Exploring UK Lean Diffusion in the period 1988 to 2010

by

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LIST OF ABBREVIATIONS

ABC	Activity Based Costing
BPR	Business Process Reengineering
CAQDAS	Computer aided qualitative data analysis
CLIP	Construction Lean Improvement Programme
CST	Critical Systems Thinking
DBR	Drum, Buffer, Rope
DEFRA	Department for Environment, Food and Rural Affairs
DLTP	Defence Logistics Transformation Programme
DMAIC	Define, Measure, Analyse, Investigate and Control
DOI	Diffusion of Innovation
DTI	Department of Trade and Industry
DWP	Department of Works and Pensions
EPSRC	Engineering and Physical Sciences Research Council
FCC	Food Chain Centre
FPS	Ford Production System
GST	General Systems Theory
HMCS	Her Majesty's Court Service
HMRC	Her Majesty's Revenue and Customs
HRM	Human Resource Management
HVLV	High Value Low Volume
IF	Industry Forum/Industry Fora
IFAI	Industry Forum Adaptation Initiative
IMVP	International Motor Vehicle Program
JIT	Just In Time
KM	Knowledge Management
LERC	Lean Enterprise Research Centre
LO	Learning Organisation
MAS	Manufacturing Advisory Service
MIT	Massachusetts Institutes of Technology
MoD	Ministry of Defence
MoJ	Ministry of Justice
NAO	National Audit Office
NHC	National Housing Consortium
NHS	National Health Service
OD	Organisational development
ODPM	Office of Deputy Prime Minister
OMI	Organisation and Managerial Innovation
PDCA	Plan, Do, Check, Act
QC	Quality Circle
R&D	Research and Development
RBG	Reading Business Group
RDA	Rural Development Agency
SME	Small to Medium Advisory Service
SMMT	Society of Motor Manufacturers and Traders
SOSM	System of Systems Methodology
TA	Throughput Accounting
TMC	Toyota Motor Company
TOC	Theory of Constraints
TPM	Total Preventative Maintenance
TPS	Toyota Production System
TQM	Total Quality Management
UKLAI	UK Lean Aerospace Initiative
USP	Unique Selling Proposition
WAG	Welsh Assembly Government
WAO	Wales Audit Office

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ABSTRACT

Lean entered management lexicon over two decades ago as a term to describe the highly successful Toyota Production System. Since then the term has evolved and is now generally used to describe a business process improvement methodology. Over time, Lean has inspired a movement. It provides the rationale for considerable work and activity that is taking place within many diverse organisations today. The purpose of this study was to explore that movement and spread of Lean over time.

A review of the literature showed that research on Lean relies heavily on case studies where the unit of analysis is the organisation and that little research focused on the spread or diffusion of Lean into a population of organisations. The review also identified two bodies of work particularly well-placed to provide theoretical underpinning for the study: the work on the diffusion of innovations; and, the work on the management of fashions and fads. The research was designed to contribute to knowledge in all three areas of literature.

The research design and methodology included two main methods of data collection: a database of publications on Lean was developed in order to enable patterns of Lean discourse to be traced over time; in-depth interviews were conducted in order to gather expert judgement on the nature of UK Lean diffusion.

The findings indicate that Lean diffusion has taken place in the UK in the period under inquiry. Lean originated in manufacturing, it later diffused in the service sector and more recently into the public sector. The findings establish that explanations of Lean diffusion in the extant Lean literature, which are generally based on a rational choice perspective, represent an overly simplistic view of diffusion. Lean diffusion has occurred as a result of the interaction of multiple factors. Some factors are generic to other managerial innovations, others are specific to Lean. Some factors were more important to early Lean diffusion and are less so to later Lean diffusion (and vice-versa). In this exploratory study, the main influencing factors are brought together in a conceptual framework for Lean diffusion. As Lean penetrates into environments such as public services, the framework offers potential for further empirical testing.

Chapter 1 Introduction

1.1 Background and Motivation for the Study

The researcher comes to this study with fifteen years of experience working for the Lean Enterprise Research Centre (LERC). LERC was established in 1994 by Professor Dan Jones in order to promote the organisational and managerial innovation called Lean or Lean Thinking. Professor Jones was one of the authors of the best-selling management book, *The Machine that Changed the World* (hereafter referred to as *The Machine*) which sold over 600,000 copies in eleven different countries during the first decade following its publication (source: www.powells.com). The stated objective of LERC was and remains to research, apply and communicate Lean Thinking (see www.leanenterprise.org). The researcher therefore has *intrinsic interest* in Lean but also certain *preconceived ideas and assumptions* about the subject of study. The primary motivation for this study is consequently the systematic questioning of those ideas and assumptions.

1.2 Subject of the Study

The convention in the introduction to a thesis such as this is to summarise the characteristics of the focal literature in order to establish the research gap to be explored. The researcher instead decided to orient this discussion around the structure of Watson's *'What, Why, How' Framework for Research Design*, shown in Figure 1, because she believes this to be a more effective means of communicating her research concept in this case. As a consequence, all of the literature is contained within three subsequent chapters.

Figure 1 Watson's 'What, Why How' Framework for Research Design

What?	Why?
•What puzzles/intrigues me? •What do I want to know more about/better understand? •What are my key research questions?	•Why will this be of enough interest to others to be published as a thesis, book, guide to policy-makers? •Can the research be justified as a 'contribution to knowledge'?
How – conceptually?	**How – practically?**
•What models, concepts and theories can I draw on to answer my research questions? •How can these be brought together into a conceptual framework to guide my investigation?	•What investigative styles and techniques shall I use to apply my conceptual framework (both to gather material and analyse it)? •How shall I gain and maintain access to information sources?

(Source: Watson, 1994)

Watson's (1994) framework for effective research design is a useful vehicle for articulating the subject of study by prompting the researcher to reflect upon important questions such as: *What* are the key issues being tackled? *Why* can this work be justified as a contribution to knowledge? *How* it will be carried out *conceptually* in terms of the models and approaches to be used, and also how can it be implemented *practically* in terms of the investigative methods to be deployed? The sub-sections that follow elaborate in turn upon each of the quadrants within this framework.

1.2.1 What (is the subject of the research)?

Turning first to the upper left quadrant of Figure 1, Watson (1994) argues that the first questions a researcher should reflect upon when designing a research project are: What puzzles me? What do I want to understand more about? In this case, the author is intrigued by the subject of Lean in the management literature: its longevity; its ability to incite great passion in some and contempt in others; its influence; its impact. These are issues at the heart of this study.

In order to undertake a rigorous research investigation it is first necessary to establish an adequate definition of the focal subject. However, the 'meaning' of Lean within the business and management literature is difficult to articulate for three reasons: it lacks common definition within this literature, (Karlsson and Alhstrom, 1996; Bartezzaghi, 1999; Shah and Ward, 2007; New, 2007; Bayou and de Korvin, 2008); it has evolved over time (Hines *et al.*, 2004; Papadopoulou and Ozbayrak, 2005); and, it tends to mean different things to different people (Benders, 1999; Benders and Bijsterveld 2000).

The term itself was first coined by a researcher from the Massachusetts Institute of Technology (MIT) named John Krafcik who was working on the International Motor Vehicle Prgramme (IMVP). The term entered the management lexicon via Krafcik's (1988) *Sloan Management Review* article when it was used to describe the Toyota Production System (TPS). The word Lean was selected to capture the essence of the far less resource-hungry TPS compared with typical Western production systems. Though coined by Krafcik, the term Lean is often cited in the literature as being made popular by the authors Womack, Jones and Roos (1990) in the influential and best-selling management book entitled *The Machine That Changed The World*, (Oliver *et al.*, 1994; Karlsson and Alhstrom, 1996; Katayama and Bennett, 1996; Benders, 1999; Benders and Bijsterveld 2000; Bhasin and Burcher, 2006; Shah and Ward, 2007). Womack *et al.* (1990) define Lean in terms of its outcomes:

'compared to mass production it uses less of everything – half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products'

(Womack *et al.*, 1990, p.13).

Schonberger (2007) notes that while this publication is commonly perceived to mark the beginning of the Lean movement, in reality Lean manufacturing was actually already well established in the US in the early 1980s, albeit under different names. In *The Machine*, the authors describe the five year, five million dollar International Motor Vehicle Programme (IMVP) of research conducted at MIT. They argue that the findings of that large-scale study revealed that there was a dramatic performance

gap between Japanese and Western car producers. The impact of *The Machine* has been far-reaching (Karlson and Ahlstrom, 1996; Lewis, 2000, Shah and Ward, 2007; Holweg, 2007; Tracy and Knight, 2008) and is central to this study. The publication of *The Machine* led to the commissioning of two follow-up studies that provided further support for the existence of a substantial performance gap (Anderson, 1992; 1994). These studies were publicised extensively to the manufacturing community at the time.

Shah and Ward (2007) have recently noted that, in spite of a plethora of academic and practitioner books and articles on Lean, there is still not a precise and agreed upon definition. Referring to the old fable of the blind men touching an elephant and imagining very different animals, the authors suggest that over time commentators on Lean have focused on a single, visible aspect of the process while missing the invisible highly inter-dependent links of Lean systems as a whole. Bayou and De Korvin (2008) and New (2007) have likewise noted that Lean lacks common definition.

As well as originally being a poorly defined construct, interpretations of Lean have continued to evolve over time. Originally presented as a counter-intuitive alternative to traditional manufacturing (Krafcik, 1988; Shingo, 1989; Womack *et al.*, 1990), it is now presented, by some at least, as a new paradigm for operations (Katayama and Bennet, 1996; Bartezzaghi, 1999; Bhasin and Burcher, 2006; Chaneski, 2009). Lean has expanded beyond its original applications on the shop floor of vehicle manufacturers to other functional areas within organisations, to other manufacturers and to non-manufacturing organisations (Hines *et al.* 2004). Consequently, Lean means different things to different people. This notion is termed 'interpretive viability' in the literature (Ortman 1995; Benders, 1999; Benders and Van Veen, 2001).

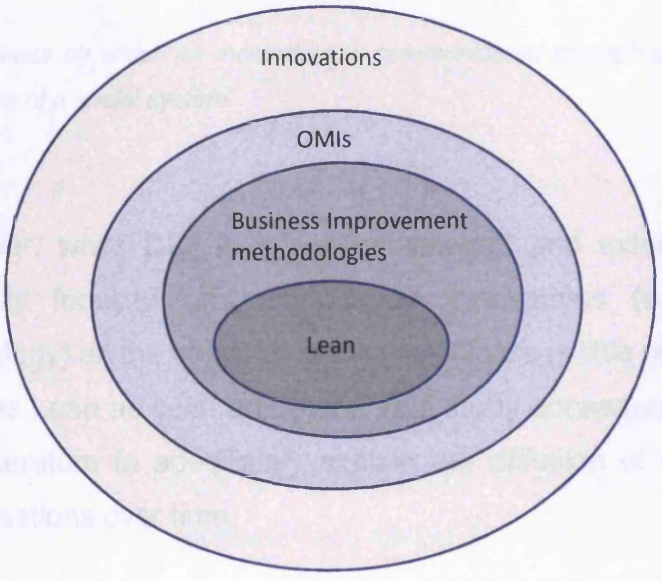
It is clear that the lack of common definition, the dynamism and interpretive viability of Lean pose problems to many authors and are an impediment to research. In order to overcome such problems and to provide clarity, the researcher has developed her own working definition of Lean for the purpose of this study, as follows:

'An organisation and managerial innovation (OMI) that advocates the emulation of the Toyota Production System (TPS) and the management discourse that emerges as a result'.

This definition includes two terms that require further clarification since they recur throughout the thesis:

Freitas (2007: p. 131) differentiates *'organisational and managerial innovations'* (OMIs) from other innovations. OMIs are innovations based on some notion of how to manage organizations better. Examples would include Knowledge Management, Management by Objectives and Organisational Development. Lean is a particular type of OMI that is later referred to as a business improvement methodology. As part of this research, Lean is compared to certain other business improvement methodologies. Figure 2 illustrates how the researcher conceptualises Lean relative to other innovations.

Figure 2 Positioning Lean Relative to Other Innovations



(Source: the researcher)

The second term that occurs within the working definition of Lean and requires further clarification is *discourse*. Hardy (2010) defines discourse as:

'an inter-related body of texts (including practices of their production, distribution and consumption), that bring so-called "reality" into being'

(Hardy, 2010).

Discourses are embodied and enacted in a variety of texts, but exist beyond the individual texts that compose them. Texts are symbolic expressions that are inscribed by being spoken, written, or depicted in some way making them "accessible to others" (Taylor & Van Every, 1993).

Having established the researcher's interpretation of Lean, it is also important to address the other important term that appears in the title of this thesis. For this study, the term *diffusion* was selected in order to follow an established research tradition. Wolfe (1994) identifies diffusion of innovations (DOI) as one of three types of research on the subject of organisational innovation. The DOI literature and theory explains social change and is one of the most fundamental of human processes (Rogers, 2003). DOI is one of the most widely researched and best documented social phenomena (Mahajan and Peterson, 1985) and, unlike Lean, there is broad consensus on the definition of diffusion of innovation as:

'the process by which an innovation is communicated through certain channels over time amongst members of a social system'

(Rogers, 2003, p.5).

However, while DOI is a well-established and extensive body of literature, it is primarily focused on technological innovations (such as product, service or technology) as the object of innovation. There is little research that considers an OMI such as Lean as such an object. This study consequently explores the ability of the DOI literature to adequately explain the diffusion of Lean through a population of organisations over time.

The overarching research question posed and examined in this study is: ***why and how has Lean diffused in the UK over the past two decades.*** Within the study, this broad question is addressed through four sub-questions:

RQ1. Why is the Lean organisational and managerial innovation (OMI) a poorly defined construct?

RQ2: How does the Lean organisational and managerial innovation (OMI) compare with others that are similar?

RQ3: What is the pattern of Lean diffusion in the period 1988-2010?

RQ4: Why has Lean diffused in this pattern?

1.2.2 Why (is the Diffusion of Lean important)?

Watson argues that a particular benefit of his framework (Figure 1) is that it forces the researcher early on in the research process to address the fundamental question of why the proposed research is significant. The diffusion of Lean is important because so many organisations have shaped their activities as a result of it. Shah and Ward (2007) describe Lean as having formed an integral part of the manufacturing landscape over the last two decades. They argue that Lean implementation is associated with superior organisational performance (in terms of growth and profitability) and that the ability of Lean to provide "competitive advantage" is well accepted among academics and practitioners alike. These claims are contested by certain academics in the UK (see, for example, Coffey, 2006, 2007; Seddon, 2005, 2008). In spite of its longevity, Lean continues to stimulate interest and debate in both the practitioner and academic communities alike. A study that focuses on Lean as an OMI that has diffused over time is likely to interest and contribute to a broad range of stakeholders:

The primary audience for this study is academia, and it aims to make an academic contribution to knowledge in two key ways: First, the study is intended to add to the existing body of empirical data on Lean. It is important to note, however, that this study provides a different perspective to that of most previous studies. In most empirical studies on Lean, the unit of analysis is the organisation. However, in this study, the unit of analysis is the Lean phenomenon itself. Second, the DOI literature is based on studies of technological innovations. Several authors plea for greater scholarly attention to OMIs (Abrahamson, 1996; Carson *et al.,*1999; Freitas, 2008). This study addresses that plea.

In addition to the academic contribution, this study will be of interest to the practitioner community. Many organisations in the UK have been influenced by Lean discourse such that it has shaped their activities. Furthermore, many consultancy firms and other organisations offer services of interpretive assistance and guidance on Lean. They work with and profit from those organisations that are reshaping their activities.

This study is also likely to be of interest to policy makers. Considerable amounts of public money have been spent and continue to be spent on promoting Lean. For example, £35 million has been spent on the governments Industry Forum initiative alone (Reading Business Group, 2006). Taxpayers and policymakers are likely to be interested in whether that expenditure is justifiable.

1.2.3 How Conceptually (will the research be conducted)?

Figure 1 illustrates that a key question, when considering how a research project is to be conceptually undertaken, is: What models, concepts and theories can the researcher draw upon in order to answer the research questions?

Critically reviewing literature involves choices and assumptions about what is important (Sturdy, 2004). While there are a number of relevant literatures that could have been drawn on for this study such as the broader literature on knowledge, knowledge transfer and innovation, the following three were selected because of their particular relevance to the topic of study. They are the:

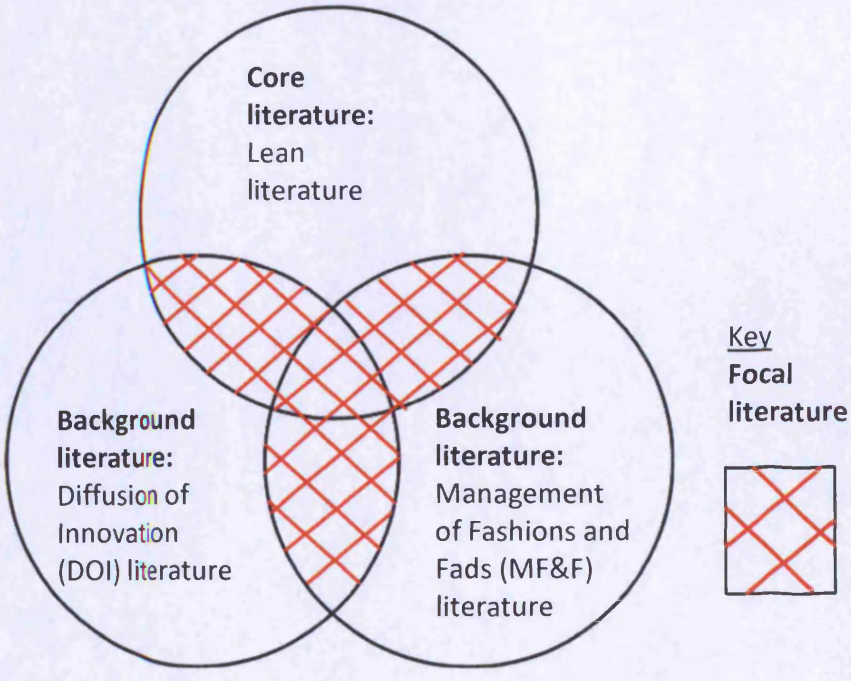
1. Lean literature: The literature on Lean is abundant, has antecedents under different guises, is often subsumed within more generic terminology such as continuous or business improvement, and is characterised by strong advocates and fierce critics. These characteristics render it a diverse body of work.

2. Diffusion of Innovation (DOI) literature: The literature on the diffusion of innovations has a long history rooted in anthropology and rural sociology. Over time the diffusion of innovations has developed in to a comprehensive and cohesive body of knowledge (Rogers, 2003). DOI research is not without methodological limitations and theoretical critics and it is partially from these limitations and criticisms that the third body of literature has emerged.

3. Management of Fashions and Fads literature (MF&F): This literature does not regard management fashions as cosmetic or trivial. On the contrary, management fashions are viewed as highly influential and as having far reaching consequences. Furthermore, this literature suggests that management fashions have been neglected in the past in spite of them being phenomena worthy of research attention. This new and emerging body of literature examines early theoretical propositions to explain the management fashions phenomena and highlights certain methodological issues pertinent to them.

These three literatures are formed into a conceptual framework for the purpose of positioning the study as illustrated in Figure 3.

Figure 3: Conceptual Framework for Organising the Literature



(Source: the researcher)

The literatures chosen to form the conceptual basis for this study are categorised into three types: the Lean literature is categorised as Core because it is central to the subject of inquiry; the DOI and MF&F literatures are collectively categorised as Background since they provide the theoretical underpinning for the study; finally, the

Focal literature consists of material that lies within the intersection of the three bodies of work and which most specifically addresses the diffusion of Lean and other OMIs over time.

1.2.4 How Practically (will the research be conducted)?

Turning now to the last quadrant in Figure 1, the key questions here are: How is the study to be conducted from a pragmatic point of view? What investigative styles and techniques are to be used? How will information sources be accessed?

These issues are fully examined in the Research Methods chapter (Chapter 5). However, in preview, the overarching research design consists of bibliometric data collection and a series of in-depth interviews. This design was guided by the research questions that emerged from the literature review.

1.3 Scope and Boundaries of the Study

Having used Figure 1 as a vehicle for describing the nature of this study, it is now astute to address the scope and boundaries of the study. A number of authors have suggested that scholarly conventions encourage researchers towards manageable problems and to avoid complex social phenomena (Ghoshal, 2005; Skinner, 2007). The researcher believes that important research should not be avoided simply because it presents methodological challenges. Some authors criticise academics for failing to fully evaluate change that emerges as a result of management ideas (Sousa and Voss, 2008, Woodman, 2008). For example, Woodman (2008) comments that:

'...the assessment of change programmes represents another area where the [business and management] field talks a better game than it plays'

(Woodman, 2008, p. 36).

This study rises to the challenge presented by that criticism. However, in order to make such a broad subject researchable and, given the time and resource constraints of a doctoral study, the following boundaries have been self- imposed:

1. The study is geographically bound. It focuses on Lean diffusion in the UK only. There may be examples from and reference to comparisons with other nations, but the study is firmly located in the UK.
2. The study is temporally bound. While the antecedents of Lean stretch back to the early 1970s when the first Japanese-owned factories appeared on UK soil (Dore, 1973), the bibliometric data analysis that forms the data collection for this study starts in 1988. This is because this is the year when Krafcik's term 'Lean' first entered management discourse.
3. The study is conceptually bound. It focuses on three key bodies of literature: the literature on Lean; the literature on DOI and the literature on MF&Fs. Other literatures related to innovation such as knowledge management and technology transfer, may also offer valuable insight. However, the literatures on Lean, DOI and MF&F have a clear and obvious relevance to the topic of the study for the reasons given earlier.

Clearly, future studies offer an opportunity to extend these self imposed boundaries.

1.4 Structure of this Thesis

Having introduced the subject and the rationale for this study, this section details the structure of what is to follow. There are nine chapters in total. Chapters 2, 3 and 4 present reviews of each of the three literature categories identified in Figure 3: the Core literature on Lean is reviewed in Chapter 2; the Background literatures on DOI and MF&F are reviewed in Chapter 3; the Focal literature, which addresses the diffusion of Lean or similar OMIs, is reviewed in Chapter 4.

Having established the conceptual foundation for this study, Chapter 5 discusses the research methodology that was developed to answer the research questions established in section 1.2.1. The chapter includes a brief overview of research philosophy and the particular research perspective of the researcher. It also provides justification of the research choices made during the research process and details the research procedures deployed and the ethical considerations encountered.

Chapters 6 and 7 present the research findings that were derived via the execution of this research methodology. Chapter 6 presents the findings that relate directly to

the research questions. Chapter 7 presents a critical evaluation of the findings in relation to the theoretical underpinning from the Background literature.

Lastly, Chapter 8 draws the thesis to a close by highlighting the various contributions yielded by this study and evaluating the relative significance of these to each of the stakeholder groups. This chapter closes with an evaluation of the limitations of the study and reflection upon future avenues for research.

Chapter 2 Core Literature Review

Hart defines a critical literature review as:

'the selection of available documents (both published and unpublished) on the topic, which contains information, ideas, data, and evidence written from a particular standpoint to fulfil certain aims or express certain views on the nature of the topic and how it is to be investigated, and the effective evaluation of these documents to the research being proposed'

(Hart, 1998, p. 13).

Figure 3 was introduced in the Introduction chapter as a conceptual framework for organising the literature. The focus of this first of three literature review chapters is the Core literature on Lean identified as central to the subject of inquiry. It was noted in the Introduction chapter that Lean lacks definitional consensus, however, section 2.1 of this chapter elaborates on this issue. The remaining sections of the chapters discuss Lean in relation to four main strands of Lean discourse that the researcher has identified within the Core literature. They are:

1. Lean as a generic representation of Toyota Production Systems (TPS): section 2.2.
2. Lean as a process improvement methodology for an organisation to follow and use: section 2.3. It should be noted that this section includes a discussion of other process improvement methodologies.
3. Lean as an ideological movement that has emerged and progressed over time: section 2.4
4. Lean as a body of literature that has developed over time: section 2.5.

2.1 Defining and Describing Lean

The lack of a clear definition of Lean has been noted by many authors. For example, Karlsson and Alhstrom (1996) observe the lack of a precise definition and the resultant uncertainty surrounding the concept. Bartezzaghi (1999) finds definitions of Lean to be 'rather vague and confused' (p. 232). Voss (1995) argues that the evolution of Lean illustrates the nature of operations management in the 1990s which consists of three key elements: the core (which is both developing and providing a strong input to new areas and approaches); the interface (between

operations management and other disciplines such as behavioural science, information management and strategy); and convergence (where new approaches such as Lean do not result from individual breakthroughs but from the convergence of many new and existing approaches). More recently, Shah and Ward (2007) comment that, in spite of a plethora of academic and practitioner books and articles, there is still not a precise and agreed upon way of defining Lean. Similarly, Bayou and de Korvin (2008) reiterate Karsson and Amhstrom's point and argue that the lack of a generally accepted definition contributes to the underdevelopment of the Lean concept.

In order to illustrate the plurality and diversity of views on the Lean phenomenon, Table 1 captures the attempts of a number of authors over the last twenty years to describe or define the nature of the Lean phenomenon. The researcher does not claim that the table is comprehensive. However, it is a representative sample of the words of the definitions and descriptions used by many well-known authors on Lean over a period of just over two decades and it is the most comprehensive listing of its type in existence. The material within the table was drawn from the bibliometric analysis that formed part of the data collection for this study. The purpose of the table is to illustrate the range of views on how Lean may be defined and the challenge this presents for bounding a study such as this one.

Table 1 Lean Definitions/Brief Explanations

Author(s)	Year	Title of Work	Publication	Quotation
Womack, Jones and Roos	1990	*The Machine That Changed The World*	*Book*	*'.....compared to mass production it [Lean] uses less of everything – half the human effort in the factory, half the manufacturing space, half the investment in tools, half the engineering hours to develop a new product in half the time. Also, it requires keeping far less than half the needed inventory on site, results in many fewer defects, and produces a greater and ever growing variety of products.'*
Williams, Haslam, Williams, Cutler	1992	*Against Lean Production*	*Economy and Society*	*'Lean production is the most widely used of the competing organising concepts for post-modern times.....lean production has been taken up by journalists, industry executives and policy makers who are otherwise not followers of intellectual fashion.'*
Oliver, Delbridge, Jones and Lowe	1994	*World-class Manufactu-ring: Further Evidence in*	*British Journal of Management*	*'The last 3 years has seen the rise of the term lean production as an umbrella term to describe a set of practices, found in their purest form in Japan in the form of TPS, which*

Author(s)	Year	Title of Work	Publication	Quotation
		the Lean Production Debate		*may explain the performance of Japanese manufacturers.'*
Cusumano	1994	*The Limits of Lean*	*Sloan Management Review*	*'.....a series of innovations and practices in manufacturing and product development that have been referred to as 'lean': aimed at high productivity as well as high quality in engineering and manufacturing, resulting in high price-performance in the value of products delivered to the customer.'*
Womack and Jones	1996	*Lean Thinking*	*Book*	*'.....there is a powerful antidote to muda: lean thinking. It provides a way to specify value, line up value-creating actions in the best sequence, conduct these activities without interruption whenever someone requests them, and perform them more and more effectively. In short, lean thinking is lean because it provides a way to do more and more with less and less – less human effort, less equipment, less time, and less space – while coming closer and closer to providing customers with exactly what they want.'*
Karlsson and Ahlmstrom	1996	*Assessing Changes Towards Lean Production*	*International Journal of Operations and Production Management (IJOPM)*	*'...lean can be seen as an intended direction, not as a state or as an answer to a specific problem.'*
Forza	1996	*Work organisation and lean production and traditional plants*	*IJOPM*	*'The terms' lean production' or 'minimum workshop' as Ohno says are inspired by the fact that, compared with Fordism, the lean model requires less stock, less space, less movement of material, less time to set up the machinery, a smaller workforce, fewer computer systems and more frugal technology. As well as responding to the need to be cost effective, this characteristic also constitutes a general principle that inspires a philosophy of essentiality and which makes every superfluous element seem wasteful.'*
Sohal	1996	*Developing a lean production organisation: an Australian case study*	*IJOPM*	*'The lean production system has been described as one which seeks to eliminate unnecessary processes, to align processes in a continuous flow and to use resources in order to solve problems in a never ending process Companies which have adopted the lean production concepts can typically design, manufacture and distribute products in less than half the time taken by other companies. Moreover they can do this by using less than half their resources. Today lean production has become the goal of manufacturers aiming for world-class status.'*
James-Moore and Gibbons	1997	*Is Lean Manufacture Universally relevant? An*	*IJOPM*	*'The concept and acceptance of lean manufacture as a set of principles is now fairly rooted in the literature.'*

Author(s)	Year	Title of Work	Publication	Quotation
		investigative methodology		
Pilkington	1998	*Manufact-uring strategy Regained: Evidence for the Demise of Best Practice*	*California Management Review*	*'The Japanese manufacturing system is now often considered under one banner with a range of titles, but most widely known as lean production.'*
Emiliani	1998	*Lean behaviours*	*Management Decision*	*'Lean production, applied correctly, results in the ability of an organisation to learn.'*
Berte-zzaghi	1999	*The Evolution of Production Models: Is a New Paradigm Emerging?*	*IJOPM*	*'Lean production, understood as all those aspects of the Japanese production system with universal validity, was to be the practical realisation of the new paradigm.'*
Lewis	2000	Production and Sustainable Advantage	*IJOPM*	*'A decade ago the lean production concept was viewed as a counter-intuitive alternative to traditional manufacturing models....Today it is arguably the paradigm for operations and its influence can be found in a wide range of manufacturing and service strategies.'*
Benders and van Bijsterveld	2000	*Lean on Lean: the Reception of a Management Fashion in Germany*	*New Technology, Work and Employment*	*'The term became well-known beyond the academic realm after the publication of the book The Machine That Changed The World.'*
Sanchez and Perez	2001	*Lean Indicators and Manufact-uring Strategies*	*IJOPM*	*'Lean production is a conceptual framework popularised in many Western industrial companies since the early 90s.'*
Cooney	2002	*Is Lean A Universal production System?*	*IJOPM*	*'Lean takes a broad view of the production and distribution of manufacturers, developing a production concept that encompasses the whole manufacturing chain from product design and development, through manufacturing and distribution. Like many other production concepts, Lean production rests upon a distinctive approach to product flow – just-in –time flow.'*
Crute, Ward, Brown and Graves	2003	*Implementing Lean in Aerospace – Challenging the Assumptions and Understand-ing the Challenges*	*Technovation*	*'Lean production – developed from the massively successful TPS, focusing on the removal of all forms of waste from a system (some of which are difficult to see).'*
Hines,	2004	*From*	*IJOPM*	*'The origins of lean thinking can be found on*

Author(s)	Year	Title of Work	Publication	Quotation
Holweg and Rich,		*Strategic Toolkit to Strategic Value Creation – A Review of Contemp-orary Lean Thinking*		*the shopfloors of Japanese manufacturers. In particular the early work of Toyota has been highlighted. Much of this early work was applied under the leadership of Taiichi Ohno to car engine manufacturing during the 50s, later to vehicle assembly (60s) and the wider supply chain (70s).'*
Liker	2004	*The Toyota Way*	*Book*	*'The TPS is Toyota's unique approach to manufacturing. It is the basis for much of the lean production movement that has dominated manufacturing trends (along with Six Sigma) for the last 10 years or so.....What exactly is a lean enterprise? You could say it's the end result of applying the TPS to all areas of your business.....to be a lean manufacturer requires a way of thinking that focuses on making the product flow through value-adding processes without interruption (one-piece flow), a 'pull' system that cascades back from customer demand by replenishing only what the next operation takes away at short intervals, and a culture in which everyone is striving continuously to improve.'*
Papa-dopoulou and Ozbayrak	2005	*Leanness: Experiences from the Journey to Date*	*Journal of Manu-facturing Technology Management*	*'Leanness was introduced as an approach to manufacturing that was aiming at the elimination of waste while stressing the need for continuous improvement'.*
Seddon	2005	*Freedom from Command and Control*	*Book*	*'The purpose of Lean is to increase capacity by designing a system that optimally responds to customer demand.'*
Bhasin and Burcher	2006	*Lean Viewed as a Philosophy*	*Journal of Manu-facturing Technology*	*'The generic term lean manufacturing was popularised by its major proponents, the IMVP researchers of MIT.... a philosophy that when implemented reduces the time from customer order to delivery by eliminating sources of waste.'*
Anderson, Eriksson and Torsten-sson	2006	*Similarities and Difference between TQM, Six Sigma and Lean*	*The TQM Magazine*	*Briefly, lean is about controlling the resources in accordance with the customer needs and to reduce unnecessary waste (including the waste of time).....While there are many formal definitions of the lean concept, it is generally understood to represent a systematic approach to identifying and eliminating elements not adding value to the process.*
Coffey	2006	*The Myth of Japanese Efficiency*	*Book*	*'Lean production, by contrast, emerged as the official interpretation of worldwide survey research centred at MIT, but also disseminated via and aggressively promoted from within the corporate sectors that was both its major sponsor and intended subject.'*
Oliver, Schab and Holweg	2007	*Lean Principles and Premier Brand:*	*Int. Journal of Production Research*	*'Ever since the publication of The Machine, the benefits of lean principles have been widely recognised. The home of lean production is the Japanese auto industry, and commentators*

Author(s)	Year	Title of Work	Publication	Quotation
		Conflict or Complement		*consistently hail Toyota as the virtuoso lean producer, and, more recently as a lean product developer.'*
Black	2007	*Design Rule for Implementing the Toyota Production System*	*Int. Journal of Production Research*	*'The Toyota Motor Company has risen to a place of world prominence in the automotive industry by redesigning the mass production system into the Toyota Production System (TPS) , or what is more known worldwide as lean production.'*
McCullen, Towill and Harris	2007	*From the Unmanned Factory to Lean-Sigma: The Role of Manu-facturing Improvement Programmes from 1980-2005* .	*Conference paper*	*'..the key messages of Womack et. al.'s (1990) Lean Production had developed into a significant change programme by the late 1990s.'*
Holweg	2007	*The Genealogy of Lean Production*	*Journal of Operations Management*	*'Lean Production not only successfully challenged the accepted mass production practices in the automotive industry, significantly shifting the trade-off between productivity and quality, but it also led to a rethinking of a wide range of manufacturing and service operations beyond the high-volume repetitive manufacturing environment.'*
Shah and Ward	2007	*Defining and Developing Measures of Lean Production*	*JOM*	*'Lean production is an integrated socio-technical system whose main objective is to eliminate waste by concurrently reducing or minimizing supplier, customer and internal variability.'*
Stewart *et al.*	2009	*We Sell Our Time No More*	*Book*	*'...Lean production was, and continues to be, a vital factor in the contemporary assault upon labour standards at work.'*

(Source: the researcher)

Table 1 also illustrates that Lean is primarily, though not exclusively, located within operations management. Operations management is a sub-field of inquiry within broader business and management that has been described as a 'mongrel mixture of natural and behavioural science (Schmenner and Swink, 1998, p. 99). It has been criticised by many commentators for both lack of, and inadequacy, of theory (Swamidass and Newell, 1987; Anderson *et al.*, 1989; Flynn *et al.*, 1990; Swink and Way, 1995 and Schmenner and Swink, 1998). Schmenner and Swink (1998) suggest that an operations management theory should exhibit certain characteristics: the operations management phenomenon for which explanation is sought should be clearly defined; the description of the phenomenon will centre on some observed regularities that have been derived logically or empirically; there should be one or

more precise statement of these regularities, which are laws; and finally, the theory should indicate a mechanism or tell a story that explains why the laws work as they do and how, and in which ways the laws may be subject to limitations. They argue that the more powerful the theory, the more likely it will unify laws and also generate predictions or implications that can be tested with data.

Although clearly positivist in their stance, the authors articulate such a theory, which they do not refer to as Lean, but which clearly describes and underpins Lean. It is a theory which seeks to explain the phenomena of why one factory or service operation is more productive, as measured by inputs and outputs, than another. They refer to this as the *Theory of Swift, Even Flow*, which they define as follows:

'....the more swift and even the flow of materials through a process, the more productive that process is'

(Schmenner and Swink, 1998, p. 102).

The theory consists of three constituent concepts. First, value-added and non-value-added work (we will see later that this is a central concept within Lean discourse as espoused by Womack and Jones, in particular *Lean Thinking*, 1996); second, materials can move swiftly only if there are no bottlenecks (we will see later that this is a central concept within the Theory Of Constraints discourse as espoused by Goldratt and Cox,1986), third, for materials to flow more evenly, it is necessary to narrow the variability associated with either the demand on the process (we will see later that this is a central concept within John Seddon's discourse on Systems Thinking) or with the process's operations steps (which we will see later is a central idea within Six Sigma discourse).

It appears then that the theoretical basis for Lean or the *Theory of Swift, Even Flow* unites ideas integral to other process improvement methodologies that have emerged alongside Lean over the last two decades. However, it is a striking feature of Table 1 that none of the authors, many of whom are highly influential commentators on Lean, refer to Lean's underpinning theoretical basis. At first sight the literature on Lean appears devoid of theory and is instead more descriptive of Toyota's Production System (TPS). It seems idiosyncratic of the Core literature then that, although there is some theoretical underpinning of Lean, it is buried within the literature and few authors refer to it.

The lack of precise definition of Lean necessitates the presentation of a working definition for the purpose of this study. The definition presented is one that reflects both a common understanding of Lean and the particular focus of this research:

> ***'An organisational and managerial innovation (OMI) that advocates the emulation of the Toyota Production System (TPS) and the management discourse that emerges as a result'.***

2.2 Lean as a Generic Representation of Toyota Production System

Benders and Slomp (2009) have commented:

'Over the course of the last three decades, the basic ideas behind the TPS.....have been published under a wide variety of labels, with 'lean' arguably being the most prominent'.

(Benders and Slomp, 2009, p. 5242).

Lean emerged at a time of great interest in Japanese production and management methods generally; and particularly Toyota and the Toyota Production System (TPS). Toyota's business success and world-leading product quality is established fact (Liker, 2004; New, 2007). Rother (2010) recently summarised Toyota's success into four key statistics: Toyota has shown sales growth for over 40 years (at the same time other car maker's sales have reached a plateau or declined); Toyota's profit exceeds that of other car makers; Toyota's market capitalisation has for many years exceeded that of other car makers; and, in sales rank Toyota has become the world leading car maker. This success is often attributed to the production system Toyota developed during 50s and 60s as a result of intense post war competition. The TPS remained largely unknown in the west until interest was stimulated by the second oil crisis (Holweg, 2007). This interest led to the publication of two english language articles in 1977; one by Sugimouri *et al.* in the *Journal of Production Research* and the other by Ashburn in the *American Machinist* (Schonberger, 2007). The TPS is characterised by a systematic approach to the organisation of production that emphasises the elimination of all forms of waste (Ohno, 1988). However, over time TPS has been discovered to be a complex, multi-faceted element of Toyota's broader management system and culture (Spear and Bowen, 1999; Liker, 2004; Hines *et al.*, 2004; Holweg, 2007; Bicheno, 2008; Seddon, 2005, 2008; Spear, 2009; Rother, 2010). As Vasilash puts it:

'The TPS is an interlocking set of three underlying elements: philosophical underpinnings, managerial culture, and technical tools – a triangle, where human development is at the core'.

(Vasilash, cited in Bicheno and Holweg, 2009, p. 1).

Paralleling the nebulous nature of the Lean concept, the TPS itself has been described variously as a method, a process, a strategy, a goal, a belief or state of mind and a philosophy (Vokura and Davis, 1996). Furthermore, TPS is not a static entity. It has evolved over time, presenting further difficulties in defining and understanding it (Spear and Bowen, 1999; Benders and Morita, 2004; Lee and Jo, 2007; Spear, 2009).

Detailed chronologies of the events and publications that led up to the emergence of the TPS and subsequent Lean phenomena have been well documented in Holweg (2007), Shah and Ward (2007), Schonberger (2007) and Bicheno and Holweg (2009). Table 2 offers a synthesis of these works and includes those events and publications regarded by the researcher to be the most important. This table is extended in chapter 6 in the light of information gathered during the course of this study.

Table 2 Publications and Events leading up to the Emergence of Lean

Year	Publications/Events
1932	Taiichi Ohno joins Toyoda Loom Works as an engineer.
1935	Toyota Motor Corp. Founded.
1937	Kiichiro Toyoda visits US, in particular Ford, and begins TPS.
1940	Training Within Industry programme introduced for US military.
1930 to 1945	Ford use flow production to produce bombers at Willow Run.
1948	Edward Deming first sent to Japan.
1950	Labour strikes bring Toyota to near bankruptcy. Kiichiro Toyota resigns and hands over to cousin Eliji Toyoda who visits Ford River Rouge plant.
1956	Ohno visits Ford River Rouge plant.
1970s	Business press identifies that Japan's exports are wreaking havoc.
1973	First oil crisis.
1977	First English language academic articles on TPS appear.
1978	Ohno publishes TPS in Japanese. Vogul publishes *Japan as Number 1: Lessons for America.*
1979	Second oil crisis.
1979	International Motor Vehicle Porgramme (IMVP) started at MIT.
1979	Repetitive Manufacturing Group (RMG) established by the American Production and Control Society (APICS) and included Schonberger and Hall.
1981	Mondon publishes a series of articles on TPS in Industrial Engineering and Shingo publishes *A Study of Toyota Production System.* Ohno and Kumagi publish a chapter in a book on TPS. Ouchi publishes *Theory Z: How American Business Can Meet the Japanese Challenge.* Pascale and Athos publish *The Art of Japanese Management.*
1982	Schonberger publishes *Japanese Manufacturing Techniques.*
1983	Hall publishes *Zero Inventories.* Hewlett-Packard produce their widely sold and copied Stockless Production at Greenly Division video Mondon publishes *Toyota Production System.*
1984	Toyota enters NUMMI joint venture with GM. First output of IMVP *The Future of the Automobile* published.
1986	The RMG splits from APICS and forms the Association of Manufacturing Excellence (AME)
1988	Ohno publishes Toyota Production System. Krafcik publishes *The Triumph of Lean Production* and coins the term Lean. Stalk publishes HBR article, *Time: The Next Source of Competitive Advantage*, expanding interest in TPS beyond manufacturing.
1990	Womack *et al.*, publish *The Machine That Changed The World.*

(Source: compiled from Holweg, 2007; Shah and Ward, 2007; Schonberger, 2007 and Bicheno and Holweg, 2009)

Most authors therefore locate the origins of Lean as the culmination of research conducted at the Massachusetts Institute of Technology (MIT) within the International Motor Vehicle Programme (see, for example Hines *et al.*, 2004; Papadopoulou and Ozbayrak, 2005; Bhasin and Burcher, 2005; Rich *et al.*, 2006; Holweg, 2007). The high-profile International Motor Vehicle Programme (IMVP) involved a global network of academics. Many academics within this network established or enhanced their career as a result of their involvement and produced

notable Lean publications. These included: Nishiguishi (1990), Lamming (1992), Nobeoka (1993), Fujimoto, (1989) and Graves (1991).

Other authors position the emergence of Lean within a 'Japanisation' debate that had been ongoing amongst a group of UK academics. Many of these were located in the human resources field of management (Schonberger, 2007) and several of whom were physically located in Cardiff University in the late 80s and early 90s. At that time, Wales was receiving a disproportionate amount of the inward investment being attracted into the UK by the policies of the Thatcher government. At that time the Japanese economy was expanding rapidly. Between 1986 and 1998, 16% of all UK Foreign Direct Investment (FDI) came to Wales, although Wales accounted for less than 5% of the population (Jones, 2000). The resultant clustering of Japanese 'transplants' (meaning Japanese-managed plants, Cusumano and Takeishi, 1991) in the South Wales area incited interest in the academic community nearby.

The term 'Japanisation' was first coined by Turnbull (1986) who borrowed it from a Trade Union official. He used the term to describe a host of changes in workplace arrangements and labour relations being introduced into Lucas Industries during the mid 80s. The term was made popular by Oliver and Wilkinson in their 1988 publication, *The Japanisation of British Industry*. Ackroyd *et al.*, (1988) identify three forms of Japanisation emerging from the debate: direct Japanisation or the penetration of the British economy by Japanese firms; mediated Japanisation or British firms engaged in attempts to borrow or copy Japanese policies and practices; and finally, full Japanisation or the drive toward the reproduction of Japanese economic structures within Britain. It could be argued that 'mediated Japanisation' continues today under the less culturally-specific banner of Lean.

Stewart (1996) is critical of the 'Japanisation' debate for having laid the basis for Lean, which he regards as a highly technocratic and overly simplistic account of Japanese pre-eminence. Elgar and Smith (1994) categorise the main contributors to the 'Japanisation' debate into three broad camps: the universalists (as exemplifed by Womack *et al.*, 1990); the exceptionalists (as exemplified by Ackroyd *et al.*'s full Japanisation); and a third group who fall somewhere between (as exemplified by Oliver and Wilkinson, 1988). It is clear then that some authors regard Lean as having

both emerged from and caused dissent within the 'Japanisation school' of the late 80s and early 90s.

Other authors locate the origins of Lean with the *Training Within Industry (TWI)* programme developed by US government and industry during the Second World War (Dinero, 2005). TWI is heralded as *'the missing link'* (Dinero, 2005) and the *'unsung part of TPS'* (Huntzinger, 2002; 2006). During the post-war period, TWI was disregarded by the Americans, who perceived it as part of the war programme. However, it was influential on the Japanese, who were eager to learn from the industrial base that had defeated them (Huntzinger, 2002; 2006). Graupp and Wrona (2008) identify other reasons for the demise of TWI in America after the war: the particular focus TWI paid to worker treatment made managers of the time feel uncomfortable; the composition of the industrial workforce changed with the influx of the untrained ex-military; and, the US infrastructure was quickly redirected to producing consumer goods. The TWI programme continues in the US today on a far smaller scale under the auspices of the TWI Institute.

Although the precise origins and antecedents of Lean are disputed, *The Machine That Changed the World* (or *The Machine*) is generally agreed as the publication that established the Lean phenomenon (Oliver *et al.*, 1994; Karlsson and Alhstrom, 1996; Katayama and Bennett, 1996; Benders, 1999; Benders and Bijsterveld 2000; Bhasin and Burcher, 2006; Shah and Ward, 2007).

The Machine reports the findings of a five year, five million dollar, industry and US government funded study of the global automotive industry. The findings of the study are positioned within an historical context which presents the automotive industry as being in transition from mass production, as exemplified by Ford's Production System (FPS), to the newly emerged Lean production, as exemplified by Toyota's Production System (TPS). The book is divided into sections that explain the origins, constituent elements and diffusion of Lean Production. Lean Production, then, is presented as the new dominant paradigm that is displacing, and will continue to displace, mass production.

The Machine has three noteworthy features. First, it represents TPS under the more generic and less culturally-specific label of Lean Production. The relevance of this relabeling is pinpointed by Oliver and Hunter (1998):

'Lean Production is significant because it represents an attempt to take Japanese methods out of their Japanese context, and elevate them to the status of universal principles that, properly applied, can produce elsewhere in the world the same outcomes as occur in Japan'

(Oliver and Hunter, in Delbridge and Lowe, 1998, p.81).

