-637.
- TAYLOR, S. & BOGDAN, R. 1984. *Introduction to research methods*, New York: Wiley.
- TEGARDEN, D., DENNIS, A. & WIXOM, B. H. 2013. *Systems analysis design UML version 2.0 : an object-oriented approach*, Singapote, John Wiley & Sons.
- TEIJLINGEN, E. & HUNDLEY, V. 2001. The importance of pilot studies. *Social research update*, 1-4.
- TEO, H.-H., CHAN, H.-C., WEI, K.-K. & ZHANG, Z. 2003. Evaluating information accessibility and community adaptivity features for sustaining virtual learning communities. *International Journal of Human-Computer Studies*, 59, 671-697.
- THE HANSARD SOCIETY. 2011. Audit of Political Engagement 8: The 2011 Report with a focus on coalition politics, civic involvement and the Big Society
 Audit of Political Available:
http://hansardsociety.org.uk/blogs/parliament_and_government/archive/2011/03/30/audit-of-political-engagement-8.aspx [Accessed 1 1 2012].
- THE SOCIAL LEARNING, G. 2001. *Learning to manage global environmental risks Vol. 1, A comparative history of social responses to climate change, ozone depletion, and acid rain*, Cambridge, MA [etc.], The MIT Press.
- THE WORLD BANK. 2012. *Saudia Arabia* [Online]. USA: The World Bank Group. Available: http://data.albankaldawli.org/country/saudi-arabia#cp_cc [Accessed 19-6-2012].
- THOGERSEN, J. 1996. Recycling and Morality: A Critical Review of the Literature. *Environment and behavior.*, 28, 536.
- THØIGERSEN, J. & CROMPTON, T. 2009. Simple and Painless? The Limitations of Spillover in Environmental Campaigning. *JOURNAL OF CONSUMER POLICY*, 32, 141-163.
- THOMAS, C. D., CAMERON, A., GREEN, R. E., BAKKENES, M., BEAUMONT, L. J., COLLINGHAM, Y. C., ERASMUS, B. F., DE SIQUEIRA, M. F., GRAINGER, A. & HANNAH, L. 2004. Extinction risk from climate change. *Nature*, 427, 145-148.
- THOMPSON, B. 2004. *Exploratory and confirmatory factor analysis: Understanding concepts and applications*, American Psychological Association.
- THOMPSON, L. G. 2010. Climate Change: The Evidence and Our Options. *Behav Anal*, 33, 153-170.
- THOMPSON, L. G., BRECHER, H. H., MOSLEY-THOMPSON, E., HARDY, D. R. & MARK, B. G. 2009. Glacier loss on Kilimanjaro continues unabated. *Proc Natl Acad Sci U S A*, 106, 19770-5.

- THOMPSON, M., ELLIS, R. & WILDAVSKY, A. B. 1990. *Cultural theory*, Boulder, Colo., Westview Press.
- THOMPSON, S. A. & SINHA, R. K. 2008. Brand Communities and New Product Adoption: The Influence and Limits of Oppositional Loyalty. *Journal of Marketing*, 72, 65-80.
- THOYRE, A. 2011. Social capital as a facilitator of pro-environmental actions in the USA: A preliminary examination of mechanisms. *Local Environ. Local Environment*, 16, 37-49.
- TIELEMAN, B. I., WILLIAMS, J. B., BUSCHUR, M. E. & BROWN, C. R. 2003. PHENOTYPIC VARIATION OF LARKS ALONG AN ARIDITY GRADIENT: ARE DESERT BIRDS MORE FLEXIBLE? *Ecology*, 84, 1800-1815.
- TONTERI, L., KOSONEN, M., ELLONEN, H.-K. & TARKIAINEN, A. 2011. Antecedents of an experienced sense of virtual community. *Computers in Human Behavior*, 27, 2215-2223.
- TRANSPORT FOR LONDON. 2006. Central London Congestion Charging: Impacts monitoring Fourth Annual Report. *Transport for London* [Online]. Available: <http://www.tfl.gov.uk/assets/downloads/FourthAnnualReportFinal.pdf> [Accessed 11 1 2012].
- TRAUTH, E. M. 2001. The choice of qualitative methods in IS research. *Qualitative research in IS: issues and trends*, 1-19.
- TREUT, L., SOMERVILLE, H., CUBASCH, U., DING, Y., MAURITZEN, C., MOKSSIT, A., PETERSON, T., PRATHER, M., . 2007. *Historical Overview of Climate Change. In: Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* [Online]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA. Available: http://www.ak-geomorphologie.de/data/Ipccreport_text.pdf [Accessed 19-6-2012].
- TRIANDIS, H. C. 1977. *Interpersonal behavior*, Brooks/Cole Publishing Company Monterey, CA.
- TROCHIM, W. M. 2005. *Research methods: The concise knowledge base*, Atomic Dog Publishing.
- TROCHIM, W. M. 2006. Research methods knowledge base: Qualitative validity. *Last updated*, 20, 2006.
- TSAI, W. & GHOSHAL, S. 1998. Social Capital and Value Creation: The Role of Intrafirm Networks. *The Academy of Management Journal*, 41, 464-476.
- TU, C.-H. 2002. The management of social presence in an online learning environment. *International Journal on E-learning* April-June, 34-45.
- TURNER, J. C. 1982. Towards a cognitive redefinition of the social group. *Social identity and intergroup relations*, 15-40.
- UNDERWOOD, J. D. M. & BRITISH PSYCHOLOGICAL SOCIETY 2007. *Learning through digital technologies*, Leicester, British Psychological Society.
- UNEP. 2010. Task force in sustainable lifestyle. Available: <http://www.unep.fr/scp/marrakech/taskforces/pdf/SLT%20Report.pdf>.
- UNGAR, S. 2000. Knowledge, ignorance and the popular culture: climate change versus the ozone hole. *Public Understanding of Science*, 9, 297-312.
- UNITED NATIONS. 1992. *United Nations Framework Agreement on Climate Change* [Online]. Available: http://unfccc.int/essential_background/convention/background/items/1349.php [Accessed 17 01 2012 2012].
- UNITED NATIONS CLIMATE CHANGE CONFERENCE HOST COUNTRY, S. 2009. *COP15 Copenhagen 2009 : United Nations Climate Change Conference : Denmark's Host Country Website* [Online].
- UPHOFF, N. T. 1992. *Local institutions and participation for sustainable development*, Sustainable Agriculture Programme of the International Institute for Environment and Development.
- URBAN, F. 2009. Climate-Change Mitigation Revisited: Low-Carbon Energy Transitions for China and India. *Development Policy Review*, 27, 693-715.
- VALENTE, T. W. & PUMPUANG, P. 2007. Identifying Opinion Leaders to Promote Behavior Change. *Health Education & Behavior*, 34, 881-896.
- VAN DE VEN, A. H. & FERRY, D. L. 1980. *Measuring and assessing organizations*, New York, Wiley.
- VAN DEN BERG, M. H., SCHOONES, J. W. & VLIELAND, T. P. V. 2007. Internet-based physical activity interventions: a systematic review of the literature. *Journal of Medical Internet Research*, 9.
- VAN HOUWELINGEN, J. H. & VAN RAAIJ, W. F. 1989. The Effect of Goal-Setting and Daily Electronic Feedback on In-Home Energy Use. *Journal of Consumer Research*, 16, 98-105.
- VAN KASTEREN, T., NOULAS, A., ENGLEBIENNE, G. & KRÖSE, B. Accurate activity recognition in a home setting. Proceedings of the 10th international conference on Ubiquitous computing, 2008. ACM, 1-9.

- VAN SETTEN, M., POKRAEV, S. & KOOLWAAIJ, J. Context-aware recommendations in the mobile tourist application COMPASS. Adaptive hypermedia and adaptive web-based systems, 2004. Springer, 515-548.
- VERBONG, G. & GEELS, F. 2007. The ongoing energy transition: Lessons from a socio-technical, multi-level analysis of the Dutch electricity system (1960–2004). *Energy Policy*, 35, 1025-1037.
- VERHEIJDEN, M. W., JANS, M. P., HILDEBRANDT, V. H. & HOPMAN-ROCK, M. 2007. Rates and determinants of repeated participation in a web-based behavior change program for healthy body weight and healthy lifestyle. *Journal of medical Internet research*, 9.
- VERPLANKEN, B., AARTS, H., KNIPPENBERG, A. & MOONEN, A. 1998. Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology*, 37, 111-128.
- VERPLANKEN, B., AARTS, H. & KNIPPENBERG, V. 1997. Habit, information acquisition, and the process of making travel mode choices. *European Journal of Social Psychology*, 27, 539-560.
- VERPLANKEN, B. & WOOD, W. 2006. Interventions to Break and Create Consumer Habits. *Journal of Public Policy & Marketing Journal of Public Policy & Marketing*, 25, 90-103.
- VIJAYASATHY, L. R. 2004. Predicting consumer intentions to use on-line shopping: the case for an augmented technology acceptance model. *Information & Management*, 41, 747-762.
- VIRRANTAU, K., MARKKULA, J., GARMASH, A., TERZIYAN, V., VEIJALAINEN, J., KATANOSOV, A. & TIRRI, H. Developing GIS-supported location-based services. Web Information Systems Engineering, 2001. Proceedings of the Second International Conference on, 2001. IEEE, 66-75.