The de-contextualisation that the above authors refer to was welcomed as an important de-mystification for many commentators; however it was regarded as a gross misrepresentation by others (Williams *et al.,* 1992; Coffey, 2006). This debate has spawned a wealth of literature that will be discussed in the sections that follow. Second, *The Machine* presents empirical evidence in support of the superiority of Lean Production/TPS over traditional manufacturing methods based on outmoded mass production logic, FPS or 'Fordism'. The empirical evidence includes an initial pilot study of two plants representing classic mass versus classic Lean production. The Lean plant is found to be almost twice as productive and able to produce at three times the quality level of the classic mass production plant (Womack *et al.*, 1990, p. 81). The pilot study was extended to include the GM-Toyota NUMMI joint venture in order to test whether a mass production plant can transform into a Lean production plant. NUMMI was found to match the classic Lean production plant in terms of quality and almost to match in terms of productivity (*ibid*, p. 83). In the main study, information is obtained from more than 90 car assemblers around the globe. The authors estimated that their sample represented about half the world's global car manufacturing capacity (*ibid*, p. 75). The findings show that all Lean plants, defined as those able to achieve both high productivity and high quality levels, are Japanese, although not all Japanese plants are Lean (*ibid*, p. 83). The authors interpret the findings as evidence that Lean production can be reproduced anywhere in the world (*ibid*, p.88). Third, the essential elements of Lean Production are identified as differences in: organising and running the factory, designing and product development, coordinating the supply system and managing customer relations. However, the complexity and interaction of these elements are reduced to a simple axiom of Lean Production's superiority and an imperative is established asserting that Lean Production should be universally adopted:

'Our conclusion is simple: Lean production is a superior way for humans to make things.....It follows that the whole world should adopt lean production, and as quickly as possible.'

(Womack *et al.,* 1990, p. 225).

A movement may be defined as a series of actions and events taking place over a period of time in order to foster a principle or policy (Collins, 1999).*The Machine* spawned a movement amongst industrial practitioners to follow the imperative set out in the book. The Lean revolution is clearly underway in US manufacturing companies. Rio (2005) claims that over 50% of manufacturing companies in the discrete industries are using Lean as their primary improvement methodology. More recently, a census of US manufacturing companies concluded that nearly 70% of all plants have adopted Lean (Blanchard, 2007).

In 1996, Womack and Jones produced a follow-up text entitled *Lean Thinking* in which they identify the core principles of Lean Production which they later describe as the generic version of Lean/TPS (Egan, 1996). The five Lean principles are:

1. Specify value from the perspective of the customer.
2. Identify the value stream or the series of process steps that will deliver value to the customer.
3. Ensure flow along those process steps.
4. Pull from customer demand where possible.
5. Pursue perfection through continuous improvement.

The five Lean principles presented in the book, *Lean Thinking,* represent a 'roadmap' for those organisations attempting to implement Lean or emulate TPS. The empirical data in this publication is based on case studies of companies who have successfully adopted the Lean imperative to become Lean organisations. *Lean Thinking* preceded a wealth of practitioner-oriented publications including: Rother and Shook (1998), Jones and Womack (2002), Bicheno and Holweg (2009). Many of these publications were by Productivity Press, the most prolific publisher of Lean business improvement books. The purpose of these publications is to help organisations who seek to implement Lean.

In a third text the authors extend the Lean philosophy to the broader process of consumption, in which they propose that mapping out the steps involved in customer delivery is applicable to any service encounter and is the best way to identify improvement opportunities (Womack and Jones, 2005; 2005a; Piercy and Rich, 2009).

To conclude this subsection, it is clear that Lean has evolved over time from a generic description of TPS to a particular type of OMI focused on best practice and process improvement methodologies.

2.3 Lean as a Best Practice Process Improvement Methodology

Van De Ven (1992) argues that *process* is a term used in three ways: as logic to explain causal relationships; as a category of concepts that refer to actions of individuals or organisations; as a sequence of events that describe how things change over time. Lean has attributes of all three. Holweg (2009) defines process more specifically in operations terms as a sequence of events that take up time, space, expertise or other resources in order to produce an outcome in response to a customer need. Schmenner and Swink (1998) define improvement as an increase in one or more dimension of performance without degradation in another. Lean is one of the best known process improvement methodologies (Bhuiyan and Baghel, 2005). It emerged during a proliferation of such methodologies in business and management literature (Freeman, 1984; Pascale, 1990; Ettorre, 1997; Appleyard, 2009), many of which appeared in the form of bestselling management books (Cummings, 1983). *The Machine* and subsequent publications by its authors are typical examples of these best selling management books that seek to articulate good or best practice in management and business. Francis (2002) defines such publications as seeking to answer the question of what practices and factors are associated with the implementation of successful innovations? Voss (2005) argues that best practice is predicated on underlying assumptions and that best practice leads to superior performance which in turn will lead to increased competitiveness. However, he identifies three difficulties associated with best practice: best practices tend to come in isolated small pieces; there is a substantial failure rate in best practice implementation; and also, not all best practices are universally applicable. Pilkington (1998) is also critical of the concept of best practice, accusing manufacturing managers and researchers alike of ignoring the clear rejection of best practice in the general business strategy literature. Dahglaad-Park and Dahglaard (2007) are similarly wary of the best practice concept, but concede that organisations that do make use of process improvement methodologies tend to have higher performance on measures of profitability, quality and productivity.

The Lean process improvement methodology has been examined by different authors from many perspectives and expanded in different ways. Some authors have examined the application of the Lean process improvement methodology in the wider supply chain (Lamming, 1993; 1996; Hines, 1994; Levy, 1997; Hines and Rich, 1997; Jones *et al.*, 1997; Christopher and Towill, 2000; Hines *et al.*, 2000). More recently, a group of authors have focused on the inability of conventional accounting to compliment and support the Lean process improvement methodology (Maskell and Baggaley, 2004; Darlington, 2010). Darlington *et al.*, (2008) argue that *Lean Accounting* has become the foremost topic of discussion amongst Lean practitioners over the last two years. As a consequence of the dislocation between conventional accounting and Lean several alternative accounting approaches have been developed. These include: Activity Based Costing (Johnson and Kaplan, 1987; Innes and Mitchell, 1991; Yoshikawa *et al.*, 1993), Throughput Accounting (Goldratt and Cox, 1986; Corbett, 1998; 2000), Target Costing (Monden, 1989), Kaizen Costing (Monden, 1992), Quality Based Pricing (Hines 2006; Hines *et al.*, 2006) and Flow Accounting, (Darlington, 2010; forthcoming).

It is clear then that Lean is one of a number of similar OMIs that are focused on process improvement methodologies and based on best practices that have been presented and promoted in recent management literature (Nave, 2002; Bhuiyan and Bagel, 2005). Pascale (1990) counted more than thirty such OMIs between 1950 and 1988 and this is before the proliferation in the 1990s. Those that emerged during the 1990s generally build on the basic concepts of quality or process improvement through productive restructuring (Goldstein, 1997). They include Total Quality Management (TQM), Six Sigma, Business Process Reengineering (BPR), Just In Time (JIT), Lean, Theory of Constraints (TOC), Kaizen and Business Excellence, to name just seven. They all have common aims (minimising waste and resources while improving customer satisfaction and financial results) and common origins (the quality evolution in Japan after the Second World War). Furthermore, they all represent ways of achieving more swift and even flow (Schmenner and Swink, 1998). Most of these other process improvement methodologies are both complementary and competitive to Lean. They are complementary in the sense that they may be implemented alongside Lean and are competitive in the sense that they compete with Lean in the market for process improvement methodologies.

In the sub-sections that follow, Lean is compared with three other process improvement methodologies. These three have been selected since they are most commonly referred to in contemporary Lean discourse. They are: Six Sigma, Theory of Constraints (TOC) and Systems Thinking. All three have striking similarities and subtle differences when compared with Lean:

1. Six Sigma emerged more recently than Lean and, like Lean, appears prevalent in non manufacturing environments. Unlike Lean, it is highly statistical and based on a rigid methodology rather than a broad set of principles.
2. TOC has similar longevity and a similar development trajectory as Lean. TOC addresses the financial dimension of performance, an important aspect of the literature on Lean. However, TOC does not appear to be as pervasive in the UK as Lean.
3. Systems thinking, at least the particular form of Systems Thinking commonly associated with Lean, has emerged more recently as Lean discourse has penetrated service and public sectors. It has provoked attention and controversy in these sectors.

Each of these three will be elaborated upon and compared with Lean in the sections that follow. These subsections have been included in order to provide context and background for the findings relating to RQ2 (see Section 1.2.1) that are discussed later.

2.3.1 Six Sigma

The quality movement has been ongoing for many years (Cole, 1998; 1999; Nair, 2006) with the early focus on quality being the evolution from quality control to quality assurance (Dale, 1999). Founders of the quality movement include W. Edward Deming, Joseph Juran and Kaoru Ishikawa (Hackman and Wagman, 1995). During the 1990s, Total Quality Management (TQM) emerged as a common term among organisations to reflect a style of management that gives everyone in an organisation responsibility for delivering quality to the customer. A key tenet of TQM is Deming's Plan, Do, Check, Act (PDCA) cycle of continuous improvement (Andersson *et al.*, 2006.) Four key assumptions underpin TQM: that quality is less costly than poor workmanship; that employees care about quality and will improve it

given the ability to do so; that organisations are systems of independent parts; and, that senior managers create the system and are responsible for it (Hackman and Wageman, 1995). Smith *et al.*, (1995) recognise that, similar to Lean, there exists a diversity of view about what TQM is and that it is many things to many people:

'The models that people developed for implementing TQ often were a result of the fuzzy images they had of what the TQ world looked like'

(Smith et al., 1995, p. 77)

They conceptualise three archetypcal approaches to TQM and add a fourth: first, the planning mindset where the focus is on measurement and the use of proven techniques; second, the learning mindset where the focus is on mobilising individual and group creativity and problem-solving; third, the visionary mindset where the focus is on customers and stakeholders and a vision for survival and growth; fourth, the transformation mindset where the focus is on taking a meta-perspective to enable movement between the other three. Crucially, in this latter mindset the role of management is as trustee rather than beneficiaries of TQM. Though popular in the 1980s and early 1990s, TQM has since been discredited in some literature by case studies of failed implementation (Andersson *et al.*, 2006). Some authors estimate that only between a fifth and a third of TQM implementations succeed (Harari, 1997).

Compared to TQM, Six Sigma is a relatively new process improvement methodology and is now generally regarded as having overtaken TQM as the concept at the forefront of the broader quality movement. Six Sigma was never intended as a replacement to TQM although the two concepts have common origins, aims and other shared characteristics. Six Sigma is a data driven method for achieving near perfect quality (Rowlands, 2003) which was originally developed by Motorola in 1987 and made popular by the well-publicised implementation at General Electric by Jack Welch (Eckes, 2001; Hammer, 2002; Catherwood, 2002; Raisinghani *et al.,* 2005; Schroeder at al., 2008). In overview, it is a business strategy that seeks to identify and eliminate causes of errors or failures in business processes by focusing on outputs that are critical to customers (Snee, 2009).

More specifically, Six Sigma itself is specific measure of quality, most commonly cited as 3.4% defects per million opportunities. The roots of sigma as a measurement standard can be traced back to Carl Gauss, who introduced the

concept of the normal distribution curve, and Walter Shewhart, who introduced three sigma as a measurement of output variation (Raisinghani *et al.*, 2005). The Six Sigma quality measure means operating at a level of quality that is defective only 0.0003% of the time. This measure acts as the goal of the Six Sigma process improvement methodology (Lazarus and Butler, 2001).

The methodology for achieving these process improvements is supported by the deployment of a Six Sigma hierarchy with champions referred to as black belts. Black belts are cadres of project managers armed with knowledge of statistically based process improvement tools. Black belts follow a common project cycle known as DMAIC (define, measure, analyse, investigate and control) which is a refinement of Deming's PDCA cycle.

Comparing TQM with Six Sigma, Schroeder *et al.*, (2008) conclude that they differ in four key ways: first, Six Sigma has a greater focus on financial and business results; second, Six Sigma insists on following the structured DMAIC cycle; third, Six Sigma uses more specific metrics; fourth, Six Sigma uses a number of full-time improvement specialists (black belts). Andersson *et al.*, (2006) compare TQM and Six Sigma to Lean in Table 3.

Table 3 Comparing Total Quality Management, Six Sigma and Lean

Concept	TQM	Six Sigma	Lean
Origin	The quality evolution in Japan	The quality evolution in Japan and Motorola	The quality evolution in Japan and Toyota
Theory	Focus on customers	No defects	Remove waste
Process view	Improve and uniform processes	Reduce variation and improve processes	Improve flow in processes
Approach	Let everybody be committed	Project management	Project management
Methodologies	PDCA	DMAIC	Principles: value, value stream, flow, pull and perfection
Tools	Analytical and statistical tools	Advanced statistical tools	Analytical tools
Primary effects	Increase customer satisfaction	Saves money	Reduce lead time
Secondary effects	Achieves customer loyalty and improves performance	Achieves business goals and improves financial performance	Reduces inventory, increases productivity and customer satisfaction
Criticism	No tangible improvements, resource-demanding, unclear notion	Does not involve everybody, does not improve customer satisfaction, does not have a system view	Reduces flexibility, causes congestion in the supply chain, not applicable in all industries

(Source: Andersson et al., 2006)

Table 3 illustrates many similarities (origin, methodologies, tools and effects) and key differences (theory, approach and criticisms) between the three concepts. Goh (2002) identifies other limitations to Six Sigma: it assumes that all defects are equally damaging; it is a prescription for conformance only and does not offer a formula for creativity; and, it fails to relate to any bigger picture and/or timeframe.

Several authors have proposed that Lean and Six Sigma are complimentary process improvement methodologies and are best combined into a hybrid form (George, 2002; Schonberger, 2009; Pepper and Spedding, 2010). For example, General Electric has successfully merged the two methodologies so that Lean addresses process flow and waste while Six Sigma addresses variation and design (Magnusson *et al.*, 2003). Anthony *et al.*, (2003) propose that the limitations of each methodology may be complemented by the strengths of the other as illustrated in Table 4.

Table 4 Complementarity of Lean and Six Sigma

Issues/Problems/Objectives	Six Sigma	Lean
Focuses on customer value stream	×	√
Focuses on a visual workplace	×	√
Creates standard work sheets	×	√
Attacks work-in processes inventory	×	√
Focuses on good house keeping	×	√
Process control planning and monitoring	√	×
Focuses on reducing variation and achieving uniform process outputs	√	×
Focuses heavily on the application of statistical tools and techniques	√	×
Employs a structured, rigorous and well-planned problem solving methodology	√	×
Attacks Ohno' seven wastes	×	√

(Source: Anthony et al., 2003)

Schroeder *et al.*, (2008) note that that the extensive literature on Six Sigma consists of articles written by practitioners and consultants with very few academic articles, a view supported by Jitu (2004, 2008). Goh (2002) is also critical of the literature on Six Sigma. He argues that the hyperbole that often accompanies the presentation and adoption of Six Sigma in industry could lead to unrealistic expectations as to what Six Sigma is truly capable of achieving. Comparing Six Sigma to Lean, Holweg (2009) argues they both exhibit very similar patterns of evolution. However, recent research suggested a possible shift in demand away from Six Sigma and toward Lean (Minton-Eversole, 2010).

2.3.2 Theory of Constraints

TOC was developed and made popular by Dr. Eliyahu Goldratt in the mid 1980s. The origins of TOC go back to a finite capacity scheduling programme that was called Optimised Production Technology (OPT). OPT was developed by Dr. Goldratt and three Israeli partners who brought it to the US in the late 1970s and formed a company called Creative Output. Creative Output attempted to protect the proprietary algorithm by installing OPT in a tamper-proof box so that the only output the plant received was a schedule (Bylinski, 1983). After seven years, Creative Output ended with a major dispute between Dr Goldratt and his partners and the bankruptcy of the company. The rights to the OPT software were sold to a British firm called Scheduling Technologies Group. In 1986, Dr Goldratt formed the Goldratt Institute as the vehicle through which to develop TOC (Goldratt, 1996; Fox, 2005). Watson *et al.* (2007) traces the development of TOC into five distinct eras of TOC discourse: era 1, Optimised Production Technology and the secret algorithm; era 2,

The Goal and articulating drum-buffer-rope scheduling; era 3, *The Haystack Syndrome* and articulating the TOC measures; era 4, *It's Not Luck* and articulating the thinking processes underlying TOC; era 5, *Critical Chain* and applying TOC to project management.

TOC was also first made popular through a best-selling management book, *The Goal*. The title of the book comes from the contention that any manageable system is limited in achieving more of its goal by a very small number of constraints and that there is always at least one constraint. Since there are few constraints in any system, management of these allows effective control of the entire system. The goal is to make money now and in the future and TOC defines three operational measures that determine whether operations are working toward that goal. These measures are throughput (the rate at which the system generates money); inventory (all the money the system invests in things it intends to or could sell); and, operating expense (all the money the system spends in turning inventory into throughput). These three operational measures are combined to identify results for the overall organisation:

Net profit = Throughput – operating expense

Return on investment = (Throughput-operating expense)/inventory

Productivity = Throughput/operating expense

Inventory Turnover = Throughput/inventory

These measures facilitate local decision making by examining the effect of those decisions on the organisation's overall throughput, inventory and operating expense. The TOC process improvement methodology follows a five step plan:

1. Identify the constraint which may be a resource or policy that prevents the organisation from obtaining more of its goal of making money.

2. Decide how to exploit the constraint by making sure the constraint's time is not wasted doing things that it should not be doing.

3. Subordinate all other processes to the constraint by aligning the whole system or organisation to support the exploitation decision.

4. Elevate the constraint and if possible permanently increase capacity of the constraint.

5. If the constraint has moved, begin again at the first step and do not allow inertia to become the constraint.

The identification of the constraint is required for the implementation of a drum-buffer-rope (DBR) scheduling methodology. Under this methodology the constraint or drum determines the pace of production; the rope is the material release mechanism and the buffer is strategically-placed inventory, to ensure the drum never constraints the entire system of throughput by running out of work (Watson *et al.*, 2007).

A number of studies suggest that manufacturing organisations employing TOC exceed the performance of those using Lean (Ramsay *et al.*, 1990; Fogerty *et al.*, 1991; Cook, 1994; Holt, 1999; Mabin and Balderstone, 2000). Furthermore a number of not for profit and government agencies around the world have also successfully adopted TOC, most notably parts of the UK NHS, the Israeli Air Force and the US Department of Defence (Watson *et al.*, 2007). In a rare UK study of the application of TOC in the NHS, Lubitsh *et al,.* (2005) find that the closer the work of a particular department resembles the relative predictability of a production process, the more straightforward applying TOC becomes.

Moore and Schienkopf (1998) argue that while there are similarities between Lean and TOC, they are fundamentally different paradigms. Lean achieves process improvement through the removal of waste; TOC achieves improvement through increasing throughput. This dichotomy is at the heart of different practices under each concept and is captured in Table 5.

Table 5 Different Practices within Theory of Constraints and Lean Concepts

	Lean	TOC
Waste	All waste is to be reduced	Not all waste is equal and prioritisation of waste removal (at the constraint) is needed
Value stream	Production should be organised around specific products or product families	There are dangers when organisational resources are shared among several products
Resource dedication	Resource dedication is encouraged	Resource dedication leads to unnecessary underutilisation of resources
Inventory	All inventory is waste	Inventory serves the purpose of protecting throughput

(Source: compiled from Moore and Schienkopf, 1998)

Watson *et al.* (2007) comment that in spite of its' use in diverse organisations, TOC has yet to achieve widespread acceptance. TOC is frequently associated with its' challenge to traditional cost accounting systems. Maskell (1991) identifies several problem areas associated with traditional cost accounting systems: lack of relevance; cost distortion; inflexibility; subjection to the needs of financial accounting; and impediment to progress in world-class manufacturing. An accounting technique called Throughput Accounting (TA) has developed based on the concepts of TOC (Rahman, 1988; Corbett, 1998). TA is based on four key assumptions: that profit is function of lead-time; that throughput not output should be the primary indicator of business health; that costs are fixed in the short term; and, that return per factory hour and not margin determines profitability (Waldron and Galloway, 1988; 1988a; 1989; 1989a).

2.3.3 Systems Thinking

Some authors have noted that system is a word that is used so frequently and with such varied interpretation that it has become a controversial and even meaningless concept (Olsson and Sjostedt, 2004). In a general sense, a system means a configuration of parts connected and joined together by a web of relationships (Banathy, 1997). At the heart of a system is interaction between a number of systemic elements separated from an external environment (Olsson and Sjostedt, 2004). Johnson *et al.*, (1964) define a system as:

'an organised or complex whole; an assemblage or combination of things or parts forming a complex or unitary whole'

(Johnson *et al.*,1964, p. 367).

The systems concept provides a framework for visualising internal and external environmental factors as an integrated whole.

'Systems thinking' is derived from General Systems Theory (GST). GST emerged during the 1950s when the biologist Ludwig Von Bertalanffy (1956, 1968) used the model of a living organism as a means of understanding complex open systems such as those of the natural world. Since then, GST has lent itself to many interpretations and applications in the biological, physical and social fields of study (Morgan, 1986). Table 6 summarises the main contributions to the development of GST.

Table 6 Main Contributions to General Systems Theory

Contributor	Original Discipline	Contribution
Ludwig von Bertalanffy (1956, 1968)	Biology	First in Europe to develop an open systems theory in biology as a working hypothesis for research. Open systems theory influenced the way organisations are conceived and managed. Founder of the general systems theory (GST) which was later developed by others. In particular, Boulding (1956) developed a classification of nine levels of systems.
Stafford Beer (1979, 1981)	Operational research and management science	Developed organisations cybernetics and the viable system model which compares organisation to human brain structures and stipulates organisational rules for survival and development.
Jay Forrester (1961, 1969)	Engineering	Developed systems dynamics which focus on applying concepts of control theory and feedback to wider issues of commerce and society.
Russell Ackoff (1981, 1994)	Operations research	Developed interactive planning which encourages the conception of idealised design and inventive ways of realising them.
Peter Checkland (1981, 1990, 1998)	Management science	Developed soft systems methodology, an interpretive based systemic theory and a brand of action research.
C. West Churchman (1968, 1979)	Philosophy	Developed critical systemic approach which emphasises recurrent questions of whether choices and actions can be justified.
Peter Senge (1990)	Management science	Developed systemic thinking which makes as one the personal disciplines in order to achieve a learning organisation.

(Source: adapted from Flood, 1999)

GST is concerned with developing a systematic, theoretical framework for describing general relationships of the empirical world (Johnson *et al.*, 1964). Systems thinking offers a way forward for decision makers faced with the failure of mechanistic and reductionist thinking when confronted with complex, real-world problems, set in social systems (Jackson, 2003).

A number of authors have offered classifications for the range of systems approaches (Banathy, 2000; Eriksson, 1998; Olsson and Sjastedt, 2004). Olsson (2004) classifies systems approaches into four types: developments directly related to GST and cybernetics; operations research and systems engineering; systems analysis and the application of GST in the social sciences; and, soft systems methodology (SSM) to critical systems thinking (CST). CST is the most recent school of thought to have emerged within the systems thinking literature as both a reaction to an extension of SSM (Olsson and Sjastedt, 2004). CST prioritises the evaluation of different systems methodologies into order to delimit their most appropriate areas of application (Jackson, 2000, 2003).

For the purpose of this study, the focus is on one particular systems thinking approach which is commonly associated with Lean. This application is John Seddon's Systems Thinking approach. Seddon is a psychologist turned management consultant who has developed a service process improvement methodology based on the work of Deming (1982) and Senge (1990). Seddon argues that 'systems thinking' underpins Lean and that TPS is a striking example of systems thinking applied to a business organisation (Seddon and Caulkin, 2007). Seddon therefore is a major exponent for the translation of TPS into non manufacturing environments such as the service and the public sectors (Seddon, 2005; ODPM, 2005; NHC, 2006; Seddon and Caulkin, 2007; Seddon, 2008; Seddon and Brand, 2008; Advice UK, 2008; Jackson, *et al.,* 2008; McQuade, 2008).

Seddon's (2005; 2008) Systems Thinking differentiates two archetypal managerial approaches: the conventional approach (which he terms Command and Control) where fragments of an organisation are optimised with little reference to the wider organisation; and a systems approach (which he terms Systems Thinking) which focuses on the interrelationship between the various parts of the organisation. The approach has three stages which are derived from Deming's PDCA improvement cycle: check; plan (or re-design); and do.

The 'check' stage involves three elements:

1. A review and articulation of the central purpose of an organisation or service.
2. A systematic analysis of the demand which differentiates between value and failure demand.

3. A systematic analysis of the end-to-end flow of work from the customer's point of view to expose the predictability of performance and its variation.

In the 'plan' stage, the service is re-designed based on the knowledge gained in the check phase. The 'do' stage involves bringing in other service deliverers into the newly re-designed system. Seddon's approach itself is systemic in that, once 'do' is complete, it is necessary to cycle back to 'check' to ensure continuous improvement (ODPM, 2005).

Jackson *et al.*, (2008) evaluate the Seddon approach to service process improvement using a CST device known as the 'system of systems methodology' (SOSM), (Jackson, 1990; 2000; 2003). SOSM, first devised by Jackson and Keys (1984), was an attempt to provide a theoretical basis for probing the interrelationship between different methodologies and their relationship to real-world problem contexts. SOSM is the most cited way of classifying systems methodologies (Jackson *et al.*, 2008). In their evaluation of Seddon's approach, Jackson *et al.*, (2008) use SOSM to conclude that his approach provides a well-specified methodology embodying many aspects of systems thinking. However two potential limitations of the approach are also identified: its' failure to accommodate a variety of possible purposes; and, the risk of sub-optimisation (or optimising one subsystem without reference to the other parts or levels of the system). Other authors have advocated leadership in the form of a clearly articulated, quantified and well-presented statement of purpose as being a key service provided to the organisation by the senior management team (Tranfield and Smith, 1998).

Having initially allied himself with the Lean movement by naming his approach 'Lean Systems' (see Jackson *et al.*, 2008), Seddon is now publicly critical of the movement. He argues that by creating the label 'Lean' to describe TPS, the movement has overemphasised the deployment of tools and techniques to the detriment of deep understanding:

'Managers are being told that tools such as 5S, Takt time, poke yoke and Value Stream Mapping are the means by which they can emulate Toyota,'

(Seddon, 2005, p. 181).

He concedes that organisations will improve by the use of such tools but that the level of these improvements are insignificant when compared to the benefits from changing system conditions and norms:

'The danger with codifying method as tools is that by ignoring the all-important context it obviates the first requirement to understand the problem and, more importantly, to understand and articulate the problem from a systems perspective,'

(Seddon, 2005, p.190).

Seddon's work has inspired debate and dissent with the Lean movement.

2.4 Lean as a Movement

A movement is defined as a series of actions and events taking place over a period of time and working to foster a principle or policy (Collins, 1999). Whilst previous sections suggested there are a number of antecedents to Lean, the Lean movement is generally traced back to the publication of *The Machine* (Delbridge and Oliver, 1991; Oliver *et al.*, 1994; Karlsson and Alhstrom, 1996; Katayama and Bennett, 1996; Benders, 1999; Dyer and Nebeoka, 2000; Benders and Bijsterveld 2000; Bhasin and Burcher, 2006; Shah and Ward, 2007). The Lean movement therefore spans two decades and continues to provide the rationale for much activity in a great many diverse organisations across the UK.

Commentators generally agree that the Lean movement has had considerable impact over the last two decades. Lean is described as:

'a dominant strategy for organising production systems'

(Karlson and Ahlstrom, 1996 p.2 5);

'arguably the paradigm for operations and its influence can be found in a wide range of manufacturing and service strategies'

(Lewis, 2000, p. 959);

'an integral part of the manufacturing landscape'

(Shah and Ward, 2007, p. 785);

'*The Machine That Changed the World* or *The Machine* is one of the most widely cited references in operations management over the last decade'

(Holweg, 2007, p. 420);

'at the forefront of advances in the practice of operations management today'

(Tracy and Knight, 2008, p. 8);

'Nowadays, lean principles are known around the world and applications reach well beyond the production of goods to service and healthcare delivery'

(Brandao de Souza, 2008, p. 122).

Papadapoulou and Ozbayrak (2005) argue that Lean has undergone and is still undergoing a process of continuous evolution and that much of the literature on Lean relies on an antiquated version of Lean that has failed to keep up with this evolution. Similarly, Hines *et al.*, (2004) propose that the Lean movement has evolved over time. They identify four distinct phases of the movement and the focus, literature themes, contributors and active sectors of each phase (Table 7).

Table 7 Evolution of Lean Movement

Phases	1980-1990 Awareness	1990-mid 1990 Quality	Mid 1990-2000 Quality, Cost & Delivery	2000+ Value System
Literature theme	Dissemination of shop floor practices	Best practice movement, benchmarking leading to emulation	Value stream thinking, lean enterprise, collaboration in the supply chain	Capability at system level
Focus	JIT techniques, cost	Cost, training and promotion, TQM, process reengineering	Cost, process-based to support flow	Value and cost, tactical to strategic, integrated to supply chain
Key business process	Manufacturing, shop floor only	Manufacturing and materials management	Order fulfilment	Integrated processes, such as order fulfilment and new product development
Industry sector	Automotive – vehicle assembly	Automotive – vehicle and component assembly	Manufacturing in general – often focused on repetitive manufacturing	High and low volume manufacturing, extension into service sectors
Main contributors	Shingo (81,88); Schonberger (82,86); Monden (83); Ohno (88); Mather (88)	Womack *et al.* (90); Hammer (90); Stalk and Hout (90); Harrison (92); Anderson Consulting (93, 94)	Lamming (93); MacBeth and Ferguson 94); Womack and Jones (95, 96); Rother and Shook (98)	Bateman (00); Hines and Taylor (00); Holweg and Pil (01); Abbas *et al.* (01); Hines *et al.* (02)

(Source: Hines et al., 2004)

The authors suggest that the Lean movement has evolved and adapted over time in order to address inherent weaknesses in the previous phase. The awareness period, prior to the publication of *The Machine*, saw the Lean movement as limited to some emulation of certain structural elements of TPS. However, the publication of *The Machine* saw a widening of the focus of Lean movement from the shop floor to the simultaneous pursuit of quality, cost and delivery. More recently, the focus of the Lean movement has shifted to value appropriation rather than cost (waste) reduction.

The Lean movement in the UK has been facilitated by certain organisations that have actively promoted the widespread diffusion Lean. Since the publication of *The Machine* and *Lean Thinking*, Womack and Jones have set up organisations to promote Lean: Womack in the US; Jones in the UK and the rest of Europe. In the

US, Jim Womack until recently was the President and Founder of the Lean Institute which aims to advance Lean Thinking throughout the world. It has affiliated organisations in seven European countries (including the UK) and five non European countries (see www.lean.org). Womack states that the Lean movement is widespread and far-reaching:

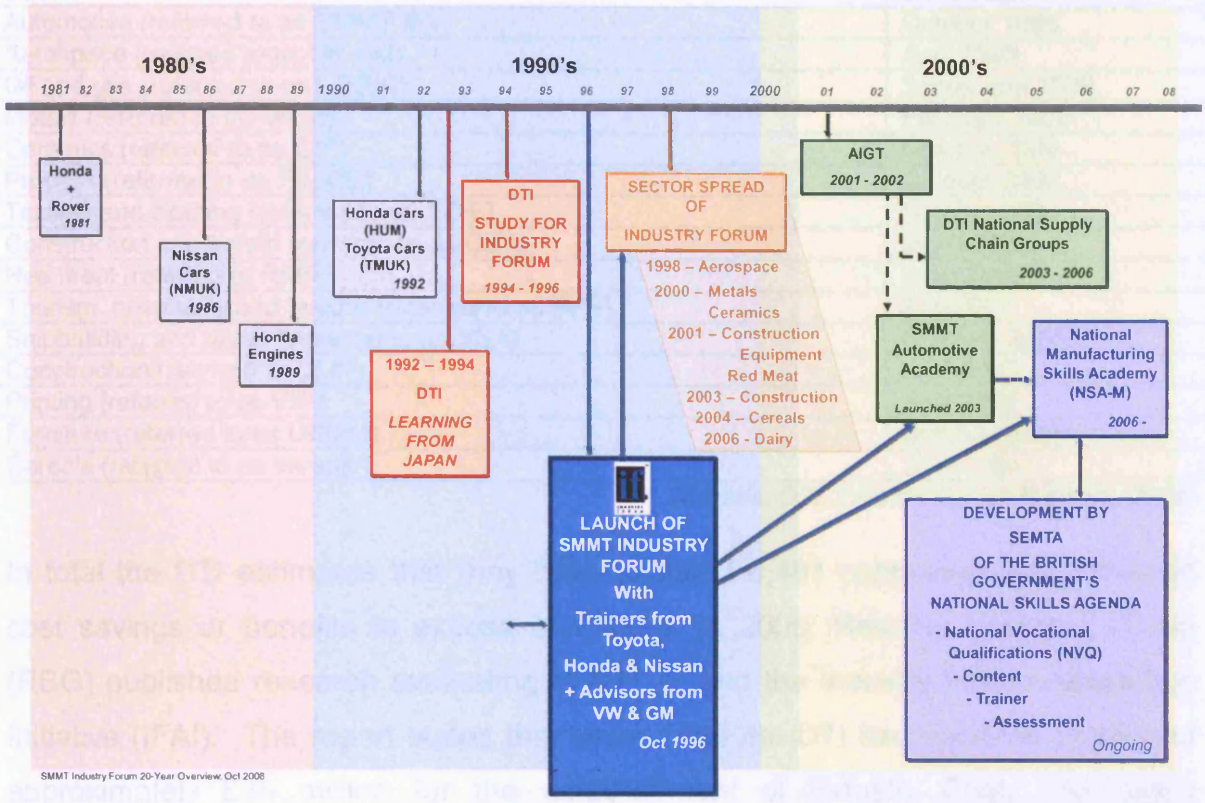
'I am delighted with the spread of lean thinking far beyond the factory and far beyond the high-wage economies to every corner of the world and to every value-creating activity. My greatest concern is that we bring the best methods to bear and create the maximum amount of knowledge exchange across the global Lean Community so these initiatives will all succeed. Life will be better for all of us if they do.'

(Jim Womack, The Dramatic Spread of Lean Thinking, LEI, 11th April, 2005).

In the UK, Professor Dan Jones worked for some years after the success of *The Machine* within Cardiff University where he co-founded the Lean Enterprise Research Centre (LERC) with the stated purpose of 'researching, applying and communicating Lean Thinking' (see www.leanenterprise.co.uk). Later, Professor Jones founded the Lean Enterprise Academy whose stated purpose is to spread Lean to every kind of organisation (see www.leanuk.org). There are many and various other consultancy firms and other intermediary bodies who also actively promote Lean.

In the early years of the movement, Lean received a great deal of support by both the UK government and other intermediary bodies (EEF, 2001). The main government vehicles for support of the Lean movement were the Department of Trade and Industry (DTI, became the Department for Business, Enterprise and Regulatory Reform or BERR and is now the Department for Business, Innovation and Skills or BIS) and the University research funding bodies. The DTI played a pivotal role in the diffusion of Lean into to the entire automotive sector when in 1995, under the leadership of Michael Heseltine, they collaborated with the automotive trade body, the Society for Motor Manufacturers (SMMT) to form the SMMT Industry Forum (SMMT IF). SMMT IF was set up following the publication of a White Paper revealing the UK's serious industrial production weakness (SMMT IF, 2006). UK based automotive specialists were seconded to work within the DTI to set up the SMMT IF initiative. Figure 4 shows the history of support for the UK automotive sector over the last three decades.

Figure 4 History of Support for the UK Automotive Sector over the Last Three Decades



(Source: SMMT IF)

Figure 4 shows that the impetus for the formation of SMMT IF was the arrival of Japanese plants: Honda in Swindon in 1985; Nissan in Sunderland in 1986 and Toyota in Derby in 1992 (SMMT IF, 2002). The UK SMMT IF initiative represents the first time that Honda, Nissan and Toyota had ever collaborated. Its' aim was to improve the knowledge and expertise of the UK supply base. Initially this was achieved by bringing in seconded engineers from these Japanese companies to train engineers in UK companies. The initiative was regarded as so successful that in the late 1990s the DTI established the Industry Forum Adaptor Programme to provide sector based sources of assistance and support for businesses with remit of improving competitiveness and efficiency (DTI, 2006). Table 8 provides a chronological overview of the sectors included in the programme and illustrates the extent of the government's efforts as a key change agent in the diffusion of Lean from automotive into wider manufacturing (Herron and Hicks, 2008).

Table 8 Sectors Included in the Department of Trade and Industry Adaptor Programme (1996-2006)

Sector	Start date
Automotive (referred to as SMMT IF)	October 1996
Aerospace (referred to as UK LAI)	April 1998
Oil and gas (referred to as LOGIC)	September 1999
Metals (referred to as MICE)	February 2000
Ceramics (referred to as CIF)	October 2000
Process (referred to as PICME)	October 2000
Textiles and clothing (referred to as TCIF)	October 2000
Construction equipment (referred to as CEA)	March 2001
Red meat (referred to RMIF)	June 2001
Tourism, hospitality and leisure (referred to as BPF)	July 2001
Shipbuilding and repair (referred to as SSA)	October 2001
Construction (referred to CLIP)	April 2003
Printing (referred to as VIP)	April 2003
Furniture (referred to as UKfirst)	October 2003
Cereals (referred to as cereals)	June 2004

(Source: DTI, Industry Forum Network, 2006)

In total the DTI estimates that they have assisted 8,481 companies and achieved cost savings or benefits in excess of £369m. In 2006, Reading Business Group (RBG) published research evaluating SMMT IF and the Industry Forum Adaptation Initiative (IFAI). The report states that since 1996 the DTI had provided funding of approximately £35 million for the establishment of Industry Fora. The report concludes that Industry Fora do create benefits for their participants but that benefits vary considerably. In terms of value for taxpayer's money, cost-benefit ratios suggest that Industry Fora generate more benefits to firms than cost to government (with estimates of benefits in the order of £174 million). However, the report is critical of the design and rationale of the initiative, describing the roll out of IFAI as 'a solution in search of a problem' and recommending that programmes should not be rolled out simply because a sector lacks competitiveness (RBG, 2006).

Certain industry sectors have been particularly proactive in their adoption and consequential promotion of Lean, in particular aerospace, construction, health and food.

The UK Lean Aerospace Initiative (UKLAI) developed into a national research programme involving a leading consortium of Universities of Bath, Cranfield, Nottingham and Warwick, working in close collaboration with the US Lean Aerospace Initiative at MIT. The programme is jointly funded by the Engineering and

Physical Sciences Research Council (EPSRC) and by forty-five industry sector companies (Crute *et al.*, 2003).

The construction sector became active in the Lean movement following the publication of the Egan report in 1996. The report led to the formation of CLIP (the construction industry forum which was later given the name Construction Lean Improvement Programme) and the Lean Construction Institute. Activity in the construction industry has led to the development of a parallel movement commonly referred to as Lean construction. The Focal Literature in Chapter 4 shows that Lean construction has its own smaller body of literature which is often compared to the wider Lean literature. However, in May of 2008 Sir John Egan made a speech to the House of Commons in which he discusses the overall response of the construction industry to the publication of his report ten years later. His impression was gloomy:

'In summary if I were giving marks out of 10 after 10 years I'd probably only give the industry about four out of 10, and that's basically for trying, for having its demonstration projects, for still being in the game, and still having enough there to actually, perhaps with another big heave, get it done the next time around.'

(Egan, House of Commons speech, 21st May 2008).

The construction sector is one that joined the Lean movement early but in which diffusion is slow and difficult.

With the exception of one early reference to *The Machine* in 2001, Lean first begins to appear in the British Medical Journal in 2004 (Young *et al.*, 2004). The UK healthcare sector first became active in the Lean movement through work within the Modernisation Agency (Rogers *et al.*, 2004). This Agency was established in 2001 to support the National Health Service (NHS) and its partner organisations in the task of improving patient experiences and outcomes. In 2005, the Modernisation Agency was replaced by the NHS Institute for Innovation and Improvement which continues to promote Lean. In the largest ever survey on innovation and improvement in the NHS, involving 4,600 staff, 44% of respondents reported that they were using Lean improvement methodologies. This compares with only 14% using Six Sigma and 12% using TOC. Early commentators on the challenges of Lean in healthcare suggest that the challenges of implementing Lean in healthcare include: highly variable and unpredictable demand (Kollberg *et al.*, 2007, Shah *et al.*, 2008);

healthcare supply chain configuration where work is distributed among many independent organisations (Shah *et al.*, 2008); and, the clarification of process orientation and patient focus (Kollberg *et al.*, 2007). More recently, the NHS Confederation which represents around 98% of the various organisations that make up the NHS became involved in the movement when they published a report, written by members of the UK Lean Academy, which includes case studies of hospitals who have successfully experimented with Lean (Jones and Mitchell, 2006). Other authors have also documented the application of Lean in healthcare (Spear, 2005; Patel, 2009; Burgess, 2011). Radnor and Bucci reviewed the literature on various process improvement methodologies in the public sector and concluded that:

'Of these approaches Lean currently appears to have the greatest uptake particularly in Healthcare.'

(Radnor and Bucci, 2008, p. 2).

In a recent comprehensive literature review of Lean in healthcare, Brandao de Souza notes that within existing literature most (57%) applications have occurred in the USA. However, the UK literature is growing with a particularly sharp increase in the number of works in 2008. In 2008, the first book dedicated solely to Lean in the UK healthcare sector was published (Fillingham, 2008).

The food sector became active in the Lean movement through the formation of the Food Chain Centre (FCC). The FCC was set up following the publication of the Curry Commission in 2002, funded by grants from the Department for Environment, Food and Rural Affairs (Defra) of £5.3 million (FCC Completion report, 2007). During it 's five year lifespan, the FCC conducted work within red meat, cereals, dairy and fresh produce, involving over 2000 farm businesses and over 120 other companies. The businesses involved reported savings of £14.4 million (FCC Completion report, 2007; Zokaei, 2008).

As well as sector-specific promotion of Lean, the government has also funded a significant intervention to support small and medium-sized enterprises (SMEs) though the Manufacturing Advisory Service (MAS). MAS was established and launched by the DTI in partnership with the UK regional development agencies (RDAs) in 2002, following a 2001 White Paper entitled 'Opportunity for All in a World of Change' (DTZ, 2007). The objective of MAS was and is to improve

competitiveness and performance in the SME sector by offering long term support and advice on manufacturing related operations and opening up opportunities for further best practice advice. In 2006 an evaluation was conducted to provide an independent review of the achievements and impact of MAS during the three years of its life. The report found that MAS outperformed its original key objectives by nearly 50% in terms of level 2 support (meaning diagnostic visits to SMEs) and by 100% in terms of level 4 support (meaning full consultancy support to SMEs). In terms of value for taxpayers money the report finds that for every £1 of public funding allocated to the delivery of MAS generated approximately £1.37-£1.83 of economic benefit for client firms, equivalent to an annual internal rate of return of approximately 20% (DTZ, 2007).

The Lean movement is now diffusing rapidly into the service sector (Fry, 2007). Services now constitutes the majority employer and source of income for developed economies, accounting for approximately three quarters of gross domestic product in the UK (Piercy and Rich, 2009).The desirability of transferring manufacturing logic and practices to service operations was first advocated by Levitt (1972; 1976) and later by Chase (1978) in three classic Harvard Business Review articles (Johnston, 1999). Bowen and Youngdahl (1998) support Levitt's view and argue that manufacturing has always been more innovative than services. Services differ to goods in three critical dimensions: first, services are intangible; second, services are heterogeneous; third, production and consumption of services are inseparable (Maddern *et al.*, 2007). In 2004 the Lean Enterprise Academy organised a Lean Service conference from which they concluded that service processes require greater analysis of demand (www.leanuk.org). It is noteworthy that the analysis and categorisation of demand into value and failure demand is a key element in Seddon's Systems Thinking approach to process improvement. Many authors have concluded that Lean is applicable to services subject to contingent application (Bowen and Youngdahl, 1998; Allway and Corbett, 2002; Swank, 2003; Malyeff, 2006; Maddern *et al.*, 2007; Piercy and Rich, 2009).

The majority of Lean implementation in the UK public sector has been within healthcare and central and local government (Radnor and Bucci, 2008; Radnor, 2010). There are five main reports concerning Lean implementation in the UK public sector. These have been published by: HMRC (Radnor and Bucci, 2007); the

Scottish Executive (Radnor *et al.*, 2006); The National Audit Office (Radnor and Bucci, 2008); the Welsh Assembly Government (CRG, 2008) and the Confederation of British Industry (CBI, 2010). All suggest that the implementation of Lean, to varying degrees, has delivered value for the public sector organisations studied.

The implementation of Lean into the HMRC attracted some controversy (Hornsell, The Times, Jan 5th 2005; Radio 4 PM, July 31st 2006). Lean implementation at HMRC has been hampered by union propaganda (see for example Gall, 2007; 2011) and recently staff morale at HMRC has been of concern (see www.publicservice.co.uk, 9th March 2010). However, the official evaluation of the HMRC 'pacesetter' initiative concluded that Lean has improved both quality and productivity (Radnor and Bucci, 2007). The Scottish Executive commissioned research which produced similar positive findings:

'the research with organisations in the Scottish public sector, together with the evidence from the literature, indicates that Lean is transferable to the public sector and can be used to develop more seamless processes, improve flow, reduce waste and develop an understanding of customer value.'

(Radnor *et al.*, 2006, p. 5).

The National Audit Office (NAO) commissioned a detailed literature review of improvement methodologies being used in the public sector. The review concluded that Lean was the most prevalent business improvement methodology with most applications being conducted in the NHS.

It is noteworthy that Seddon is critical of the methods used in Radnor's work, in particular the Scottish Executive study. He argues that evidence of use does not provide evidence of efficacy (Seddon *et al*, forthcoming). Seddon launched a scathing attack on government efforts towards public sector reform (Seddon, 2008). He argues that the way government has traditionally managed the public sector, through excessive standards, targets and measurement, is the reason for performance failure, rather than poor employees or managers, as the media would often have us believe. He comments of current reform efforts:

'What was supposed to be a system for liberating public sector organisations has turned into a burgeoning and dysfunctional stranglehold of bureaucratic control.'

(Seddon, 2008, p. 11).

Seddon is not alone in lobbying for a systems thinking approach to public sector management (see, for example, Chapman, 2004). Welsh Assembly Government (WAG) commissioned research into business improvement methodologies in Welsh local government concluded that although there is considerable activity taking place there is little consistency or coherence (CRG, 2008). Also, the Confederation of British Industry (CBI, 2010) refer to Lean as a method for reversing the declining trend in public services productivity.