- VLIET, B. V., CHAPPELLS, H. & SHOVE, E. 2005. *Infrastructures of consumption : environmental innovation in the utility industries*, London; Sterling, VA, Earthscan.
- WACHTER, R. M., GUPTA, J. N. D. & QUADDUS, M. A. 2000. IT takes a village: Virtual communities in support of education. *International Journal of Information Management*, 20, 473-489.
- WALL, R. 2005. *Psychological and contextual influences on travel mode choice for commuting*. PhD, De Montfort University.
- WALSHAM, G. 1995. The emergence of interpretivism in IS research. *Information systems research*, 6, 376-394.
- WALTERS, S. T., WRIGHT, J. A. & SHEGOG, R. 2006. A review of computer and Internet-based interventions for smoking behavior. *Addictive behaviors*, 31, 264-277.
- WAND, Y. & WEBER, R. 2002. Research commentary: information systems and conceptual modeling—a research agenda. *Information systems research*, 13, 363-376.
- WANTLAND, D. J., PORTILLO, C. J., HOLZEMER, W. L., SLAUGHTER, R. & MCGHEE, E. M. 2004. The effectiveness of Web-based vs. non-Web-based interventions: a meta-analysis of behavioral change outcomes. *Journal of medical Internet research*. *Journal of medical internet research*.
- WARF, B. 1994. Structuration theory and electronic communications. In: *Wilson, D., Huff, J. (Eds.), Marginalized Places and Populations: A Structurationist Agenda*. Praeger, Westport, Conn., 43-57.
- WASKO, M. M. & FARAJ, S. 2005. Why should I share? Examining social capital and knowledge contribution in electronic networks of practice. *MIS Quarterly*, 29, 35-57.
- WATSON, R. T., ALBRITTON, D. L. & DOKKEN, D. J. 2003. *Climate change 2001: synthesis report*, World Meteorological Organization.
- WEBB, T. L., JOSEPH, J., YARDLEY, L. & MICHIE, S. 2010. Using the internet to promote health behavior change: a systematic review and meta-analysis of the impact of theoretical basis, use of behavior change techniques, and mode of delivery on efficacy. *Journal of medical Internet research*, 12.
- WEBER, E. U. 2010. What shapes perceptions of climate change? *Wiley Interdisciplinary Reviews: Climate Change*, 1, 332-342.
- WELLMAN, B. & GULIA, M. 1999. Net surfers don't ride alone: Virtual communities as communities. Available: <http://homes.chass.utoronto.ca/~wellman/publications/netsurfers/netsurfers.pdf> [Accessed 11 2012].
- WENGER & ETIENNE, C. 1998. *Communities of Practice: Learning, Meaning, and Identity*. Cambridge: Cambridge University Press.
- WENGER, E. 2000. Communities of Practice and Social Learning Systems. *ORGANIZATION -LONDON-*, 7, 225-246.
- WENGER, E. 2008. *Communities of practice : learning, meaning, and identity*, Cambridge, Cambridge University Press.
- WENGER, E., MCDERMOTT, R. A. & SNYDER, W. 2002. *Cultivating communities of practice : a guide to managing knowledge*, Boston, Mass., Harvard Business School Press.

- WHELAN, E. 2006. Exploring knowledge exchange in electronic networks of practice. *J Inf technol*, 22, 5-12.
- WHITMARSH, L. 2008. Are flood victims more concerned about climate change than other people? the role of direct experience in risk perception and behavioural response. *J. Risk Res. Journal of Risk Research*, 11, 351-374.
- WHITMARSH, L. 2009a. Book Review: 'Public Participation in Environmental Assessment and Decision-Making, Panel on Public Participation in Environmental Assessment and Decision-Making'. In: STERN, T. D. A. P. C. (ed.) *Public Participation in Environmental Assessment and Decision-Making*. Environmental Science & Policy, 12, 1069-1072.
- WHITMARSH, L. 2009b. What's in a name? Commonalities and differences in public understanding of "climate change" and "global warming". *Public Understanding of Science Public Understanding of Science*, 18, 401-420.
- WHITMARSH, L., KEAN, S., PEACOCK, M., RUSSELL, C. & HASTE, H. 2005. Connecting Science: What we know and what we don't know about science in society. London.
- WHITMARSH, L. & KÖHLER, J. 2010. Climate change and cars in the EU: the roles of auto firms, consumers, and policy in responding to global environmental change. *Cambridge Journal of Regions, Economy and Society*, 3, 427-441.
- WHITMARSH, L. & LORENZONI, I. 2010. Perceptions, behavior and communication of climate change. *Wiley Interdisciplinary Reviews: Climate Change*, 1, 158-161.