2.5 Lean as a Body of Literature

The literature on Lean is located primarily in the operations and organisational behaviour fields of inquiry within broader business and management literature. Harrison and Storey (1996) propose that this creates both tensions and limitations with the literature. While the operations management literature tends to ignore social and organisational dimensions; the organisational behaviour literature fails to fully engage with the technical aspects of Lean.

However, it is not the bold claims so much as the standard scientific form of the evidence presented in *The Machine* that was the key ingredient of the success of the publication. Almost two decades later, Holweg (2007) presents an historical account of the research activity that led to the formation and dissemination of Lean, which he regards as one of the most influential manufacturing paradigms. Following interviews with Womack and Jones, two of the authors of *The Machine*, Holweg reports the authors' own assessment of the success of their book:

1. Timing: at the time of publication awareness of the crisis of Japanese exports had been raised through the business press.

2. Style: the easy, readable, non-technical style of the book. The book was written for industry executives and was never intended for use in classrooms.

3. Empirical evidence: the empirical evidence proves the superiority of TPS or Lean over typical western mass production systems. This differentiates the book from others that are similar.

4. Global data: the inclusion of data from regions other than Japan acts as a further differentiator of this book over others.

5. Comprehensiveness: more systematic treatment of the wider management system at Toyota than other similar books.

While Holweg (2007) successfully captures much of the complex web of activity leading up to the IMVP study, as a self-proclaimed supporter of Lean, his work lacks critical evaluation. For example, the point made above by the authors regarding the intended audience for the publication is contradicted in the text itself, where they state:

'Our story is not just for an industry audience but for everyone – government officials, labour leaders, industry executive, and general readers – in every country with an interest in how society goes about making things'

(Womack *et al.*, 1990, p. 8).

The broader issue here concerns the blurring of the boundaries between practitioner and academic communities, and the resultant effects. This issue is a recurrent theme of this study. Furthermore, the empirical evidence in *The Machine* has been challenged for both methodological robustness (Williams *et al.*, 1994) and for interpretive validity (Coffey, 2006, 2007; Coffey and Thornley, 2006; 2007a). Yet there is no mention of these challenges. Finally, the universal application claims within *The Machine* are also ignored in the self assessment in spite of their having stimulated widespread debate and criticism (Cusumano, 1994; Katayama and Bennett, 1996; Miyai, 1996; James-Moore and Gibbons, 1997; Jina *et al.*, 1997; McDonnell, 2000; Cooney, 2002).

New (2007) is more critical of *The Machine*. He highlights the role of politics in the publication:

'We should note that there is always politics at work when people explain these ideas, inevitably affected by the interests and agendas of whoever is doing the explaining. The authors of The Machine now speak candidly that they coined 'lean' as an acceptable way of describing TPS without offending the sponsors of the IMVP research.'

(New, 2007, p. 3547)

In 1996, Womack and Jones, two of the three authors of *The Machine* produced a follow-up text entitled *Lean Thinking* in which they identify the core principles of Lean Production (discussed in Section 2.3 on Lean as a Process Improvement

Methodology). Later, they later refer to Lean as the generic version of TPS (Egan, 1996).The empirical data in that publication is based on case studies of successful Lean implementations. Consequently, *Lean Thinking* had less of an impact on the academic community than on the practitioner community, though it is an important contribution to the Lean movement and clearly demonstrates the disconnection between academia and practice. The five Lean principles presented in *Lean Thinking* represent a roadmap for organisations attempting to implement Lean or emulate Toyota Production System (TPS) in some way. Spear and Bowen (1999) also provide a set of principles to characterise TPS: standardisation of work; seamless work flows; direct links between suppliers and customers; and, continuous improvement based on scientific methods. Shah *et al.* (2008) argue that practices are the physical manifestation of Lean principles which explains why much of the empirical data are case studies.

In a third text, *Lean Solutions*, Womack and Jones extended the Lean philosophy to the broader process of consumption proposing that mapping out the steps involved in customer delivery is easily applicable to any service encounter and is the best way to identify improvement opportunities (Womack and Jones, 2005, 2005a; Piercy and Rich, 2009).

Collectively the three texts produced by Womack and Jones reflect that trajectory of the Lean movement from a description of TPS/Lean to the generic principles underpinning TPS/Lean to the wider application of Lean. The Lean literature which follows this trajectory may be conceptualised as emerging in waves.

The first wave of Lean literature, based on translations from the writing of the key architects of TPS, focuses on describing the TPS (Ohno, 1988; Shingo, 1989; Mondon, 1983). Following some semantic debate on the most appropriate label, Western authors soon offered their own interpretations of the multi-faceted TPS (Schonberger, 1996; Standard and Davis, 1999; Womack *et al.*, 1990; Harrison, 1992; Bicheno, 1994).

The second wave of Lean literature reflects attempts made to identify the constituent elements or components of Lean. Papadopoulou and Ozbayrak (2005) categorise Lean into four main elements: production floor management; products/process oriented; production planning scheduling and control implementation; and, work

force and supply chain management. They identify eight works that offer key contributions to this wave of literature. Similarly, Shah and Ward (2003) categorise four main Lean practices: JIT, TQM, TPM and HRM. Cusumano (1994) likewise sets out the broad range of main factors as the necessary conditions for achieving the objectives of quality, productivity and flexibility in Lean Production. Karlsson and Ahlstrom (1996) use the description in *The Machine* as a basis from which to find measurable determinants of a Lean system. Panizzolo (1998) uses a similar four-part model to examine the degree of diffusion amongst a sample of successful Italian firms. However, as Papadopoulou and Ozbayrak (2005) observe, there is lack of consensus on the critical implementation elements of Lean. They conclude that this is due to its' context-specific origins and the fact that Lean has and continued to evolve through experimentation. Furthermore, they argue that the literature fails to keep up with Lean's ongoing evolution.

The third wave of literature reflects criticisms of Lean, the IMVP study and *The Machine*. This polemic literature is reviewed in detail in the section that follows.

The final wave of literature reflects the interest in how the transformation from a traditional production system to a Lean system takes place, or, Lean implementation. There is a lack of consensus in the literature regarding the benefits and objective of Lean implementation. Some authors emphasise the cost and lead-time benefits (Standard and Davis, 2000; Lebow, 1999), others describe the benefits in more generic terms such as waste elimination (Krizner, 2001) or systems improvement (Meier and Forrester, 2002). A number of authors have noted the difficulty of measuring the success of lean implementation efforts (Hines and Taylor, 2000; Maskell and Baggaley, 2004; Darlington, 2011, forthcoming). Maskell and Baggaley (2004) argue that Lean implementation often leads to cost avoidance rather than cost reduction and that the accountant community lags behind the operations community in recognising this. Therefore, the accounting community is accused of hindering Lean implementation efforts.

Many authors emphasise the long-term nature of Lean implementation (Ohno, 1988; Chase, 1999) and that Lean must be adopted in its' entirely, and not in a piecemeal fashion (Karlsson and Ahlstrom, 1996; Bergstrom, 1995; Henderson *et al.*, 1999; Allen, 2000; Convis, 2001; Lewis, 2001). Some authors advocate a systems

approach to Lean implementation (Lathin and Mitchell, 2001; Convis, 2001; Pullin, 2002; Seddon, 2005). Other authors emphasise the need to implement Lean beyond the enterprise and into the supply chain (Lamming, 1993, 1996; Hines, 1994; Levy, 1997; Dimancescu *et al.*, 1997; Hines and Rich, 1997; Naylor *et al.*, 1999; Hines *et al.*, 1998, 2000; Christopher and Towill, 2000; Hines and Taylor, 2000; Taylor and Brunt, 2001; Baker, 2004; Liker, 2004; Bicheno and Holweg, 2009).

There are many case studies in the Core literature concerning Lean implementation. These include: Raleigh (Parker, 2003); Boeing (Lewis, 2001); ICI, Lever Brothers and Pedigree (Bateman, 2002); Landrover (Pullin, 2002); Lincoln Electric Holding (Prizinsky, 2001). Indeed the abundance of case evidence has led some authors to comment that the body of research on Lean is primarily anecdotal rather than enlightening (Spencer and Guide, 1995). Lean implementation failures are frequently accounted for as failings of corporate culture (Utley *et al*, 1997; McNabb and Sepic, 1995). As a consequence, many authors focus on the process of change management (Sohal and Eggleston, 1994; Jina *et al.*, 1995; Allen, 2000; Womack and Jones, 1996; Sanchez and Perez, 2001; Hines *et al.*, 2008; Bicheno and Holweg, 2009). More recently, sustaining Lean transformations has emerged as an important topic in the literature (Bateman, 2002; Hines *et al.*, 2008) and the need to regard Lean as a mind-set, philosophy or way of thinking (Hines *et al.*, 2004; Seddon, 2005; Papadolpoulou and Ozbayrack, 2005; Bhasin and Burcher, 2006).

While this section of the literature has painted a picture of the diverse and wide interest in Lean, the final section reviews in more detail the polemic Lean literature.

2.5.1 Criticisms of Lean

It is possible to categorise five main schools of criticism of Lean:

1. The style and narrative devices of *The Machine* or the discourse school of Lean critics.
2. The empirical evidence contained in *The Machine* or the empiric school of Lean critics.
3. The effects of Lean on the workforce or the exploitation school of Lean critics.

4. The transfer and universal application claims of Lean or the transfer school of Lean critics.
5. The financial benefits of Lean or the financial benefits school of Lean critic.

The five schools are addressed in turn in the sections that follow.

The Discourse School of Lean Critics

The Machine follows a relatively contemporary genre of bestselling management books (Appleyard, 2009). In keeping with this genre, it makes bold claims and assertions:

'Our conclusion is simple: Lean production is a superior way for humans to make things.....It follows that the whole world should adopt Lean production and as quickly as possible'

(Womack *et al.*, 1990, p. 225).

Delbridge (1995) is critical of the arrogance of such claims which he dismisses as generalised simplifications based on stereotypes and Western misconceptions. New (2007) takes a similar view, denouncing simple schema which seek to assert bald polarities between TPS and Taylorism. Similarly, Williams *et al.*, (1992; 1994) argue that the 'periodisation' of craft, mass and Lean, used as one of the narrative devices in *The Machine*, is misleading.

Williams *et al.* (1992) polarise the Japanisation debate into two basic positions: *the sceptical pessimists*, who argue that Japan's success is the result of higher wages and healthcare costs in the west, and *apologetic optimists*, who argue that the Japanese represent more efficient productive methods that will eventually diffuse. These authors (*ibid.*) regard *The Machine* and IMVP as significant because they provide heavy-weight social scientific support for the apologetic optimists.

The Machine is criticised for its gospel-like preaching of Lean production (Williams, in Stewart, 1996). Similarly, Stewart (1996) argues against Lean which he regards as the 'reification' of Japanese management techniques. He attacks the authors directly:

'Many people's lives are changed unrecognisably by the latest management whim, proselytised by academic consultants who knowing better should be wary of promised wonders'

(Stewart, 1996, p.16).

The Empirics School of Lean Critics

Some authors focus less on the style and genre of *The Machine* and more on the empirics within. Williams *et al.*, (1992) argue that the difference between Lean and mass production is not empirically sustainable and accuse the authors of basing their account on standard secondary sources that are known to be deficient. Similarly, Coffey (2006) questions the historical accuracy of *The Machine*.

Furthermore, Williams *et al.*, (1992) argue that the 'half the human effort' claim exaggerates the Japanese advantage: first, the claim is based on three final processes which only account for 15% of the labour in a car anyway; second, *The Machine* ignores the prevailing literature which warns against the difficulties of process comparisons; third, *The Machine* ignores the influence of market demand, not correcting for capacity utilisation and ignoring the problem of a company, which may be a bundle of plants, being the unit of analysis.

In addition, the emphasis on the company as the unit of the analysis leads to the neglect of the wider social context such as economic and market conditions (Williams *et al.*, 1992; Cooney, 2002; Jorgensen, 2008). Katayama and Bennett (1996) point out that the research reported in *The Machine* was conducted at the time of Japan's 'bubble economy' of the late 1980s during conditions of a bullish stock market and low interest rates. Commentators have also highlighted the importance of the Japanese economic context (Cusumano, 1994) and the particular business context (Pilkington, 1998). Finally, Papahristodoulou (1994) and Berggren (1992) argue that environmental and social conditions have not been fully taken into consideration in explaining Japan's competitive advantage.

Coffey (2006, 2007; Coffey and Thornley 2006, 2007a) is also critical of empirics within *The Machine* partly for methodological robustness but primarily for poor interpretation of data. He suggests that the role of automation was downplayed in *The Machine* and that, if due account had been taken of Europe's weak overall results, automation would have offered far greater causal explanation. Coffey goes

further to suggest that Lean is an historically counterfactual myth, formulated through a collective process of fictionalisation, which is essentially politically motivated:

'The proposition considered is whether Lean thinking, as expounded in the specimen text, is best viewed as a substantive project that draws on the experiences of Japanese car assemblers in order to evolve 'best practice' recommendations for manufacturers, or as a cultural counterfeit that owes little to Japan by which has become a convenient vehicle by which to promote quite separate agendas'

(Coffey, 2006, p. 12).

Coffey's recent deliberations are reminiscent of Graham's much earlier characterization of 'Japanisation' as a myth,

'....management techniques are developed in a covertly political discourse which masquerades as consensual progression to higher levels of efficiency.'

(Graham, 1998, p.71).

Coffey (2006; Coffey and Thornley, 2007a) argues that the official, flawed, interpretation of the IMVP survey was disseminated via and aggressively promoted from within the corporate sector that was both its major sponsor and intended subject.

The Exploitation School of Lean Critics

Several studies have highlighted the stressful effects that Lean has on the work life of Japanese people (Kamata, 1982; Hutchinson *et al.*, 1996; Sugimoto, 1997). Some authors have suggested that Lean is primarily about greater power and control over workers (Wilkinson and Oliver, 1989; Sewell and Wilkinson, 1992; Delbridge *et al.*, 1992; Delbridge 1995; 1995a; 1998). Delbridge's ethnographic study of workplace relations (1995; 1998) describes one Japanese transplant as a fast-paced and highly stressful working environment. Stewart and Garrahan (1992) convey similar findings based on research accounts from former employees at Nissan's Sunderland plant. Gill (2003) found that Lean leads to elevated stress levels, increased worker turnover, absenteeism and time loss due to accidents. Gall (2007) proposes that Lean is simply the latest in a long line of management techniques designed to increase worker exploitation. Recently, Stewart *et al.*, (2009) examine worker responses to Lean at Vauxhall-GM and Rover/BMW and find that they are intimately tied to changing patterns of exploitation in the car industry. They conclude that:

'at the heart of lean lies the irreconcilable contraction between the rhetoric of success, security and a range of enriching employment experiences, and the reality for many millions of workers, of exclusion, insecurity and deteriorating employment experience ...many workers whose work and lives have been devastated by the ravages of lean production'

(Stewart *et al.*, 2009, p. xi).

In summary, the exploitation school of Lean critics is essentially concerned with the displacement of cost and risk onto labour and suppliers.

The Transfer School of Lean Critics

Some authors criticise the claims of Lean to universal applicability. Some dispute the claims prevalent in the Lean literature that Lean is the dominant production method of Japanese industry (Pilkington, 1998; Jorgensen, 2008). Cooney (2002) describes the claimed universality of the Lean production concept as a chimera, arguing that Lean is an addition to rather than a replacement for existing production systems. Many authors note that Lean requires modification (Cusumano, 1994; Katayama and Bennet, 1996; Miyai, 1996; James-Moore and Gibbons, 1997; Cooney, 2002).

Lee and Jo (2007) categorise the ongoing debate on the transferability of Lean into four perspectives:

1. The convergence perspective which draws upon the IMVP work (Womack *et al.*, 1990) and treats Lean as a universal set of management norms that can be transferred anywhere. In this line of thought, Lean is the system into which every business player tends to converge when trying to survive in the contemporary global market.
2. The structuralist perspective which denies the transferability of Lean, emphasising the unique socio-economic context in which Toyota exists (Williams, 1992; 1994; Nakamura *et al.*, 1996; Cooney, 2002).
3. The contingency perspective which postulates a compromise by considering both the superiority of Lean and the necessary pre-conditions and constraints relating to its transferability (Kast and Rosenzweig, 1985; Harber *et al.*, 1990; White *et al.,* 1999; Mehta and Shah, 2004).
4. The 'emergent process' perspective which views the spread of Lean as an evolving and indeterminate transformation process which can lead to various outcomes depending on the form adopted (Liker *et al.*, 1999). Bartezzaghi

(1999) in particular distinguishes between a production model and a production paradigm, arguing that while TPS was a specific production model it later became recognised as a production paradigm from which emulators have developed their own production models, through a process of interpretation and transmutation. Similarly, Lewis (2000), drawing upon resource-based theory, asserts that each emulator must follow its own trajectory.

Certain authors suggest that Lean is weak in its ability to accommodate the variations or reductions in demand for finished productions (Miyai,1996). Other authors question the application of Lean to low volume, high variety production environments. For example, Jina *et al.*, (1997) comment that implicit in most widely publicised examples of successful Lean manufacturing is the fact that the complexities of satisfying order winning criteria have been mitigated by high production volumes. They therefore argue that that most companies will need to adapt Lean practices to meet their special circumstances. Chrisopher and Towill (2000) suggest that organisations will need to progress from Lean and functional supply chains to agile and customised ones.

Many authors note that successful Lean implementation is dependent upon several organisational factors such as management strategies, labour-management cooperation, employee and union involvement, investment in training (Harber *et al.*, 1990; White *et al.*, 1999; Hines *et al.*, 2008). Other authors observe that Lean is also conditioned by external forces such as market situations, international division of labour, local institutional environment and social culture (Liker *et al.*, 1999; Mehta and Shah, 2004). Some authors stress the importance of considering the evolution of firms and transplants in the light of their own trajectories and particular histories (Pardi, 2005).

A number of authors have highlighted the role of the national context in Lean implementation. Nakamura *et al.*, (1996) emphasise the influence of different social contexts (culture, social relations, economics conditions and business practices) across international boundaries. Similarly, Doeringer *et al.*, (2003) revealed national differences in Multinational National Enterprises (MNEs) in the US, the UK and France. Kumon (2000) highlights differences between American and European Lean

researchers and observes that: while American researchers tend to see the transferability of Lean in positive terms; European researchers tend to focus on the selectivity of introduction or hybridisation based on the trajectory of the firm.

Some authors emphasise the role of the social context in Lean implementation. Cooney (2002) claims the Lean concept simply does not encompass the influence of social and political institutions. Therefore, Lean has evolved under Toyota's singular conditions and its substance can only be transferred to other structural contexts with difficulty. Majek and Hayter (2008) suggest that hybridisation is a search for an appropriate mix of practices that ensure viability in local circumstances rather than the transfer of established best practices. Several authors are wary of the wider notion of best practice (Pilkington, 1998; Dahlgaard-Park and Dahlgaard, 2007).

Seddon (2005) specifically questions the application of Lean in the service sector. While he concedes that TPS is probably the most highly developed, best articulated and most successful example of systems thinking applied to a business organisation in the world (Seddon and Caulkin, 2007), he is critical of Lean (as a movement) for promoting tools which are concerned with how to do it thereby obscuring the importance of perspective and how to think about improvement (Seddon, 2005).

The Financial Benefits School of Lean Critics

A number of authors have questioned the assumption that Lean leads to financial benefits (Lewis, 2000; Cooney, 2002). In an early attempt to address the lack of empirical evidence on the financial outcomes of Lean implementation, Oliver and Hunter (1998) conducted longitudinal research and found the links between manufacturing practice and financial performance to be complex and problematic. Several authors suggest that these problems lie primarily with traditional accounting convention and practice (Yishikawa *et al.*, 1993; Maskell and Baggaley, 2004; Johnson, 2007). Darlington *et al.*, (2008) argue that *Lean Accounting* has become the foremost topic of discussion amongst Lean practitioners over the last two years.

2.6 Chapter Review

The content of this literature review chapter was broad and diverse necessitating a summary of the key points. Lean was identified as a nebulous phenomenon and a poorly defined construct in the literature. Four strands of Lean discourse prevalent in

the literature were identified and reviewed: Lean as a representation of TPS which highlighted the origins and antecedents of Lean; Lean as a process improvement OMI which highlighted the need to compare Lean with other process improvement OMIs; Lean as a movement which highlighted the characteristics of Lean's evolution over time; and Lean as academic body of literature which highlighted the diversity of perspective and opinion Lean has inspired. The review of the Core literature reveals certain characteristics about that body of work. It is clear that the literature on Lean is vast and diverse, that it has emerged primarily from the operations management field of inquiry, and also that it seems to rely heavily on case studies. Later, the characteristics of the Core literature are compared to the Background literatures reviewed in the chapter that follows.

Chapter 3 Background Literature Review

This chapter reviews the two bodies of work identified in Figure 3 of the Introduction chapter as Background literature. They are the diffusion of innovation (DOI) literature and the management of fashions and fads (MF&F) literature. These are collectively referred to as Background literature because they represent the literature sources from which background theoretical underpinning has been drawn. The chapter is divided into two sections addressing each of the background literatures in turn. The sections are organised into introductory comments including definitions and background to the literature, followed by an explanation of the theory within the literature, including a discussion of the limitations of the theory.

The review of the DOI literature relies heavily on Rogers 2003. Rogers' text, *The Diffusion of Innovations*, first published in 1962 and now in its 5th edition, is the second most widely cited text in the social sciences (Backer and Singhal, 2005). It has been described as an 'encyclopedic' review of more than 400 studies (Abrahamson, 1991). When considering the ubiquity of Rogers' text, it should not be forgotten that this text is an assembly of the work of many other authors. The text presents a general diffusion model, the culmination of 100 years of diffusion research in a range of academic disciplines. Google citations for the Rogers text exceed twenty thousand, over twenty times more than the next most frequently cited work on the subject. It is because of the comprehensiveness and ubiquity of this text that it is frequently cited in this section. Furthermore, tables are frequently used as a device to provide dense information in a more easily digestible form. Some tables are compiled and others are adapted. By *compiled* the researcher means they are reproduced, though often in a simpler form; by *adapted*, the researcher means that they have been developed by her, drawing on the text.

3.1 Diffusion of Innovation Literature

The diffusion of an innovation refers to its spread through a population of potential adopters. The diffusion of innovation (DOI) literature has traditionally focused on technological innovations (Wolfe, 1994) where new technologies diffuse through a population of potential buyers over time and successive generations of a technology compete with earlier ones (Norton and Bass, 1987). In the social sciences, the DOI

literature is a well established body of literature with origins in anthropology and rural sociology. The diffusion process is one of the most widely researched and best documented social phenomena (Mahajan and Peterson, 1985). It explains social change and is one of the most fundamental of human processes (Rogers, 2003). Rogers (*ibid.*) identifies nine major research traditions within the social sciences that have studied innovation diffusion, including business and management within which this study is located.

In stark contrast to Lean, there is consensus on the definition of diffusion of innovation (DOI) as:

'the process by which an innovation is communicated through certain channels over time amongst members of a social system.'

(Rogers, 2003, p. 5).

This working definition will be deconstructed into its constituent elements. It is important to note that it is crucial to this study that Lean is conceived as an object of innovation to potential adopters. Birkenshaw *et al.* (2008) define a management innovation as:

'....the invention and implementation of a management practice, process, structure or technique that is new to the state of the art and is intended to further organisational goals'

(Birkinshaw *et al.*, 2008, p. 825).

They identify one of the key questions that arise in developing an operational definition of a management innovation as being: how new does the innovation have to be? These authors hold the view that it has to be new to the state of the art, however, they recognise that most authors implicitly see innovations as new to the organisation. For example, Damanapour and Evan's (1984) define an organisational innovation as:

'...the implementation of an internally generated or borrowed idea, whether pertaining to a product, device, system, process, policy, programme or service, that was new to the organisation at the time of adoption'

(Damanpour and Evan, 1984, p. 393).

Rogers' own definition of an innovation also provides support for this key assumption:

'[An innovation is] *an idea, practice or object that is perceived as new by an organisation or indeed any other unit of adoption.'*

(Rogers, 2003, p.12).

The inclusion of the word 'perceived' negates the importance of an idea being objectively new as measured by the lapse of time. Therefore, drawing on these definitions, the researcher concludes that if an organisation decides to implement Lean today, it is an innovation to them and irrelevant that Lean has a long history and that Lean can reasonably be regarded as an organisational innovation.

Another important constituent of the working definition of DOI is the reference to communication channels. Communication is generally regarded as the process by which participants create and share information with one another to reach a mutual understanding. Diffusion, however, is a special type of communication where those messages are about a new idea. Channels of communication form the conduit of the diffusion process, the information exchange through which one individual communicates a new idea to others (*ibid.*).

A further important constituent of the working definition of DOI is the reference to time. This is in contrast to much other social science research that simply ignores time. However, the inclusion of time as a variable presents certain methodological difficulties. Diffusion studies often require retrospective data collection which introduces the possibility of recall bias (*ibid.*).

The final important constituent of the working definition of DOI is the reference to the social system. The social system represents the boundaries of diffusion. The social system is defined as the set of interrelated units engaged in joint problem-solving to accomplish a common goal. It is the sharing of the common goal that binds the system together (*ibid.*). Katz (1961) argues that it is as unthinkable to study diffusion without some knowledge of the social structures in which potential adopters are located as it is to study blood circulation without adequate knowledge of veins and arteries.

3.1.1 Heritage of Diffusion of Innovation Research

The objective of DOI research is to explain or predict rates and patterns of adoption over time and/or space (Wolfe, 1994). Such research generally focuses on the fit of hypothesised innovation diffusion models to actual diffusion histories (Fischer and Carroll, 1986; Tolbert and Zucker, 1983). Historically, diffusion rates and explanatory variable information have been collected by survey questionnaire (Rogers, 2003), expert judgement (Souder and Quaddus, 1982) and archival analysis (Fischer and Carroll, 1986; Tolbert and Zucker, 1983). This study will deploy two of these traditional methods: expert judgement and archival information.

The origins of DOI theory can be traced to Europe a century ago when sociology and anthropology were emerging as new social sciences (Rogers, 2003). DOI research began in a number of scientific enclaves but has emerged as a single integrated body of concepts and generalisations in spite of the fact that studies have been conducted in different scientific disciplines (*ibid.*) Indeed Rogers states that he was motivated to write his comprehensive text in order to promote greater awareness among the various research traditions. He defines research traditions as being series of investigations on a similar topic on which successive studies are influenced by preceding inquiries. Table 9 was compiled (reproduced in a simpler form) from Rogers (2003) as a summary of the heritage and legacy of the nine DOI research traditions.

Table 9 Summary of DOI Research Traditions and their Contributions

Research Tradition	Main study or type of study	Methods Used	Findings/contribution to DOI theory	Additional information
An-thropology	Anthropologist lives for several years in a system of study e.g. peasant village. Seminal work is Steve Lansing (1987; 1991), introduction of miracle rice varieties in Bali.	Participant observation (PO).	Method provides a unique understanding of consequences of innovation.	Oldest and most distinctive in its methodological approach which tells story from respondents' viewpoint thereby overcoming pro-innovation bias of other diffusion research. There are, however, problems with the generalisability of results, and although other traditions do not use PO, they have carried forward theoretical leads pioneered by anthropology. Today, anthropology is one of

Research Tradition	Main study or type of study	Methods Used	Findings/contribution to DOI theory	Additional information
				smaller diffusion research traditions.
Early sociology	Seminal work is Bowers' (1937; 1938), study of the diffusion of ham radio sets. This study traced the diffusion of a single innovation over geographical areas to understand the process of social change.	Quantitative data analysis: primary data from respondents and secondary data from secondary sources such as government records.	Bower was first to find that interpersonal channels are more important than mass media channels for later adopters than for earlier adopters.	
Rural sociology	Seminal work is Ryan and Gross (1943), study of the diffusion of hybrid seed corn.	Qualitative data from survey interviews, then coded.	Study established the customary research methodology used by most diffusion investigations: retrospective surveys where adopters are asked when they adopted, where they got information about the innovation and the consequences of adoption.	Credited with forming the basic paradigm for DOI research. Rural sociology is a subfield of sociology that focuses on the social problems of rural life. Today DOI research is passé in rural sociology.
Education	Columbia University's education diffusion studies considered whether local control over school financial decisions led to school innovativeness (Mort, 1957; Ross, 1958). Richard O' Carlson's (1965) study of the spread of modern maths among schools in Pennsylvania and West Virginia.	Questionnaires mailed to school heads. The unit of analysis the school system. Data collected through personal interviews.	Best single predictor of school innovativeness was educational expenditure per school student. The study highlights the considerable time lag required for adoption of educational innovations. O' Carlson's (1965) work highlights the role of opinion leaders in diffusion networks.	Important development because organisations are involved (making collective and/or authority innovations decisions) rather than individuals (making optional innovation decisions).
Public Health and Medical Sociology	Studies of new drugs, medical ideas, family planning methods, Seminal work is the Columbia	Objective measure of each doctor's time of adoption obtained from drugstore records so no reliance on recall.	Importance of interpersonal networks through which subjective evaluations of an innovation are exchanged amongst individuals in a system.	This investigation has striking parallels with the hybrid corn study.

Research Tradition	Main study or type of study	Methods Used	Findings/contribution to DOI theory	Additional information
	University's study of adoption of new drugs HIV/AIDS prevention (Coleman *et al.*, 1966).			
Communic-ation	Seminal work is Deutschmann/Da nielson (1960) study of the diffusion of news events.	Firehouse research design – questionnaire planned in advance of an event so that questioning can be done 24 hours after news event.	The conditions under which mass media are relatively more important than interpersonal communication channels in spreading news. Salience is the degree to which news is perceived as important by individuals.	Particular advantage of communication research is that it can analyse any particular type of innovation. There are no limitations. It therefore frees research to concentrate on the process of diffusion.
Marketing	Diffusion of telecoms services such as mobiles. Seminal work is Bass' (1969) prediction model, a popular model in marketing.	Emphasises the prediction of the rate of adoption for new products and how attributes of innovation affect its rate of purchase.	Highlights the role of culture, national government regulations and other factors in the global diffusion of new products.	Marketing often conduct studies with funding from or collaboration with sellers of new product. This attracts criticism for siding with the source of an innovation resulting in intellectual and ethical problems.
Geography	Seminal work is Hagerstrand 's (1952) simulation work.	Simulation approach to investigate how spatial distance affects diffusion.	Space is important in determining the adoption of an innovation.	
General sociology	A wide variety of ideas.	Survey interviews and statistical analysis.	The characteristics of adopter categories.	

(Source: compiled from Rogers, 2003)

Table 9 highlights the breadth of appeal and relevance that DOI research offers a number of disciplines. In business and management, DOI research has been dominated by marketing, in particular the Bass prediction model (Bass, 1969; Norton and Bass, 1987). Rogers (2003) is critical of marketing scholars and their source bias, arguing that marketing DOI studies have led to highly applied research that are methodologically sophisticated but which deal with trivial diffusion problems in a theoretical sense (*ibid.*).

Table 10 summarises the eight main types of DOI research that have highlighted key variable(s) of considerable explanatory value. It is notable that the characteristics of members of the social network of potential adopters emerge frequently as a key variable. This reinforces the notion of diffusion as a social process.

Table 10 Types of DOI Research

Type of DOI research:	Key variables found to be:
1. Earliness of knowing about an innovation	characteristics of members
2. Rate of adoption of different innovations in a social system	attributes of an innovation
3. Innovativeness	characteristics of members
4. Opinion leadership	characteristics of members
5. Diffusion networks	patterns in the network links between two or more members of a system
6. Rate of adoption in different social systems	system norms
7. Communication channel usage	innovativeness and other characteristics of a members
8. Consequences of innovation	characteristics of members

(Source: adapted from Rogers, 2003)

3.1.2 Diffusion of Innovation Theory

The diffusion of an innovation (DOI) is essentially an uncertainty reduction process. In this section the theory of innovation diffusion is distilled down to its core concepts and their interrelationships. Table 11 has been adapted (meaning developed by the researcher, drawing from the text) from Rogers (2003) as a list of these main concepts. It is important to note that the table is large in order to accurately reflect the breadth of DOI theory and that it is intended purely as a reference list for the terminology used within the explanation of DOI theory that follows.

Table 11 Main Concepts within Innovation Diffusion Theory

	Concept	Definition/Meaning/Explanation
1	Diffusion	The process by which an innovation is communicated through certain channels over time among the members of a social system.
2	An innovation	An idea, practice of object that is perceived as new by an individual or other unit of adoption.
3	Communic-ation channels	The information exchange through which one individual communicates a new idea to one or several others.
4	Social system	The set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organisations and/or subsystems.
5	The innovation development process	All the decisions, activities and their impacts that occur from recognition of a need or problem, through research, development and commercialisation of an innovation, through diffusion and adoption of the innovation by users to its consequences.
6	Need or problem recognition	Recognition of a need or problem may stimulate research or raise to high priority a system's agenda of social problems through an agenda-setting process.
7	Research	Most technological innovations are created by scientific research which may be basic or applied.
8	Development	The process of putting a new idea in a form that is expected to meet the needs of an audience of potential adopters.
9	Commercialisa	The conversion of an idea from research into a product or service for sale in

	Concept	Definition/Meaning/Explanation
	tion	the marketplace.
10	Diffusion and adoption	Defined elsewhere in this Table.
11	Consequences	The changes that occur to an individual or to a social system as a result of the adoption or rejection of an innovation.
12	Innovation attributes	The characteristics of innovations as perceived by individuals that explains their different rate of adoption: relative advantage, compatibility, complexity, trialability, observability.
13	Relative advantage	The degree to which an innovation is perceived as being better than the idea is supersedes, often expressed as economic profitability, conveyed social prestige or in other ways.
14	Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters.
15	Complexity	The degree to which an innovation is perceived as difficult to understand and use.
16	Trialability	The degree to which an innovation may be experimented with on a limited basis.
17	Observability	The degree to which the results of an innovation are visible to others.
18	The innovation decision process	The process through which an individual (or other decision-making unit) passes from gaining initial knowledge of an innovation to forming an attitude toward the innovation, to making a decision to adopt or reject, to implementation of the innovation and to confirmation of this decision.
19	Knowledge	When an individual learns of the innovation's existence and gains some understanding of how it functions.
20	Persuasion	When individual forms a favourable attitude towards the innovation.
21	Decision	When an individual engages in activities that lead to a choice to adopt or reject the innovation.
22	Implement-ation	When an individual puts an innovation to use.
23	Confirmation	When an individual seeks reinforcement of an innovation decision.
24	Innovation decision period	The length of time required to pass through the innovation decision process.
25	Adoption	A decision to make full use of an innovation as the best course of action available.
26	Rejection	A decision not to adopt an innovation.
27	Reinvention	The degree to which an innovation is changed or modified by a user in the process of its adoption and implementation.
28	Innovation decision type	Innovation decisions can be adopted or rejected by an individual member of a system, by the entire social system which can decide to adopt or reject by a collective or an authority decision.
29	Organisations	A stable system of individuals who work together to achieve a common goal through a hierarchy of ranks and a division of labour.
30	Organisational innovativeness	Degree of resistance or otherwise to the adoption of an innovation.
31	Champion	A charismatic individual who throws his weight behind an innovation thus overcoming indifference or resistance that the new idea may provoke in an organisation.
32	Organisational structure variables	Larger organisations are more innovative. Other organisational structure variables that relate to organisational innovativeness are: centralisation, complexity, formalisation and organisational slack.
33	Centralisation	The degree to which power and control in a system are concentrated in the hands of a relatively few individuals – usually found to be negatively associated with innovativeness.
34	Complexity	The degree to which an organisation's members possess a relatively high level of knowledge and expertise.
35	Formalisation	The degree to which an innovation emphasises its members following rules and procedure.

	Concept	Definition/Meaning/Explanation
36	Interconnected -ness	The degree to which the units in a social system are interlinked by interpersonal networks.
37	Organisational slack	The degree to which uncommitted resources are available to an organisation.
38	The innovation process in organisations	Consists of a five stage sequence: agenda-setting and matching (initiation) and redefining or restructuring, clarifying and routinisation.
39	Agenda-setting	Occurs when a general organisational problem is defined that creates a perceived need for an innovation.
40	Matching	Occurs when a problem for the organisation's agenda is fit with an organisation and this match is planned and designed.
41	Redefining/ restructuring	Occurs when the innovation is re-invented so as to accommodate the organisation's needs and structure more closely and when the organisation's structure is modified to fit with the innovation.
42	Clarifying	Occurs as the innovation is put into more widespread use in an organisation so that the meaning of the innovation gradually becomes clearer to the organisation's members.
43	Routinising	Occurs when an innovation has become incorporated into the regular activities of the organisation and has lost its separate identify.
44	(Interpersonal) diffusion networks	Networks that convey evaluation information to an individual in order to decrease uncertainty about an innovation.
45	Critical mass	The point after which further diffusion becomes self-sustaining.
46	Opinion leadership	The degree to which an individual is able informally to influence the other individuals' attitudes or overt behaviour in a desired way with relative frequency.
47	Homophily	The degree to which a pair of individuals who communicate are similar in certain attributes (such as beliefs, education, socio-economic status etc.).
48	Heterophily	The degree to which pairs of individuals who interact are different in certain attributes.
49	Change agents	An individual who influences clients' innovation decision in a direction deemed desirable by a change agency.
50	Change agents efforts	The relationship between the rate of adoption and change agent's efforts is not direct or linear. A greater payoff from a given amount of change agent activity occurs at certain stages in an innovation's diffusion.
51	Diffusion systems	May be centralised or decentralised.
52	Adopter categories	The classification of members of a social system on the basis of innovativeness.
53	S- shaped curve	Most innovations have this shaped curve plotted on a cumulative frequency over time but there is variation in the slope of the S from innovation to innovation.
54	Rate of adoption	The relative speed with which an innovation is adopted by the members of a social system, usually measured by the length of time required for a certain percentage of the members of a system to adopt an innovation.

(Source: adapted from Rogers, 2003)

The first concepts within Table 11 (concepts 1 to 3) relate to the definition or basic elements of diffusion. DOI theory suggests that mass communication channels are primary knowledge creators, while interpersonal networks are more important in persuading individual members to adopt or reject. It also suggests that the structure of a social system and system norms may facilitate or impede the diffusion of an innovation (Katz, 1961).

The next concepts in the table (concepts 5 to 11) are concerned with the generation of innovations. DOI theory suggests that there are up to six stages to the innovation development process. These include: need recognition, research, development, commercialisation, diffusion and adoption, and consequences. It is important to note that according to DOI theory, diffusion and adoption are often regarded as synonymous. It will be shown later that this assumption is challenged by authors within the other body of work reviewed in this chapter. Furthermore, while the innovation development process model is a useful conceptualisation of main stages, it is limited by linear assumptions. The process is not necessarily linear, as the model implies, and certain stages may be skipped or occur in a different order.

Concepts 12 to 17 concern the attributes of an innovation. There are five attributes of innovation that collectively form an important variable for explaining the rate of adoption of that innovation. These innovation attributes explain most (specifically, between 50 and 80%) of the variance in adoption rates. The most important innovation attribute and the strongest predictor of an innovation's adoption rate is relative advantage. This refers to the degree to which an innovation is perceived by potential adopters as being better than the idea it supersedes. Relative advantage has a number of sub-dimensions including: economic profitability; low initial cost; decrease in discomfort; social prestige; a saving of time and effort and immediacy of reward. A limitation of DOI theory is that these sub-dimensions may vary considerably in importance from innovation to innovation. Furthermore, DOI theory suggests that all new ideas are evaluated in comparison to existing practice. The compatibility attribute is the degree to which a new idea is perceived in relationship to existing practices that are already familiar. A further limitation of DOI theory is that some diffusion studies have been unable to empirically distinguish between relative advantage and compatibility (Rogers, 2003). DOI theory suggests that complexity is negatively related to the rate of adoption although the research evidence is not entirely conclusive (*ibid.*) A further limitation of DOI theory is that although it highlights the fact that for some innovations complexity is an important barrier to adoption, it does not address the reverse situation. In other words, are innovations that are simpler to understand adopted more rapidly? This could be an important factor differentiating Lean from other management concepts. Finally, DOI theory suggests that innovations that can be trialed are generally adopted more quickly than

innovations that are not divisible (trialability). Similarly, it suggests that when the results of an innovation can be seen easily, the innovation is generally adopted more quickly (observability).

The innovation decision process is the focus of concepts 18 to 28. DOI theory suggests that there are five stages to the innovation decision process. They are: knowledge, persuasion, decision, implementation and confirmation. Crucially, at the decision stage, innovations can be adopted, rejected or reinvented. Reinvention is an important concept within DOI theory. Early research assumed that diffusion was an invariant quality or that innovations did not change as they diffused. However, in the 1970s the notion of reinvention emerged. Reinvention led to two important claims: first, that an innovation will diffuse more rapidly when it can be reinvented; second, that an innovation is more likely to be sustained when it can be reinvented (*ibid.*). DOI theory suggests that the type of innovation decision (concept 28) is another important variable in determining the rate of adoption of an innovation. There are three types of innovation decision: first, optional innovation decisions, where choices to adopt or reject are made by an individual independent of the decisions of other members of the system; second, collective innovation decisions, where choice to adopt or reject are made by consensus among the members of a social system; third, authority innovation decisions, where choice to adopt or reject are made by relatively few individuals in a system who possess power, status or technical expertise. The theory suggests that collective innovation and authority decisions are more common in organisations and that the fastest rate of adoption stems from authority decisions.

Some diffusion research has specifically focused on innovations in organisations. For example, concepts 29-42 illustrates the assumption in DOI theory that an innovation spreads among the companies in an industry in a diffusion process that is similar to the way an innovation diffuses among the individuals in a community or some other system. This assumption is based on early studies of organisations which illuminated the characteristics of innovative organisations, many of which were equivalent to the characteristics of innovative individuals. However, such an assumption presents a serious limitation to DOI theory since organisations are highly complex, dynamic and political entities. DOI research suggests that size and five other organisation structural variables (concepts 33 to 37) relate to the

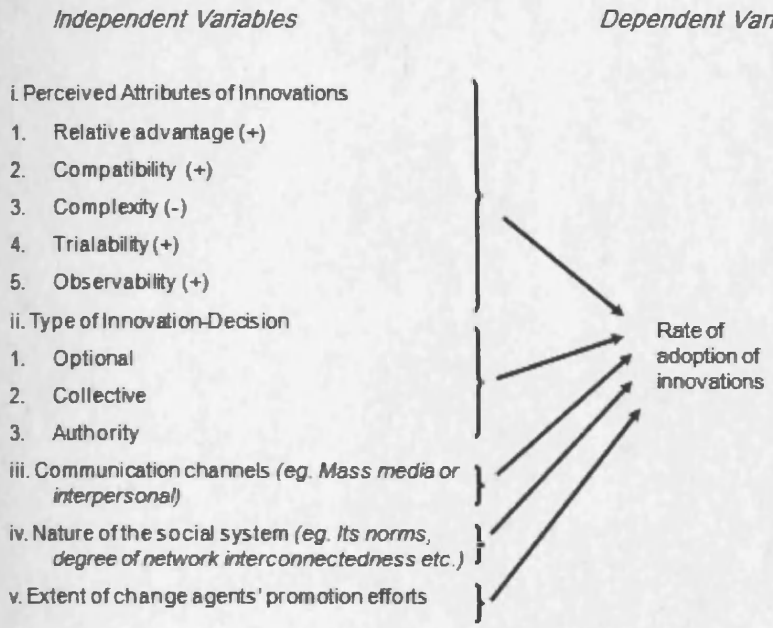
innovativeness of an organisation as well as individual leader characteristics (such as attitude towards change) and external characteristics (such as system openness). It is notable that DOI theory has consistently found that larger organisations are more innovative than smaller ones, suggesting that this may be because size is easily measured or because size may be a surrogate for other dimensions such as resource availability. Concepts 38 to 42 within Table 11 relate to the innovation process within organisations. There are five stages in the process: agenda-setting, matching, redefining or re-structuring, clarifying and routinising. Of the five, two precede the decision to adopt and are sub-processes of the initiation phase and three follow the decision to adopt and are sub-processes of implementation. Concepts 43 to 50 within Table 11 relate to diffusion networks and systems. DOI theory suggests that interpersonal communication drives the diffusion process by creating a critical mass of adopters, that interpersonal networks are mostly homophilious (concept 44) but when they are heterophilious (concept 45), followers seek opinion leaders of higher socioeconomic status. Change agents are needed in the diffusion of innovation because of the social and technical chasms between the change agency and the social system. The theory suggests that change agent success in securing the adoption of innovations by client is positively related to the extent that he or she works through opinion leaders. Concept 51 also relates to diffusion systems. The classic diffusion model is relatively centralised, whereby an innovation originates from an expert source which then diffuses the innovation as a uniform package to potential passive adopters, who accept or reject it. More recently DOI research suggests that actual diffusion systems range in type and could equally be highly decentralised. Centralised and decentralised diffusion systems are extremes on a continuum and are differentiated by: the degree of decision making power and control of administrators and experts, the direction and source of diffusion and the amount of reinvention.

The recipients of the diffusion systems may be divided into various adopter categories (concept 52). DOI theory suggests that the normal distribution curve can be use as the basis for a typology of adopter categories with individual categories based on standard deviation from the population mean. There are five adopter categories: innovators (accounting for around 2.5% of total adopters); early adopters (13.5%); early majority (34%); late majority (34%) and laggards (16%).

The S shaped curve (concept 53) is a central tenet in DOI theory. Adoption of an innovation usually follows a normal, bell-shaped distribution curve (above) when plotted over time on a frequency basis. The S-shape emerges by plotting the cumulative number of adopters. Where only a few adopt at first, adoption accelerates until half the members of a system have adopted and then increases at a gradually slower rate as fewer and fewer remaining units adopt. Geroski (2000) has recently challenged the dominant notion in DOI theory that the usage of new technologies over time typically follows an S-curve. His epidemic model suggests that speed of usage is limited by the lack of information available about the new technology, who to use it and what it does.

Another central tenet in DOI theory concerns the rate of adoption (concept 54). The theory suggests that there are five key variables that determine the rate of adoption of an innovation. These include: the attributes of the innovation itself; the type of innovation decision; the communication channels deployed; the nature of the social system; and, the degree of effort of change agents. This is of particular importance since the model identifies reasons for innovation diffusion and is therefore illustrated in Figure 5.

Figure 5 Variables Determining the Rate of Adoption



(Source: Rogers, 2003, p. 222)

Each of the five key variables has been discussed individually in the preceding sections. However, it is the collective interaction of these five variables that determines the rate at which an innovation is adopted and therefore resultant gradient of the overall S-curve. Rogers (*ibid.*) notes that there has been little research to determine the relative contribution of each of the five variables. This study goes some way to address that gap. Innovation attributes have received more attention than others and has been previously noted account for over half the variance in adoption rates. Generally, the more people involved in making an innovation decision, the slower the rate of adoption and innovations requiring an individual-optional innovation-decision are adopted more rapidly. Communication channels may influence adoption rates since if interpersonal channels rather than mass media channels are used, adoption rate may be slower. Social system norms and interconnectedness also influence adoption rates. Finally, there is a relationship between change agent activity and innovation rate although it may not be direct or linear. The most influential opinion leaders are key targets for change agents' efforts. The greatest impact of change agent activity occurs when opinion leaders adopt; there may be little change agent activity once a critical mass has been reached

(*Ibid.*). The variables determining the rate of adoption are later empirically tested in this study.

3.1.3 More Recent Contributions to DOI Theory

Nelson *et al.*, (2004) have more recently made a significant contribution to DOI theory. They argue that there are two fundamental variables that should be included in DOI theory. The first is the ability to generate widely persuasive evidence of an innovation's actual merit. This may in turn be influenced by the clarity of the performance criteria or the ability to get strong feedback from experiments, or both. They refer to this as the strength of the evidence with regard to an innovation's efficacy. The second is extent to which the benefits of adoption are affected by the numbers of users who have previously adopted. They refer to this as the presence, or absence, of increasing returns. They argue that all innovations differ across these two dimensions and that these differences map onto four models of innovation diffusion in the literature (illustrated in Table 12).

Table 12 Four Models of Innovation Diffusion

	Absence of dynamic increasing returns	**Presence of dynamic increasing returns**
Ability to get sharp persuasive feedback	Model 1: Rational choice diffusion	Model 2: Quasi rational choice with possibility of 'lock-in'
Inability to get sharp persuasive feedback	Model 4: Fads	Model 3: Social construction

(Source: Nelson et al., 2004, p. 682)

Model 1, the rational choice model, the basic assumption here is that criteria of merit are sharp and unambiguous and decision makers eventually receive solid information about these criteria. Choices made by various users themselves do not influence the value of the innovation. It is in this regard only that Model 1 differs from Model 2, the quasi-rational choice model with the possibility of 'lock in'. In Model 2 there are decreasing dynamic returns meaning that the number of potential users who actually adopt the innovation affects its performance. An example that would fit Model 2, and one which is commonly cited in DOI theory, is the Dvorak keyboard. Although far more efficient than the standard QWERTY, which was originally designed to slow typists down in order to prevent keys jamming on early keyboards, almost no one has adopted it. Therefore, superior technological innovations do not necessarily diffuse. Model 3, the social construction model, differs from the first two

in that it is difficult to get sharp feedback about performance so that all actors interpret similarly. This may be because the innovation is amorphous and its implementation differs significantly from case to case. A key variable may be ideological or politically motivated judgements made by opinion leaders which if favourable may begin a snowball or bandwagon effect. Model 4 differs from Model 3 in that no such significant effect occurs since sanctions on non-adopters are weak. The authors suggest that the controversial screening mammography would be an example of Model 3 (social construction) while Quality Circles provide an example of Model 4 (fads). The authors conclude that differences in reliability and persuasiveness of evidence of efficacy will vary dramatically across innovations and lead to very different diffusion patterns. Nelson *et al.*'s (2004) work synthesises traditional DOI theory with more recent work on the management of fashions and fads. While Models 1 and 2 capture hard technological innovations; Models 3 and 4 capture softer organisational and managerial innovations (OMIs) such as Lean. However, the dimensions of dynamic increasing returns and the ability to get sharp feedback may not be the only variables relevant to explaining the diffusion of OMIs.

Bresnen and Marshall (2001) also draw directly on DOI theory. However, their work highlights the fact that the diffusion of knowledge is not a simple, neutral and rational process but one that is highly socialised and subject to a range of psychological, social and political influences. The authors identify six areas of general difficulty with regard to the diffusion of managerial knowledge: first, the lack of clear definition and internal coherence; second, piecemeal and ad hoc applications; third, conflicting orientations to change; fourth, problems of measurability and validation; fifth, lack of sensitivity to context; sixth, problematic processes of implementation. Fineman (2001) supports the notion of management knowledge as being shaped by a range of rhetorical, social, emotional and political features.

Having summarised the key contributions and constructs of DOI theory, the researcher has already noted several limitations. These include: the conceptual transition from individual to organisation; the assumption of linear, sequential processes; the lack of empirical support for the construct of organisational size; the omission of reverse logic (complexity versus simplicity); and, the fact that subdimenions of relative advantage vary from innovation to innovation. Wolfe (1994)

concludes that DOI research is limited by the stringent assumptions of the diffusion model (Wolfe, 1994) and that these assumptions, in particular diffusion as an invariant unit of analysis and a definable and more or less equivalent population of potential adopters, do not hold true in most cases. Rogers (2003) himself regards pro-innovation bias to be the most serious limitation of DOI research. First recognised by Rogers and Shoemaker (1971), pro-innovation bias is the presumption that an innovation will benefit the organisation adopting it (Kimberly, 1981). Abrahamson (1991) criticises DOI research for being dominated by a perspective that perpetuates pro-innovation bias. The full extent and implication of his criticism is explained in full in the next section of this chapter. Another important limitation of DOI research is recall bias. Recall bias concerns potential inaccuracies in data collection methods in which respondents are asked to remember (Rogers, 2003). These limitations of the DOI literature provide at least partial impetus for the emergence of the following body of work which deals with the management of fashion and fads (MF&F). DOI research shows that the spread of an innovation, whether the unit of adoption is an individual or an organisation, is rarely based on evaluation of scientific studies. In other words, that diffusion is very much a social process (Rogers, 2003). However, the DOI literature does little to shed light on the other factors that influence this process. The body of literature reviewed in the following section goes some way to addressing this shortcoming.

3.2 Management Fashions and Fads Literature

The adoption of new management ideas and practices has become an important and substantial area of study and debate within organisational studies, often under the label of management fashions and fads (Sturdy, 2004; Birkinshaw *et al.*, 2008). Less extensive than the DOI literature, theory within this literature has been heavily influenced by the work of Abrahamson (1991, 1996, Abrahamson and Rosenkopf, 1997, Abrahamson and Fairchild, 1999; Abrahamson and Eisenman, 2001). This explains the prominence of this author within this section. The Management of Fashions and Fads (MF&F) literature developed partially in response to the proliferation of management ideas that emerged in the 1980s and 1990s (Freeman, 1984; Ettorre, 1997; Towill, 2006; Marmor, 2008; Appleyard, 2009) and partially in response to the inability of DOI theory to explain this proliferation (Abrahamson,

1991). Abrahamson (1991) argues that MF&F have repeatedly seen technically inefficient innovations diffuse and efficient innovations be rejected. Yet the DOI literature continues to assume that rational adopters make independent and technically efficient choices. This efficient choice perspective dominates the DOI literature and perpetrates pro-innovation bias which limits our understanding of why technically inefficient processes sometimes diffuse and efficient innovations are sometimes rejected.

MF&Fs are not differentiated in the literature although most authors use *fads* to mean short-lived *fashions*. Both terms are used to mean managerial interventions which appear to be innovative, rational and functional and are aimed at encouraging better organisational performance (Carson *et al.*, 1999). Scarborough (2002) defines *fashions* as management knowledge that has been diffused but not institutionalised. Abrahamson by contrast defines management fashions as:

'transitory collective beliefs that certain management techniques are at the forefront of management progress'

(Abrahamson, 1996, p. 254)

Fashion setters are the various groups that disseminate management fashions, including: consulting firms; management gurus; business mass media publications; and, business schools. Collectively, they operate in a *fashion setting community*.

Fashions and fads are associated with aesthetics and consequently suggest the trivial and unimportant. However, Abrahamson (1996) challenges this *a priori* assumption, arguing that there is a crucial difference between aesthetic fashions and management fashions: aesthetic fashions need only appear modern and beautiful. Management fashions on the other hand must appear rational and progressive.

In fact, several authors solicit more research into MF&F (Abrahamson, 1996; Carson *et al.*, 1999; Spell, 1999; Sturdy, 2004). Abrahamson (1996) highlights in particular the need to understand what forces, external to the fashion-setting process, shape management fashion demand. Abrahamson and Fairchild (1999) specify two primary reasons for the study of MF&Fs. Firstly, historically research has focused on institutionalised organisational forms and practices to the neglect of un-institutionalised or weakly institutionalised ones. Secondly, there is a lack of

empirical testing of recent theories conceptualising how and why such fashions occur. Newell *et al.*, (2001) also note that theorising about MF&Fs is in its relative infancy and that detailed empirically grounded examples are rare. Similarly, Sturdy (2004) argues that little attention has been paid to the theoretical positions, problems and possibilities evident in this literature.

The dominant research method espoused in this body of literature involves the tracing of publications over time. This is referred to by some authors as the historical bibliometric method (Charvet *et al.,* 2008; Spell, 1999). Abrahamson (1996) argues that management fashion setters articulate rhetorics and disseminate them using popular and academic press articles. These articles therefore form a large archival database that is useful for the study of management fashions, covering a long time period. These archives are carefully indexed and available in computer readable formats (*ibid.*). He empirically demonstrates the 'shape' of the management fashion popularity cycle using this method. He uses Quality Circles (QCs) as a basis for this study and argues that a normal distribution or bell-shape is caused when different types of management producing publications (more or less academically oriented) began and stopped promoting the QC fashion. Carsen *et al.*, (1999) also trace the process of fad adoption using historical bibliometric data. They support their methodology with the claim that the longitudinal bibliometric data collection technique has been praised by management scientists as well as management fashion theoreticians as being appropriate for the investigation of the cyclical influences of managerial innovations. Spell (1999) supports these findings.

Whilst the bibliometric approach is the most frequently used method for researching MF&Fs, some authors have been critical of the use of this approach. Fichman and Kemerer (1999) highlight the fact such an approach is inappropriate where a new information technology may be widely acquired, but then only sparsely deployed among acquiring firms. They term the gap between acquisition and deployment the assimilation gap. Benders (1999) supports this view and suggests that organisational concepts are particularly prone to the decoupling of label and content. In summary, since the popularity of a topic in the press is not necessarily closely linked to its adoption in a particular management population, a high rate of coverage in the media does not necessarily mean a high rate of application. Conversely, the disappearance of the label in the media does not necessarily reflect that the

underlying ideas have been dismissed (Benders and van Veen, 2001). Database searches, then, can therefore only be used to investigate the intensity of the discourse (Benders, 1999) and not the extent of adoption. Clark (2004) similarly argues that there is a tendency in the literature to assume a symbiotic relationship between the pattern in the volume of discourse and trends in the adoption and rejection of ideas by organisations.

The various methodological issues surrounding the literature on MF&Fs have served to steer the researcher away from an over reliance on historical bibliometric data collection towards a multi-method approach.

3.2.1 Management Fashions and Fads Theory

Abrahamson's theory is that management fashion setters engage in a race to sustain their position as fashion setters. They engage in a number of activities as part of this race: they sense the emerging collective preferences of managers for new management techniques; they develop rhetorics that describe these techniques as being at the forefront of management progress; they disseminate these rhetorics back to managers and organisational stakeholders in advance of other management fashion setters. Abrahamson's (1991; 1996) theory is based on an extension of a particular branch of neo-institutional theory that focuses on 'norms of rationality'. A central hypothesis of institutional theory is that organisations have to adopt structures that have become institutionalised in society in order to acquire and retain legitimacy and support from stakeholders (Meyer and Rowan, 1977; Tolbot and Zucker, 1983; DiMaggio and Powell, 1983; Ashworth *et al.*, 2007). In this way, management techniques gain legitimacy with regard to norms of progress.

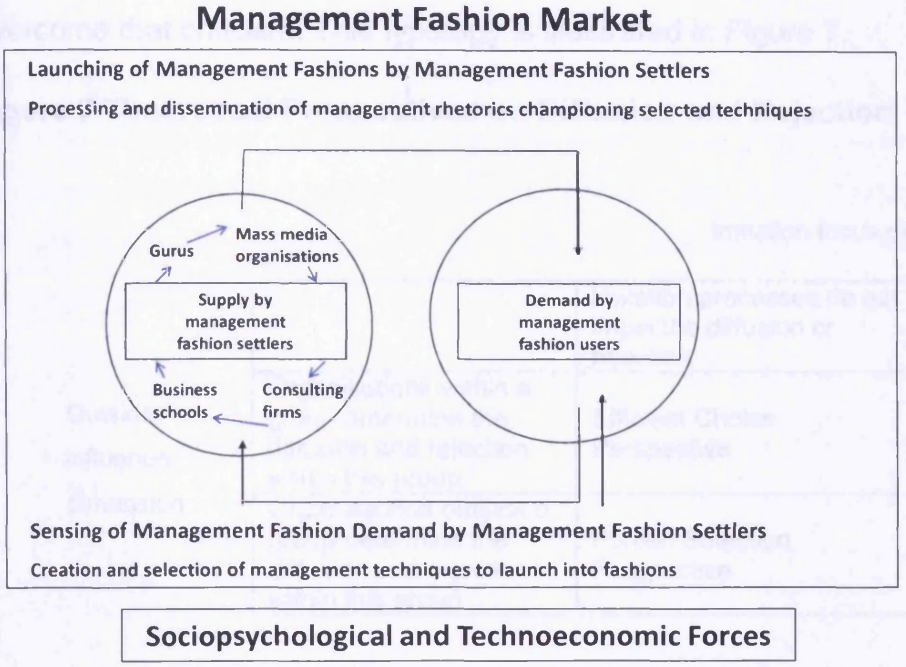
The activities of fashion setters collectively form a management fashion setting process, defined as:

'The process by which management fashion setters continuously redefine both their and fashion followers' collective beliefs about which management techniques lead rational management progress.'

(Abrahamson, 1996, p. 257)

The dynamics of the fashion setting community and the fashion setting process are illustrated in Figure 6.

Figure 6 Management Fashion Setting Process



(Source: Abrahamson, 1996, p. 265)

The fashion setting process takes place within a market. The demand side of the market encompasses a variety of socio-psychological factors (fashion followers needs to appear individualistic and progressive). It also encompasses a variety of techno-economic factors such as macroeconomic fluctuations, structural conflict between managers and workers and organisational contradictions. Abrahamson (*ibid.*) suggests that the supply of management fashions consists of a four phased process: *creation*, where managers and fashion setters invent or reinvent techniques; *selection*, by managers who are themselves fashion setters; *processing*, where management setters elaborate rhetorics to convince fashion followers; and, *dissemination*, by mass-media publications that pick up the rhetoric developed by fashion setters. Collectively fashion setting markets form fashion setting industries that supply mass audiences with a limited set of innovations that are candidates for becoming mass fashions.

In his early (1991) work, Abrahamson criticises the DOI literature which, he argues, is dominated by an efficient choice perspective that consequently causes and perpetuates pro-innovation bias. He challenges the assumptions inherent in the

efficient choice perspective (freedom to adopt and goal certainty) and proposes a typology of perspectives that encompasses alternative perspectives in order to overcome that criticism. This typology is illustrated in Figure 7.

Figure 7 Theoretical Perspectives on Diffusion and Rejection

		Imitation focus dimension	
		Imitation processes do not impel the diffusion or rejection	Imitation processes impel the diffusion of rejection
Outside influence dimension	Organisations within a group determine the diffusion and rejection within this group	Efficient Choice Perspective	Fad Perspective
	Organisations outside a group determine the diffusion and rejection within this group	Forced Selection Perspective	Fashion Perspective

(Source: Abrahamson, 1991, p. 591)

The typology highlights the roles of outside influences and imitation processes as dimensions that determine diffusion. These dimensions interact to form four alternative perspectives. The *efficient choice perspective* assumes organisations independently and rationally adopt technically efficient innovations. The *forced selection perspective* assumes a few powerful organisations dictate which technologies will diffuse; the *fashion perspective* assumes organisations in a group imitate other organisations outside that group; the *fad* perspective assumes organisations in a group imitate organisations within that group. The efficient choice perspective fails to explain the diffusion of technically inefficient technologies or the rejection of technically efficient technologies. As a result it perpetuates pro-innovation bias. The additional perspectives are based on contrary assumptions in order to facilitate avoiding pro-innovation bias.

In later work, Abrahamson and Rosenkopf (1997) emphasise the role of social networks in management fashions. Network structure influences the strength of 'bandwagon' pressure on each potential adopter and therefore the extent of innovation diffusion. DOI theory frequently draws on 'bandwagon' processes or positive feedback loops. These processes are of particular importance for the

diffusion of MF&Fs. According to these processes, an increase in the number of adopters creates stronger and stronger 'bandwagon' pressures that have the effect of increasing the number of adopters. There are three schools of thought concerning such bandwagon processes. Each school differs according to the assumptions they make about the ambiguity or otherwise of information about the innovation. Table 13 has been adapted (meaning developed by the researcher, drawing on the text) from Abrahamson and Rosenkopf (1997) as a summary of the three schools, their assumptions and effects.

Table 13 Bandwagon Theories, Assumptions and Effects

Bandwagon theory school	Assumption	Effect
Increasing returns theories of bandwagons	The profitability of an innovation is unambiguous.	As the number of adopters increases so does its profitability, causing more potential adopters to adopt.
Learning theories of bandwagons	Incomplete information means the information about the profitability of an innovation is ambiguous.	An innovation's profitability is ambiguous and potential adopters must learn about the innovations before deciding to adopt it.
Fad theories of bandwagons	Not only is profitability ambiguous but updated information about an innovation's profitability does not flow from earlier to later adopters nor does it influence their adoption decisions.	It is the information about who has adopted the innovation rather than the innovation itself that generates a social bandwagon pressure to conform, causing more potential adopters to adopt, and thereby reinforcing the bandwagon pressure.

(Source: adapted from Abrahamson and Rosenkoft, 1997)

Fad theories of bandwagons are similar to information cascade theory that suggests that firms follow the lead of other adopters in spite of private information (Bikhchandi *et al.*, 1992; Walden and Browne, 2002). Information cascade theory has recently been presented as a potential, albeit controversial, explanation for the current orthodoxy on global warming (Martin Cohen, THES, 10th December, 2009). Abrahamson and Rosenkopt (1997) suggest that bandwagon theories are questionable under conditions of ambiguous information about the innovation. Under these conditions, social comparison theory is more appropriate. Social comparison theory suggests that when confronted with empirically ambiguous questions, decision-makers base their decisions on social cues such as how many of their close contacts have adopted the innovations and what they have to say about it. What each adopter finds out about an innovation therefore depends on the structure of the social network that disseminates information about the innovation and that potential adopters' position in it.

Abrahamson and Fairchild (1999) emphasise the importance of feedback loops between discourse and diffusion. They propose that forces, both exogenous and endogenous to the management knowledge market, can trigger and shape fashions. The management fashion popularity curve is empirically demonstrated through the example of quality circles (QCs). In a more recent study, Abrahamson and Eisenman (2001) emphasise the role of management scholars in shaping the supply side of the knowledge market. More latterly, Abrahamson (cited in Clark, 2004) extends his theory to examine how recurrent fashions within business knowledge niches cumulatively build on one another to form a particular trajectory.

Abrahamson's management fashions theory has been criticised by a number of other authors (Keiser, 1997; Benders and van Veen, 2001; Scarborough, 2002). Notable among these is Keiser who criticises Abrahamson's theory for underemphasising the role of rhetoric which he regards as the main fabric of the management fashion arena (Keiser, 1997). By conceptualising an arena rather than a market, Keiser conjures up the metaphor of gladiatorial combat and bloodshed:

'A management fashion is conceptualised as forming an arena in which different groups of participants bustle about – consultants, professors, managers, editors of management magazines, publishers, commercial seminar organisers, organisers of internet forums....The participants can achieve their individual goals of highest possible profit, public image, power or career by widening the arena through luring further participants into it. For this purpose they play principally co-operative games. Rhetoric is the main input currency in this game. Competition only occurs in some instances.....The speed at which the arena grows depends largely on the attractiveness of the game that the first players are able to produce.'

(Keiser, 1997, p. 57).

Keiser also argues that certain management fashions, usually those that link extraordinary performance and extraordinary personalities, assume a mythical quality:

'In order to produce management fashions and myths, the potential bestseller must become an object of public discourse'

(Keiser, 1997, p. 63).

The myth spreads through the activities in the management fashion arena: management magazines pick up the ideas developed in best sellers; consulting

companies follow the fashion but at the same time must differentiate themselves (thereby increasing ambiguity and contradictions and opening up new space for further articles of interpretation, new books and more myth creation); University professors enter the discourse, welcomed into the arena since they provide legitimacy. Keiser is particularly critical of the role of academics in the management fashion arena:

'For many of them, participation in the arena is a substitute for academic research. The acceptance of their contribution to the fashion by managers, measurable by the fees that they can charge, replaces serious theorising, empirical test and feedback to the scientific community.'

(Keiser, 1997, p. 63).

Keiser (*ibid.*) is not completely dismissive of MF&Fs and concedes that they do leave behind useful ideas and techniques that are retained by organisations. Other commentators have also highlighted the role of rhetoric and, in particular, the influence of management gurus in shaping management fashions (Clark and Salaman, 1998; Clark 2004; Oliver, 2008). Huczinsky (1991) identifies three types of management gurus: *academic gurus* (such as Rosabeth Moss Kanter and Michael Porter); *consultant gurus* (such as Peter Drucker and Tom Peters); and *hero managers* (such as Jack Welch and John Harvey-Jones). Several commentators suggest that metaphors are particularly powerful in breaking through the 'banal' and 'commonplace' and in creating the promise of the 'new' (cited in Clark and Salaman, 1998 are Czarniawaska-Jeorges, 1990 and Legge, 1996). Clark and Salaman (1998) argue that the role of management gurus in the production and diffusion of accepted management wisdom is fundamental and has been largely overlooked. They comment that most individuals in employment will be currently experiencing the consequences of some 'guru-led' programme of organisational change. Management gurus develop and disseminate ideas that permeate through the management community and become the issues that management scholars investigate. Management gurus therefore set the management agenda, consequently an understanding of what they refer to as the 'guru phenomenon' is vital. They assemble a range of explanations for the 'guru phenomenon'. Some apply to management users (the satiation of psychological needs, the nature of managerial task and management learning); some to the gurus themselves (guru performances); some to socio-economic and cultural factors (capturing the spirit of

the times, economic expansion and contraction). They define the client-guru relationship as equal and interactive suggesting that the role of the guru lies in supporting management work and reducing uncertainty by their competence at managing meanings.

Like Keiser and others who emphasise the role of rhetorics and gurus, Benders and van Veen (2001) also criticise Abrahamson's work. Their criticism concerns Abrahamson's omission of a key characteristic of management fashions. The missing characteristic is interpretive viability which the authors define as:

'a certain degree of ambiguity in a fashion's content, and its' consequences for the dynamics involved in the ongoing shaping and reshaping of a concept's connotations.'

(Benders and van Veen, 2001, p. 33).

The term itself was first coined by Ortman (1995) who argues that it is a necessary feature of MF&Fs for two reasons: first, for them to be applicable in varying situations; second, for them to gain the acceptance of the different parties involved in change processes. Benders and van Veen (2001) therefore conclude that organisational changes are not simply the result of fashion setters imposing beliefs on fashion followers, as Abrahamson's diffusionistic explanation suggests. Rather, these changes are linked to the ways in which different actors make use of the discourse around MF&Fs. A second implication of the concept of interpretive viability is that it renders it impossible to judge the efficacy of a MF&F *per se* since efficacy is determined by the way it is interpreted and enacted in a setting (*ibid.*).

Carson *et al.* (1999) argue that some MF&Fs evolve into trends, once their effectiveness in numerous and diverse setting has been demonstrated. From trends, they evolve into collective wisdom. There are a range of preconditions to the adoption of MF&Fs by organisations. These include environmental pressures, forces for conformity and organisational characteristics. The authors propose that MF&Fs typically progress through a life-cycle and that organisations are more likely to adopt a MF&F in its earlier stages than in the latter ones. Table 15 has been adapted (meaning developed by the researcher, drawing on the text) from Carson *et al.* (1999) as a summary of the four stages of the fad lifecycle, the main characteristic of each stage and the prototypical nature of publications of each of these stages.

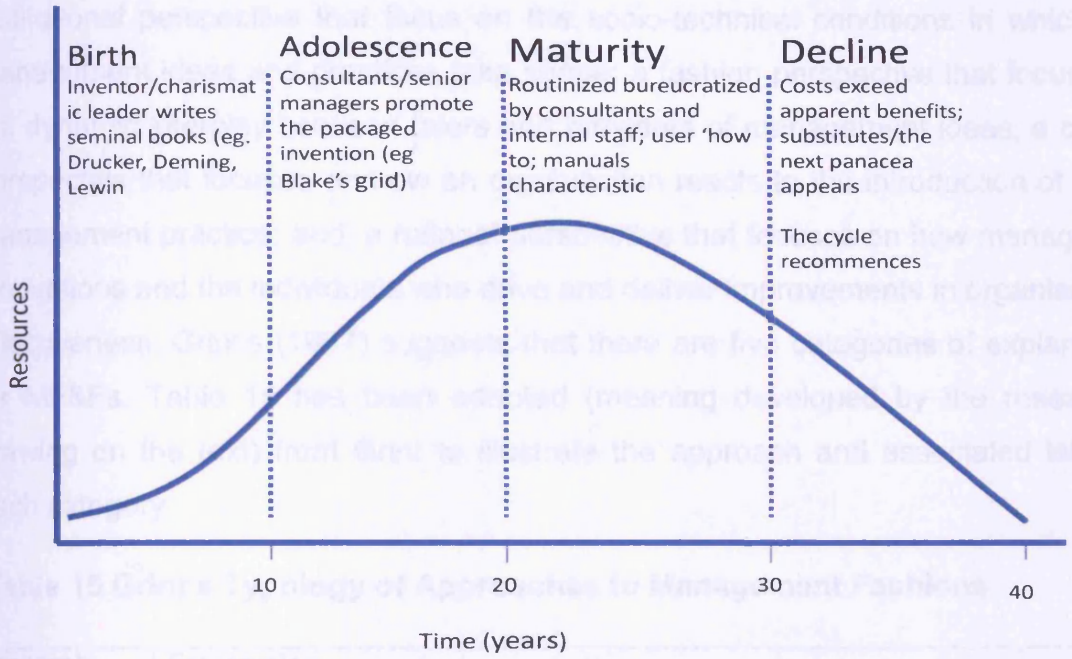
Table 14 Life-Cycle of Management Fashions and Literature Patterns

Stage of life cycle	Characteristic	Prototypical Nature of Publications
Invention	Low awareness of fad	Practitioner literature introducing fad.
Acceptance	Implementation of fad	Significant increase in the number of publications on fad.
Disenchantment	Evaluation and potential adoption of fad	Academic literature defining boundary conditions, disadvantages and limitations. Plateau in number of publications on the fad.
Decline	Abandonment of fad	Practitioner literature disclaiming effectiveness. Significant decline in the number of publications on the fad.

(adapted from Carson et al., 1999)

Gill and Whittle (1992) conceptualise MF&Fs as panaceas and similarly propose that they follow a lifecycle trajectory. Figure 8 illustrates the variation in resources dedicated to the various stages of this lifecycle over a time span of four decades. Figure 8 illustrates typical patterns of activity at each of the four stages of a MF&F, or to use their term, 'management panacea': birth, adolescence, maturity and decline. The authors suggest that the transitory nature of much managerial activity is rooted in cultural (consultancy-led and anti-intellectual) and psychodynamic (power of leaders and small groups) phenomena. Other authors highlight the importance of other parts of the management fashion setting community. For example, Newell *et al.* (2001; 2001a) emphasise the role of professional associations and funding bodies in packaging and commodifying management rhetorics about best practice.

Figure 8 Lifecycle of Management Fashions and Fads



(Source: Gill and Whittle, 1992, p. 289)

Several authors argue that research on the DOI process must emphasise the context-dependent nature of the diffusion process (Newell *et al.*, 2001; Scarborough, 2002). Context dependency is related to the highly social nature of the innovation diffusion process (Newell *et al.*, 2001). Most studies focus at the micro-level of analysis (the level of the individual or organisation), but more recently it has been recognised that meso- and macro-level factors also need to be taken into account (*ibid.*). The macro-level constitutes many broad elements: legislative system; culture; national institutions; labour relations. However, an organisation's national government is pinpointed as one of the most significant elements of the macro-context. The meso-level constitutes an intermediate position and includes the industry sector and inter-organisational network relations. Their empirical study of Business Process Re-engineering (BPR) highlights the fact that diffusion of a MF&F, regardless of its technical merits, can only be explained by considering the joint impact of micro-level organisational factors and meso and macro-level contextual factors.

Some authors have considered the diverse views within the literature concerning OMIs. Birkinshaw *et al.,* (2008), for example, identify four perspectives: an institutional perspective that focus on the socio-technical conditions in which new management ideas and practices take shape; a fashion perspective that focuses on the dynamic interplay between users and providers of management ideas; a cultural perspective that focuses on how an organisation reacts to the introduction of a new management practice; and, a rational perspective that focuses on how management innovations and the individuals who drive and deliver improvements in organisational effectiveness. Grint's (1997) suggests that there are five categories of explanations for MF&Fs. Table 15 has been adapted (meaning developed by the researcher, drawing on the text) from Grint to illustrate the approach and associated label for each category.

Table 15 Grint's Typology of Approaches to Management Fashions

Approach	Explanation
The rational idea approach	We innovate all the time because innovation works and the only way to stay marginally ahead of your competitors in a dynamic market economy is to generate some sort of competitive advantage through innovation. The focus is how rational the innovation is.
The structural requirements approach	Considers the extent to which explanation lies outside the control of individuals or groups and instead falls within the requirements of the situation. The focus is on management ideas for enhancing or reducing control over labour in direct response to economic expansion or contraction. (Barley and Kunda, 1992).
The charismatic approach	Highlights the weaknesses of organisational leaders rather than the requirements of the environment. Leaders respond emotionally and tend to consider how an idea can serve them rather than examining what the external situation suggests they should do. The focus is that the content of a charismatic performance is secondary to the performance itself.
The distancing approach	Considers the continued retrenchment of status divisions. Social distancing is tightly associated with identity construction (we do not wear certain clothes because our parents do). Some organisations have introduced uniforms to decrease the social distance between managers and frontline workers. Managers adopt ideas because faced with huge choice the decision is made easier by adopting whatever the class leader is adopting.
The institutional approach	Organisational decision makers, especially under conditions of uncertainty are forced into taking action that resembles the lead taken by others in the field. Since progress implies change then status implies a lack of progress, eventually the potency of a change programmes declines and the tendency to decay plays into the hands of those with an interest in generating change, consultants and trend setters.

(Source: adapted from Grint, 1997)

Sturdy (2004) provides a similar typology. He suggests six perspectives on MF&F. Table 16 has been adapted from Sturdy as a summary of the explanation behind and main exponents of each perspective together with their key determining factor and limitation.

Table 16 Sturdy's Typology of Perspectives on Management Fashions

Perspective	Exponents	Explanation	Key factor	Limitation
Rational view or efficient choice perspective	Abrahamson, 1991; Rogers, 2003; Sturdy, 2004	New ideas are adopted because they work or promise to work. Managers are purposive and methodical.	Organisational effectiveness.	Only applicable in situations of low uncertainty which are rare in management (Abrahamson, 1991, Salaman, 2002).
Psychodynamic view	Gill and Whittle, 1992; Huczynski, 1993	New ideas are transient because managers are anxious. Ideas are adopted without consideration of effectiveness and are discarded when they fail to deliver.	Relieving anxiety and securing identity.	Portrays managers as anxious and under pressure which is only a partial view.
Dramaturgical view	Keiser, 1997; Grint, 1997	Focuses on the supply side of ideas and the persuasive power of agents such as gurus. Impression management is key not content.	Successful rhetoric .	Management ideas are not simply ways of talking and thinking but legitimate, represent and constitute particular forms of work organisation while silencing others.
Political view	Ramsay, 1977	Which ideas diffuse depend on who has control of the means of dissemination. The role of large organisations, consultancy, development and education is therefore important. The emergence and dominance of particular ideas may be seen as a competition between different management functions.	Furthering careers, function, status or control.	Underplays the role of context. In particular, why some ideas spread and other so not or why they do so in a different time and sequence.
Cultural view	Warner, 1991; Simon and Davies, 1996	Draws attention to the locally embedded nature of knowledge such that culture can act as a bridge or barrier to transfer of ideas. Concerned more with the nature or particular form of management idea	Cultural resonance or meaning.	Beyond increasing cultural training and awareness, other obstacles and facilitators to diffusion are ignored.
Institutional view	Meyer and Rowan, 1977; Powell and DiMaggio, 1991; Talbot and Zucker, 1996	Central tenet of institutional theory is that organisations sharing the same environment will employ similar practices. Practices are adopted for symbolic reasons such as seeking peer and shareholder legitimacy rather than efficiency of control outcomes.	Securing organisational legitimacy	Institutional theory tends to aggregate and ignore the eclectic sector or region that does not fit the institutionally shaped pattern of the sector or region.

(Source: compiled from Sturdy, 2004)

There are obvious similarities and important differences between the two typologies. First, both authors note that a rational view dominates prescriptive accounts, as well as providing a point of departure for others, and that many writers retain a strong utopian faith in the possibility of adopting new ideas on the basis of objective evaluation. Second, Sturdy's dramaturgical perspective and Grint's charismatic approach both focus on the persuasive texts and speakers and the packaging of

ideas. These tend to present managers as gullible and diffusion as one way but they do serve to draw attention to the importance of management discourse. Third, both authors include an institutional approach which focuses on organisations securing legitimacy through new ideas. Fourth, Grint's structural requirements approach and Sturdy's political perspective both focus on the forces external to the organisation, although Grint emphasises macro economic expansion and contraction while Sturdy emphasises power and influence. In Sturdy's political perspective power and contestation are seen as important stimuli to action rather than simply obstacles to the diffusion of ideas. Fifth, Grint's distancing approach and Strudy's cultural perspectives are similar in that they are internal to the organisation, although Sturdy's perspective allows a wider range of cultural explanations. For Sturdy, emphasis is placed on different forms of knowledge and how their embedded nature may form barriers or bridges to new ideas. Finally, Sturdy's psychodynamic opens up explanations of managerial impulsiveness and emotional existence concerns.

Theoretical perspectives are largely a matter of choice founded on prior assumptions and may be deployed according to their empirical relevance (Sturdy, 2004). Each provides insight into why managers adopt ideas and practices. However, the adoption of ideas is multidimensional. For example, managers may adopt new ideas on the basis of both systematic evaluation and social influence (Abrahamson and Rosenkopf, 1997). Sturdy (2004) argues that the use of multiple perspectives is achieved through a contingent approach whereby different accounts of adoption are seen as appropriate depending on the circumstances (Van de Venn and Pool, 1995). For example, Abrahamson (1991) regards the rational view more appropriate in situations of low uncertainty. Talbot and Zucker (1983) argue that early adopters may be more rational than the herds of followers.

Sousa and Voss (2008) have recently proposed contingency theory as a major theoretical lens through which to view MF&Fs. Contingency theory holds that organisations adapt their structures in order to fit with changing contextual or contingency factors (Donaldson, 2001). Contingency studies involve three types of variables: contextual variables or situational characteristics usually exogenous to the focal organisation; response variables or organisational actions taken in response to current or anticipated contingency factors; and, performance variables or the dependent measures appropriate to fit between contextual variables and response

variables (Sousa and Voss, 2008). Benders and Slomp (2009) also advocate a contingent approach to MF&Fs. They argue that practitioners face two difficulties in deciding whether to use a particular concept: first, hasty adoption as a result of the fear of staying behind competitors; second, because of interpretive viability concepts, deciding how the MF&F fits with their own local situation.

Doorewaard and Bijsterveld (2001), however, draw on translation theory which in turn is based on actor network theory (ANT). ANT is a body of theoretical writing which treats social relations, including power and organisations as network effects (Law, 1992). The authors argue that translation in organisational discourse resembles the process of osmosis more than the process of cloning. Actors do not simply emulate ideas, instead ideas must fight their way through a 'semi-permeable organisational membrane' (p. 55) consisting of existing power networks, organisational culture and subcultures.

Drawing on empirical evidence rather than theory, Cole (1998, 1999) concludes that MF&Fs undergo a process of accommodation followed by adaptation and later institutionalisation. Focusing on the quality movement in the US, he argues that for the first few years of the quality movement, the conditions for effective organisational learning could not be met due certain constraints, in particular, incomplete information and existing values, norms and practices. This led to wasted resources on failed quality initiatives. Over the course of the late 1980s and early 1990s, however, a 'rich infrastructure of organisational activities' (1998, p. 70) emerged to facilitate learning about Japanese quality methodologies and how to adapt them to local conditions in order to enable managers to convert learning into effective practice. Grint (1997) however identifies other reasons for failed TQM initiatives: first, externally imposed systems of standards and measures which will never secure the commitment that can only be secured through ownership; second, the tendency to over-measure, and to measure what is easiest, often has unintended negative consequences; third, organisational improvement inevitably leads to de-layering and downsizing; fourth, the loss of organisational purpose as a consequence of overemphasis on compliance. Referring back to the Core literature, it is noteworthy, that a key component of Seddon's Systems Thinking approach is the early focus on a single unifying purpose in order to overcome systemic tendencies towards a *de facto* purpose such as target compliance. Hackman and Wageman (1995) also

consider the diffusion of TQM. They question whether TQM is real or merely a banner under which a 'pot pourri' (p. 309) of unrelated organisation changes are undertaken. To answer this question, they propose tests of convergent validity and discriminate validity. Convergent validity is the degree to which the versions of TQM promulgated by its founders and observed in practice share a common set of assumptions and prescriptions. Discriminate validity is the degree to which TQM can be reliably distinguished from other improvement strategies. They conclude that TQM passes with reference to the writings of the TQM founders (convergent validity) but is close to failing when focusing on contemporary organisational practice (discriminate validity).

Some authors have drawn on the growth of interest in knowledge management (KM) to explain the diffusion of MF&Fs. Scarborough and Swan (2001) conduct a literature review of the books and papers on KM by contrasting KM with the parallel but distinct topic of the Learning Organisation (LO). They find that the diffusion pattern suggests that KM has taken over the LO 'baton in the 'fashion relay' (pg. 6). They conclude, however, that KM is not a development of, but rather a divergence from the literature on LO, or a fashion in its own right with a new focus on tools and systems, rather than on people and processes. They suggest that KM is a popular term that provides a convenient trigger with which to resurface and revitalise change processes associated with earlier LO initiatives. Their work builds on that of Gibbons *et al.*, (1994) who argue that we are currently experiencing a fundamental shift towards a new mode of production in which knowledge is increasingly generated by users in the context of its application. Therefore, instead of the uniform movement of ideas described by the fashion metaphor, KM spreads in a ripple effect in which it serves as a trigger for activating locally-situated change processes. Also focusing on KM, Scarborough (2002) focuses on the different role of various intermediary groups. He suggests that there are three main episodes of change (theorisation, diffusion and institutionalisation) and that different intermediary groups play the dominant role in each episode (see Table 17).

Table 17 Role of Intermediary Groups in the Development of Management Fashions

	Theorisation	Diffusion	Institutionalisation
Major role	Professional groups	Consultants	Professional groups and consultants
Major activity	Colonization	Commodification	Translation
Implications for the development of fashion	Development of multiple interpretations of new management knowledge	Development of ambiguous rhetoric	Fragmentation of fashions

(Source: compiled from Scarborough, 2002)

At the theorisation stage, professional groups 'colonise' the organisational concept. Colonisation refers to the competition between professional groups to claim ownership and dominance of management knowledge. At the diffusion stage, consultants 'commodify' the organisational concept. Commodification refers to the development of MF&Fs as tools and system to be universally marketed. Finally at the institutionalisation stage both consultants and professional groups translate. Translation refers to a subtle shift in meaning as the original knowledge is disembedded from its original context abstracted into iconic form and re-embedded into another organisational context. The authors conclude that KM was certainly fashionable in that it achieved widespread diffusion but that its' institutionalisation is far less evident.

Some commentators highlight the importance of external bodies and entities to the diffusion of MF&Fs. For example, Newell *et al.*, (1998) emphasise the role of professional networks. Institutional theorists regard such networks as potential sources of normative forces towards isomorphism (Ashworth *et al.*, 2007). Newell *et al.'s* work focuses on the diffusion of Business Process Reengineering (BPR) across different industrial sectors and across four countries in Europe. They identify three perspectives on the diffusion process: the individualist perspective which focuses on the influence of individual people in the process; the structuralist perspective which focuses on structural characteristics; and, the interactive perspective which focuses on the interaction between individuals and structural characteristics. They observe that all three perspectives focus on a micro-analysis at the level of the organisation or firm and argue that more recently it has been recognised that meso-level (industry sector) and macro-level (national) contextual factors need to be taken into account as well. In the case of Lean, meso- and macro-level factors are clearly important.

Newell *et al.*, (2001) highlight the role of funding bodies in the diffusion of MF&Fs. They argue that part of their role is the 'commodification' and widespread diffusion of knowledge that is relevant for a broad range of users. This is based on the assumption that knowledge creation during research happens via a rational decision-making and planning process which leads to the identification of the optimal solution that can then be diffused to users as new forms of best practice. This assumption is based on a linear model of diffusion process (Rogers, 2003) and is problematic for two reasons: first, in reality processes of knowledge creation and diffusion are conflated during research projects; second, the assumption that a generic and portable best practice model can be developed. Their study includes two cases where the knowledge creation and diffusion processes of two research projects were clearly shaped by the strategies adopted by their respective funding bodies under pressure to respond to government directives. The authors distinguish between academic and popular claims to knowledge and argue that the moral high ground for academic management knowledge may be overestimated. They note that there is often overlap between the two, in other words, where popular books are written by academics or where consultants write books based on systematic research.

3.3 Synthesising the Core and Background Literatures

Each of the three bodies of literature that have been reviewed in this and the previous chapter exhibit distinctly different characteristics. The Lean literature is large and diverse with a strong polemic element. It relies heavily on case studies for its empirical evidence notwithstanding the large-scale IMVP project reported in *The Machine*. The literature exhibits other idiosyncratic characteristics. For example, the literature lags behind practice (Papadopoulos and Ozbayrak, 2005; Tracy and Knight, 2008) and is theoretically underdeveloped (Gill and Whittle, 1992). By contrast, the DOI literature has far greater heritage (Rogers, 2003). It has been developed from a variety of sources into a well-established and testable general diffusion theory, nothwithstanding some methodological limitations common to all data collection methods in this field. However, the theory has largely been developed based on the object of innovation being product technologies with less empirical studies based upon OMIs such as Lean. Some authors have questioned the generalisability of product based innovations (Greehalgh et. *al.,* 2004). Lastly, the

MF&F body of literature has been formulated as a result of the proliferation of managerial ideas like Lean that have emerged over recent decades. Theory is still emerging and empirical studies are as yet few. Research methods tend to rely on tracing publications through time, although it is now recognised that this will represent the extent of discourse rather than the extent of idea adoption. The differences between the three bodies of literature that have been reviewed so far are summarised in Table 18.

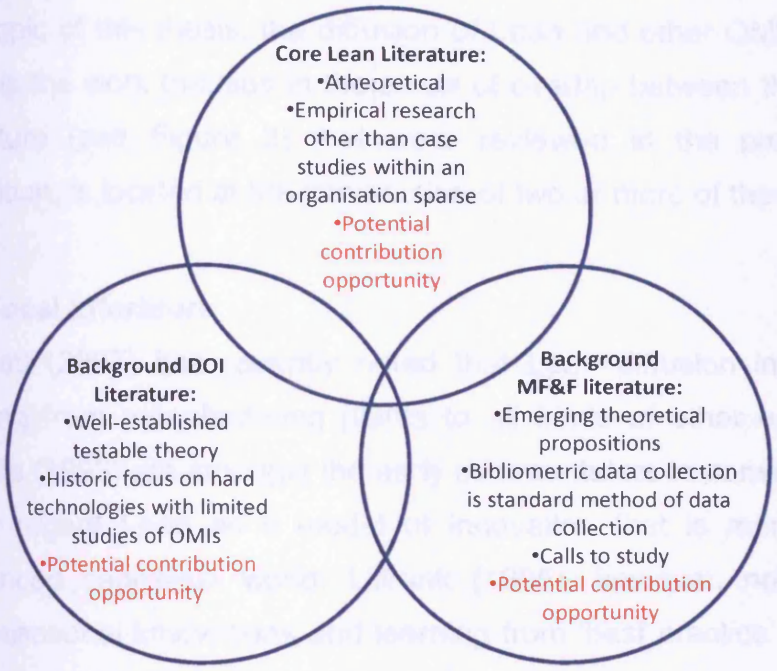
Table 18 Characteristics of the Core and Background Literatures

	Lean Literature	DOI Literature	MF&F Literature
Longevity	20 years (30 including previous manifestations)	100 years	20 years
Scope	Vast and diverse	Vast	Narrow
Loci	Business and management, primarily operations and organisational behaviour subfields	Range of disciplines	Business and management
Theoretical basis	Atheoretical, practice in advance of research	Testable theory	Emerging theory
Methods	Case studies	Various, though methodological problems common	Longitudinal bibliometric data collection
Research opportunity	Lack of theory development	Primarily based on hard technologies	Little empirical evidence

(Source: the researcher)

Synthesising these three literatures based upon these characteristics enables the enhancement of conceptual framework presented in the Introductory chapter. This is illustrated in Figure 9.

Figure 9 Enhanced Version of the Conceptual Framework for Organising the Literature



(Source: the researcher)

This version of the conceptual framework identifies potential opportunities for contribution to knowledge for this study in each of the three bodies of literature.

Chapter 4 Focal Literature Review

This chapter critically reviews the body of literature that is most directly focused on the topic of this thesis, the diffusion of Lean and other OMIs through organisations. This is the work that lies in the areas of overlap between the Core and Background literature (see Figure 3) that were reviewed in the previous chapters and by definition, is located at the intersection of two or more of these three bodies of work.

4.1 Focal Literature

Corbett (2007) has recently noted that Lean diffusion in the UK is widespread, moving from manufacturing plants to all kinds of other organisations. Kenny and Florida (1993) are amongst the early commentators to consider the diffusion of Lean. They regard Lean as a model of innovation that is reproducible throughout the advanced capitalists world. Lillrank (1995), however, notes that the transfer of organisational innovations and learning from 'best practice' is slow and complicated and may take decades to spread. He suggests that the diffusion of management concepts from Japan, such as Lean, may be likened to the transfer of electric power over long distances. The analogy is that electricity running in cables meets resistance and the power loss is a function of distance and voltage. Therefore, for long-distance power transmission, electric current is switched to a higher voltage, which reduces resistance. At the receiving end, voltage is switched down to usable level. In a similar way, ideas emanating from Japan have to travel along an 'idea line'. The distance is not only geographical but also psychological as a result of cultural differences. The larger the distance, the more is lost due to misunderstandings, incomplete information and essential parts of the original context being missing. To reduce losses, new ideas and practices get switched up to various levels of abstraction and repackaged for the transfer process. The package includes concepts, models, tools, propositions of causal connections and illustrative examples. The receiver switches down the abstraction to suit local conditions so that the foreign impact becomes part of the local learning process. The switching up and down, or the packaging and repackaging, are key processes that need to be clearly understood (Lillrank, 1995; Herron and Hicks, 2008).