- WHITMARSH, L., O'NEILL, S. & LORENZONI, I. 2010. *Engaging the public with climate change : behaviour change and communication*, London; Washington, DC, Earthscan.
- WHITMARSH, L., SEYFANG, G. & O'NEILL, S. 2011. Public engagement with carbon and climate change: To what extent is the public 'carbon capable'? *Global Environmental Change*, 21, 56-65.
- WHITMARSH, L., SWARTLING, A. G. & JAGER, J. 2009. Participation of experts and non-experts in a sustainability assessment of mobility. *Environ. Policy Gov. Environmental Policy and Governance*, 19, 232-250.
- WHITTINGTON, R. 1992. Putting Giddens into action: social systems and managerial agency. *Journal of management studies*, 29, 693-712.
- WILBANKS, T. J. 2003. Integrating climate change and sustainable development in a place-based context. *Climate Policy.*, 3S1, S147-S154.
- WILHITE, H. & LUTZENHISER, L. 1999. Social Loading and Sustainable Consumption. in *Advances in Consumer Research*
- WILKES, G. A. & KREBS, W. A. 1995. *Collins concise dictionary*, HarperCollins.
- WILLIAMS, J. B., SHOBRAK, M., WILMS, T. M., ARIF, I. A. & KHAN, H. A. 2012. Climate change and animals in Saudi Arabia. *Saudi Journal of Biological Sciences*, 19, 121-130.
- WILLIAMSON, D., SQUIRE, K., HALVERSON, R. & GEE, J. 2005. Video games and the future of learning. *Phi Delta Kappan*, 87, 104-111.
- WILSDON, J., WILLIS, R. & DEMOS 2004. *See-through science : why public engagement needs to move upstream*, London, Demos.
- WIMMER, R. D. & DOMINICK, J. R. 2014. *Mass media research : an introduction*.
- WINTER, J. 2008. Stewards of the earth?: a study of teenagers' pro-environmental attitudes and lifestyles in Devon, UK and Malaga, Spain.
- WOLF, J., BROWN, K. & CONWAY, D. 2009. Ecological citizenship and climate change: perceptions and practice. *Environmental Politics*, 18, 503-521.
- WOLF, J. & MOSER, S. C. 2011. Individual understandings, perceptions, and engagement with climate change: insights from in-depth studies across the world. *Wiley Interdisciplinary Reviews: Climate Change*, 2, 547-569.
- WONG, W. & WELCH, E. 2004. Does E-Government Promote Accountability? A Comparative Analysis of Website Openness and Government Accountability. *Governance*, 17, 275-297.
- XIONG, H., FU, D., DUAN, C., LIU, C. E., YANG, X. & WANG, R. 2013. Current status of green curriculum in higher education of Mainland China. *Journal of Cleaner Production*.
- YAU, S. S. & LIU, J. Hierarchical situation modeling and reasoning for pervasive computing. Software Technologies for Future Embedded and Ubiquitous Systems, 2006 and the 2006 Second International Workshop on Collaborative Computing, Integration, and Assurance. SEUS 2006/WCCIA 2006. The Fourth IEEE Workshop on, 2006. IEEE, 6 pp.
- YIN, R. K. 2009. *Case study research: Design and methods*, sage.
- YOO, W.-S., SUH, K.-S. & LEE, M.-B. 2002. Exploring the Factors Enhancing Member Participation in Virtual Communities. *Journal of Global Information Management*, 10, 55-71.

- YORK, R. 2006. Ecological Paradoxes: William Stanley Jevons and the Paperless Office. *Human Ecology Review* [Online], 13. Available: <http://www.humanecologyreview.org/pastissues/her132/york.pdf> [Accessed 12-9-2012].
- ZHANG, Y. & HILTZ, S. R. 2003. Factors that influence online relationship development in a knowledge sharing community. In Proceedings of the Ninth American Conference on Information Systems Tampa FL. Available: [http://www.hsw-basel.ch/iwi/publications.nsf/ae2a39a43cc09951c12572180036eb5b/25b51e9445f286fac125722e00292344/\\$FILE/amcis_Zhang.pdf](http://www.hsw-basel.ch/iwi/publications.nsf/ae2a39a43cc09951c12572180036eb5b/25b51e9445f286fac125722e00292344/$FILE/amcis_Zhang.pdf) [Accessed 11 2012].
- ZIKMUND, W., BABIN, B., CARR, J. & GRIFFIN, M. 2012. *Business research methods*, Cengage Learning.
- ZIV, B., DAYAN, U. & SHARON, D. 2005. A mid-winter, tropical extreme flood-producing storm in southern Israel: Synoptic scale analysis. *Meteorology and Atmospheric Physics*, 88, 53-63.