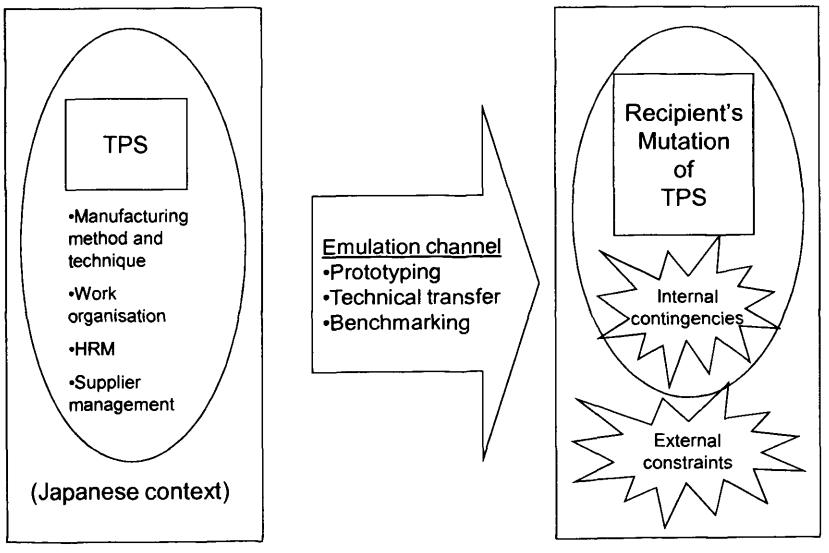
MacDuffie and Pil (1997) are also concerned with the diffusion of Lean across international borders. They suggest that key factors determining the effective diffusion across national boundaries include: increased international competition, managerial choices, labour union choices and government policy. In earlier work, MacDuffie and Pil (1995) review the adoption of Lean in the world automotive industry and argue that as more companies pursue Lean, variation in the rate of adoption increases. This greater variation renders it harder to discern any correlation that may exist between strategy, organising principals and performance. Scarborough and Terry (1998) give an account of Rover's implementation of Lean which supports MacDuffie and Pil's argument. Reporting on Rover's experience, they note that there is a shift towards the techniques, norms and language of Lean while at the same time high levels of variation both between and within plants. Scarborough and Terry (1998) argue that Lean implementation should not be regarded as a diluted form of Japanisation nor a minor set of system modifications, but rather as a creative process of adaptation.

Liker *et al.*, (1999) also focus their attention on the international diffusion of Lean, in their case, into the US. They refer to transferred management systems as hybrids. They propose three theoretical perspectives on Lean diffusion. First, the traditional DOI perspective where transfer is similar to the diffusion of social and technical innovations and diffusion is determined primarily by the attributes of the innovation itself. Second, the context perspective where international diffusion is shaped by forces such as: competition among firms; division of labour or parent-subsidiary relations; specific societal effects; specific companies. Third, the emergent perspective where diffusion is regarded as an evolving and indeterminate transformation process that can lead to a variety of outcomes.

Majek and Hayter (2008) have provided recent support for concepts of emergence and adaptation in the literature. They use the term hybridisation which they regard as a search for an appropriate mix of practices that ensure viability in local circumstances rather than the transfer of established best practices. They conclude from their study of Lean in Poland's automotive industry that Lean provides an important case in hybridisation. Lee and Jo (2007) also refer to hybridisation. They posit a categorisation of perspectives on Lean. First the convergence perspective which draws on the IMVP work and treats Lean as a universal set of management

norms that may be transferred and diffused anywhere. Second, the structuralist perspective which denies the universal transfer of Lean and instead emphasises the unique socio-economic context in which Toyota exists. Third, positioned between the polar extremes of the first two, is the compromise contingency perspective. This perspective accepts both the superiority of Lean and the presence of certain constraints related to its transferability. The authors argue that both the convergence and the structuralist perspectives represent a one-sided view of the diffusion of Lean. While the convergence perspective disregards the impact of national and organisational factors, the structuralist perspective underestimates the competitive advantage Toyota has enjoyed in recent decades. The authors further argue that the contingency perspective ignores the dynamic nature of Lean diffusion. Drawing on empirical work with Hyundai in Korea, the authors conceptualise a model of Lean diffusion in which TPS mutates as a result of internal and external contingent factors. Figure 10 illustrates this process of mutation.

Figure 10 Hypothetical Diagram of a TPS/Lean Diffusion Model



(Source: Lee and Jo, 2007)

The diagram suggests that TPS (or Lean) is defined as a collection of principles which originated with Toyota but is now recognised as a standard for manufacturing

worldwide. These principles may be emulated by various means including prototyping (replication of manufacturing arrangements), technical transfer (imitation or import through Toyota-related consultancies) or benchmarking (establishing goals and comparative standards). Through the emulation process the recipient 'mutates' Lean and develops its own production model by selecting, interpreting and transmuting Lean to meet its own business context. Their work is reminiscent of what others have called hybridisation (Liker *et al.*, 1999; Majek and Hayter, 2008), adaptation (Scarborough and Terry, 1998; Radnor and Bowden, 2008) or reinvention (Rogers, 2003). Hines *et al.,* (2008) also highlight the importance of adapting Lean implementation to take account of international cultural differences.

Kumon (2000) highlights subtle differences between US and European researchers on the diffusion of Lean. While American researchers tend to see the transferability of the system in positive terms, European researchers tend to focus on the selectivity of transfer or hybridisation. He notes that critiques of Lean have primarily emerged in Europe.

Keiser (1997) focuses on the role of rhetorics in making management concepts such as Lean popular. He frequently refers specifically to *The Machine* to identify a set of rhetorical devices employed that will determine whether a book will be become a bestseller. Table 19 summarises these devices and their particular manifestation in *The Machine.*

Table 19 Rhetorical Devices and Their Manifestation in *The Machine*

No.	Rhetorical device	How this devices was used in *The Machine*
1.	One factor is identified as the crucial one for success which has been gravely neglected and its discovery can be described as a revolutionary departure from management concepts valid til now.	Lean production. Other include organisational culture (Peters and Waterman, 1983); BPR (Hammer and Champy, 1993).
2.	The implementation of the new principles is presented as unavoidable because the old principles are bound to fail in the face of menacing dangers.	Efficiency gains of Japanese economy.
3.	The new principles are linked to highly treasured values	Customer satisfaction.
4.	The author does not instruct the manager but instead points out outstanding solutions that were achieved by extraordinary managers.	Lean production is presented as the masterful discovering of a young Japanese engineer and his production genius.
5.	No manager must feel guilty that he has not already thought of the new principle for himself.	The old principles were evidence of excellent management but pioneers are exceptional managers (so the earlier a manager accepts the new principle the sooner he becomes a fellow pioneer).
6.	A clever mixture of simple and clear concepts which are also ambiguous, vague, contradictory and puzzling.	The reader can project the problems he encounters in his organisation into the concept and interpret is as the solution to these pressing problems.
7.	The author point out the difficulty of implementation.	Lean production took many years for Toyota to perfect.
8.	The author couples the new principles to science and points to the results of systematic empirical research.	IMVP study. *'In management books results of empirical studies are often impermissibly generalised and manipulated'* (Keiser, 1997, p. 60)
9.	The book must be easily readable.	No foreign words or academic jargon used. Short sentences.
10.	Timing.	Japanese economic miracle.

(Source: the researcher, adapted from Keiser, 1997)

Benders (1999) focuses on the features that characterise OMIs like Lean. He argues that such concepts exhibit two key characteristics. First, they leave room for interpretation, referred to as the concept of interpretive viability. Second, they promise performance improvements. The author argues that interpretive viability is a necessary feature of a successful OMI for two reasons: first, there must be room for interpretation for the concept to be applied in varying situations; second, there must be room for interpretation for the concept to gain wide acceptance among the different parties that are involved in organisational change. He identifies that research focused on organisational concepts should be sensitive to the possibility of decoupling label and content. Such research should distinguish between rhetorical

adoption (applying the label) and substantive adoption (applying the content) since the two may, but do not necessarily, coincide. Benders and Bijesterveld (2000) consider the diffusion of Lean in Germany. Their study draws on a systematic literature evaluation to gain insight into Lean's reception in Germany and the impact of Lean on business practice. The authors find that empirical studies on Lean are extremely sparse and that most German authors prescribing Lean use it in a generic sense appealing to a 'beauty ideal' (p. 58). This means that Lean is no longer used to describe the means that Japanese car manufacturers deployed to become efficient. Rather, it has become so central to German management discourse that:

'This created a tautological circle, turning the message of 'Lean leads to efficiency' into 'it is efficient, so it must be Lean'

(Benders and Bijsterveld, 2000, p. 58).

The authors conclude that *The Machine* is a typical fashion-setting book and that Lean is an OMI that exhibits interpretive viability. More generally, the authors address the blurring of boundaries in the academic community. They argue that the rhetoric of fashion setters is at odds with academic criteria. Fashion setters try to convince managers of the merits of their products, while academics are expected to give a balanced account of the pros and cons. However, since academics are dependent on the business community their work must also be legitimate in the eyes of corporate sponsors:

'Academics then need to find ways to combine their prime task of expanding knowledge with societal pressure to use such knowledge,'

(Benders and Bijesterveld, 2000, p. 62).

Freitas (2008) also considers Lean as an OMI. Based on secondary data from the Workplace and Employment Relations Survey (WERS), she argues that Business Process Re-engineering (BPR) and Quality Circles (QCs) have developed into Lean. She suggests that as an OMI loses its novelty, it is likely to be reabsorbed and treated as an element of the new fashion rather than completely discarded.

Tracey and Knight (2008) however directly refute the concept of Lean as a management fashion. They argue that it is a philosophy based on traditional engineering and operations management concepts and that Lean is at the forefront

of advances in operations management practice today. The authors propose, however, that a gap exists between Lean theory and practice. This gap exists in three forms. First, the textbook gap where operations management text books lag behind current business practices; Second, the marketplace gap where the assumption is that lean management is a private sector practice and not sufficiently emphasised in academia; Third, the faculty gap where academia activities remains unrelated to application developments in Lean practice.

Construction is an industrial sector that attracted more academic attention than others following the publication of the Egan report (1996). Lean construction in the UK is now a sub-movement within the broader Lean movement and has a sub-literature within the broader Lean literature. Green (1999) criticises the Lean construction literature for ignoring the polemic elements of the broader Lean literature. He warns that the consequence of this is that construction policy risks being driven by dogma rather than a balanced appraisal of the available evidence. Green and May (2005) are also critical of the literature on Lean construction which they characterise as highly prescriptive and failing to recognise the social and politicised nature of the diffusion process. Based on interviews with construction industry policymakers, the authors propose an alternative view. They suggest that the diffusion of Lean occurs in contested pluralistic arenas where different actors mobilise different storylines to suit their own personalised agendas. Lean construction differs across different contexts, often shaped by pre-existing social and economic structures over which managers have little influence. They posit a broader conceptualisation of Lean construction as a quest for structural flexibility that involves restructuring, downsizing and outsourcing. Jorgensen (2008) also compares the literature on Lean construction with the broader Lean literature. They suggest that the former is under-developed compared to the latter, resulting in the slow development of critical debate in the Lean construction literature. They conclude that a coherent philosophy for Lean construction has yet to be developed and warn that both researchers and practitioners in the construction industry are currently being misled by an overly optimistic literature on Lean construction.

Some authors focus their attention on the diffusion of Lean into different manufacturing environments. For example, James-Moore and Gibbons (1997) highlight the fact that little research specifically addresses the application of Lean in

high value low volume (HVLV) goods manufacture. In a study that compares an aerospace case and vehicle manufacturing case, the authors conclude that there are product-derived, unique characteristics of HVLV production. It is these characteristics that explain the low level of Lean adoption in this type of environment, as opposed to a time lag in the diffusion process. Jina et al., (1997) also highlight technical and organsational barriers in HVLV manufacturing, however Lean can be adapted to overcome these barriers. Crute *et al.* (2003) provide further support for this view. Their study of the application of Lean in the HVLV aerospace industry concludes that implementation difficulties are typically explained by individual plant context issues as opposed to sector specific factors.

The diffusion of Lean into the service sector, or Lean service as it is sometimes referred to, has attracted particular attention recently. The service sector generally has grown in interest to the academic community over the last two decades (Johnston, 1998; Chase and Apte, 2007). In a classic Harvard Business Review (HBR) article Levitt (1976) advocated the desirability of transferring manufacturing practices to service operations. This view was endorsed by Chase (1978) who in particular advocated that service organisations separate of 'front' offices (dealing with customers) and 'back' offices (those processing work). His rationale was that since back offices were not dealing with customers, they could focus on operating at peak efficiency like factories do. Bowen and Youngdahl (1998) endorse this view. Noting that services are typically innovation laggards compared to manufacturing, the authors advocate the application of Lean in the services sector.

In a meta-analysis study of sixty services systems, Mayleff (2006) found considerable overlap in the processes typical of manufacturing and service organisations. Snee and Heorl (2009) also find similarities in service and manufacturing processes. Table 20 is adapted from Snee and Heorl (2009) as a summary of their views of the differences and similarities in service and manufacturing processes.

Table 20 Difference and Similarities in Service Processes and Manufacturing Processes

Differences	Similarities
Service processes lack suitable measurement systems.	All work occurs through processes.
Service processes are not well defined or standardised.	Processes provide information and data that can be used to improve them.
Service processes often have a greater human element.	All Processes have 'hidden factories' that add cost and reduce output.
Service processes typically lack engineers.	Undesired variation is a common source of process problems.

(Source: adapted from Snee and Heorl, 2009)

The authors conclude that service processes are more similar than different to manufacturing processes. They advocate the widespread application of a Lean Six Sigma hybrid improvement methodology for services.

Other authors have similarly proposed a role for Lean in the service sector since Womack and Jones (1996) first proposed the idea (see for example, Swank, 2003; Atkinson, 2004; May, 2005; Ehrlich, 2006; Abdi *et al.*, 2006; Corbett, 2007). However, some criticism has also emerged. In particular, Sprigg and Jackson (2006) found negative consequences for worker morale and performance in call centre that had adopted Lean. Overall, however, the application of Lean in the service sector is ongoing and evidence is emerging (Piercy and Rich, 2009).

Seddon (2005, 2008) has been a major exponent of Lean service. His work in the service sector has culminated in an improvement approach, known initially as Lean Systems, but latterly as Systems Thinking. As discussed previously, the change of name reflects Seddon's disenchantment with the UK Lean movement. In earlier work, he allied himself closely with the Lean movement (see Seddon and Caulkin, 2007; Jackson *et al.*, 2008). More recently, however, Seddon has espoused a critique of the Lean movement. He accuses the Lean movement of providing Ohno's work on the TPS with a label. The effect of this 'labelling' (Seddon, 2005, p. 182) has been to legitimise the codification of method (or how Ohno achieved TPS) and of presenting this method as a suite of tools and techniques. For Seddon, the choice of improvement method should be based upon an understanding of the problem. In Ohno's case the problem to be solved was how to produce cars at the rate of customer demand. He argues that service organisations are not faced with that particular problem. However, advocates of Lean frequently conceptualise Lean as a

toolkit (see for example Radnor *et al.*, 2006, p. 1), without fully understanding the particular problem faced by that organisation. The result is often the application of the wrong tools and improvement work that is ineffective. Seddon argues that the task of the service organisation is to design around and absorb demand variety and that this should therefore guide improvement work. Seddon is particularly critical of improvement work focused on standardisation. Standardisation is a key tenet of Lean. Bicheno and Holweg (2009) define standard work as a key component of TPS that aims to create reliable processes and procedures. Seddon argues that service organisations should avoid the application of standard work since it reduces their ability to absorb demand variety. He argues that the application of Lean and in particular standard work at HMRC has led to the alienation and demoralisation of the workforce (Seddon *et al.,* forthcoming). This view has some support in recent press releases (www.public service.co.uk, *Staff Morale is Rock Bottom at HMRC*, 9th Mar 2010). Bicheno and Holweg (2008) offer some support for Seddon's view. They argue that service organisations adopting Lean often try to adapt the manufacturing tools derived from Toyota, instead of deriving what to do from the more fundamental and profound systems ideas that Toyota used to develop TPS. Seddon's Systems Thinking approach also challenges the division of service processes into front office and back offices based on efficiency gains (Levitt, 1971; 1976; Chase, 1978).

The public sector forms an important part of the wider service sector. In recent years various organisations within the public sector have also begun to experiment with Lean implementation (Radnor, 2010). HM Treasury recently published their Operational Efficiency Programme Final Report in which they recommend that continuous improvement tools such as Lean be used more systematically across the public sector. The report states that:

'there are numerous and diverse examples of continuous improvement in public services, based on Lean principles, which have delivered substantial improvements'

(Treasury, 2009, p. 79).

The report cites four examples of successful public sector Lean applications. These are summarised in Table 21.

Table 21 Public Sector Lean Applications

Department	Programme name	Successes so far...
Police service	Operation QUEST	72% reduction in number of apology calls in Brighton and Hove. Projected net office time savings worth over £1million pa in Norfolk.
HMRC	Pacesetter	Productivity increases of 30% in areas where Pacesetter is operational.
Local government	National Process Improvement Project (NPIP)	Efficiency gains of up to 12% across 10 service areas and types of Local Authority.
DWP	The Lean Way	Efficiency gains of 18-30% and savings of over £10million pa with projected savings of over £40 million.

(Source: Treasury, 2009)

In a literature review of improvement methodologies in the public sector, Radnor and Bowden (2008) found that over half were focused on Lean. They found that health is the area of the public sector with the most reported applications of Lean. Young *et al.* (2004) argue that there is obvious opportunity for the application of Lean in healthcare, in particular the elimination of delays, repeated encounters, errors and inappropriate procedures. Greenhalgh *et al.* (2004) considers how we spread and sustain innovations in UK health service delivery and organisation. Their systematic literature review confirms many well-established themes in the DOI literature: innovation attributes predict but do not guarantee adoption; the importance of social influence and networks; the complex and contingent nature of adoption and implementation processes; the characteristics of organisational innovativeness. Their findings also expose some anomalies in the current DOI literature: the lack of empirical evidence for adopter traits; the disproportionate focus on centralised over decentralised diffusion; the limited generalisability of empirical work on product based innovations; and, the lack of empirical studies on the sustainability of complex service innovations. They conclude that there are few empirical studies that acknowledge let alone focus on the complexities of spreading and sustaining innovations in service organisations. They argue that context and setting are not extraneous to the object of study but an integral part of it. Kollberg *et al.*, (2007) examine the application of Lean in the Swedish healthcare services. They highlight three important issues surrounding the application of Lean into health care: wider issues concerning new public management; the focus on the patient as the primary customer; and, demand predictability. There are a number of case studies describing the successful application of Lean in health care (Rogers et al., 2004; Sobek and Jimmerson, 2004; Miller, 2005; Spear, 2005). Papadopoulos and Merali (2008) use

Actor Network Theory (ANT) to elucidate the dynamics of Lean implementation in a UK hospital Trust. ANT offers a framework that recognises the diversity of stakeholder agendas to explore how the social, political and cognitive dimensions of networks evolve. Radnor and Bowden (2008) support the view that Lean in the UK public sector is a process of adaptation rather than adoption.

Outside of health care, in a study of non-health public sector organisations in Scotland, Radnor *et al.* (2006) conceptualise two approaches to Lean implementation: full implementation; and, rapid implementation. Full implementation in where Lean is embedded into the wider organisational culture is rarely found in the public sector. Rapid implementation, based on the concept of kaizen blitz (see Bicheno and Holweg, 2009) to make small but quickly introduced changes, is now common across the Scottish public sector. The authors draw on this evidence to conclude that Lean can be used to develop better processes, improve flow, reduce waste and develop an understanding of customer value. In studies to evaluate the success of Lean in HMRC and HMCS, Radnor and Bucci (2007; 2010) conclude that Lean can and should be, diffused into the public sector. Hines and Lethbridge (2008) report early findings of the diffusion of Lean in universities. Bagley and Lewis, (2008) compare Lean to other policies over recent decades that seek to stimulate in the public sector the conditions that make the private sector compete (such as, for example, compulsory competitive tendering, outsourcing, best value initiative, capability reviews, inspections and targets).They conclude that the problem with 'quasi-competition' is that it delivers 'quasi-solutions'. They suggest targets should be designed with behaviours, rather than numbers, in mind. Seddon (2008) is also sceptical of targets in the public sector. In recent work, Seddon has directed his attention away from private sector service organisations and towards public sector organisations. He is highly critical of the UK current public sector reform regime for being based on a set of false beliefs. These beliefs are predicated on a certain set of assumptions, namely, that: inspection drives improvement; economies of scale increases efficiency; choice and 'quasi-markets' are levers for improvement; people can be motivated with incentives; organisational leaders need visions and managers need targets; and, information technology drives change. He challenges these assumptions drawing on a range of examples from various public sector organisations.

4.2 Chapter Review

This chapter reviews literature that is referred to as Focal because is specifically concerned with the diffusion of the Lean OMI. Table 22 provides a chronological summary of main contributors to this literature.

Table 22 Key Contributions on the Diffusion of Lean

Author	Year	Contribution
Kenney and Florida	1993	Lean is reproducible in all advanced capitalist economies.
Lillrank	1995	An analogy may be drawn between the transfer of management concepts from Japan like Lean to the transfer of electric power over long distances.
MacDuffie and Pil	1997	The international diffusion of Lean is determined by greater international competition, managerial choice, labour union choice and government policies. As more companies pursue Lean, variation in the rate of adoption increases.
Keiser	1997	The rhetoric of *The Machine* is a key determinant of its success.
James-Moore and Gibbons	1997	There are characteristics of High Value Low Volume (HVLV) manufacturing which explains why Lean has been slow to diffuse there.
Jina *et al.*	1997	There are major barriers to the application of Lean in HVLV manufacturing.
Scarborough and Terry	1998	Lean implementation is a process of creative adaptation.
Bowen and Youngdahl	1998	Service organisations should adopt Lean practices.
Liker *et al.*	1999	Transferred management systems like Lean are hybrids.
Benders	1999	Interpretive viability determines whether an organisational concept will diffuse.
Green	1999	The construction sector has ignored the critical literature on Lean and Lean dogma many drive construction policy.
Benders and Bijsterveld	2000	Lean is characterised by 'interpretive viability'
Kumon	2000	Americans tend to regard the diffusion of Lean more positively than Europeans.
Crute *et al.*	2003	Lean is applicable for the manufacture of high value, low volume goods.
Young *et al.*	2004	There are obvious applications of Lean in UK health care service provision.
Greenhalgh *et al.*	2004	Context and confounder lie at the heart of diffusion of complex innovations like Lean in the UK health delivery and organisation. Multiple interactions arise in particular context and setting and are precisely what determine the success or failure of an innovation initiative.
Green and May	2005	The literature on Lean construction is prescriptive and fails to recognise the social and political nature of the diffusion process.
Seddon	2005	The various parties that have encouraged the diffusion of Lean into the service sector have interpreted Lean as a suite of tools and techniques. They have failed to represent Ohno's work from a systems perspective.
Sprigg and Jackson	2006	There may be negative consequences in terms of worker morale and performance in the adoption of Lean in services.
Radnor *et al.*	2006	Examples are rare but Lean can and should be diffused into the public sector.
Corbett	2007	Lean diffusion is widespread in the UK.

Author	Year	Contribution
Kollberg *et al.*	2007	Lean is applicable in health care services.
Radnor and Bucci	2007	Lean is being successfully implemented into HMRC.
Seddon	2008	Lean is being introduced into public sector organisations without those organisations taking a systems view. There have been some, and will be in others, detrimental unintended consequences as a result.
Jorgensen	2008	Lean in construction is in danger of being misled b y the broader and overly optimistic Lean literature.
Radnor and Bucci,	2008	Lean can be applied to the public sector and health has the most reported applications of Lean so far.
Radnor and Boaden	2008	Lean can and should be diffused into the public sector.
Tracy and Knight	2008	A gap exists between Lean theory and Lean practice.
Piercy and Rich	2008	The application of Lean in the service sector is still emerging and empirical evidence remains sparse.
Majek and Hayter	2008	Lean is an important case in hybridisation.
Shah *et al.*	2008	Lean can be successfully applied in health care in spite of the difference in the supply chain characteristics of health care.
Papadapoulos and Merali	2008	Actor network theory (ANT) provides a framework for understanding the social, political and cognitive dimensions of network dynamics. It is a useful framework for exploring the application of Lean in health care.
Hines and Lethbridge	2008	Lean is beginning to diffuse into the university sector.
Bagley and Lewis	2008	Lean can and should be diffused into the public sector.
Hines *et al.*	2008	National characteristics influence organisational culture and therefore the likely success of Lean implementation.
Freitas	2008	Lean is likely to be absorbed into another management fashion rather than discarded completely.
Snee and Heorl	2009	Manufacturing and services are more similar than they are different. Thinking they are different is the main hurdle to diffusion but the lean six sigma hybrid should be widely adopted.
Radnor and Bucci	2010	Lean has had significant impact in HMCS.
Radnor	2010	Lean is one of several business process improvement methodologies being deployed in the public sector.

(Source: the researcher)

It is notable from the table that few authors have explored the full range of influences and dynamics of Lean diffusion and those that do have either examined Lean in another country (Benders and Bijsterveld, 2000) or Lean in construction (Green and May, 2005) sub-movement within the broader Lean movement. This study focuses on the dynamics of the broader Lean movement and thereby offers a contribution to our current knowledge of Lean diffusion.

Chapter 5 Research Methodology

Several authors distinguish between research methodology and research methods. Silverman (2005) defines research methodology as being how research is conducted and research methods as the specific research techniques. Ghauri and Gronhaug (2002) by contrast define research methodology as the system of rules and procedures and research methods as the tools for proceeding to solve the research problem. Wass and Wells (1994) define research methodology as the instrument through which the research objectives are achieved. However, research methodology is more than merely a label for methods of investigation (Blaug, 1992). It bridges the gap between higher philosophical ideas and research findings (Wass and Wells, 1994). The purpose of this chapter is to begin building that bridge.

Reference was made in Chapter 1 to Watson's 'What, Why and How' framework for crafting research. The consideration posed by employing this framework have been addressed and interpreted for the purpose of this study in Figure 11.

Figure 11 Interpretation of Watson's Framework for the Purpose of this Study

What?	Why?
•The Lean phenomenon intrigues me. Lean appears to be more widespread and to have achieved greater longevity than other similar OMIs. •**Overarching Research Question: Why and how has Lean diffused in the UK over the past two decades?**	•Many organisations are embarked on Lean (or some other OMI) inspired improvement programme. •Today many service and public sector organisations are becoming interested in Lean.
How – conceptually?	**How – practically?**
•By drawing on two bodies of literature that focus on innovations and how those innovations diffuse. •By using a conceptual framework that brings together the current body of literature on Lean with these two bodies of literature.	•Through qualitative analysis of Lean publications and qualitative analysis of in-depth interviews with individual who have expertise in Lean.

(Source: the researcher)

The top two quadrants concerning what and why formed the subject of the Introduction which explained the researcher's rationale and motivation. The bottom left quadrant addresses the conceptual underpinning for the study and formed the basis of the literature review in chapters 2 to 4. The final quadrant in the model forms the focus of this chapter.

In order to most effectively explain and justify the methodology developed, this chapter is divided into five sections. The first section locates the study within the range of philosophical perspectives and paradigms that underpin business and management research. The aim of this section is to be explicit about the researcher's personal research paradigm, to distinguish between this the researchers' personal stance and the dominant research paradigm, both of the wider business and management field of study and of the narrower the operations subfield. The second section explains the research approach that has been adopted in the study and how it aligns with the researchers' personal stance. The third section justifies the research design deployed in this study. The fourth section explains the research design and data collection methods deployed including details of how the research was conducted. The chapter closes with a fifth section in which the strengths and weaknesses of the research design are examined. The researcher has constructed a brief glossary of some of the commonly used terms within the research methodology literature. This glossary is included in Appendix A. As in the previous chapters, tables are frequently used as a device to provide dense information in a more easily digestible form. Some tables are compiled and others are adapted. By *compiled* the researcher means they are reproduced, though often in a simpler form; by *adapted*, the research means that they have been developed by her, drawing on the text.

5.1 Research Paradigms

Guba (1990) defines a paradigm as a basic set of beliefs that guides action. Paradigms encompass three elements: ontology (raising questions about reality); epistemology (raising questions of knowledge) and methodology (raising questions of how we gain knowledge about the world). They deal with first principles and define a world-view that guides the investigator not only in choices of methods but also in ontologically and epistemologically fundamental ways.

Many commentators have developed a typology of different research paradigms. For example, Easterby-Smith *et al.*, (2002) compare two dominant research paradigms (positivist and phenomenological) and identify the preferred methods for each. Similar comparisons are made by Wass and Wells (1994) and Saunders et al., 2007). Table 23 is adapted from Guba and Lincoln's (1998) typology of four main research paradigms.

Table 23 Main Research Paradigms

	Positivist	Post-positivist	Critical theory	Constructivism/Interpretivist
Ontology	Realism – there is one reality which exists.	Reality exists but it cannot be perfectly understood because it is flawed by human intellectual mechanisms.	Historical realism – a reality is assumed to be apprehendable but is viewed as being shaped by political, economic, ethnic and gender factors.	Relativist – there are realities to understand but these are always multiple and intangible constructions. They are based on social and experiential knowledge which is local and specific in nature. They can also change as those investigated become more informed.
Epistemology	Dualist and objectivist – the investigator and investigated object are assumed to be independent entities and the investigator is assumed to be able to investigate the object without influencing it.	Modified dualist/objectivist – dualism is abandoned but objectivity is an ideal	Transactional and subjectivist – the investigator and investigated are assumed to be interactively linked with the values of the investigator inevitably influencing the inquiry. Ontology and epistemology are interlinked.	Transactional and subjectivist - findings are created as the investigations proceeds because the investigator and investigated are interlinked.
Methodology	Experimental and manipulative – hypotheses are stated in propositional form and subjected to empirical testing.	Modified experimental/manipulative – emphasis on critical multiplism as a way of falsifying hypotheses. Inquiries are conducted in more natural settings, collecting more situational information.	Dialogue and dialectical. The dialogue is dialectical in that the investigator seeks to transform those they investigate to make them realise that structures can be changed through action.	Dialectical – the nature of social constructions suggests that individual constructions can be elicited and refined only through interactions between and among investigator and respondents.

(Source: adapted from Guba and Lincoln, 1998)

Johnson *et al.*, (2006) recently produced a similar typology in which alternative terms are used. They refer to post-positivism as neo-empiricism and to constructivism/interpretivism as affirmative postmodernism.

The table illustrates that approaches to the social sciences can be divided into two main camps: those that argue that the social sciences can and should with minimal modification follow the methods of the natural sciences (the positivist camp); and, those that reject any attempt to apply the methods of the natural sciences to the study of the social world (the interpretivist/constructivitist camp). The positivist camp has dominated business and management research for decades (Bryman and Bell, 2003). Positivism is a natural science epistemology which advocates the application of the methods of the natural sciences to the study of social reality. It is guided by the four principles of positivism: phenomenalism; deductivism; inductivism; and, objectivism (Byman and Bell, 2003). A variety of terms are used in the literature to capture the alternative to positivism, based on a constructivist ontology, including interpretivism (Bryman and Bell, 2003) naturalism (Wass and Wells, 1994), phenomenology (Wass and Wells, 1994; Byman and Bell, 2003) and post-modernism (Silverman, 2005). While there are subtle differences in these terms, they are commonly used to include the views of writers who have been critical of the application of the scientific model to the study of the social world and who have been influenced by other intellectual traditions (Bryman and Bell, 2003).

Some authors conceptualise research paradigms in terms of a distribution, positioning positivism and naturalism at the polar extremes, with the middle ground occupied by realism (Wass and Wells, 1994). Realism is a branch of epistemology which is similar to positivism in that it assumes a scientific approach to the development of knowledge (Saunders *et al.*, 2007). Some authors distinguish between two types of realism (Wass and Wells, 1994; Bryman and Bell, 2003; Saunders *et al.*, 2007). For example, direct or empirical realism is a position that asserts that reality can be understood through the senses while critical realism is a position that asserts that our knowledge of reality is a result of social conditioning (Saunders *et al.*, 2007). Some authors argue that critical realism is a naturalistic interpretation of realism (Wass and Wells, 1994). Other authors argue that critical realism firmly rejects both the extremes and that it has its own ontology (Ackroyd and Fleetwood, 2000; Fleetwood and Ackroyd, 2004). They reject the view that critical realism is an attempt to occupy some middle ground between two extremes in the hope of reaching an accommodation that might be acceptable to the less extreme proponents of each approach (Wight 1988). Wight (1988) comments that it does not

follow that simply because positions differ from one another the mid-point is a better alternative,

'A synthesis based upon two incorrect positions produces only a synthesis of two incorrect positions - not a correct, or better, position'

(Wight, 1988, p. 24).

5.1.1 Critical Realism

Critical realism presents an alternative ontology that highlights fundamental weaknesses inherent in both the positivist and naturalist paradigms. It is a blend of Bhaskar's (1979) general philosophy of science (transcendental realism) and special philosophy of the human sciences (critical naturalism). Since it first became popular in the 1970s critical realism has become one of the major strands of social scientific method rivalling both positivism/empiricism and naturalism/interpretivism. Some authors argue that critical realism has the potential to unify the field of management studies and that this potential is currently overlooked (Ackroyd and Fleetwood, 2000). Critical realism in business and management has inspired considerable interest in recent literature (Junor, 1996; Reed, 2005; 2005a; 2009; Contu and Wilmott, 2005).

In essence, critical realists are concerned with the way in which events are generated over time. They do not seek to position their findings into general laws but rather seek to explain specific phenomena and how they came to be.

Sayer (1992) offers eight principles (which he terms 'signposts') to characterise critical realism. Table 24 is adapted from Sayer (1992) as a summary of these principles.

Table 24 Principles of Critical Realism

No.	Principles/Signpost of Critical Realism
1.	The world exists independently of our knowledge of it.
2.	Our knowledge of the world is fallible and theory-laden, though knowledge is not immune to empirical check.
3.	Knowledge develops neither wholly continuously as the steady accumulation of facts within a stable conceptual framework, nor discontinuously through simultaneous and universal changes in concepts
4.	There is necessity in the world; objects, natural or social, have particular powers or ways of acting and particular susceptibilities
5.	The world is differentiated and stratified, consisting of not only events but structures which have powers and liabilities capable of generating events
6.	Social phenomena are concept dependent and therefore their meaning has to be interpreted.
7.	Science or the production of any kind of knowledge is a social process.
8.	Social science must be critical of its object.

(Source: adapted from Sayer, 1992)

Three of the principles (numbers 1, 2 and 8) are common to most forms of realism but critical realism may be differentiated by the others. Critical realism is a large and complex school of thought and field of study. In the interest of brevity, the main underpinning concepts of critical realism are contained in Appendix B. Table 25 illustrates Tsoukas' (2000) summary of the ontological assumptions of critical realism.

Table 25 Ontological Assumptions of the Realist View of Science

	Domain of Real	Domain of Actual	Domain of Empirical
Mechanisms	X		
Events	X	X	
Experiences	X	X	X

(Source: Tsoukas cited in Ackroyd and Fleetwood, 2000)

This table illustrates that, according to Tsoukas (2000), social reality is stratified into three domains: the empirical domain is made up of experience and events through observation; the actual domain includes events whether observed or not and the real domain consists of the processes, powers and causal mechanisms that generate

events. The critical realist aims to explain observable phenomena with reference to underlying structures and mechanisms. Sayer (1992) also defines the critical realism ontology as stratified and concludes that critical realist explanation and theorising involves revealing the underlying mechanisms and structures that connect events in causal sequences. Archer *et al.* (1999) summarise the three advantages critical realism has to offer the researcher: first, the idea of a stratified ontology; second, the idea that social structures and human agency exhibit causal powers and that the task of the social scientist is to explore their interaction; and third, the idea that the researcher starts with the assumption that (rather than there being one cause producing one effect) there is more likely to be a whole range of causes interacting with each other and producing a variety of effects in different circumstances.

5.1.2 The Researchers' Philosophical Stance

In the previous sections greater attention was paid to the critical realist paradigm than of others. The reason for this is that critical realism is the researcher's preferred paradigm. It is the one that is most closely aligned both with the researcher's philosophical stance and with the purpose of the study. A positivist paradigm underplays the importance of human interpretation and interaction in the diffusion of OMIs. A constructivist paradigm underplays the external reality that is visible to all. The fact that many organisations are now familiar with and are experimenting with Lean is an indisputable reality. Therefore while Lean itself might be socially constructed, the effects on organisations are real and visible. The researcher therefore rejects the extreme positions, both of which favour certain methodological choices. Instead, the researcher adopts a critical realist philosophy which embraces a wide range of methodological approaches.

In broad terms, this study adopts a post-positivist methodological approach. There are two reasons for this: First, methodology is not solely influenced by philosophical stance but also by personal background, training and experience. The researcher has a background in operations management (OM). OM is a subfield of the business and management field of study in which the positivist paradigm remains dominant, especially in the US (McCutcheon and Meredith, 1993; Vokura, 1996; Meredith, 1998; Naslund 2002; Sprague, 2007). A number of authors have identified the relative paucity of case and field research in operations management (Wood and Britney, 1989; Ebert, 1989; McCutcheon and Meredith, 1993). This has been

addressed by some authors, in particular, authors focused on Lean and OMIs like Lean. However, her personal background experience in the OM field has steered the researcher away from the constructionist end of the research spectrum and towards the positivist end. Second, the researcher is mindful of the fact that recipients of this study are also likely to come from an OM background and are therefore also likely to be more familiar with, and sympathetic to, positivist approaches. The researcher's sensitivity to the recipients of this document has therefore also influenced methodological decisions.

5.2 The Research Approach

There is a clear relationship between the research paradigm of the researcher and the research approach adopted (Burrell and Morgan, 1979; Gill and Johnson, 1991; Blaikie, 1993). In this study, the researcher's critical realist research paradigm has drawn her towards an explorative, qualitative study which adopts a process view of the phenomenon under inquiry. The constituent elements of this overarching statement are deconstructed in the following sections. The approach is primarily based on grounded theory (Glaser and Strauss, 1967), however the research design incorporates both elements of both inductive and deductive theory building (Eisenhardt, 1989).

5.2.1 The Exploratory and Qualitative Aspect

The research topic of this study is how and why Lean has diffused in the UK over time. The review of the Focal literature identified only two similar studies. The first addressed the diffusion of Lean in Germany (Benders and Bijesterveld, 2000) in which the primary data collection method used was publications data. The second addressed the diffusion of Lean in UK but into the construction industry only (Green and May, 1999) in which the primary data collection method was in-depth interviews. The research design of this study takes a multi-methods approach and incorporates both the data collection instruments used in these similar studies. However, the dearth of similar studies means that this study is primarily exploratory in nature.

Qualitative research studies phenomena in the environments in which they naturally occur and use meanings that social actors attach to phenomena to understand them (Denzin and Lincoln, 2000). It is generally multi-method in approach and typically

uses an interpretive, naturalistic approach to its subject matter which emphasises the qualities of entities, the processes and meanings that occur naturally (Denzin and Lincoln, 2000). Miles and Huberman (1994) identify eight features common to most qualitative research. Table 26 compares this study against each of those features.

Table 26 Common Features of Qualitative Research and their Application in this Study

	Feature	Application in this study
1	Research is conducted through an intense and/or prolonged contact with a 'field' or life situation.	The researcher has 15 years of work experience in an organisation involved in the Lean movement.
2	The researcher's role is to gain an 'holistic' (systematic, encompassing, integrated) overview of the context under study, its logic, its arrangements, its explicit and implicit rules.	The researcher favours a critical realist research paradigm and process approach.
3	The researcher attempts to capture data on the perceptions of local actors 'from the inside', through a process of attentiveness, of empathetic understanding and of suspending preconceptions about the topic under study.	The research design and strategy incorporates a series of interviews designed with a cooperative format.
4	Reading through materials, the researcher may isolate certain themes that can be reviewed with informants but should be maintained in their original forms throughout the study.	The findings chapter includes much of the original data from which the researcher has interpreted meanings.
5	A main task is to explicate the ways people in particular settings come to understand, account for, take action and otherwise manage their day-day-day situation.	Data collection includes in-depth interviews.
6	Many interpretations of the material are possible but some are more compelling for theoretical reason or on grounds of internal consistency.	Data collection includes in-depth interviews with multiple informants.
7	Relatively little standardised instrumentation is used at the outset. The researcher is essentially the main 'measurement device' in the study	The research design does incorporate some standardised instrumentation. The methodological approach adopted is post-positivist.
8	Most analysis is done with words. The words can be assembled, sub-clustered, broken into semiotic segments. They can be organised to permit the researcher to contrast, compare, analyse and bestow patterns upon them.	The research design incorporates the use of computer software data analysis tool in order to facilitate and enhance data analysis.

(Source: the researcher, adapted from Miles and Huberman,1994)

The table illustrates that the features common to qualitative studies apply to this study.

Qualitative research does, however, present a number of challenges (Miles, 1979; Seale, 1999; Cassell and Symon, 2006; Johnson et al., 2007). Mason (2002) identifies the problem of constructing and presenting a convincing argument on the

basis of qualitative data. Miles and Huberman (1994) identify that the strength of qualitative research rests very heavily on the competence with which analysis is carried out. Bryman and Bell (2003) criticise many qualitative studies for generating interesting and illuminating findings but unclear theoretical significance. Miles and Huberman (1994) pinpoint the challenge that qualitative research presents:

'The challenge is to be explicitly mindful of the purposes of your study and of the conceptual lenses you are training on in, while allowing yourself to be open to and re-educated by things you didn't know or expect to find'

(Miles and Huberman, 1994, p.56).

Qualitative research is therefore appealing to the researcher because of the richness of the data generated. However, data analysis and theory generation can be difficult. Mason (2002) offers a set of guiding principles for the conduct of qualitative research. These are summarised in Table 27.

Table 27 Guiding Principles for Conduct in Qualitative Research

No.	Qualitative research should be.....
1.	Systematic and rigorous but not rigid.
2.	Accountable (by being amenable to assessment).
3.	Strategically conducted (thoughtfully planned but attentive to changing circumstances).
4.	Reflexive (recurrently asking difficult questions about the role of the researcher in the research process).
5.	Provide explanations or arguments (not just mere descriptions that appear factual).
6.	Recognise that the distinction between qualitative and quantitative is not clear-cut.
7.	Recognise that research is a moral practice involving many moral and political dilemmas.

(Source: compiled from Mason, 2002).

The research design and execution has been guided by these overarching principles.

5.2.2 The Process Aspect

One advantage of qualitative research is its ability to accommodate a process approach. This is an approach in which data is gathered that indicates how processes unfold over time. Pettigrew et al., (2001) comment that,

'.....process questioning involves the interrogation of phenomena over time using the language of what, who, where, why, when and how'

(Pettigrew et al., 2001, p. 21).

Such an approach therefore aligns well with a critical realist research paradigm in which the working of underlying mechanisms are contingent and conditional and therefore are only found in particular local, historical or institutional contexts.

A process theory approach offers a model of scientific explanation that is different from the more commonly adopted variance approach favoured by a positivist research paradigm (Van de Venn, 1992; Van de Venn and Poole, 1995; Van de Venn *et al.*, 2000). Table 28 has been compiled from Van de Venn et al. (2000) to summarise the key differences between the process approach and the more conventional variance approach.

Table 28 Variance versus Process Approach

Variance Approach	Process Approach
Fixed entities with varying attributes	Entities participate in events and may change over time
Explanations based on necessary and sufficient causality	Explanations based on necessary causality
Explanations based on efficient causality (a force conceived as acting on a unit of analysis	Explanation based on final, formal and efficient causality
Generality depends on uniformity across contexts	Generality depends on versatility across cases
Time ordering among independent variables is immaterial	Time ordering of independent variables is critical
Emphasis on immediate causation	Explanations are layered and incorporate both immediate and distal causation
Attributes have a single meaning over time	Entities, attributes, events may change meaning over time

(Source: compiled from Van de Venn et al., 2000)

A process approach seeks to overcome the weakness of the more conventional variance approach that is premised upon focusing on a single point in time, reductionist, and offer simple answers to complex problems (Naslund, 2002). Pettigrew (1997) defines process research as:

'*.....research concerning any process that exists between two points in time, for which the irreducible purpose is to account for and explain the what, why and how links between the context, processes and outcomes*'

(Source: Pettigrew, 1997, p.340).

Pettigrew suggests a theory of method for conducting process research that involves what he calls five internally consistent guiding assumptions. These are summarised in Table 29.

Table 29 Five Internally Consistent Guiding Assumptions for Conducting Process Research

No.	Guiding Assumption
1.	Embeddedness or studying processes across a number of levels of analysis
2.	Temporal connectedness or studying processes in past, present and future time.
3.	A role in explanation for context and action.
4.	A search for holistic rather than linear explanations
5.	A need to link process analysis to the location and explanation of outcomes.

(Source: Pettigrew 1997).

The table illustrates that, according to Pettigrew, the first assumption is that social processes are deeply embedded in the contexts within which they interact, and can only be studied as such. The second assumption emphasises the need to understand temporal interconnectedness, which he defines as the sequence and flow of events over time and stresses the need to study case processes in past, present and future time. The third guiding assumption is that context and action are inseparably intertwined so that it is not possible to talk about process without also discussing human agency in context. The fourth and fifth assumptions emphasise the need for holistic explanations of process. Pettigrew's guiding assumptions have been instrumental in guiding this study, particularly in its' aspiration towards an holistic perspective on Lean diffusion.

5.2.3 The Role of Theory

A theory is a set of concepts used to define and/or explain some phenomenon (Silverman, 2005). Good theory should be parsimonious, testable and logically coherent (Pfeffer, 1982; Whetten, 1989). Bryman and Bell (2003) distinguish between grand theories, which operate at an abstract level (such as critical theory or post structuralism), and middle-range theories, which operate in a far more limited domain (such as contingency theory, which has been widely used in business and management). Middle-range theories are generally the main focus of empirical research.

Theory emerges from research through deduction or induction. Deductive theory represents the most common view of the nature of the relationship between theory

and research where theory, and the hypothesis deducted from it, comes first and drives the process of data gathering. Inductive theory reverses the logic so that theory follows data gathering (Bryman and Bell, 2003). Cresswell (1994) suggests that quantitative research generally uses theory deductively while qualitative research generally uses theory inductively. In practice, however, research involves an interactive weaving between theory and data and the relationship between the two is not as clear cut as Creswell suggests. Saunders *et al.*, (2007) argue that it is misleading to convey the impression that there are rigid divisions between deduction and induction,

'Not only it is perfectly possible to combine deduction and induction within the same piece of research, but also in our experience it is often advantageous to do so'

(Saunders *et al.*, 2007, p.119).

The research approach adopted in this study incorporates both induction with the aim of theory building from the Lean phenomenon and movement as well as deduction from the testing of theory developed in selected literatures. Furthermore, in close alignment with a critical realist paradigm, the study incorporates retroduction (see Appendix B) meaning that close attention is paid to the process of identifying what causal powers are active in a given situation.

Finally, the study incorporates grounded theory. In their pioneering book *The Discovery of Grounded Theory,* (1967), Glaser and Strauss challenged the hegemony of the quantitative research paradigm in the social sciences with the notion that theories should be grounded in real world observations. In grounded theory, analysis begins early with the coding of emerging data and coding starts the chain of theory development (Calloway and Knapp, 1995). Grounded theory methods consist of systematic inductive guidelines for collecting and analysing data to build middle-range theoretical frameworks that explain the collected data (Charmaz, 2000).

5.3 Research Design

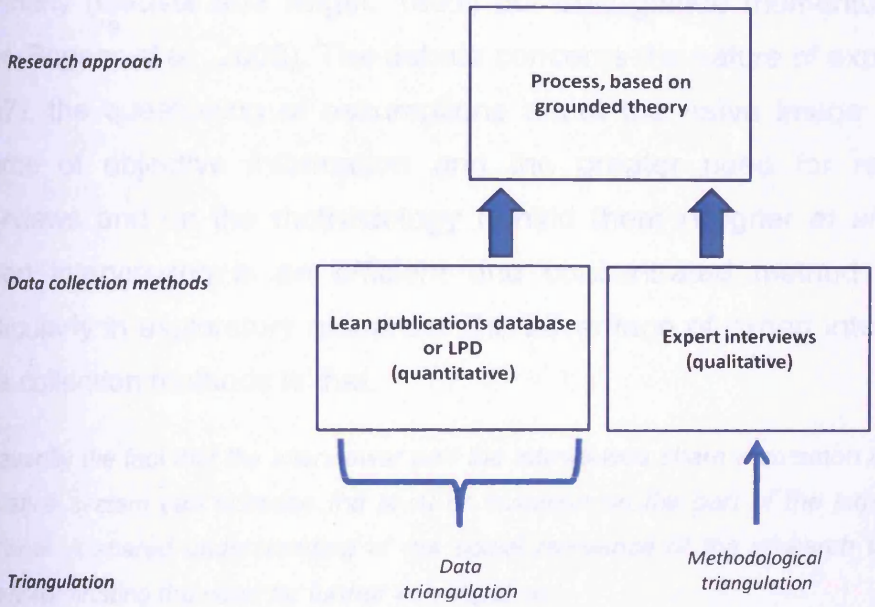
Research design may be defined as,

'A framework for the generation of evidence that is suited both to a certain set of criteria (for evaluating research) and to the research question in which the researcher is interested'

(Bryman amd Bell, 2003, p.31).

Research design relates to the choice of strategy to collect the data needed to answer the stated research problem (Ghauri and Gronhaug, 2002). The research problem this study addresses is how and why Lean has diffused in the UK over time. The research design that has been devised to address this problem is an exploratory, qualitative design to facilitate a process approach based on grounded theory. The components of the research design are illustrated in Figure 12.

Figure 12 Research Design



(Source: the researcher)

The design of this study incorporates two primary data collection methods in order to generate both quantitative and qualitative evidence.

The first data collection method is the Lean publications database (LPD) which serves the primary purpose of providing quantitative evidence that Lean *has* diffused over time. The literature review revealed that the literature on managerial fashions and fads advocates the use of longitudinal bibliometric data collection (Abrahamson and Fairchild, 1999; Carsen *et al.*, 1999). This research study follows that precedent. The LPD identifies patterns of publications on Lean over time and traces the nature of various publications as well as their frequency and occurrence. The LPD provides

evidence of the shift in the Lean movement from its origins in manufacturing and into the service, public and third sectors more recently.

The second data collection method is a series of expert interviews which serve the primary purpose of providing qualitative evidence of *why* and *how* the diffusion of Lean has occurred. Expert interviews are incorporated into the research design because the quantitative evidence generated via the publications database was regarded as necessary but not sufficient to address the research questions posed. Although the use of expert interviews has long been popular in social research, the debate surrounding expert interviews is more recent. A systematic debate began in Germany (Meuser and Nagel, 1991) but only gained momentum some ten years later (Bogner *et al.*, 2009). The debate concerns the nature of expertise itself (Evans, 2007), the questioning of assumptions about the naïve image of the expert as a source of objective information and the greater need for reflection on expert interviews and on the methodology behind them (Bogner *et al.*, 2009). However, expert interviewing is an efficient and concentrated method of data gathering, particularly in exploratory research. The advantage of expert interviewing over other data collection methods is that,

'Frequently the fact that the interviewer and the interviewee share a common scientific background or relevance system can increase the level of invitation on the part of the expert to participate in an interview. A shared understanding of the social relevance of the research can often be assumed, largely eliminating the need for further investigation.'

(Bogner *et al.*, 2009, p. 2).

Expert interviews are a manifestation of purposive sampling. Gummesson (1991) advocates purposive sampling where the aim is not to establish a representative sample but rather to identify key informants whose context-specific knowledge and expertise regarding the issues relevant to the research are significant and information rich.

Interviews are often categorised as structured, semi-structured and unstructured (Mason, 2002; Bryman and Bell, 2003; Silverman, 2005). Structured interviews aim to capture precise data of a codable nature in order to explain behaviour within pre-established categories whilst unstructured interviews aim to understand the complex behaviour of members of society without imposing any *a priori* categorisation. Semi-

structured interviews aim to reconcile these two opposing positions and are used for this reason (Fontanna and Frey, 2000). However, Rapley (2001; 2004) presents an alternative typology. He identifies three interview formats: facilitative and neutral (similar to the structured interview); cooperative; and, self-disclosing (both of which are less concerned with the avoidance of bias). The self-disclosing format involves building trust through disclosure of personal experiences and feelings. Useful for certain social research, such a format would be inappropriate for this study. The cooperative format, however, involves a style of interviewing which allows the interviewer to offer ideas and opinions, contradictory or complimentary to those of the interviewee, in order to simulate debate and discussion around the topic of study. The cooperative interview format was adopted for this study in order to encourage informants to fully explain the rationale behind their opinions, providing evidence where possible. The cooperative format was therefore selected in order to yield in-depth information.

Triangulation is the use of two or more independent sources of data collection methods within one study. The purpose of triangulation is to help ensure that the data are telling you what you think they are telling you' (Saunders *et al.*, 2007). Denzin (1978) classifies triangulation into four types: by data source, by method, by researcher and by theory. The design incorporates two of these triangulation types.

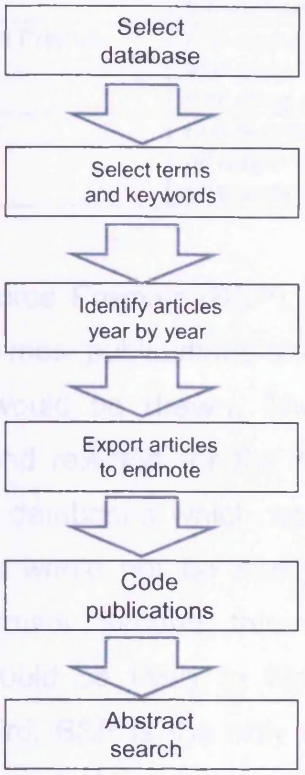
5.4 Research Execution

The final stage of the research process is the actual execution of the research. The sections that follow explain the actual, detailed data collection procedures followed.

5.4.1 Lean Publications Database (LPD)

A systematic literature review differs from a more traditional narrative review in that the systematic review makes the reviewing process as structured, transparent, replicable and exhaustive as possible (Wu, 2006). In order to achieve these aims, a structured process was followed to design and implement the LPD. Figure 13 illustrates the main stages of that process.

Figure 13 Formation of the LPD



(Source: the researcher)

The resultant LPD was based on the Endnote referencing database software application which is generally used for storing and retrieving bibliographic references from online databases. Endnote was selected because it is widely used among researchers and is fully supported by the researchers' host University.

There are a number of online resources that act as repositories for multiple journal titles and publications on Lean. Metalib is Cardiff University's meta-database or library portal through which to access these electronic resources. Metalib categorises electronic resources according to subject matter. The category entitled 'business, economics and transport' was reviewed and three online databases were identified as being business and management specific and databases for which full text access was available. Table 30 provides a brief comparison of these three.

Table 30 Online Database of Lean publications

Database	Publication breadth
ABI Inform from the Proquest database	*Full-text access to over 3,040 business, management and trade journals. The index for many journals goes back to 1970. Many of the full text articles are available from the late 1980s and early 1990s*
Business Source Premier (EBSCo)	*Full-text access to over 7,400 scholarly journals, trade publications and popular business magazines in nearly all areas of business, including over 1,100 peer-reviewed journals.*
Emerald Library	*Full-text access to over 100 Emerald journals, covering all major management. Full text access is available back to 1994 with abstracts back to 1989.*

(Source: the researcher)

Business Source Premier (BSP) was found to be the database providing full-text access to the most publications and was selected as the one from which publications information would be drawn. The idea of using more than one database was considered and rejected for the following three reasons: First, many publications feature in all databases which would mean manually filtering to avoid duplication. Such repeats would not be easily identified since online databases vary in their extraction formats. Second, this variation in extraction formats of different online databases would be likely to hinder the use of Endnote's search and retrieval functions. Third, BSP is the only online database to classify articles as academic, trade or magazine. According to information supplied by BSP online, multiple factors affect the designation of publications. However the most relevant four factors, as judged by the researcher, were the typical content and purpose of the journal, its' intended audience and its' citation rules. These are illustrated in Table 31.

Table 31 Main Factors Determining BSP Designation as Academic, Trade or Magazine

BSP Designation factor	Academic	Trade	Magazine
1. Content	Research, analysis and theory	Industry trends	News and opinion
2. Purpose	Document research and advance knowledge	Keep practitioners and professionals in the field up to date on industry trends	Inform the general public
3. Audience	Scholars and researchers	Staff writers, industry specialists, contributing and freelance authors	Journalists, staff writers, contributing and freelance authors
4. Bibliography	Always provided	Maybe, rarely provided	Never provided

(Source: Periodical Publication Categories, EBSCO online)

The background literature review revealed that in the case of one OMI (Quality Circles) a gradual decline occurred because semi-academic and academic press remained interested long after most of the popular business press (Abrahamson and Fairchild, 1999). It was therefore considered that type of publication may be important in determining patterns of Lean discourse. The BSP classification as Academic, Trade and Magazine takes account of many factors but the most important is the intended audience. The intended audience is categorised as: academic (scholars, researchers and experts); Trade (practitioners and professionals in the field); or, Magazine (general public and non-professionals). Whilst the BSP classification is sometimes erroneous, the alternative would have been for the researcher to have classified articles. This would have been a highly judgement-laden process. Despite the limitations, the researcher considered the use of the BSP classification as a preferred option.

Like many online databases, BSP offers subject selection advice. It identified Lean Manufacturing as the best phrase to use to capture publications on Lean. However, the use of this phase alone would constrain the search to those publications that include both the terms Lean and manufacturing, potentially omitting publications on Lean other than those concerned with manufacturing. On the other hand, searching with just the term Lean or with a wildcard would cast the net too wide. The potential phases that could have been included is vast, however, the following terms (in Table 32) were selected to represent a balance between breadth and focus.

Table 32 Key Terms Used in the Formation of the LPD

Lean production	*Lean manufacturing*	*Lean management*
Lean survive	*Lean health*	*Lean thinking*
Lean construction	*Lean aerospace*	*Lean defence*
Lean process	*Lean electronics*	*Lean government*
Lean education	*Lean finance*	*Lean media*

(Source: the researcher).

It is noteworthy that the LPD is dynamic and new terms may be retrospectively added at any time.

The search yielded in excess of 3,500 results. Publications between the years 1987 (the year prior to the one in which the term Lean was first coined) and 2010 were extracted from the BSP online database and imported into the Endnote publications database. Publications were exported in batches of 50 since BSP only allows exportation of up to 50 at a time. Imported publications excluded the BSP classification of Academic, Trade or Magazine so that this had to be manually re-entered. Once imported, publication abstracts were interrogated for relevance at various points during the course of the study.

At the time of writing the LPD includes over 3050 publications on Lean and is sufficiently representative to provide evidence of patterns of Lean discourse as a proxy for Lean diffusion over time. The LPD is a flexible data source that can be expanded in the future.

5.4.2 Expert Interviews

Qualitative data was gathered from a series of in-depth interviews with expert informants. Data collection involved four main stages: first, the selection of informants; second, the design of interview process; third, the interviews themselves; and fourth, analysis of interview data. Each stage is explained in the section that follows:

Following a purposive sampling logic, the selection criteria for informants was set broadly as being individuals who have knowledge of or who have had a role in the diffusion of Lean over time. As such, they would be likely to have an overview understanding of the Lean movement (or Lean diffusion) over time. Informants included a mixture of academics, consultants, practitioners or representatives of intermediary bodies who have particular interest in Lean, and represent different

fashion setter groups (Abrahamson, 1991; 1996; Abrahamson and Rosenkopf, 1997; Abrahamson and Fairchild, 1999). Informants targeted for interview were either known to the researcher, recommended by others (such as the researcher's supervisors), or identified in the literature as having written about Lean diffusion. In Table 34 informants are listed with a brief profile of each along with the primary reason they were selected for interview. Informants were promised anonymity in order to encourage them to be open and candid.

Table 33 Brief Profile of Interviewees and Reasons for Selection

Inter-viewee No.	Date of interview	Brief Profile of interviewee	A, C, I or P	Reasons for selection/method of selection/additional information
1	19/06/08	Currently a consultant, formerly an academic who has studied lean implementations in a range of environments, though primarily manufacturing.	C(A)	*Involved in lean implementations in manufacturing and non manufacturing for last 18 years *Involved in a variety of research projects on lean
2	08/06/08	A business improvement manager within the Welsh Assembly Government (WAG) and a six sigma 'black-belt'.	I	*Involved in lean and six sigma implementation in welsh SMEs for many years *Six sigma 'black-belt' *Current role in WAG includes awareness raising of business improvement in Wales
3	16/07/08	A business improvement manager within WAG.	I	*Involved in lean and six sigma implementation in welsh SMEs for many years *Current role in WAG includes awareness raising of business improvement in Wales
4	31/07/08	An academic with particular interest in postgraduate and executive education..	A	*Author of many books on lean tools and techniques *Developer of postgraduate courses on lean over last decade
5	24/09/08	A consultant with affiliation to several universities and with a particular interest in how lean translates to the service and public sectors.	C(A)	*Author of several books over last decade *Currently highly active in the public sector *Key protagonist in contemporary lean debates
6	16/10/08	A consultant with affiliation to a university and with experience of lean and TOC implementation in a wide variety of manufacturing environments.	C(A)	*Key protagonist in contemporary lean debates
7	29/10/08	An academic with a particular interest in lean implementation in the food sector.	A	*Specialist knowledge of the food sector and environment issues

Inter-viewee No.	Date of interview	Brief Profile of interviewee	A, C, I or P	Reasons for selection/method of selection/additional information
8	08/01/09	A management guru and author of several influential management books.	A	*Key figure in the lean movement in the UK
9	11/02/09	Leader of one of the most successful regional manufacturing advisory services.	I	*Involved in business improvement including lean into SMEs
10	18/02/09	Former leader of a government initiative.	I	*Key figure in the application of Lean into the UK food sector
11	03/03/09	Key player in the SMMT IF.	I	*Specialist knowledge of the development of SMMT IF in 90s
12	12/03/09	An academic and authors of books and articles on lean.	A	*Key protagonist in contemporary lean debates
13	09/04/09	A consultant with particular interest in how lean translates into the service and public sectors.	C	*Self selected * MD of consultancy highly active in lean in service and public sector environments
14	21/04/09	Formerly an automotive sector practitioner, now retired.	P	*Self selected *Active as part-time consultant and lecturer on lean
15	05/05/09	Leader of a lean transformation program within the financial services sector.	P	*Selected by referral *Specialist knowledge of lean in the service sector
16	19/05/09	Leader of a lean transformation program within the services sector.	P	*Selected by referral *Leader of lean implementation in the media sector
17	09/06/09	Working in the National Audit Office with a particular interest in business improvement across government.	I	*Selected by referral *Specialist knowledge of business improvement in a variety of central government departments
18	06/08/09	Leader continuous improvement in the MOD.	I	*Self selected *Specialist knowledge of lean implementation in the MOD
19	28/08/09	Successful consultant active in the implementation of lean in NHS Trusts.	C	*Self selected *Involved in lean implementation in health sector
20	03/09/09	Practitioner in local government.	P(A)	*Self selected *Involved in lean implementation in public sector *Recently completed doctoral research
21	08/09/09	Academic with particular interest in the automotive industry..	A	**Key protagonist in contemporary lean debates

Note: In column 3, A = academic, C = consultant, I = intermediary, P = practitioner. Where there is overlap in role, as is the case for interviewees 1, 5, 6 and 20, the primary role is given first and the secondary in brackets after.

(Source: the researcher)

The table illustrates that expert opinion was solicited from a range of academic, consultant, intermediary and practitioner views. The resultant interviews were designed around a cooperative and semi-structured format. Each interview was divided into five sections (see Table 34) in order to guide the discussion and maintain focus as well as to facilitate analysis. At the outset of the interview, the five sections of the interview were presented to informants with the aid of a conference folder.

Table 34 Interview Structure and Content

Section	Title	Explanation
1	Defining Lean	This section presents interviewees with the proposition that Lean lacks clear definition and means different things to different people. Interviewees were asked to comment on this and discuss their conceptualisation of Lean. Interviewees were also asked how they understand Lean in comparison to other management concepts, in particular, six sigma, TOC and systems thinking
2	The role of government	This section presents interviewees with the proposition that the government played a role in promoting Lean and its diffusion into other sectors. Interviewees were asked to comment on this, what they knew about it and for their opinions on the success and impact of the role of government.
3	The diffusion of Lean over time	This section presents interviewees with the proposition that Lean has spread over time from car manufacturing to general manufacturing and more recently into the service, public and third sectors. Interviewees were asked to comment on this and to identify the nature, causes and consequences of that spread.
4	Diffusion of innovation theory	This section presents interviewees with a proposition that a key model from the diffusion of innovation literature (Figure 7, discussed in Chapter 2) may be useful in helping to explain the diffusion of Lean over time. Interviewees were asked for their general reaction to the model. In this section, interviewees were asked to comment on the independent variables within model and to offer a crude, relative rating on each. The simple rating suggested was: 0 = do not understand the variable/attribute. 1 = I understand the variable/attributes but do not think it important. 2 = somewhere above 1. 3 = somewhere above 2. 4 = somewhere above 3. 5 = I understand the variable/attribute and think it very important. Furthermore, one of the variables within the innovation diffusion model concerns the attributes of the innovation, in this case Lean. Innovation attributes have been identified in the literature as the most important of the independent variables determining the rate of innovation diffusion. The literature has identified five attributes of an innovation of an innovation. Interviewees were asked for a similar crude, relative rating of these five attributes in relation to Lean, but also in relations to six sigma, TOC and systems thinking.
5	Sweep	This section presented the interviewees with the opportunity to mention anything that they felt was important to the study but that had not been covered or adequately covered during the discussion so far. The purpose of this section was to free the discussion from constraints that may have been imposed through the semi-structured format.

(Source: the researcher)

Informants were contacted initially by telephone wherever possible, email otherwise, in order to secure their participation. As part of this initial contact, the researcher explained the background and subject matter of the study and why they had been selected for interview. They were asked to confirm that in their own opinion that they were suitable interview candidates. They were told they would need to set aside two hours of their time for the interview and that the interview would be recorded. Once

their agreement to participate had been secured, an arrangement was made to meet at a place and time that was convenient for the interviewee and suitable for audio recording conditions. Before meeting for the interview, they were sent the interview schedule. The interview schedule consisted of the information contained in Table 34 together with some additional details and guiding questions. The interview schedule is included in Appendix C. The interview schedule was sent in advance in an attempt to secure interviewees' most considered responses, as opposed to spontaneous responses, to the questions posed. Most informants had read the interview schedule prior to meeting and some had made notes in preparation.

The interview began by informants being asked to sign a consent form which had been awarded prior approval from Cardiff Business School's Ethics Committee. They were assured of anonymity in order to secure honest and open responses and discussion. This was particularly important where informants were also representatives of an intermediary organisation. In some instances there was clear conflict between their personal views and the views their organisation would expect them to present. The interview opened with introductory discussion about the informants' personal background and involvement in the Lean movement. This part of the interview was designed to serve a dual purpose: first, to place the interviewee at ease; second, to provide the researcher with background context to the person behind the opinions in order to facilitate later reflection that had been identified as being of particular importance in expert interviewing. It should be noted that the introduction of this thesis presented a working definition of Lean that was originally intended for data collection purposes. The subsequent literature review showed that Lean lacks definitional consensus. It was subsequently decided to acknowledge this and to use the interviews to explore how these particular experts personally conceptualise Lean. Interviews lasted for approximately two hours, although around half were nearer to four hours. All interviews were recorded and transcribed. The decision to record interviews was made following careful consideration of the advantages and disadvantages outlined in Table 35.

Table 35 Advantages and Disadvantages of Recording Interviews

Advantages	Disadvantages
Produces a reliable account.	May be regarded by respondents as obtrusive.
Ensures nuances are captured.	May not be appropriate.
Allows freedom for the researcher (to participate in cooperative interview format)	It is time-consuming to transcribe.
Enables the use of qualitative data analysis software,	May produce too full an account (may only be a small part of the interview which is valuable).
	May only be possible in certain environments (under certain sound conditions).

(Source: the researcher)

While agreeing that selectivity is endemic to all data collection (Miles and Huberman, 1993), the researcher took the view that transcribing the interviews would minimise selectivity at this stage of the research process. Interviews were transcribed immediately following the interview and transcriptions were sent back to interviewees for them to confirm that they were true and fair representations of the interview. Two informants made minor adjustments to their transcriptions to provide greater accuracy or explanation.

The expert interviews generated more than 300 pages of transcription text. Data reduction is the process of selecting, focusing, simplifying, abstracting and transforming the data that appears in transcriptions (Miles and Huberman, 1993). The first stage of the data reduction process and analysis involves coding. Codes are segments of information that are:

'.....tags or labels for assigning units of meaning to the descriptive or inferential information complied during a study. Codes usually are attached to 'chunks' of varying size – words, phrases, sentences, or whole paragraphs, connected or unconnected to a specific setting'

(Miles and Huberman, 1993, p. 56)

Computer assisted techniques provide a shortcut method for coding, sorting and interrogating data. Their use has been criticised by some commentators who warn that they overemphasise coding and promote a superficial view of grounded theory (Coffey *et al.*, 1996, Charmaz, 2000). However, other authors argue that data indexing, retrieval and slicing is both facilitated and enhanced by the use of computer aided qualitative data analysis software (commonly abbreviated to CAQDAS), (Mason, 2002). For pragmatic reasons the researcher used NVIVO (version 8) since this is the software provided and fully supported by her host University. Other software packages may have been more appropriate for this study

but the researcher took the view that any marginal benefits that may have accrued from using another software package were outweighed by the benefits of using software for which full training and support was available. Data may be read literally, interpretively or reflexively (Mason, 2002). In this study, data are read interpretively. The researcher is concerned with the interviewees' interpretations and understandings, their version of how they make sense of the social phenomena under inquiry. In order to facilitate this interpretive reading of the data, the researcher conducted cross-sectional or categorical coding. Cross-sectional or categorical coding involves devising a consistent system for indexing the whole of a data set according to a common set of principles and measures (Mason, 2002). During the coding process the NVIVO 'free and tree' coding functions were used to separate the emergence of inductive theory generation and deductive theory testing.

To recap, the expert interviews were semi-structured, co-operative in format and in-depth, lasting typically between 2 and 3 hours. Data triangulation was achieved through the use of multiple informants. The words that informants used were transcribed verbatim and resulted in 166,000 words of transcription.

5.5 Strengths and Weakness of the Research Design and Execution

In this section the strengths and weaknesses of the research design and data collection methods are discussed. The strengths are addressed in three ways: the research design is evaluated against various measures; the research design is evaluated against triangulation; the research design is evaluated against other previous diffusion research. A number of limitations to the study are also identified and where possible countermeasures are deployed to limit their impact.

5.5.1 Design Strengths

Lincoln and Guba (1985) argue that conventional measures of reliability, replication and validity do not apply to qualitative research. They suggest that alternative criteria are trustworthiness and authenticity. For them, trustworthiness is made of up four criteria. Table 36 compares the research design against these four criteria of trustworthiness.

Table 36 Research Design Evaluated against Criteria of Trustworthiness

Criteria	Parallels	This study
Credibility	Internal validity: match between researchers observations and theoretical ideas adopted	The research is exploratory in nature and focused on nebulous concepts (lean and diffusion). Credibility achieved through triangulation.
Transferability	External validity: degree to which findings can be generalised across social settings	Critical realism rejects positivism aims of generalisation across social settings. However a synthesising conceptual framework was devised that could be applied to other OMIs.
Dependability	Reliability: degree to which a study can be replicated	The study is fully documented such that it could be replicated.
Confirmability	Objectivity: degree to which researchers personal values or theoretical inclinations sway the research and subsequent findings	The researcher rejects the notion that research can ever be value free but accepts that the conduct of research should be as value free as possible and a reflective approach was adopted.

(Source: adapted from Lincoln and Guba,1985)

According to Lincoln and Guba, authenticity concerns the wider, political impact of the research and again has four criteria. Table 37 illustrates how this consideration was addressed in the study

Table 37 Research Design Evaluated Against Criteria of Authenticity

Criteria	Meaning	This Study
Fairness	Does the research fairly represent different viewpoints among members of the social setting	The methodology limited data collection to expert views although different types of experts were included.
Ontological authenticity	Does the research help members to arrive at a better understanding of their social milieu?	The value of the study lies in the fresh perspective in which Lean is regarded as an object of innovation and considered from a diffusionistic and management fashion perspective.
Educative authenticity	Does the research help members to appreciate better the other members of their social setting?	The management fashion perspective focuses on roles of different groups in the diffusion of an OMI.
Catalytic authenticity	Has the research acted as an impetus to members to engage in action to change their circumstances?	The researcher rejects the legitimacy of this measure.

(Source: adapted from Lincoln and Guba, 1985)

However, Lincoln and Guba's (1985) measures are more applicable to naturalistic inquiry than to the post-positivist methodological approach adopted in this study. Earlier it was explained that this approach was adopted partly as a result of the researchers' background and experience and partly as a result of the researchers'

sensitivity to the recipients of this thesis. For this reason, reliability is an important feature of the research design. Reliability or the ability of the study to be replicated has been achieved by two means: thorough documentation and triangulation. Documentation of the data was achieved by transcribing all interview scripts and by the use of qualitative data analysis software. However, the research design also incorporates triangulation. Denzin (1978) classifies triangulation into four types: by data source, by method, by researcher and by theory. Table 38 provides an evaluation of the research design against each of these types.

Table 38 Research Design Evaluated against Denzin's Triangulation Classification

Triangulation type	Meaning	Application in this study
Theoretical	Borrowing models from one discipline and using them to explain situations in another discipline.	Models and theoretical concepts are borrowed from the DOI and management fashions bodies of knowledge.
Data	Data is collected over different time frames or from different sources.	Data collected from multiple informants.
Researcher	Different researchers collect data (usually in multi-disciplinary research teams) and evaluate the same data set from different individual perspectives.	Not applicable for PhD research.
Methodological	Using both qualitative and quantitative research strategies and data collection methods.	Publications database provides quantitative data and interviews provide qualitative data.

(Source: adapted from Denzin 1978)

The table highlights the fact that three of four types are applicable to PhD research. The research design incorporates all of these three types of triangulation. Furthermore, the research design has been informed by shortcomings of previous DOI research (Rogers, 2003). Table 39 highlights these and explains the design and execution countermeasures adopted to mitigate these.

Table 39 Research Design Evaluated against Previous DOI Research

Type of Diffusion Study	Explanation	Criticism	This study
Tracer or retrospective studies	Attempt to reconstruct the sequences of main events and decisions in the diffusion process where key sources of data are interviews with key informants and research publications but also archival records of research grants and other change agency records.	Tracer studies are retrospective of the process.	Lean diffusion is partially retrospective and partially current.
Variance vs. process type	Most diffusion research is 'variance-type' investigation consisting of highly structured gathering of cross-sectional data (Rogers, 2003)	Variance type investigation ignores the process dimension of the data.	Particular attention is paid to Lean diffusion as a process over time.
Diffusion study of opinion leadership and diffusion networks	There have been four main methods that have been used in the past: the socio-metric method; key informants; the self-designating technique; observation). All methods are equally valid	Not applicable	Key informants (through expert interviews) are an established and valid method of data collection.
Single vs multiple innovations	Many diffusion studies focus on only one innovation.	Studies that focus on one innovation do not trace the interrelationship between rates of adoption for two or more new ideas that are diffusing into the same system or systems.	The research design incorporates comparison between Lean with other OMIs.

(Source: adapted from Rogers, 2003).

The table illustrates that DOI research would be enriched and complemented by more qualitative studies to balance the dominance of quantitative studies in the field. The research design of this study addresses that imbalance.

5.5.2 Design Weaknesses

The use of interviews as a data collection method is both a strength and weakness of the research design. Interviews are regarded by some as the best of the data collection methods (Ghauri and Gronhaug, 2002). Others, however, warn that interviews can yield insufficient, irrelevant and erroneous data (Cohene and Easterbrook, 2005). Cohene and Easterbrook (2005) identify three types of problems with interviews:

1. Communication factors: participants are subject to the limitations of their own memory and communication abilities
2. Social factors: status, gender and environment may lead to problematic data
3. Cognitive factors: cognitive biases refer to distortions in the way people see reality

Two of the three types are of particular relevance to the research design. They are the communication factor of recall bias and the cognitive factor or pro-innovation bias. They are addressed in the sections that follow:

Recall bias is a feature of much DOI research. The reasons for is that DOI is different to most other social science research in that the time variable is not ignored (Rogers, 2003). The inclusion of the time dimension is therefore an important strength of DOI research in general and of the research design of this study. However, the inclusion of the time dimension introduces methodological difficulties. Interviews are retrospective and hindsight is seldom completely accurate. Rogers (*ibid.*) argues that the degree of accuracy varies according to several factors including: the basis of the innovation's salience to the individual, the length of time over which recall is requested and individual differences in education, memory and other factors. The research design incorporates some countermeasure to limit the impact of recall bias by incorporating multiple data sources.

Pro-innovation bias refers to the assumption that an innovation should be diffused and adopted by all members of a social system, that it should be diffused more rapidly and that the innovation should be neither re-invented nor rejected. Rogers (*ibid.*) regards pro-innovation bias is the most serious shortcoming of previous DOI research. He argues that pro-innovation bias has led to several detrimental effects in previous DOI research. These include: a tendency to ignore the study of ignorance about innovations; a tendency to under-emphasise the rejection or discontinuance of innovations; a tendency to overlook reinvention and a failure to study anti-diffusion programmes. Furthermore, Rogers (*ibid.*) argues that the reason for pro-innovation bias in much DOI research is two-fold: first, the prevalence of funding by change agents with a particular agenda; second, the naïve acceptance of the pro-innovation bias of such change agents by researchers. Pro-innovation bias may be overcome by examining the broader context within which an innovation diffuses and by probing

into why (*ibid.*). The research design adopts such an 'holistic' processual perspective. Abrahamson (1991) offers more specific advice for researchers to overcome pro-innovation bias: first, they should critically examine the dominant perspective in the DOI literature; second, they should reject the assumptions that underlie the dominant perspective and expose counter-assumptions.

The researcher identifies two types of potential pro-innovation bias that are likely to influence the findings of this study: the pro-innovation bias of the informants and the pro-innovation bias of the researcher. These are addressed in turn:

The research design includes interviews with informants who are experts in Lean and who are or were involved in the Lean diffusion. Consequently, they are likely to favour Lean and to support Lean diffusion. The countermeasure deployed to address this potential informant pro-innovation bias was the deliberate inclusion of some informants known for their dissenting view on Lean. The countermeasure was designed to expose some of the assumptions of other informants.

The researcher has a personal background in Lean. This simultaneously presents both advantage and disadvantage to the research design. The advantage is that addition validation is provided by what Mason (2002) refers to as 'standpoint logic'. Standpoint logic means that by having some knowledge of the phenomenon under investigation offers two advantages: first, the researcher is able to place interviewees 'at ease'; second, interviews will not be dominated by trying to decipher much of the 'technical jargon' surrounding Lean. However, the researcher's background in Lean also represents a disadvantage since it may present researcher pro-innovation bias. The countermeasure deployed to counter this disadvantage is critical and transparent reflection (Hardy *et al.*, 2001)

5.6 Chapter Review

The nature and scope of this chapter warrants a brief review of the salient points. The researcher identified her personal inclination towards a critical realist paradigm. The research design was developed in line with this personal stance. Critical features of the design include its' primarily qualitative, process-based approach to be built upon grounded theory. Two main data collection methods were deployed: First, a Lean publications database (or LPD) was developed to enable longitudinal

bibilometric data analysis. Second, a series of in-depth, semi-structured expert interviews were conducted with key informants. Informant selection was based on a purposive sampling approach. Interviews were designed around a cooperative format. Interview output was recorded, transcribed and codified using computer aided qualitative data analysis software. The main limitations of the research design were anticipated as being pro-innovation bias and recall bias. Countermeasures were deployed wherever possible in order to limit the effect of these limitations. The remainder of this thesis addresses the implications of the execution of the research methodology explained in this chapter.

Chapter 6 Discussion of Findings

This is the first of two chapters that discuss the findings from the fieldwork produced using the methodology explained in the previous chapter. The chapter is divided into five sections. The first four sections address the findings pertinent to each of the four research questions in turn. The primarily qualitative nature of the findings means that these sections include extensive extracts from the expert interviews. Consequently, the last section draws this material together to recap the main findings that emerged in this chapter pertinent to each question.

The overarching research question posed at the outset of this study was: ***why and how has Lean diffused in the UK over the past two decades?*** This broad question was addressed through four sub-questions:

> ***RQ1. Why is the Lean organisational and managerial innovation (OMI) a poorly defined construct?***
>
> ***RQ2: How does the Lean organisational and managerial innovation (OMI) compare with others that are similar?***
>
> ***RQ3: What is the pattern of Lean diffusion in the period 1988-2010?***
>
> ***RQ4: Why has Lean diffused in this pattern?***

6.1 Discussion of Findings (RQ1)

Why is the Lean organisational and managerial innovation (OMI) a poorly defined construct?

During the expert interviews, informants were asked to articulate their personal conceptualisation of the Lean organisational and managerial innovation (OMI). This evidence was derived from section 1 of the interview schedule (see Appendix C). Table 40 summarises their responses. These were striking in their diversity. In order to demonstrate this diversity, these responses have been clustered by the researcher into to six common themes. The six themes include Lean as: a technical phenomenon; an economic phenomenon; a political phenomenon; a social phenomenon; a systems phenomenon; and, a philosophical phenomenon.

Table 40 Conceptualisations of Lean

Lean as a technically focused phenomenon	**Lean as an economically focused phenomenon**
'the common-sense compression of leadtime' [Informant 6] *'identifying value to the customer, making it flow and eliminating waste'* [Informant 6] *'a combination of effectiveness and efficiency'* [Informant 4] *'the scientific method'* [Informant 6; informant 8] *'tools to eliminate waste'* [Informant 8] *'a more structured form of traditional cost cutting'* [Informant 8] *'removing waste from an end to end process and more importantly focusing on value'* [Informant19] *'an improvement methodology that is based on removing the non-value added steps from a process'* [Informant 21] *'a toolbox in manufacturing'* [Informant 21] *'a means of achieving efficiencies'* [Informant 15] *'a means to optimise your processes by choosing the one best way'* [Informant 15] *'a codification of how one company runs its business'* [Informant 17] *'holistic, interactive approach to managing problems'* [Informant 20] *'traditionally sigma and lean are about reducing variety, clearly in service.....it is an absorb variety challenge'* [Informant 13] *'the seven wastes'* [Informant 21] *'a translation of the TPS'* [Informant 7]	*'initially about a gap'* [informant 8] *'a posh name for a bonus scheme'* [Informant 18] *'industrial engineering'* [Informant 4] *'competitive advantage in operations and production'* [Informant 1] *'competitive advantage in the supply chain and distribution channels'* [Informant 1] *'a consensus based approach to running a process based business'* [Informant 1] *'theory of Lean being if you organise around these five principles, you can make a business more efficient'* [Informant 18] *'a working culture designed to provide the customer with exactly what they want using resources efficiently and effectively'* [Informant 15] *'a framework for people struggling'* [informant 2] *'an entire methodology for running a business'* [Informant 19] *'a moving target'* [Informant 4] *'a means of looking up and down the supply chain, seeing where waste is, seeing where non value activity is, seeing where the actions of one person impinge adversely on the actions of another, trying to align those more coherently so you have fewer linkages, more efficient supply chain'* [Informant 10]
Lean as a politically focused phenomenon	**Lean as a socially focused phenomenon**
'a metaphor with no local content but great emotional appeal' [Informant 12] *'an unsubstantiated and empirically false set of claims, drawn from initially interesting data by supported later largely by assertion'* [Informant	*'developing staff and involving them in improvement activity'* [Informant 15] *'intelligent management'* [Informant 14] *'the reality of it is it is all about building teams,*

12] *'contentless, no substance but emotionally appealing'* [Informant 12] *'just a brand name'* [Informant 18] *'Lean is only coining a term using a brand, trying to own some of ideas developed by other people'* [Informant 7] *'emotionally Lean has been sold as the elimination of waste'* [Informant 12] *'a word, coined by a student working with Womack in order to describe TPS'* [Informant 5] *'a reinvention of the Quality Circles of the 80s'* [Informant 14] *'I think the hypocrite is saying Lean isn't about getting rid of people. Actually it is'* [Informant 18] *'I think Lean in practice has zero effect'* [Informant 12] *'somebody that thinks that Lean is this huge renaissance'* [Informant 12]	*transferring to them knowledge about simple problem solving tools, which are not rocket science, and then facilitating them to come up with good ideas about implementing them'* [Informant 9] *'about people, it is about customers, it is clearly about value '* [Informant 13] *'exceedingly good for the people working in the environment'* [Informant 13] *'cultural empowerment of your people'* [Informant 17] *'a people issue'* [Informant 11] *'giving simple techniques to people with low brain power'* [Informant 15] *'you can get bogged down in the tools and techniques of this stuff and miss the people aspect'* [Informant 11] *'I was seeing it as more of a social phenomenon and less of a revolution in actual practice'* [Informant 12] *'Lean is about people for me but we dismiss them as something called resource'* [Informant 14] *'it is democracy'* [Informant 14] *'context specific'* [Informant 21]
Lean as a systems focused phenomenon	**Lean as a philosophy focused phenomenon**
'a form of systems thinking' [Informant 1] *' the system boundary of Lean is a big issue'* [Informant 4] *'a business system to improve the performance of business as a system'* [Informant 8] *'the Toyota system wasn't a toolbox, it was a system'* [Informant 5] *'holistic, inter-activist approach to managing problems'* [Informant 20] *'a retrospective look by some academics at a cultural system'* [Informant 18]	*'latest improved version of Deming's management philosophies'* [Informant 14] *'an emerging management philosophy'* [Informant 14] *'the philosophy at the top, universally applicable'* [Informant 21] *'Lean is a philosophy – a philosophy in terms of a mindset of ways of doing things. A generic approach within a business context'* [Informant 3] *'an overarching business improvement philosophy'* [Informant 3] *'a way of thinking'* [Informant 8] *'an experiential process'* [Informant 8] *'a patriarchal model'* [Informant 7] *'Lean being the foundation of anything in the management science'* [informant 14]

	'Lean has a utopian approach' [Informant 7] *'not a science, it is an art'* [Informant 18] *'a foundation philosophy'* [Informant 14]

(Source: the researcher)

The above table illustrates that responses range from traditional views of Lean, as a way of reducing waste in order to increase efficiency and reduce operating costs, to a far broader view of Lean in which the phenomenon is afforded philosophical status. They encompass a micro-economic perspective of Lean, in which in which Lean is primarily concerned with people and behaviours, to a more macro-economic perspective where Lean is concerned with cooperation and synchronisation across supply chains. They include a systemic perspective on Lean as well as one in which Lean is seen as a highly politically-motivated phenomenon.

The findings support the views of those authors (such as Karlsson and Amhstrom, 1996; Bartezzaghi, 1999; Shah and Ward, 2007, and, Bayou and de Korvin, 2008) who identify Lean as a phenomenon that lacks clear definition. Furthermore, they provide evidence that Lean is a complex and multidimensional phenomenon (Voss, 1995; Hines *et al.*, 2004; Papadopoulou and Ozbayrak, 2005; Bhasin and Burcher, 2005; Bicheno and Holweg, 2009). Whilst informant 1 described Lean as amorphic, meaning formless or shapeless, the collective evidence of expert interviews leads the author to characterise Lean as polymorphic, meaning that it takes on many forms and shapes. The characterisation of Lean as polymorphic offers support to those authors such as Benders (1999) and Benders and van Veen (2001) who argue that OMIs like Lean have 'interpretive viability', by which they mean ambiguity of content.

As part of the discussion that formed section 1 of the interview (see Appendix C), informants offered underlying explanations to their conceptualisation of Lean. For example, several informants argued that Lean has changed over time:

'Lean has morphed. In the beginning it was about competitive advantage in operations and production and concerned with manufacturing in one factory. Then it became enterprise wide and was about competitive advantage in the supply chain and distribution channels.' [Informant 1]

'All of these tools and ideas have coalesced.....Lean is a moving target.....It actually gets wider and wider and in a sense more difficult to define but I think this is all good news, this stage of maturity.....What is the system boundary of Lean is a big issue' [Informant 4]

'the definition of Lean is different now than it was earlier as our understanding has grow..... initially about a gap. It was then about tools to eliminate waste.....it was a more structured form of traditional cost cutting.....It has moved away from just blanket application of tools to eliminate waste to what do we need to do to? What changes do we need to make and what tools do we need to use to turn this into a process?..... .....So now I see Lean as a way of thinking as well as a set of principles for improving processes.....So Lean is actually, if you like, now, is a business system to solve a business problem, or a business system to improve the performance of business as a system.....So it's moved on from tools to eliminate waste: how to we reach that process? How do we build a management system to support it? How do we build a management system to direct it? OK and I think that is where the frontier is now.....It's not the tools. It is the tools, but it's beyond the tools. It is how you use the tools' [Informant 8]

'It is organic, it has grown' [Informant 13]

'What has happened is that Lean has morphed into something smaller.....I believe Lean is an emerging management philosophy' [Informant 14]

'I could call it an emerging management paradigm' [Informant 20]

'It certainly means different things to different people, but that is a consequence of its evolution over time' [Informant 21]

These findings support authors such as Hines *et al.*, (2004); Papadopoulou and Ozbayrak, (2005) who make just such a claim to the evolving nature of Lean and suggest that the Lean OMI is dynamic as well as polymorphic.

As part of the discussion of their conceptualisation of Lean in section 1 of the interview (see Appendix C), most informants clearly located the origins of Lean with *The Machine* and firmly acknowledged the impact and role of *The Machine* in making Lean popular:

'Then come 1990s, The Machine That Changed The World starts to appear which started the word lean but also had started to have a big impact on the UK.....Reasons for impact of The Machine: 1. MIT based; 2. Dramatic series of case studies in particular Toyota; 3. Good marketing; 4. Well written, well researched, impressive study, more comprehensive than anything that had appeared up until then' [Informant 4]

'those two books The Machine and Lean Thinking, truly got this on the map. They did a service' [Informant 6]

'..... stunned by the reaction to it. It hit the market at the right time, 1991, there was a big recession in the car industry. The American car makers were in deep, deep trouble, so were the Europeans for the first time' [Informant 8]

'The Machine does read well, it is very well written.....I still think it is a good study, credit where credit is due. Krafcik worked out a really good questionnaire. It is an impressive research effort' [Informant 12]

'The Machine put it out there.....I think it did a real big service.....' [Informant 13]

'before Womack and Jones wrote the book we were running round like headless chickens, thinking the Japanese were superhuman' [Informant 14]

'What would have happened with or about lean if it hadn't been for people like Womack and Jones who did a big thorough, well written up piece of work which has gained legitimacy' [Informant 20]

However, not all the informants were complimentary about the way that Lean has been represented since *The Machine*. In particular, some were critical of the follow-on publication written by Womack and Jones, two of the authors of *The Machine* who went on to publish *Lean Thinking*. They accuse this follow-on publication of being exploitative and unoriginal:

'I don't think Lean Thinking adds anything conceptually to The Machine That Changed The World' [Informant 5]

'If you look at Monden's book, there is not a line out of Lean Thinking that is not out of that, written differently but there is not a single concept which is original. .....Why Lean Thinking is not that interesting? It has not got nothing new in it and it is not as good as The Machine That Changed The World and it just accepts that everything in The Machine is true and then just re-states what had been written before that book was published' [Informant 12]

However, these extracts illustrate that although they are critical of *Lean Thinking*, both informants compliment *the Machine.* The authors of *The Machine* themselves describe their book as a departure from convention. They state that it is:

'a hybrid product – based on a rigorous research programme by speaking to a general audience – reflects a successful melding of two distinct cultures'

(Womack *et al.*, 1990, p.vii).

The melding of cultures refers to the practitioner and academic communities. During the expert interviews, evidence was gathered which suggested that this melding of academic and practitioner cultures resulted in a blurring of traditional academic boundaries:

'.....encouraged by industry executives who had been involved and seen it for themselves to go further and develop a benchmarking methodology to convince their colleagues that this was

significant.....abandon.....academic credentials,.....writing a book for industry.....aim was to get this message across that this was of huge significance....target customer for that book [The Machine] was the industry executive for the auto industry. For the later, Lean Thinking book.....target customer was the plant manager, doing his own plant. The Machine book was read by everybody including academics, Lean Thinking has hardly ever been read by academics. For some reason, academics just don't like it, but industry loves it. Academics don't really like something that is very, very experiential. The Machine was kind of objective and so on.....' [Informant 8]

'It was not subject to the normal academic process.....It comes from a non-academic source, so for a lot of academics it is suspect anyway, so there is no point looking at it very closely. It's based on empirical work and academics could review it quite carefully and they didn't do it. So it didn't have what I would call a normal academic review process. But it's got the MIT aura.....Academics that do review it do it in a knee-jerk way.....So it split into camps of self-evident or so awful that is doesn't deserve interrogating closely' [Informant 12]

'This book [The Machine] was written to shake. That is why we have written our book differently. We tried to avoid what was being criticised of the Machine book, and we tried to avoid being black and white.....Academia didn't accept it. That is not what you did at MIT at the time, you did not write such books. It certainly didn't get you tenure or a faculty position. This book was meant for an industry audience and just by chance it was very readable and caught the industry at a time when this message was really interesting and people wanted to hear it' [Informant 21]

The blurring of traditional academic boundaries represented an issue of particular importance to one of the dissenting informants. Informant 12 identified what he considered to be three important outcomes to this blurring of traditional academic boundaries further. First, he argued that the polemic literature that followed *The Machine* failed to truly scrutinise the claims and original data on which the phenomenon was based:

'Human Resources Management (HRM) took up the empirical claims and then tried to interpret them in different ways. If you argue that a different interpretation of The Machine's evidence shows no real evidence of a net Japanese productivity advantage that's also saying there is no net evidence of super-exploitation.....People that say that this is the most extreme exploitation have already assumed that it is true, they are not actually interrogating the evidence.....So, an atypical source, there is a polemic literature, so it went from polemic to accepted or totally rejected. It just didn't get that mathematical or statistical viewpoint. There is no culture academically emerges to actually test against aggregate data. This study says, well twenty years on and looking at British empirical trends, where is this big step up from lean production?.....The only way you can expose problems with it is looking at the original survey work in The Machine and asking why wasn't the data interrogated more intensely and secondly looking for the macro-economic evidence.....That

fitted neither the exploitation thesis because you can't argue that someone that is a super-exploiter is actually not that great. And it didn't fit with the Japanisation is the new Grail literature. So there wasn't a .....that was just not taken as a serious research angle.....People...you think are quite critical, they are still quite intolerant of saying certain things about Japanisation.....you expect people who assert lean production to explain the anomaly, they don't so that because it is not how they think, it is at a business level. But even at the business level, where are the really detailed studies showing empirically over time a step change in performance? They don't exist, what you get is lots of anecdotes and self-referential descriptions. It is very easy to do that unconsciously' [Informant 12]

The second important outcome of the blurring of traditional academic boundaries, suggested by Informant 12, was that, while *The Machine* itself is based on empirical research, the body of literature on Lean that has emerged since is largely anti-empirical and historically inaccurate:

'So The Machine has data in it which is interesting but wrongly interpreted but it launches the metaphor of lean that is later sustained by much less impressive.....the literature after The Machine on the whole is of inferior quality because it gives up the empirical research, assumes it is all true and just repeats it ad nauseum. So what starts as an empirical project becomes something different.....In The Machine there is a huge empirical survey, in Lean Thinking it is all case study, there is actually a passage that says there is no reason to do empirical studies of The Machine, we know the basic story.....So there is an anti-empirical strain in this literature. Not initially, it is initially very clever, contentiously interpreted, but still clever.....You would think nothing had been written in the 40/50 years before, a whole generation or two generations of literature wiped out because the contents are inconsistent with this completely counter-factual history, and it has been created, served up and embellishes this type of literature.....It is the most historically uninformed literature you can get, technically easy to access. Historically uninformed, technically easy to access, because it makes no demands, and no empirical development.....Perhaps one sign that this is less important than it looks to itself, is the amount of leeway that has been given to the pure historical research. The fact they can get away with it and nobody really cares, perhaps tells you it is less significant as a managerial revolution than it gives itself credit for.....there is no evidence of a net Japanese productivity gap' [Informant 12]

According to Informant 12, the third important outcome of the blurring of traditional academic boundaries is that certain academics had a vested interest in the success of the phenomenon and used it to further their personal careers:

'I think there was a period when a lot of people were looking for chairs on the back of this stuff. I think in academia it is exhausted and are looking for the next best thing. I think with academic this is very

close to being the next best thing and that is just because it is such an opportunistic profession' [Informant 12]

Some supporting evidence to this latter point was offered by informant 18 who suggested that Lean diffusion into the service and public sectors may, in part at least, be the result of academics looking for new markets:

'if you look at Andrew Graves at the University of Bath. His specialisation is Lean aerospace. Why? Because the other markets were saturated. Where else can I do this?' [Informant 18]

The culmination of Informant 12's argument is that Lean should be considered as a socially constructed phenomenon rather than an object of innovation that is causing a change in organisational practice:

'..... more as a social phenomenon and less of an actual revolution in production practice.....It is a question of belief and perception rather than a substantive change in manufacturing capabilities or competencies, because there is not evidence of that from Britain, absolutely zero.....socially constructed understanding of production which are themselves of social interest, you can interpret them as phenomena..... The gap between what can be shown and what is said becomes the data for social science anthropological study.....although there is a huge problem in models and theories, they have a huge hold, that's of social and anthropological interest' [Informant 12]

Informant 12 goes further and suggests Lean is a socially constructed phenomenon that exhibits characteristics of religious fervent:

'if you know something is right, it is almost offensive to test it. Let's say you are a very devout religious person and I say to you I can prove to you there is no God. That is a blasphemy' [Informant 12]

'It is not a big thing to say that this shows aspects of a cult' [Informant 12]

These findings support those of Coffey (2006) who argues that Lean is a myth that has developed as a cultural response to global stresses. They are reminiscent of the work of some authors of management fads and fashions (Keiser, 1997). The literature review made clear that there are many critics of Lean and that the nature of their criticism is diverse. The findings clearly indicate that Lean remains a contentious phenomenon that continues to attract notoriety, even today.

6.2 Discussion of Findings (RQ2)

How does the Lean organisational and managerial innovation (OMI) compare with others that are similar?

The literature review revealed that Lean is one of a number of similar OMIs that focus on process improvement methodologies and are based on best practices that have been presented and promoted in recent management literature (Nave, 2002; Bhuiyan and Bagel, 2005). In particular Lean was compared with three other process improvement methodologies that are commonly associated with Lean in contemporary Lean discourse. They are: Six Sigma, Theory of Constraints (TOC) and Systems Thinking. These three business improvement methodology OMIs were selected for particular attention because of their striking similarities and subtle differences when compared with Lean. Informants were asked for their views on Lean as compared with these other three (see section 1 of the interview schedule included in Appendix C). Clearly, informants had been purposively selected for their expertise in Lean and were therefore inclined to favour Lean over other OMIs. However, Table 33 in chapter 5 illustrated that some informants were equally, or even more, expert in their knowledge of the other OMIs under inquiry. Informants identified benefits and failings of each business improvement methodology. Informant responses are given in full in the Addendum while Appendices D, E and F provide summaries of these responses in the form of perceived benefits and failings of respectively Six Sigma, TOC and Seddon's Systems Thinking. These summaries are presented as Appendices because they are so extensive. However, a discussion based on the material therein now follows.

The expert interview responses, summarised in Appendix D, regarding the perceived benefits of Six Sigma as being that Six Sigma: appeals to the American psyche that tends to value exclusivity; includes a prescriptive process to focusing thinking and evidence based decision-making; may be particularly applicable to certain industries such as processing industries; includes a qualification hierarchy; and finally, that it has been championed by a charismatic industrialist. These findings support authors who advocate Six Sigma (Eckes, 2001; Hammer, 2002, George, 2002; Catherwood, 2002; Raisinghani *et al.*, 2005; Schroeder at al.; Pepper and Spedding, 2010).

In contrast, the perceived failings of Six Sigma were: that the hierarchical qualification system places power and knowledge for improvement in the hands of an elitist few; that it relies on complex statistical analysis; that Motorola is no longer regarded as a successful exemplar company; that it lacks strategic focus; that it is a mere 'repackaging' of the earlier TQM OMI; and finally, that it is weak academically. These findings support authors who advocate Six Sigma whilst simultaneously acknowledging problems associated with it. Eccles (2001), for example, acknowledges that Six Sigma initiatives are prone to abuse and are often hi-jacked by statistician consultants. The criticism that is it weak academically is supported in the literature by several authors (Goh, 2002; Antony *et al.*, 2003, Schroeder, 2008; Antony, 2008). The criticism regarding lack of strategic focus also has some support in the literature (Goh, 2002) and may explain why Six Sigma is often represented as a subordinate part of the superior 'Lean armoury' (Bicheno and Holweg, 2009).

The expert interview responses, summarised in Appendix E, regarding the perceived benefits of TOC as being that TOC : prioritises improvement work; challenges organisational policies; challenges conventional cost accounting; includes generic thinking processes; and that, *The Goal* has appeal because it is written as a novel. It is noteworthy that most of these perceived benefits are the perceptions of a single expert (informant 6). Many informants claimed that they have limited knowledge of TOC. The findings therefore support authors who argue that TOC lacks widespread acceptance (Watson *et al.,* 2007). The findings also confirm that TOC is often associated with Throughput Accounting (Corbett, 1998; Rahman, 1988).

The contrasting failings of TOC were found to be that TOC: is overly complex and technical; originated from a proprietary production scheduling product (the origins of TOC were described in the literature review); and finally, is championed by an intimidating management guru. The criticism relating to the origins of TOC are well-documented in the literature (Bylinski, 1983; Fox, 2005, Watson *et al.*, 2007).

The expert interview responses, summarised in Appendix F, regarding the perceived benefits of Seddon's Systems Thinking were: that failure demand is an important contribution to knowledge; that it is a non-prescriptive approach to improvement; that it challenges target setting for its tendency to distort overall system behaviour; and finally, that it is widely used, particularly in local government. These findings support

authors who advocate Seddon's Systems Thinking (Seddon, 2005, 2008; Jackson *et al.*, 2008; Seddon *et al.*, forthcoming). The finding that Systems Thinking is widespread in UK local government has recently been corroborated by Summers (2010) who described it as 'entrenched' there (p. 2).

The contrasting findings reveal the perceived failings of Seddon's Systems Thinking to be: first, that it fails to address capacity planning issues; second, supporters and promoters adopt an evangelical approach; third, it is championed by an intimidating and sometimes offensive management guru. It is particularly noteworthy that criticism of Seddon's System's Thinking tends to be focused on *the individual* and *his marketing strategy* rather than *the methodology itself*. Furthermore, the volume and nature of the criticism triangulates findings presented later which suggest that a splinter movement to the wider Lean movement has developed.

Table 41 draws together and summarises these findings regarding each of the four OMIs (Lean, Six Sigma, TOC and Seddon's Systems Thinking).

Table 41 Perceived Benefits and Failings of Lean and other OMIs

OMI	Perceived Benefits	Perceived Failings
Lean	Simplicity (and consequential ease of access and participation). Visibility. Inspiring, captures the imagination. Most widespread.	Tools based approach to improvement. Based on questionable empirical evidence.
Six Sigma	Appeals to American psyche that values exclusivity. Prescriptive process to focus on evidence-based decision making. Highly applicable to certain industrial sectors (eg process). Includes qualification hierarchy. Championed by a charismatic leader.	Hierarchical qualification system places power/knowledge in hands of elitist few. Relies on complex statistical analysis. Motorola no longer a successful exemplar company. Lacks strategic focus. Merely repackaging of TQM. Command and control, top down.
TOC	Prioritises improvement activity. Challenges organisational policies. Challenges conventional cost accounting. Presented in appealing format (novel). Includes generic thinking processes.	Overly complex and technical. Originated from a proprietary production scheduling product. Championed by an intimidating management guru.
Seddon's Systems Thinking	Failure demand represents an important contribution to knowledge. Not a prescriptive approach. Challenges target setting. Widely used in local government.	Fails to address capacity planning issued. Supporters adopt an evangelical approach. Championed by an intimidating management guru.

(Source: the researcher)

The most striking feature of the table is that it suggests that the perceptions of an OMI are determined more by the market characteristics of that OMI than its efficacy. This supports previous DOI research that identifies diffusion as primarily a social process in which an innovation is rarely evaluated according to its efficacy (Rogers, 2003). The table suggests that simplicity and visibility are perceived attributes of Lean that appear to differentiate it from other similar OMIs. This point is further corroborated by the finding that excessive complexity is a perceived failing of both Six Sigma and TOC.

Another marked feature of the table is the importance that informants attach to the attributes of the OMIs. Specifically, informants seem to identify simplicity and visibility as attributes of Lean that differentiated it from other OMIs. These findings support previous DOI research which identifies the attributes of an innovation as being the most important determinants of diffusion (Rogers, 2003). The specific attributes of innovations are identified in the DOI literature and were discussed with informants in a later section of the interview (see section 4 of the interview schedule included in Appendix C). According to DOI literature, there are five perceived attributes of an innovation: relative advantage, compatibility, complexity, observability and trialability. These were previously defined in Table 11 of Chapter 3. However, for ease of reference, the definition of each are reproduced in Table 42.

Table 42 Five Attributes of an Innovation

Relative advantage	The degree to which an innovation is perceived as being better than the idea it supersedes, often expressed as economic profitability, conveyed social prestige or in other ways.
Compatibility	The degree to which an innovation is perceived as being consistent with the existing values, past experiences and needs of potential adopters.
Complexity	The degree to which an innovation is perceived as difficult to understand and use.
Trialability	The degree to which an innovation may be experimented with on a limited basis.
Observability	The degree to which the results of an innovation are visible to others.

(Source: compiled from Rogers, 2003)

Previous DOI research has found that collectively these attributes form by far the most important variable for determining the rate at which an innovation diffuses (Rogers, 2003).

The expert interviews included a discussion of whether these attributes were appropriate for OMIs like Lean. In order to gather comparative information, informants were asked to score each of the five perceived attributes for their

relevance in the case of the Lean OMI. They were then asked to do the same for the Six Sigma, TOC and Seddon's Systems Thinking. To evaluate the relevance of the perceived attributes, a simple rating scale was used in which: 5 = very highly relevant; 4 = highly relevant; 3 = relevant; 2 = not very relevant; 1 = slightly relevant; and, 0 = no relevance.

Table 43 provides a summary of their score for each OMI in which those scoring the OMI **High** against the attribute (ie. a score of 4 or 5) are shown in red and compared with those scoring the OMI **Low** against the attribute (ie. a score of 3 or less). Where many (meaning more than 75% or 14 or more respondents) have scored the OMI high against the attribute, the number of respondents that do so has been highlighted in bold and underlined. It is noteworthy that three informants did not consider themselves to be sufficiently knowledgeable of all four OMIs to be able to participate in this exercise.

Table 43 Summary Table of Perceived Innovation Attribute Scores

Perceived Attribute	**Relative advantage**		**Compatibility**		**Complexity**		**Trialability**		**Observability**	
Score	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**	**High**	**Low**
Number of informants scoring **Lean** as:	**17**	1	10	8	8	10	**14**	4	**15**	3
Number of informants scoring **Six Sigma** as:	6	12	7	11	5	13	8	10	4	**14**
Number of informants scoring **TOC** as:	6	12	3	**15**	2	**16**	6	12	4	**14**
Number of informants scoring **Seddon's ST** as:	9	9	7	11	7	11	2	**16**	3	**15**

Note: n=18 (three informants were unwilling or unable to participate in this exercise)

(Source: primary data gathered by the researcher based on the DOI model in Rogers, 2003)

The first point of note in Table 43 is that, with the exception of complexity, informants perceived Lean to be superior to the other OMIs in all other attributes, but most markedly in relative advantage.

The second point of note in Table 43 is that over 75% (14 or more) of informants scored Lean higher than other OMIs on relative advantage, trialability and observability.

The third point of note in Table 43 is that the scores for relative advantage reveal this to be the most important attribute of an OMI. These findings support previous DOI research in which relative advantage is found to be the most important of the five attributes (Rogers, 2003).

The fourth point of note in Table 43 is that the scores for observability offer some triangulation to the findings reported in Table 41 in which informants identified visibility as a perceived benefit of Lean over other OMIs. The scores for complexity should similarly have offered some triangulation with those reported in Table 41 in which informants expressed simplicity as a perceived benefit of Lean. However, the empirical testing of the DOI model (see Figure 5) posed some pragmatic difficulties. One such difficulty is that complexity is different to all other attributes (and in fact all other variables) in this model. The difference is that complexity is negatively related to the dependent variable (diffusion rate) whilst all other attributes and variables are positively related to it. During the interviews, this caused informants confusion in their understanding of the model. Such confusion must cast some doubt as to the reliability of the scores for complexity. One immediate and simple improvement of the model would be to reverse the negatively related complexity construct (to the dependent variable) with a positively related simplicity construct. Furthermore, most informants argued that while they perceive Lean to be a simple concept, successful implementation of Lean is far from simple. Another area of confusion during the empirical testing of the model was that some informants were unable to distinguish between relative advantage and compatibility or between triability and observability.

However, in spite of some pragmatic difficulties, the findings represent a novel method for comparing perceptions of various OMIs. The model provided a mechanism for directing attention towards the attributes of an OMI and away from the market characteristics of an OMI which dominated earlier findings. It is noteworthy, however, that the five attributes in the model have been derived from research primarily based on the diffusion of product, service of technological innovations. The findings also cast doubt over their appropriateness for OMIs like Lean. The development of more appropriate set of perceived attributes for OMIs as an object of innovation offers potential for further research.

6.3 Discussion of Findings (RQ3)

What is the pattern of Lean diffusion in the period 1988-2010?

To recap, this study begins in 1988 when Krafcik first coined the term Lean. Since then Lean has diffused or spread to many organisations and may now be regarded as a movement spanning more than two decades. The literature review included Table 2 which summarised key events and publications leading up to 1990. Table 44 is a similar of key publications and events since 1988. It has been developed from various primary and secondary sources identified during the course of the research.

Table 44 Publications and Events Shaping Lean Diffusion

Year	Publications/Events
1988	Ohno publishes TPS. Krafcik publishes *The Triumph of Lean Production* and coins the term Lean. Stalk publishes HBR article, *Time: The Next Source of Competitive Advantage*, expanding interest in TPS beyond manufacturing.
1990	Womack *et al.*, publish *The Machine That Changed The World.*
1992	Anderson Consulting publishes T*he Lean Enterprise* report. Toyota announces the opening of a car assembly plant in Derby. Garrahan and Stewart publish *The Nissan Enigma.*
1993	Lamming publishes Lean Partnership: Strategies for Innovation and Lean Supply
1994	Anderson Consulting publishes *The Second Lean Enterprise* report. Williams *et al.* publish *Against Lean Production.* Hines publishes *Creating Worldclass Suppliers.* Womack and Jones publish an HBR article on Lean.
1995	The DTI launches SMMT Industry Forum (IF).
1996	Womack and Jones publish *Lean Thinking.* The government publishes *The Egan* report. Toyota opens a plant in Derby.
1997	Dimancescu *et al.* publish *The Lean Enterprise.*
1998	The DTI launches the IF adaptor programme. The Society of British Aerospace Companies (SBAC) launches UK Lean Aerospace Initiative (UK LAI). Delbridge publishes *Life on the Line in Contemporary Manufacturing.*
1999	The IF initiative expands into oil and gas (LOGIC).
2000	The IF initiative expands into metals (MICE), ceramics (CIF), process (PICME) and textiles (TCIF). Bicheno publishes *The Lean Toolbox.* The MoD launches the Defence Logistics Organisation (DLO) to deliver the Defence Logistics Transformation Programme (DLTP).
2001	The NHS launches the Modernisation Agency. The IF initiative expands into construction equipment (CEA) , meat (RMIF), tourism (BFP) and shipbuilding (SSA).
2002	The DTI launches Manufacturing Advisory Service (MAS). DEFRA launches the Food Chain Centre (FCC). The MoD establishes the Lean Support Team.
2003	Seddon publishes *Freedom From Command and Control.* The IF initiative expands into construction (CLIP), printing (VIP) and furniture (UK first).
2004	The LEA organises the first Lean service conference. The IF initiative expands into cereals. Liker publishes The Toyota Way: The Company That Invented Lean Production.
2005	The NHS Institute for Innovation and Improvement replaces the Modernisation Agency.

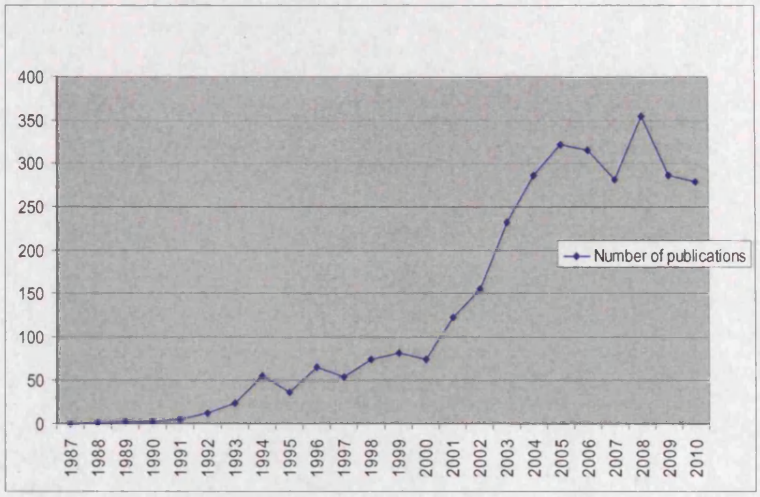
Year	Publications/Events
	The Times publishes an article ridiculing Lean in HMRC. Womack and Jones publish *Lean Solutions.*
2006	The Scottish Executive publishes a report on lean in the public sector. Radio 4 broadcast a programme on Lean in HMRC. Rich *et al.* publish Lean Evolution. Reading University publishes a report evaluating the IF initiative. NHS Confederation publishes Lean Thinking for the NHS.
2007	Seddon publishes *Systems Thinking in the Public Sector.* Holweg publishes *The Genealogy of Lean.* Coffey publishes *The Myth of Japanese Efficiency.* Pubic and commercial services union (PCS) publishes a leaflet opposing Lean. The International Journal of Production Research publish a special edition on TPS. The FCC publishes its Completion Report. DTZ publishes a report evaluating the MAS initiative. HMRC publish an interim evaluation report on their Lean implementation.
2008	Schonberger publishes *Best Practices in Lean Six Sigma Process Improvement.* Fillinghan publishes *Lean Healthcare: Improving Patient's Experience.* Bicheno publishes *The Lean Toolbox for Service Systems.* Hines *et al.* publish *Staying Lean.* The NAO publishes a review of Improvement Methodologies in the public sector. Sir John Egan addresses the House of Lords on progress in the construction industry.
2009	Stewart *et al.* publish *We Sell Our Time No More: Workers Struggles Against Lean Production in the British Car Industry.* Spear publishes *Chasing The Rabbit.*
2010	Rother publishes *Toyota Kata.* HMRC publishes the final report on their Lean implementation. HMCS publishes an evaluation of their Lean implementation.

(Source: the researcher)

The content of the above table shows the longevity of the Lean movement and illustrates that Lean continues to inspire discourse and debate.

In order to explore the diffusion of Lean over time, it was necessary to define an effective unit of measurement. The review of the MF&F literature revealed that tracing publications over time is a dominant research method within in this body of work. This method is referred to by some authors as the historical bibliometric method (Abrahamson, 1996; Charvet *et al.,* 2008; Spell, 1999; Carsen *et al.*, 1999; Spell, 1999). Evidence of publications on Lean is provided in Figure 14. This Figure is derived from the Lean publications database (LPD) which includes over 3050 publications on Lean during the period January 1987 (the year before Krafick's 1988 artlcle in which the term Lean is first used) to the end of December 2010. The LDP enables analysis of the pattern of publications on Lean in total, by publication type and by major sectors. Turning first to the LPD findings regarding the volume of publications on Lean:

Figure 14 Number of Publications on Lean (1987-2010)



(Source: the researcher drawn from the LPD)

The first point of note in Figure 14 is the steady rise in the number of publication produced since the term Lean entered the management lexicon in 1988.

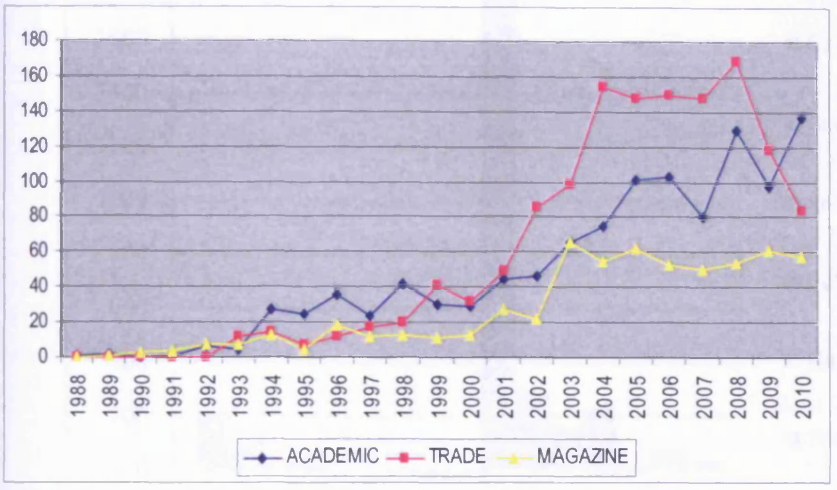
A second point of note in Figure 14 is that publications up to 2007 resemble the emergence of a normal distribution. The number of publications on Lean captured in the database peaked in 2005 at 322 and declined thereafter to 282 publications in 2007 with the 2007 level returned to again in 2009. Authors, such as Rogers (2003) and Ryan and Gross (1943), of DOI theory argue that adopter distributions follow a bell-shaped curve over time and approach normality. DOI theory states that a normal distribution provides the basis of the well-established S-curve which plots the cumulative number of adopters. Such authors would argue that the evidence in Figure 14 suggests that Lean is a successful innovation that displays a normal pattern of diffusion. However, authors within the MF&F literature are likely to interpret the same evidence in a different way. For example, Gill and Whittle (1992), Abrahamson (1996) and Spell (1999) argue that management fashions go through a lifecycle. They might regard the fact that publications on Lean appear to have peaked as evidence that Lean is entering the later, declining stages of its lifecycle.

On the other hand, Carson *et al.* (1999) might interpret the same evidence differently again. They argue that most OMIs start as a management fad but that some develop into a trend and later evolve into collective wisdom. They might interpret the two decade longevity of Lean, and fact that it has passed its peak in publications, as evidence that it is moving into the latter stages of that transition. Finally, authors such as Benders (1999), Benders and van Veen (2001) and Clark (2004) might highlight the potential decoupling of label and content in the case of an OMI such as Lean. Publications data offers a barometer of discourse but not necessarily diffusion. Since the *popularity* of a topic in the press is not necessarily closely linked to its *adoption* in a particular management population, a high rate of coverage in the media does not necessarily mean a high rate of application. Conversely, the disappearance of the label in the media does not necessarily reflect that the underlying ideas have been dismissed (Benders and van Veen, 2001). It is clear that evidence drawn from the LPD may be subject to alternative interpretations. Consequently, the data drawn from the LPD is triangulated with data drawn from the expert interviews presented later in this chapter.

The third point of note in Figure 14 is that the apparent decline in publications on Lean was briefly interrupted by a surge of publications in 2008. This finding provides some support for others who identified that 2008 saw a surge of interest in Lean in the healthcare sector (Brandao de Souza, 2008). However, the literature review identified a number of works produced in 2008. Some of these were specific to healthcare. However, others were related to areas of the public sector other than health.

Turning now to the findings derived from the LPD regarding publication type. Figure 15 shows publications on Lean according to their designation as *academic, trade* or *magazine* (see section 5.4.1 of chapter 5).

Figure 15 Publications on Lean by Type (1987-2010)

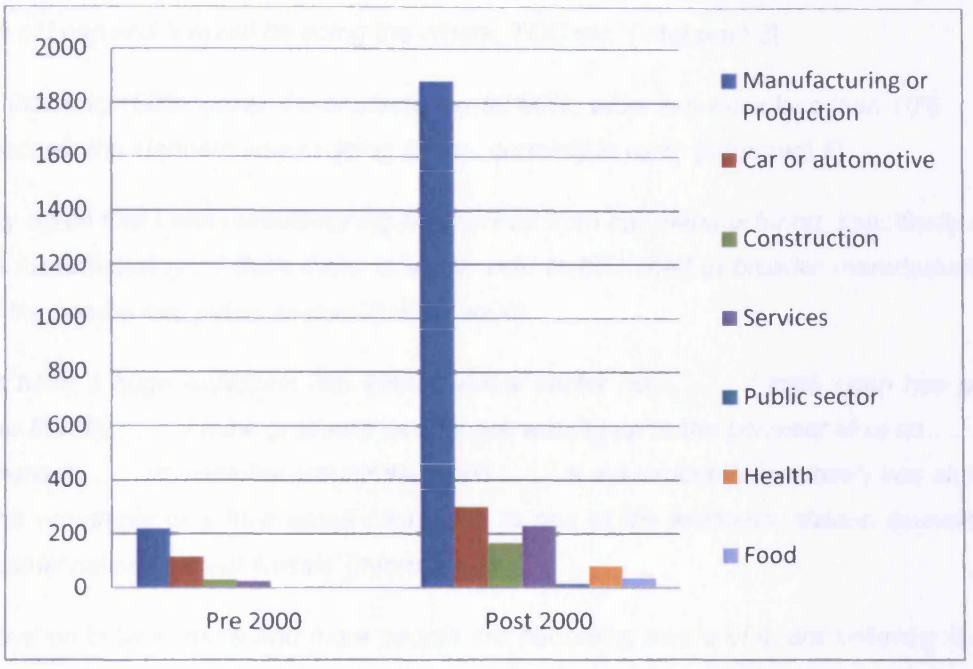


(Source: the Lean publications database)

The figure illustrates the early interest in Lean among the academic community. Interest in Lean was dominated by academia between the years 1993 and 1998. Since that time, however, Lean has featured in all types of publication. Previous research on management fashions (Abrahamson and Fairchild, 1999; Spell, 1999) has sought to explain patterns of an OMI's discourse by the interest in different types of publication. For example, Abrahamson and Fairchild (1999) explain the gradual decline of discourse in Quality Circles by the persistent interest from the semi-academic and academic press long after the business press lost interest. The findings presented here, however, do not show similar patterns in Lean discourse. The broader implication of this finding may be that Lean fails to exhibit similar patterns to other OMIs regarded as transitory management fashions. This may be an area suitable for further research.

Turning now to findings drawn from the LPD regarding publications on Lean by sector, Figure 16 shows the findings of a simple keyword interrogation by major industrial sectors before and after the year 2000. The year 2000 was selected simply because it divides the period under inquiry into two distinct halves.

Figure 16 Pre and Post 2000 Publications on Lean by Sector



(Source: the researcher)

There is some inevitable double counting within Figure 16 since some publications may appear under two or even more of the keywords used. However, with this caveat in mind, it may reasonably be inferred from Figure 16 that while Lean discourse was well established in manufacturing prior to the year 2000, Lean discourse in services, construction, public sector, health and food appear to be post 2000 developments.

The literature review revealed that the publications data contained within the LPD may be open to diverse interpretation. In particular, certain authors argue that bibliometric data only provides evidence of discourse as a proxy for diffusion (Benders, 1999; Benders and van Veen, 2001; Clark, 2004). In view of this, the data drawn from the LPD is triangulated with data drawn from the expert interviews. The associated part of the interview was section 2 (see the Interview Schedule in Appendix C). There was complete consensus among informants that Lean is a diffusing phenomenon and that it has recently spread into new environments. The following extracts, taken from seven of the 21 informants, are the most definitive statements that Lean is a diffusing phenomenon:

'Gut feel, if you were to group all the business in Wales who understood and applied a business improvement philosophy and that number as an index was 100, I would say that 95 would have some application of Lean and 5 would be doing the others, TOC etc.' [Informant 3]

'Car manufacturing 100%, general manufacturing 50/60%, wider business less than 10%.....but I think it's become the standard way of doing things, certainly in cars' [Informant 4]

'I definitely agree that Lean manufacturing has spread from car manufacturing, specifically assembly to general manufacturing....I think there is a rich vein to be mined in broader manufacturing to say nothing of the service and public sectors' [Informant 6]

'there has been a huge explosion into almost every sector now.....I think Lean has penetrated everywhere literally.....I think gradually people are waking up to the potential of Lean..... the Lean movement.....16 institutes around the world..... a movement that probably has about 15,000 people who voluntarily give their email addresses to one of the institutes, sixteen countries, all the major industrial nations except Russia' [Informant 8]

'As we move on in time, more and more people are becoming aware of it, are believing in it.....I was conscious of the Lean movement' [Informant 11]

'It has been diffused, it has been spread out.....I would say Lean is now quite pervasive.....It definitely has moved. It certainly has moved to the health sector. I believe it has moved to the public sector non health, so Customs and Excise. I know it has moved to the construction and administration sectors' [Informant 19]

Evidence from the expert interviews therefore concurs with the diffusion trend illustrated in Figure 14. However, while there was consensus amongst experts that Lean is a diffusing phenomenon, the dissenting informants presented an alternative view of Lean diffusion. They argue that Lean is not an innovation that is radically changing organisational practice; rather that it is merely the Lean lexicon that is diffusing while organisation practice remains largely unchanged:

'The metaphor is spreading' [Informant 12]

'There's a lot of Lean tools work going on in manufacturing, but it is not changing the system. And now the same thing is happening with service organisations.....So it's diffusing but it ain't changing the system' [Informant 5]

Their views of Lean diffusion suggest that they regard the Lean phenomenon as the current dominant management fashion, but more myth than reality (Coffey, 2006) and impotent for radical organisational improvement (Seddon, 2005). Their views

support those of other authors who argue that in the case of OMIs, content and label may be decoupled (Benders, 1999; Benders and van Veen, 2001; Clark, 2004).

Some informants were purposively selected for their knowledge of the more recent diffusion of Lean into newer environments of the service (informations 13, 15 and 16)and public (5, 8, 17, 18, 20) sectors:

'my role was to translate the Lean manufacturing into a service industry.....I have just launched a Lean forum and I have got people from Sellafield, from banking, from insurance, from broking, from telecoms, from underwriting, from all walks of life.....We have found there is real desire to Lean.....Today, financial services and service sector represents 80% of our business, the energy and manufacturing is completely marginal' [Informant 13]

'Lean is actively being applied across industries. It started in car manufacturing (Toyota) but is now widely spread in service (McDonalds), financial services (Lloyds Banking Group), and public sector (NHS)' [Informant 15]

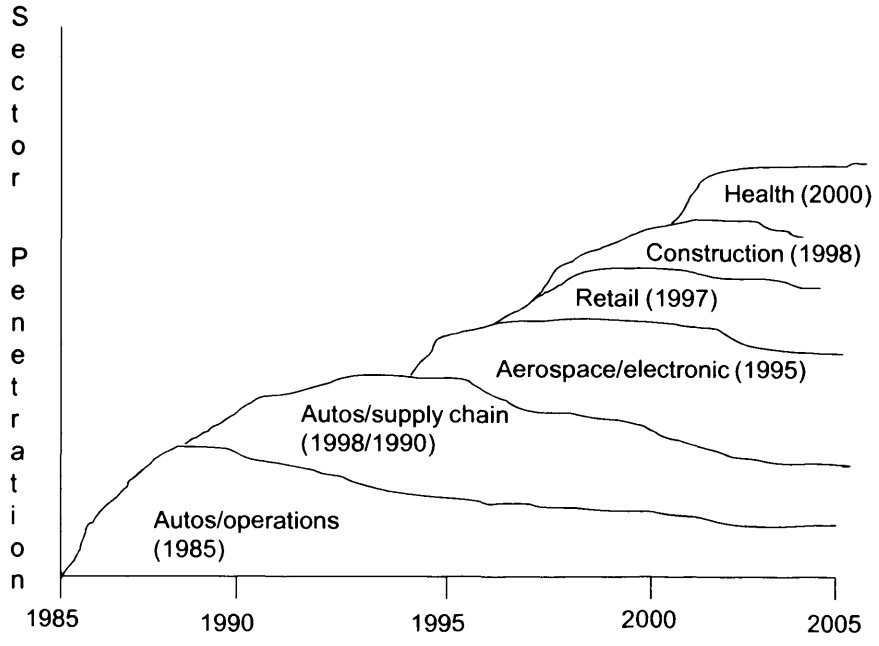
'at last count I think there were 26 government departments (they do change), I think we counted that 24 of them to our knowledge had some kind of transformation programme based on Lean or something similar. Lean is pervasive.....In terms of spread I would say it is incredibly pervasive around central government' [Informant 17]

Informant 1 described Lean diffusion over time as having occurred in waves, entering new sectors at different points in time:

'If you look at Lean over time you can see little waves. The first wave would be autos and ops and then the next product proliferation would be autos and supply chain....Then it goes to aero....Electronics was at the same time as aeros. Then I think it was retail with the likes of Tesco' [Informant 1]

This informant sketched out his perception of Lean diffusion. His sketch is reproduced in Figure 17 which depicts Lean diffusion as sedimentary layering, penetrating different sectors at different points in time. It illustrates that the population into which Lean is diffusing has changed and expanded over time. This is an important point that will be returned to in Chapter 8:

Figure 17 Informant 1's Perceptions of Lean Diffusion



(Source: informant 1)

Interestingly, one informant (Informant 4) pointed out that Lean penetrated the electronics sector much earlier but in a different guise (Just in Time rather than Lean). His comments confirm the views of others who suggest that Lean is derivative of the earlier Just in Time (JIT) phenomenon (Schonberger, 2007). The implication of his comment is that Lean consists of a mere re-labelling of an earlier OMI e.g. JIT, just as Six Sigma was earlier accused (by Informant 5) as a mere re-labelling of the earlier TQM OMI. Overall, the findings triangulate with those reported earlier in Figure 14.

Some informants were purposively selected for their knowledge of the newer environments of the service (informants 13, 15 and 16) and public (informants 5,8,17, 18 and 20) sectors. There are three main findings pertinent to the emerging debate on Lean in the service sector identified in the literature review. The first of these findings is that, in service organisations, Lean is a response to a former decision in favour of task fragmentation based upon economies of scale:

'If you think about 10 years ago there wasn't a back office.....We didn't have a mass production environment then.....People said it must be better to create scale and save loads of money,

probably looking at people like manufacturing..... the job is to make more of your floor space for the customer, so the more we can encourage the back office, the more they can use the front office for sales' [Informant 15]

'as the mid 80s had set up large what I would call time and motions capability and had centralised its operations along mass production principles.....They had saved money, don't get me wrong, they had gone from 90 service centres to 6 so they had saved all those buildings, there are some economies of scale, but the process didn't work.....I mean their complaints departments, they had hundreds of people on an industrial scale dealing with complaints. You know as a business that when you have got complaints on an industrial scale..... it was chaotic because what they had done was that they had functionalised everything and were going for the sweat index productivity volume challenge.....I reckon if you looked at their end to end right first time they had got more rejects than units, because there were 30% failures on the front end, 15% error rate at each step in the process so you have got more defects than units at the end of the day, so going in there making improvement is like shooting fish in a barrel' [Informant 13]

'the realisation in some of those areas that some of that work was factory-like and there were processes' [Informant 16]

The findings therefore corroborate an early trend, identified in the literature review, in which service organisations were encouraged to adopt task fragmentation in order to realise efficiency gains (Levitt, 1972, 1976; Chase, 1978). Task fragmentation is predicated on economies of scale and mass production logic. The findings support those authors who have criticised that trend. Seddon *et al.,* (forthcoming) have criticised task fragmentation in service organisations on the grounds that it diverts managerial attention away from the central remit of high-quality service delivery. They advocate the elimination of task fragmentation and the re-organisation of the work according to service effectiveness rather than efficiency. (Seddon *et al.*, forthcoming). The wider implication of this finding supports authors who have questioned the 'best practice' approach to organisational improvement (Pilkington, 1999; Francis, 2002; RBG, 2006). The validity of this approach is an obvious area ripe for further research.The first main finding related to Lean in services is therefore that Lean may be a reaction to the legacy of earlier decisions to fragment tasks based on economies of scale logic.

The second finding related to Lean in services concerns the period of time under inquiry (1988 to 2010). This period has seen dramatic growth in the service sector and equally dramatic decline in the manufacturing sector. Informants 13 and 16

argued that the early 90s saw the growing service sector receive an influx of managers from manufacturing armed with Lean knowledge and skills:

'What then happened was that they had started to recruit from industry as early as the late 80s and were open from a culture perspective to take these people from, who were probably higher order animals when it came to lean and industrialisation, when they came into the market in the late 90s.....I think that what generally happened is that a lot of left the auto industry in the 90s because they could see the writing on the wall. What happened was that they found themselves moving to industries that have subsequently been the bedrock of the UK economy, telecoms, banking, insurance and those businesses had been through the mass production cycle in the late 80s' [informant 13]

'The service industry over the last 20 years or so has grown quite dramatically and I think that has taken a number of forms, obviously there is financial services and I think there has been a development of a raft of other types of industries that have fed a consumer boom like mobile, telecommunications, travel etc. and that those industries are maturing.....I think from being the only game in town, service industry has started to bring people from manufacture. People from manufacturing naturally migrated for a whole bunch of reasons, not least of all because there weren't any other jobs.....in my recruitment up til now I have looked for lean practitioners, guys who have been in manufacturing, consulting or both, or manufacturing, consulting and service to come here and help us.....Two of my guys are ex-Toyota but have been elsewhere, two of my guys are ex-manufacturing' ' [Informant 16]

'Instead of recruiting from the banks, people like me who had no ideas about operations, I started recruiting people to do banking operations jobs from car factories. I went out and recruited production line directors to come and work in banks, so I had people from Renault and over the bloody place. Some haven't worked out, some have worked out brilliantly, one has been with me the whole time' [informant 15]

Informant 13 argued that there is far greater mobility of labour between industrial sectors in the UK than in other European countries:

'I think the UK has got an advantage over a lot of countries there. We have got a lot of mobility between sectors and also we have got a pretty dynamic market based economy, so you have got freedom of capital, freedom of movement of people as well. Whereas I think in countries like France and Germany, much harder to do because they would be much more protectionist and their industry specialism is much more important barrier to move between companies and sectors. So I think in the UK it start with our capital system in that capital moves freely between sectors.....My French friends are stunned that I can work in banking and underwriting and health. They say 'you know nothing, how the hell do they let you in?' [Informant 13]

The movement of labour was the result of accelerated decline in manufacturing due to the monetarist policies of the government at the time. The findings suggest that the diffusion of Lean into the UK service sector may be the result of inter-sectoral labour mobility. The author is unaware of research on this issue in the extant literature. This finding also offers potential for further research.

The third finding that is pertinent to the ongoing debate on Lean in services concerns the appropriateness and effectiveness of Lean to the service sector. Debate on this issue has polarised into two camps. Some authors argue that Lean is a process-based improvement methodology that translates well into the service environment (Swank, 2003; Atkinson, 2004; May, 2005; Abdi *et al.*, 2006; Ehrlich, 2006; Corbett, 2007; Piercy and Rich, 2008). Others argue that Lean encourages the use of inappropriate techniques which result in detrimental effects on service provision (Seddon, 2005, Seddon *et al.,* forthcoming). Seddon (2005), in particular, has been critical of the use of standardisation, arguing that standardisation dampens the organisations' ability to absorb variety (Seddon *et al.*, forthcoming). The findings presented in Appendices I and J, although based on evidence from only two service organisations, offer no support for Seddon's main criticism of Lean application to service organisations. On the contrary, in both cases standardisation has been used with discernment and discretion.

Informants collectively identified a number of Lean implementations currently underway in the public sector:

'the Society for IT Managers for Local Authorities called SOCITM.....launch from the centre of lean .....SOCITM is promoting it to its members, the Department of Communities and Local Government (DCLG).....encourage local authorities to do it' [Informant 5]

'So I think it really has penetrated the public sector. The bits of the public sector that are just waking up are local government, police force, justice, the main tax and benefits, DWP, the main service delivery kind of back office have been in it for a bit' [Informant 8]

'HMRC had put in a pretty formal transformation program of which lean principles were going to play an intrinsic part.....You have got HMRC, DWP, MoD, the military. The justice sector, the home office.....The home office has got quite a well developed (in terms of time lines) program based on lean principles way of improving performance within the police service.....At last count I think there were 26 government departments (they do change) I think we counted that 24 of them to our knowledge had some kind of transformation programme based on lean or something similar. Lean

is pervasive. As to how far along and what they effects are, the reason why.....In terms of maturity of approach you would be looking at the three services of the military, HMRC, DWP, Home Office, the Justice Department, they have been going the longest.....If you have a look at the Operational Efficiency programme lean is mentioned by name because there is evidence within places such as HMRC, Home Office, MoD wherever that this might be a good thing for departments to consider' [Informant 17]

'HMRC have a program called Pacesetter.....they have used the lean word and it has been adapted to suit their methodology. They adapted the Unipart way.....The Ministry of Justice have a lean program which they are rolling out across 42 justice systems in England and Wales.....If you look at CPS (Crown Prosecution Service), they have got the Optimum Business Model where they are trying to maximise their processes.....The police service have a thing called Operation Quest' [Informant 18]

'I've been to Job Centre Plus in North London. They are doing a lot of work with lean thinking and they are using.....' [Informant 20]

Some of these Lean implementations in the public sector had previously been revealed by the literature review (Radnor *et al.*, 2006; Radnor and Bucci, 2007, 2008; Radnor and Bowden, 2008; Hines and Lethbridge, 2008). The Treasury (2009) identified four main Lean implementations in the public sector: the police service (named Operation Quest); HMRC (named Pacesetter); local government (named National Process Improvement Project or NPIP); and the Department of Works and Pensions or DWP (named the Lean Way). The findings suggest, however, that the Ministry of Justice, Home Office and Crown Prosecution may now be added to the list. These findings are corroborated by three recent publications: The first is an article giving details of a cross-government collaboration group which includes all of the aforementioned organisations and the NHS (Chapman, 2010); the second is an article recently published by the Ministry of Justice (MoJ) with details of their Lean implementation efforts (Hamer, 2010); the third is an evaluation of Lean implementation in HM Courts Service (Radnor and Bucci, 2010). The wider implication of these findings is that Lean is regarded by government as a means of achieving the operational efficiency objectives for the public sector in the future (Treasury, 2009). Further evidence of this claim emerged during the May 2010 government election campaign in which waste removal and other Lean axioms were often referred to by campaigners.

Informants 17 and 18 argued that Lean diffused into the public sector via defence. The RAF discovered Lean from the US air force and they in turn introduced it into the Ministry of Defence (MoD). Lean diffusion in the defence sector took place in the midst of broader contextual changes following the end of the Cold War. Lean formed an integral part of the Defence Logistics Transformation Programme (DLTP), a restructuring response to the 1998 Strategic Defence Review:

'I am sure in your work on diffusion you have come across how defence logistics has played its part in getting to the public sector both in the US and in the UK.....the US Airforce were the first military organisation to adopt lean at Warner Robins.....They then hired some of the Lean consultants to come in and help them on their repair lines. They then saw some great benefits from that.....the RAF got wind of and sent a couple of their guys across to see what was going on at this particular base. What you had then was a success story that built up from one particular repair line for one particular part of one particular aircraft.....The RAF took it across, it then spread through the military in the UK. The military then started trying to influence its civilian partner which is the MOD about how they could perhaps operate in a lean way.....The military then started trying to influence its civilian partner which is the MOD about how they could perhaps operate in a lean way. At the same time you had things going on in healthcare.....So it seeped into the public sector from the military' [Informant 17]

'It started in the military in 1998. We had tiger team which led onto the DLTP. It was all part of the big change to cut cost by 20%. They were consultancy led. We had consultants in defence until 2005. So there was a big consultancy input to get this thing running' [Informant 18]

It is noteworthy that defence and the military is the part of the public sector that bears most resemblance to traditional manufacturing, operations and logistics.

Two same informants emphasised the extent of adaptation required for successful Lean implementation in the public sector. They drew on the example of the MoD to illustrate this point. Informant 17 referred to profound changes that the MoD have made in traditional contractual arrangements. Informant 18 referred to the MoD as consisting of four constituent parts (the army, navy, RAF and Civil Service) and argued that each part has an organisational culture of its own:

'Also at the same time they were downsizing the number of airbases, they were downsizing their supply chain in terms of changing their contractual arrangements, not going in and improving the efficiency in the supply chain, just changing the actual contractual basis, things like contracting for availability where you contract for output rather than parts' [Informant 17]

'The MoD is not one unified business, it is actually four businesses. You've got the department of State, the major government department: the MOD and then within that you have got four subsections: Army, Navy, Air Force and Civil Service. They all work independently and collegiately'. Civil Servants will work in each of the main services and we will have some cross pollination but the Army, Navy, Air Force tend to work in their own silos.....change in the RAF which is only 90 years old it is different to change in the Army, which 400 years old. The Navy is 1000 years old according to them. These people are embedded in the culture. .....So they are three different cultures and you have to deliver change in three different ways. The Navy is the easiest to change, they walk the floor, their floor is a little floor. The RAF is the hardest' [Informant 18]

The findings support those authors who argue that Lean diffusion in the newer environments involves reinvention (Rogers, 2003) or creative adaptation (Scarborough and Terry, 1998; Rogers, 2003; Lee and Jo, 2007, Radnor and Bowden, 2008; Majek and Hayter (2008). They also support authors who argue that Lean diffusion involves accommodating differences in cultural characteristics (Hines *et al.*, 2008). However, such authors generally refer to cultural characteristics resulting from differences between nationalities. Interestingly, these findings suggest that cultural characteristics can also occur across large organisations within national boundaries.

There was some disagreement as to whether Lean is being 'pushed' or 'pulled by the public sector. Informant 17 argued that Lean in central government is not the outcome of a coordinated initiative and that there is no government agenda to promote Lean:

'This isn't a coordinated initiative. This is departments choosing the approach that they set fit in order to meet the objectives they have been set so there is no agenda to push Lean..... Lean or some way of improving business performance through improving processes could be a way of meeting efficiency targets without an effect on services delivery to the taxpayer' [Informant 17]

Informant 5, however, claimed that Lean is being actively promoted by the Treasury:

'So it's a bit of push going on from those in authority and those representing organisations..... agencies being bullied to do it by the centre for cost reduction purposes, HMRC, DWP, the Environment Agency (National Rivers Authority as it used to be called). These are organisations effectively run by the Treasury, who can bully them. The message is getting to them from the Centre, from the Treasury. You need to cut your costs and lean is the way to go' [Informant 5]

Consultants appear to play a prominent role in Lean in the public sector:

'The Treasury employs consultant to tell them what to do. The big boys are in there, the McKinseys, Price Waterhouse and Accenture' [Informant 5]

'the £420 million spend on consultancy isn't that much, we spend £600 billion a year, more this year' [Informant 17]

Informant 17 referred to two National Audit Office (NAO) reports, both of which are published on the NAO website (NAO, 2006; Czerniawkski, 2006). These reports show that the public sector spending on external consultants increased by 33% in the three years preceding the end of 2006. This trend may well change following the autumn 2010 public sector spending review.

Lean in the public sector is represented as a difficult and slow process due to the size of the institution, its fragmented structure and political imperatives:

'Why doesn't government learn from itself? It sounds a lot more simple than it is. You talk about stove pipes in an organisation, you should see this one? It is 26 loosely federated states ie. departments with hundreds of sub-agencies underneath. These departments are big organisations in their own right, they have got their own stovepipes. Are we that surprised that lesson over here aren't finding their way over there?..... the burden of proof in the public sector is a lot higher because the accountability you have to work towards, it is not shareholder value, it is not if I get this wrong I might be out of the door, it is Minister might be fired, bad press, vilified by the public and all these kinds of things, they are different drivers and behaviours' [Informant 17]

'We have a demand based on policy of politicians which is not necessarily factually driven. Our big move within central government is to have policy based on fact rather than the emotion of a Minister.....Ministers don't have any power. The power is with the civil service. The civil servants are the constant.....Senior Civil Servants move every three years maximum. Most government departments SCS move every 18 months to 2 years. They want a bang and a result in that time and lean will never deliver that. The quick wins, the low hanging fruit stuff, yeah you will get some of that and that is what they get promoted on.....the general government philosophy is not necessarily to bring in an expert to do a specialist job'. [Informant 18]

Informant 17 suggested polarisation between central and local government. He argued that while Lean is favoured in central government, John Seddon's Systems Thinking is favoured in local government:

'Systems Thinking is more dominant in local government because local government is very much the intangible delivery stuff.....What effect has John Seddon's writings had in central government? I know that it is probably more accepted in local government. A lot of his case studies talk about local government examples.....If you were going to look at the public sector, I would try and

segment that and my perception is local versus central for JSs influence and why is that? Maybe there is a reason why ST is more adopted in the local government context' [Informant 17]

Other informants who had been purposively selected for their knowledge of local government (informants 5, 13 and 20) confirmed that Seddons Systems Thinking is pervasive in local government:

'There is another, a smaller group of people doing systems thinking' [Informant 5]

'ST is a splinter off it. I still think lean is much much bigger than ST, the only areas where that is probably debateable these days is the local councils, they are a lot of them talking in terms of ST' [Informant 13]

'There is a version of lean or ST that is more popular in local government and a version of lean that is more popular in central government. I agree with that.' [Informant 20]

The findings suggest that central and local government is an area of the public sector in which Lean and Seddon's Systems Thinking are competing for dominance. Currently, Lean dominates central government while Seddon's Systems Thinking dominates local government. Explanation for this apparent polarisation and the efficacy of the two approaches offer considerable potential for further research.

Overall, a number of intriguing findings that emerged pertinent to Lean in the service and public sectors. In particular, the role of inter-sectoral Labour mobility in diffusion of Lean, and potentially other OMIs, is novel. It has certainly not featured in the three areas of literature reviewed as part of this study. In addition, the findings revealed that the relatively public sector territory of central and local government may be likened to a 'jousting arena' in which Lean and Seddon's systems thinking are vying for dominance. This finding is reminiscent of authors such as Keiser (1997). The public sector as a whole offers considerable potential for further research. Certain areas of the public sector such as education, with the exception of some universities, remain completely untouched by Lean. As the government are poised to embark on extensive public sector spending cuts, it is unclear as to whether government will rely on the Lean OMI to deliver those cuts or whether the Lean OMI will be a victim of them.

6.4 Discussion of Findings (RQ4)

Why has Lean diffused in this pattern?

While the findings relating to RQ3 confirmed that Lean has diffused in the UK and revealed patterns within this diffusion, this question seeks explanation of why this pattern took this form. Data to inform this question was derived from the expert interviews. In section 2 of the interview, informants were asked open-ended questions about Lean diffusion while in section 4 they were asked for their views on a diffusion model derived form the DOI literature (see Appendix C).

Turning first to the findings from section 2 of the interview, the researcher used a simple cluster analysis technique to identify common themes. These themes are formed into seven main influencing factors underlying Lean diffusion. Each one is discussed in turn:

6.4.1 Influencing Factor 1: The Promotion of Lean

Several informants suggested that Lean diffusion has occurred because of effective promotion. The promotion of Lean began with the publication of *The Machine* and the promotional activities of individuals closely associated with the IMVP research:

'if you track his sales, that book sold 750K copies before they stopped counting. I don't know what that meant for the UK but let's say 30K, you've got 30K Financial Times reading senior executives reading books on Lean and presumably they're asking their organisations to go away and think about it.....I think there is a case to say that certain case study companies changed their industries when all they did was question their business models. They then happened to call it Lean because it was just in vogue' [Informant 1]

'The reason for the impact of The Machine? Good marketing '[Informant 4]

'My answer to all of this is because it's been promoted, it's been boxed up as tools. It appeals to organisations that think that's what change is. That is really what accounts for it growing.....But you see I think what drove this innovation, the driver, you can go back to your list, is this (change agent efforts)' [Informant 5]

'So Lean, written about by clever people who made good observations about the Toyota system.....The Machine and Lean Thinking truly got this on the map.....there has been a lot more written on Lean particularly in the UK' [Informant 6]

'They are very good at marketing, creating networks. It is very important. We live in an information age' [Informant 7]

'I was conscious of the Lean movement.....at the DTI: Dan Jones, Betty Thayer (she was the principle person from Anderson consulting) and Nick Oliver (now Dean or Deputy Dean of Lancaster). These three would go around giving presentations.....With the publication of the Anderson report and TMTCTW, it attains a huge amount of prominence as a concept.....who aggressively markets particular....concepts can actually rise to a level of prominence.....what is it that determines the success of some of these things? Partly marketing.....Dan was much more pivotal than the book....Dan is quite persuasive. I think Dan the man rather than Dan the book.....there is an east versus west. You need to market it and sell it on one side of the world, you need to apply it and make it happen on the other side of the world' [Informant 11]

'you can be the biggest idiot in the world but if you are successful, your words carry credence' [Informant12]

'Ohno was really good at his job and maybe he was a great self publicist' [Informant 12]

'The Machine put it out there. Did everybody understand it? No. Did I understand it when I first read it? No. But I think it did a real service' [Informant 13]

'There are people in the LEI forum saying that Lean is an imperfect subset of the TPS, I have gone back to them and said, trust me, before Womack and Jones wrote the book we were running round like headless chicken, thinking the Japanese were superhuman' [Informant 14]

'I could have met John Seddon before I met Dan and I could be sat here talking to you about what John Seddon says' [Informant 17]

'I think we have already said about what gets written up.....Perhaps by good fortune Lean has gained legitimacy and has got publicity whereas other equally valid and viable techniques have fallen by the wayside.....Some ideas get exposure and others do not' [Informant 20]

'I think big projects that draw a lot of work, publicise, and publish, help a lot' [Informant 21]

The literature review revealed that some authors consider Lean and Six Sigma to be complementary (George, 2002; Antony *et al.*, 2003; Magnusson *et al.*, 2003; Pepper and Spedding, 2010). Informant 8 suggested that Lean promotion was rejuvenated by Lean joining forces with Six Sigma:

'....Jack [Welch] said it's Lean guys. So all the consultants tried to repackage what they were doing as Lean Six Sigma.....For Jack to say this has enormous impact because so many ex-GE folk across American industry who spun out by not getting to the next rung up in GE, you know, we had a lot of them.....So now it is not uncommon for a CEO to say my colleagues are doing Lean or my competitors are doing Lean.....So now Chief Executives are quite familiar with the term. He was the

hero figure at the time and GE was the showpiece and everybody was trying to copy Jack.....the significant thing was that that week we had calls from several people, ex-GE folk who were now running other businesses....saying can we do Lean right across out global operations? So the significance of that was that it began to legitimise Lean at the senior executive level, at the CEO level, and for the first time we had top management interested in Lean and that has continued to spread' [Informant 8]

Several informants described Lean promotion as the formation of a Lean brand. A brand has been defined as 'a product or service made distinctive by its positioning relative to the competition and by its personality in the context of the target market' (Hankinson and Cowking 1993, p.5):

'From a diffusion point of view, systems thinking doesn't sell, Lean sells because it has got a brand.....it just so happened that they got hold of Toyota at that stage and then by not calling it fragile production, by calling it Lean, they moved into a market that was just begging to be filled' [Informant 1]

'I've already lost the lean brand' [Informant 5]

'Lean is only coining a term using a brand, trying to own some of the ideas developed by other people' [Informant 7]

'It's quite interesting there are several people, part of the process movement who don't want to be part of our movement, who want to distinguish themselves from the lean brand' [Informant 8]

'Lean is just a brand name' [Informant 18]

Various informants pointed out that Lean was promoted by individuals within both consultancy firms and academic institutions:

'So I don't think to be fair consultants have spread Lean other than to be busy bees, turning it into a product and then mass marketing it to a relatively innocent and pretty dumb purchasing public' [Informant 1]

'It has been subsumed into management business process tools and people, because it's been bloody sold that way, which is where the big bucks are' [Informant 5]

'people are going to try and make money out of this.....and they are going to do it badly and you know it gives Lean a bad name' [Informant 8]

'...the people who have dumbed it down are selling it for a living' [Informant 11]

'I think there was a period when a lot of people were looking for chairs on the back of this stuff. I think in academia it is exhausted and are looking for the next best thing. I think with academics this is very

close to being the next best thing and that is just because it is such an opportunistic profession' [Informant 12]

'if you look at Andrew Graves at the University of Bath. His specialisation is Lean aerospace. Why? Because the other markets were saturated. Where else can I do this?' [Informant 18]

'The problem is that industry needs novelty; academia needs new concepts' [Informant 21]

Finally, Lean was promoted by the government, through various initiatives. Three informants (9, 10 and 11), were representatives of three important such government initiatives: Industry Forum (IF), Manufacturing Advisory Service (MAS) and the Food Chain Centre (FCC). Appendices G, H and I present background information on these three initiatives drawn from these interviews. Collectively, they suggest that government initiatives have played an important role in promoting and diffusing Lean. Overall the government has played a reduced role more recently. One notable exception is the food and agricultural sector where the formation of the Red Meat Industry Forum (RMIF) and the Food Chain Centre (FCC) promoted their particular form of Lean for a period of five years or so. This sector is one in which Lean has been 'pushed' by government rather than 'pulled' by industry and the findings cast some doubt as to whether this represents good value for taxpayers money. The best practice approach has been questioned by several authors (Pilkington, 1999; Francis, 2002; RBG, 2006) and yet it remains highly institutionalised by government (Bateman, 2002; Francis, 2002; Ashworth *et al.*, 2007). It represents an area suitable for further research.

One informant argued that the government was highly motivated at the time to promote Lean as an antidote to competitive pressures. He suggested that there was a common pattern to the government promotion of Lean:

'automotive industry were crapping themselves because the government reports at the time were saying 250K people leaving the sector, that would have been catastrophic for the UK Treasury, that's 250K people out of work, that's a big hole and would have hit regionally.....The economic and industrial relations unrest in the UK in the 1980s, coming out of miners strike in 84, then all of a sudden we are into telling people about partnerships and persuading unions to work with managers and company unions are better than trade unions.....All the key influencing people in all sorts of major sectors were behind this. It was a win-win agenda for everybody. People who owned the businesses, the venture financiers said this is what we want, cost down, all the people inside shitty manufacturing organisations who have never had any strategic power because they were operations people, thought this was a life-raft, a saviour.....Everything was teed up for Lean to be a rip

roaring success.....They funded automotive and aerospace when they said they wanted help, I do think Treasury was more likely to fund DTI based on the prominence of the sector....headcount and contribution to GDP.....There were monies set aside by government to promote healthy working relations, just to get the productivity improvements in. So I think that sort of indirect funding helped as well, or helped the diffusion of Lean by creating less resistance to it.....I think the unions didn't create the barrier that most would have expected. Certainly union militancy in Germany was far greater than in the UK, so IG Metall certainly resisted Lean's diffusion, whereas AMACUS or AWU, which I belonged to at the time, was supporting it and certainly saw our salvation in management-union partnerships.....the government also gave ACU an amount of money to act in partnership with the government, particularly with government bodies' [|Informant 1]

'Typically you will find that the evolution goes: major think-piece White Paper at the request of government, outcome of White Paper, setting up of Trade Organisations to promote Lean so the Industry Forum.....so what we did in the UK is, we looked at the model and thought wow that's great, how can we do it without breaching State aid or others so what they did was set up charitable Trade Bodies for each sector, following a report that said that this sector needs to improve.....MoD is a sector that has followed the classic pattern. McKinsey end to end reports, the creation of industry fora, the creation of dedicated integrated project team. So the diffusion of Lean in military terms has followed the classic pattern.....So I think professional bodies, government, structural investment, like the fora, all basically aided promotion' [Informant 1]

This informant made a direct link between the extent of Lean diffusion in different industrial sectors to the government's initiatives in those sectors. His views were triangulated with those of informants 10 and 11:

'Those that had structural investments in their sector, that were sponsored by government, diffused lean a lot quicker than others and I think MAS is a bit of a mop-up activity for those companies that didn't fall into' [Informant 1]

'I think that you could argue that, had food been sponsored by DTI, it might have spread more quickly in food than it did' [Informant10]

'We have been into many types of environments. In many cases there is a bigger persuading job to be done' [Informant 11]

Some informants suggested that government funding of Lean initiatives in certain sectors provided motivation for organisations in other sectors to fabricate initiatives in order to attract funding for their own sector:

'There was huge levels of enthusiasm from other trade associations and other sectors to say, 'phaw, there is some government funding there, I'll have some of that' [Informant 11]

'Then what has happened subsequently of course is that many associations, organisations and so on, have picked up that and propagated it' [Informant 5]

Informant 5 argued that the government is aggressive in its approach to Lean promotion. The same view was expressed by informant 10 who was purposively selected for his role in the Food Chain Centre initiative:

'So it is a bit of push going on from those in authority and those representing organisations.....The question is what are you being bullied to do and how are you going to get your stars and comply. If you don't comply you are in trouble' [Informant 5]

'Our ability to sell this, initially at least on proven benefits, was actually very, very low. We had to rely on the fact that this is funded, the fact that you are getting free consultancy from one of the biggest world-class business schools, and the fact that this was very strongly supported by government, and if you don't take part, we won't name and shame you but government is not going to look very favourably' [Informant 10]

However, evidence from other informants, less familiar with various government initiatives, revealed diverse views as to both the extent and success of the government's role in Lean diffusion. Appendix J presents a table of informant responses to the question of the role of government in Lean diffusion (see section 4 of Appendix C). The table shows responses categorised into four types: first, those who consider the government to have played a good role in diffusing Lean; second, those who consider the government to have played a poor role in diffusing Lean; third, those who consider the government to have played a role but that the role has not been significant; fourth, those who consider that the government have not played a role. Much of the diversity of these views may be explained by the variation in levels of awareness amongst informants. However, they do cast some doubt as to at least the perceived effectiveness of such government initiatives.

Overall, the findings clearly indicate that promotion is an important influencing factor in Lean diffusion. Promotion, referred to as change agent activity, forms a central construct of DOI theory. The theory asserts that the greatest impact of change agent activity occurs when opinion leaders adopt and there may be little change agent activity once a critical mass has been reached (Rogers, 2003). The findings broadly support this assertion since there was broad agreement amongst informants that Lean was heavily promoted in the past. Their views of more recent Lean promotion were, however, rather more mixed. Informant 15, who had been selected for his

expertise in the service sector, did not believe Lean had been promoted in the service sector. He commented that he had been drawn to Lean partly for that reason. In the public sector, Informant 17 argued that Lean is one of many possible improvement methodologies being promoted by central government. Informant 5, however, argued that public sector organisations are currently being 'bullied' into Lean by central government. The findings therefore suggest that promotion is an important factor influencing Lean diffusion but that while very important to early diffusion, it may be less important to more recent Lean diffusion. Promotion is also central to MF&F theory. The findings support Abrahamson's (1996) conceptualisation of various fashion setters forming the supply side of a market. The findings also support those authors who highlight the role of professional associations, funding bodies and other intermediary groups in promoting best practice such as Newell *et al.*, (2001, 2001a) or Scarborough, (2002). The promotion of Lean may have been facilitated by the second influencing factor, the empirical foundations of Lean.

6.4.2 Influencing Factor 2: The Empirical Foundations of Lean

Several informants suggested that Lean diffusion has occurred because of the empirical foundations of the Lean OMI. There are two main aspects to the empirical foundations of Lean.

First, the MIT research study from which the term Lean was coined and which is reported in *The Machine*. The literature review and primary findings reported earlier revealed that although contentious, even those who challenge the study remain impressed by it:

'The Machine was important. To a psychologist because it helped to understand how Taiichi Ohno experienced counter-intuitive moments' [Informant 5]

'The reason for the impact of The Machine? MIT based.....The reason for the impact of The Machine? Well written, well researched, impressive study, more comprehensive than anything that had appeared up until then.....It is to do with something that can be seen to have worked. One guy starts and it is demonstrably a success then others have to follow' [Informant 4]

'The degree of substance in the book is that you get this desirable result from concrete, achievable practices which were observed in Japan and the process of diffusion. What you have got is a set of empirical claims that you can test, you can check and find out if it is true or not, you can look over

time and see if there is any change in productivity.....I still think it is a good study. Krafcik worked out a really good questionnaire. It is an impressive research effort. But it is not the study to end all studies. It is still a contribution and then you think through and that part is not there' [Informant 12]

Second, Lean is based on observations of Toyota's Production System (TPS):

'The reason for the impact of The Machine? Dramatic series of case studies in particular Toyota.....There is a fantastic case study of who is demonstrably a massive success story. It helps to say what those guys are doing so we've got to do the same.....It is to do with something that can be seen to have worked. Once one guy starts, and it is demonstrably a success, then others have to follow, particularly if there is a situation of success' [Informant 4]

'What distinguishes Lean from any other movement is that Toyota is the reference model, without that reference model this would not have strength. None of the other movements has a reference model as powerful as that' [Informant 8]

'And I think another element we mustn't underestimate is the rise and rise of Toyota. It is inescapable' [Informant 13]

Although contentious, dissenting views of the empirical foundations of Lean are generally confined to the academic community (informants 5 and 12). Representatives of the wider practitioner community (informants 1, 6, 7, 13, 14, 15, 16, 18 19, and 20) appear to regard the empirical foundations of Lean as an important influencing factor in Lean diffusion. This was clear from evidence presented earlier in which informants described the impact of *The Machine*. However, once again this influencing factor may be less important to more recent Lean diffusion. Practitioner informants, who had been purposively selected for their expertise in the service and public sectors (informants 10, 16, 17, 19 and 20), appeared to have low awareness and also interest in the empirical foundations of Lean. Instead, they drew heavily on their knowledge of the manufacturing sector as evidence of the efficacy of the Lean OMI. The findings support those authors who suggest that the strength of evidence is important to the diffusion of an OMI (Nelson *et al.*, 2004). They also offer some support for DOI theory which posits that diffusion of an innovation is rarely based on evaluation of scientific studies (Rogers, 2003).

6.4.3 Influencing Factor 3: The Simplicity and Visibility Attributes of Lean

Several informants argued that simplicity and visibility are attributes of Lean that explain its widespread appeal and subsequent diffusion:

'Contextual factors include: ease of understanding.....The tactical features of Lean were easy enough to move over' [Informant 1]

'So why has it spread? Because of the strong generic aspects of it, doing more with less, everybody can relate to that' [Informant 3]

'Lean is on the surface quite simple to do' [Informant 4]

'So I don't think it scores as high as Lean on accessibility, understanding, participation' [Informant 6]

'The ideas of waste and value, people understand that. It has different meanings in the industry for sure, people regard value in different ways, people regard waste in different ways but they do have some notion of what you are talking about and I think those are the easiest ways in' [Informant 10]

'it [Lean] captures the imagination in a way in which a sigma control chart never will.....I will go to networking events, I'll talk to very senior bankers or very senior directors in telecoms firms or public sector and say would you mind giving us a reference and talking to x,y,z, they have got no problem whatsoever, come and see what we have done. They are proud of it because it is tangible and visible.....There is a real accessibility and visible side of it which is really important.....Where people were doing CI programmes, it is true to say that few of them were successful, but I think that the Lean programmes, many, many more of them have been successful and the reason is they are far less esoteric and much more physical' [Informant 13]

These findings triangulate with those discussed earlier in which perceived lack of complexity (or simplicity) and observability (or visibility) were found to be important attributes of Lean. Informant 21 suggested that Lean diffusion has occurred because it de-contextualised TPS. In doing so, Lean facilitated the application of TPS to other organisational contexts:

'The extension of Lean from a manufacturing concept means that you are de-contextualising it' [Informant 21]

This informant argued that other OMIs have undergone a similar de-contextualisation transition. Therefore Lean, TOC and Six Sigma began as a set of tools and techniques used in a specific context. They later evolved into guiding principles for improvement and later again evolved into an overarching philosophy. OMIs may therefore be perceived as following a common transition, which may be expressed through the following simple formula in which tools minus context equals philosophy:

'Lean, Six Sigma, TOC have all undergone this toolbox to principles to philosophy transition as they have been taken out of context. Each context they are adapted to they have to change. They either grow in terms of tools or they are reduced to a higher form. So it is almost a lower level form in one

context but if you take it to a new context, you need a higher level form.....Significant name changes. JIT to TPS to Lean. It is not sequential. JIT is a pure shop floor scheduling tool. TPS is set of principles around a manufacturing organisation. Lean is the philosophy at the top, universally applicable' [Informant 21]

This informant's evolutionary pattern of OMIs offers some support for those authors who have previously characterised Lean as a de-contextualisation of TPS such as Oliver and Hunter (1998). They offer some support for authors such as Benders (1999) who might interpret this evolutionary pattern by suggesting that at each stage of the transition, the interpretive viability of the OMI increases.

6.4.4 Influencing Factor 4: A Practitioner Response to Financial Pressures

Several informants argued that Lean was drawn upon by different industrial sectors as they encounter financial and competitive pressures:

'Contextual factors include: economic conditions of the time' [Informant 1]

'But also it is to do with crises and cost pressures or competition. That is certainly the case in retail, construction and healthcare, probably why we are actually picking up on banking and insurance right now. Why, for example, I don't think there is much on Lean in hotels etc. because those guys are making a lot of money right now' [Informant 4]

'In most cases it is a sector getting into trouble.....What I see is gradually sectors have woken up when they've got into trouble.....What I also see though...if the sector gets into trouble. I mean pharmaceuticals is not in trouble yet, they are completely oblivious to costs, they couldn't care less.....There are many other companies that have done it as a last resort' [Informant 8]

'Lean has been on a burning platform. Lean has been taken up in manufacturing because manufacturing has been under pressure from global competition. You've got low wage locations, you've got global competition from China, India and Eastern Europe, you've got global OEMs putting pressures on their supply chains to do Lean and maybe you haven't had the same sort of pressures in other sectors. In the public sector, in services, they've just not had the same pressure.....There is a culture in manufacturing, like a welcome to manufacturing, you cannot win' Informant 9]

'They key reason for Lean spreading for us is the need for cost effectiveness and more demanding consumer behaviours.....The regulator is a huge player in it now whereas they weren't so great in the banking system before. If Lean was seen incorrectly by a regulator as just cost focused and anti-customer, which it could be, then it would be pretty hard in the context of diffusing it' [Informant 15]

'I think sectors are less receptive if they are doing well, more receptive if they are not doing well.....So the reason Lean became so prominent was not because the Machine book had all sorts of new stuff in it but because it coincided with a crisis in Detroit' [Informant 21]

One informant developed this influencing factor further, arguing that the manufacturing community was psychologically needy for a solution at the time the Lean OMI emerged:

'The Japanese come in the 80s and there is all this hysteria, like the second coming, the Japanese will come and sort it all out. Japanisation becomes almost ridiculous in British academic circles. Much more so than in Europe who think it is bizarre, who think that this degree of Japanisation is bizarre. So if you look at it in its entire political economic history, the whole context. Britain starts to boast then about having an easily sacked workforce, dealing with yellow markets. Anything in Europe that are signs of disaster, becomes a strength in Britain. Come to us and invest here, you will do well. And yet at the same time because Britain is so needy for Foreign Direct Investment, having lost any serious core industries, both governments, both labour and conservative think this is a fundamental shift. Conservatives are quite nationalistic, labour party also very pro-British business. There is a general shift towards dependency on foreign investors. All the businesses in Britain require it as well because there are no indigenous customers. In that context lean production sells itself.....The evangelicalism you can interpret as psychological neediness.....there is a lot of emotional investment by managers in Britain in Lean Production.....It is not a big thing to say this shows aspects of a cult.....I am suggesting that they had a line which they believed and this confirmed it.....Typical confirmation bias is where you interpret everything you see, it is an unconscious thing, it is not cheating.....when you just see everything in a certain way' [Informant 12]

The findings suggest that Lean has diffused because it provided a solution to financial pressures. During the period under inquiry, (1987 to 2010), advancing globalisation has caused many industrial sectors to encounter intensive competitive pressures. Practitioners have to navigate their way through the uncertainty and complexity that characterises the modern competitive environment. The Lean OMI offers a solution to reducing uncertainly and complexity. Practitioners may be drawn to it for this reason. These findings are reminiscent of Sturdy's (2004) psychodynamic view of management fashions.

6.4.5 Influencing factor 5: Networking

Several informants argued that Lean diffusion has occurred as a result of networking:

'Geographical location – when you have conurbations of common sector groups, like automotive in Wales, the diffusion spreads a lot more virally and quicker. You seem to have a lot more mobility in managers in these areas' [Informant 1]

'I think a lot of this is fad-driven and/or word of mouth.....I think that word of mouth is really quite important' [Informant 4]

'So now they have got a network of LEIs around the world' [Informant 7]

'by word of mouth and people networking basically' [Informant 9]

'as move on in time, more and more people are becoming aware of it , are believing in it' [Informant 11]

'I think there is a lot of word of mouth because it is so visible.....I will go to networking events. I'll talk to very senior bankers or very senior directors in telecoms or public sector and they would say would you mind giving us a reference and talking to XYZ, they've got not problem whatsoever, come and see that we've done. They are proud of it because it is so tangible and visible.....I have just launched a Lean forum and I have got people from Sellafield, from banking, from insurance, from broking, from telecoms, from underwriting, from all walks of life and they are getting together quarterly and sharing best practice and, you know what, they haven't got any problem with that, they haven't any problem with that at all' [Informant 13]

'It's all about networks. Networks of people come together for conferences or through education.....In terms of moving, I think it is networking. It is education. I think it is the job market and I think it is just becoming aware' [Informant 18]

Networking essentially involves meeting new people through business or social contexts and is important for both early and later Lean diffusion. One informant expressed his own networking theory of Lean diffusion which he referred to as his 'bomb-burst' theory:

*'I have a **bomb-burst** theory. You will get groups of people who will be together for a period of time. Take Cardiff when it first started out. A group of people come together. Brilliant communication is going on. If you look at some of those early papers and the number of people who have written on those early papers, Bath was the same at the turn of the decade. And then they **bomb-burst** away and they go around to other business areas. Like Laming and Steve Brown. If you look at Warwick. Warwick Business School, they didn't know that Warwick Manufacturing Group was teaching Lean and that it had done 120 hours from the MOD. It is the same in industry and consultancy. People come together for one to two years. If you look at the Hawthorne works in the mid 20s to mid 30s, look at all the theorists that were there, Maslow was there. That was where General Electric were trying to be more efficient. So you get this **bomb-burst** where people come together, they bomb off again. New clusters in new places, which is why Lean has gone on. If you take Carlton Brand for*

example from Wiltshire. He came from Ford and he became a quality supplier to Ford. He came into local government. Local government is moving into improvement in a big way. So you get these ***bomb-bursts*** *of people.'* [Informant 18]

The findings support the central assertion of DOI theory that diffusion is a highly social process (Rogers, 2003; Bresnan and Marshall, 2001; Green and May, 2005). The findings also support authors such as Abrahamson and Fairchild (1999) who emphasise the importance of feedback loops between discourse and diffusion. In addition, informant 18s' 'bomb-burst' theory is highly reminiscent of authors who draw on learning theories of bandwagons (Abrahamson and Rosenkopf, 1997; Nelson *et al.*, 2004)

6.4.6 Influencing Factor 6: Labour Mobility

Several informants argued that Lean has diffused as a result of labour mobility between the declining manufacturing sector and the growing service sector,

'I think what generally happed is that a lot left the auto industry in the 90s because they could see the writing on the wall. What happened was that they found themselves moving to industries that have subsequently been the bedrock of the UK economy, telecoms, banking, insurance and those businesses had been through the mass production cycle in the late 80s' [informant 13]

'Instead of recruiting from the banks, people like me who had no ideas about operations, I started recruiting people to do banking operations jobs from car factories. I went out and recruited production line directors to come and work in banks, so I had people from Renault and all over the..... place.' [informant 15]

'I think from being the only game in town, service industry has started to bring people from manufacture. People from manufacturing naturally migrated for a whole bunch of reasons, not least of all because there weren't any other jobs' 'in my recruitment up til now I have looked for lean practitioners, guys who have been in manufacturing, consulting or both, or manufacturing, consulting and service to come here and help us.....Two of my guys are ex-Toyota but have been elsewhere, two of my guys are ex-manufacturing' [Informant 16]

'A lot of people get poached. If they see a guy and see that it really works, why don't we do that? But how do we do that? We had better get this guy in to give us a talk. Or they bring in a sidekick and the sidekick comes and says give us a job for £20K or more and I'll come and do it for you. £20K or a consultancy, we'll have the guy in. He will lead the change. And it moves around like that.....Back in 1989 there was a massive recession....recession forces people to move.....In terms of moving, I think it is networking. It is education. I think it is the job market and I think it is just becoming aware' [Informant 18]

One informant argued that this inter-sectoral labour mobility differentiates the UK from other European countries:

'I think the UK has got an advantage over a lot of countries there. We have got a lot of mobility between sectors and also we have got a pretty dynamic market based economy. So you have got freedom of capital, freedom of movement of people as well. Whereas I think in countries like France and Germany, much harder to do because they would be much more protectionist and their industry specialism is a much more important barrier to move between companies and sectors. So I think in the UK it starts with out capital system in the capital moves freely between sectors and that is the nature of who we are, along with the US we are the ultimate capitalist system. My French friends are stunned that I can work in banking and underwriting and health, they say, how the hell do they let you in?' [Informant 13]

The findings suggest that the growing service sector received an influx of managers from the declining manufacturing sector. These managers were armed with Lean knowledge and skills. Lean therefore diffused into the service sector as they began to apply their skills to their new working environment. This movement of labour was stimulated by accelerated decline in manufacturing due to the monetarist policies of the government of the time. Labour mobility does not feature in DOI or management fashion theory. This influencing factor may be more specific to Lean than other OMIs and of particular importance to Lean diffusion into the service sector.

6.4.7 Influencing Factor 7: Isomorphism

One informant argued that isomorphism influenced early Lean diffusion in the automotive sector. This sector is oligopolistic and characterised by strong trade and professional bodies:

'Dependency, part of isomorphic change, if I am dependent on you as a customer, I will take all of your trappings, so I look like you.....Dependency is definitely one of them. Organisation is another. So their Trade Bodies are strong. It is one of the arguments in isomorphic change as well, if you've got strong professional bodies you tend to find organisations that look similar.....Miskin's work is they've all done MBAs. They argue that the more MBAs you have, the more likely they will use the same conceptual models to analyse their problems and will come up with the same answers.....I think you can't rule out the role of professional bodies, particularly CIPS and the Institute of Operations Management, the IOM because they added a professionalism and they also added lean into their courses.....Geographic location. When you have conurbations of common sector groups, like automotive in Wales, the diffusion spreads a lot more virally and quicker. You seem to have a lot more mobility in managers in these areas.....Oligopolies, there are few

alternative providers at each level of the supply chain. Automotive is classic for that, if you want to buy automotive radiators you bought it from Bosch, Calsonic, Beyer or Valeo, so there are four, maybe Unipart is a fifth, but most of the volume is down to four. I think I'm more paranoid if there are four of us. I'm watching what you are doing all the time. If you doing Lean, oh shit, we had better do Lean' [Informant 1]

Institutional isomorphism is a central construct of institutional theory. Institutional theory suggests that similar organisations exhibit institutional isomorphism (Meyer and Rowen, 1977; DiMaggio and Powell, 1983) and adopt innovations in order to secure legitimacy (Tolbot and Zucker, 1996; Ashworth *et al.*, 2007). Institutional isomorphism is the tendency for similar organisations in the same environment, like oligopolies, to emulate each other. Authors of management fashion theory have previously drawn on institutional theory as a way of explaining diffusion (Grint, 1997; Sturdy, 2004). This influencing may be less important to more recent Lean diffusion into environments that are not oligopolies.

6.5 Chapter Review

This chapter has presented the findings directly related to the research questions posed at the outset of this study. Table 45 presents a summary of the main findings that have been discussed.

Table 45 Summary of Main Findings

RQ	Question	Findings
RQ1	Why is the Lean OMI a poorly defined construct?	Three characteristics of the Lean OMI: polymorphism; dynamism and contention render it indefinable and explain why it is a poorly defined construct in the literature.
RQ2	How does Lean compare with other OMIs?	Perceptions of OMIs tend to be based on the market characteristics of that OMI rather than the efficacy. However, Lean has an apparent advantage over other OMIs as a result of its perceived relative advantage, simplicity and visibility.
RQ3	How has Lean diffusion occurred in the period 1987 to 2010?	Lean diffusion refers to the spread of the Lean movement over time. Lean diffusion has broadened over time. It originated in car manufacturing and spread quickly into wider manufacturing. More recently, Lean has diffused into the newer environments of the service and public sectors. The research also generated a number of findings specific to these newer environments.
RQ4	Why has Lean diffusion occurred in the way it has?	Lean diffusion is the outcome of many influencing factors. Factors influencing Lean diffusion include: promotion, empirics, attributes of simplicity and visibility, practitioner response to financial pressures, networking, labour mobility and isomorphism. The degree of influence of these factors varies over time. Some factors are generic and others are specific to Lean.

(Source: the researcher)

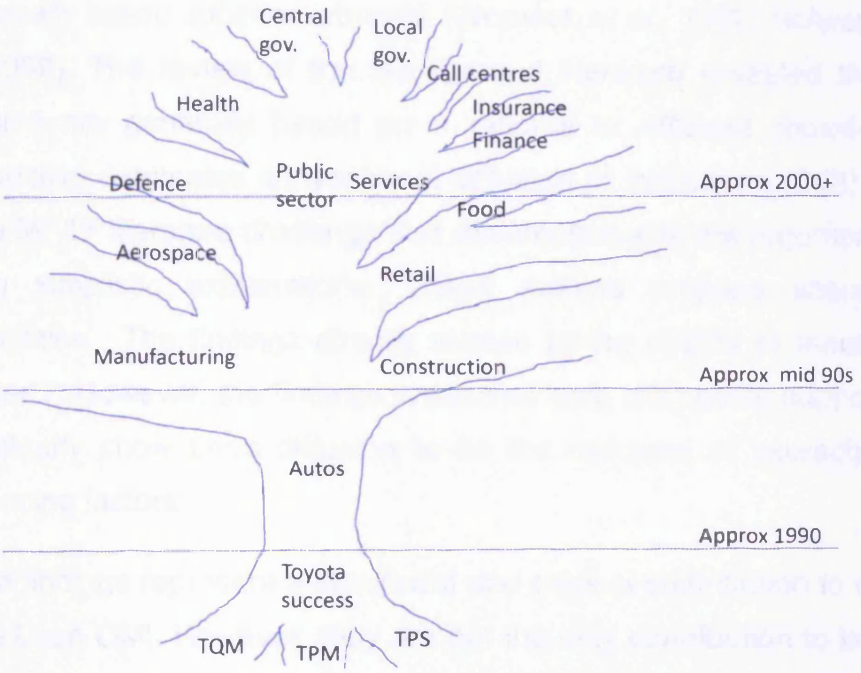
The discussion of RQ1 identified three distinguishing characteristics of the Lean OMI: first, Lean is polymorphic, meaning it now exists in many forms; second, Lean is dynamic, meaning it has changed over time; third, Lean is contentious, meaning it continues to attract criticism. Collectively these characteristics render Lean indefinable and explain why Lean remains a poorly defined construct. However, the interrelationships between the three characteristics are unclear. For example, it may be that Lean's polymorphism is the consequence of its evolution over time, as one informant [Informant 21] suggested. It may be that the contention fuels success. Untangling the relationship between these characteristics offers potential for further research. Overall, the findings for RQ1 reveal characteristics of the Lean OMI that may explain why Lean is a poorly defined construct in the extant literature.

The discussion of RQ2 revealed two main findings emerging from a comparison of Lean with other similar OMIs: First, perceptions of OMIs are determined by the market characteristics of that OMI rather than by its' efficacy. This finding may be of particular interest to the practitioner community. It provides contextual insight for

practitioners seeking to discern between the various OMIs they encounter. It may also be of interest to policymakers who commit large sums of taxpayers' money on research designed to evaluate of the efficacy of various OMIs. They do so often on the assumption that such evaluation is objective and independent. This finding might lead them to reconsider that assumption. Second, the findings for RQ2 suggest that Lean may have certain attributes that distinguish it from other OMIs. In particular, the perceived attributes of relative advantage, simplicity, visibility (or observability) and trialability appear to differentiate Lean. These attributes may go some way to explaining the longevity, popularity and diffusion of the Lean OMI.

The discussion of RQ3 revealed that Lean diffusion has broadened over time and that the Lean OMI has an expanding sphere of influence. Its origins in car manufacturing and early diffusion into general manufacturing are well documented in the literature. More recently, however, Lean has diffused into the newer environments of the service and public sectors. The progress of Lean diffusion over time may be represented pictorially by drawing on systematics. Systematics (or cladistics) is a sub-field of evolutionary biology which focuses on the study of the diversity of organism characteristics. In biology, systematists are the scientists who classify species with the aim of defining how they relate evolutionarily. Drawing on systematics, Figure 18 depicts Lean diffusion as a tree branching out from a commen trunk that in turn was formed from many roots.

Figure 18 A Representation of Lean Diffusion over Time



(Source: the researcher)

The tree analogy represents the Lean OMI as a tree with roots showing that Lean is the coalescence of preceding OMIs. The tree analogy represents the Lean OMI as branching to represent Lean as an evolving and expanding movement. A tentative and approximate timeline has been included.

The discussion of RQ4 revealed that Lean diffusion is more complex than has previously been portrayed, described and explained in the extant core literature on Lean. Lean diffusion was found to be an outcome of the interaction of many influencing factors. The findings revealed at least seven such factors. Some appear to be important to early Lean diffusion but less important to more recent diffusion (empirics and isomorphism). Others appear more important to recent diffusion (labour mobility). Furthermore, some may be generic to many OMIs (promotion, networking, practitioner response to financial pressures and isomorphism) while others may be specific to the Lean OMI (empirics, simplicity and visibility attributes and labour mobility). The review of the Core literature revealed a gap in the literature with regard to Lean diffusion. In this literature, Lean diffusion is presented either as

part of the wider reactionary rejection of reductionism (Seddon, 2005; Seddon and Caulkin, 2007; Bicheno and Holweg, 2009) or as the obvious outcome of an empirically based superior rationale (Womack *et al.,* 1990; Holweg, 2007; Holweg et al., 2009). The review of the Background literature revealed that explanations of diffusion are generally based on a rational or efficient choice perspective. This perspective dominates conventional diffusion of innovation (DOI) research. Authors of the MF&F literature challenge that assumption with the argument that it predicates overly simplistic explanations. These authors propose alternative explanatory possibilities. The findings directly related to the validity of these are presented in chapter 7. However, the findings presented here offer some support to these authors and clearly show Lean diffusion to be the outcome of interaction between many influencing factors.

These findings represent a significant and original contribution to existing knowledge of the Lean OMI. However, they are not the only contribution to knowledge made by this research. The two chapters that follow discuss contributions drawn from the *a posteriori* findings of the research.

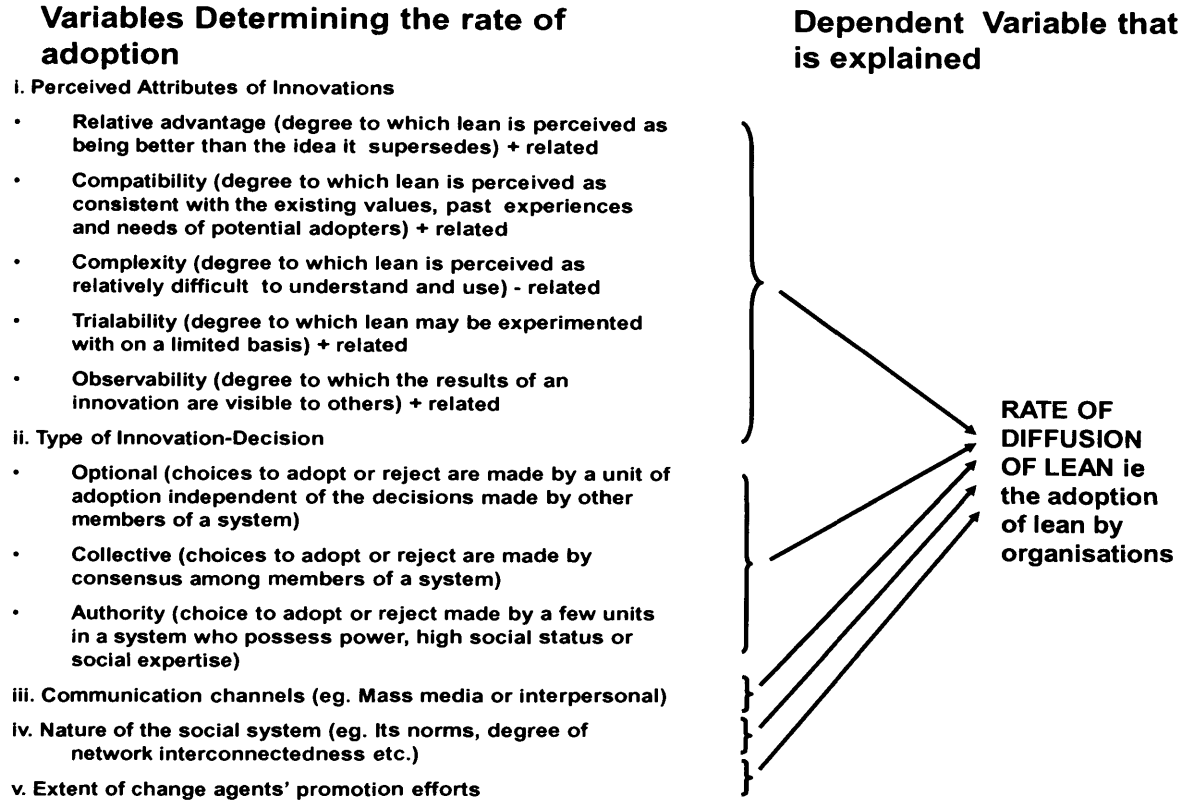
Chapter 7 Evaluation of Background Literature

The background literature review established that there is an extensive extant body of material that addresses the diffusion of an innovation over and that there is a less extensive body of material that addresses organisational and managerial innovations (OMIs) such as Lean. However, this latter body of material does not necessarily specifically address the diffusion of OMIs. It was this gap in the current state of knowledge that formed the basis for constructing the four research questions that were the focus of this study. Having answered these four questions in a previous chapter, the research methodology yielded additional findings that were unforeseen at the outset of the study. These findings are pertinent to the Background literature and are now discussed as they offer an extension to the existing boundary of knowledge in that area.

7.1 Evaluation of Findings Related to DOI Literature

To recap, DOI theory is a well-established body of knowledge that offers rich and diverse insights. Rogers (2003) synthesised extensive DOI research into an explanatory model that specifies the determinants of diffusion (see Figure 5 of Chapter 3). Although the model is based on primarily on research of products services and technology, rather than OMIs, in spite of this, it represented a rational starting point for exploring Lean diffusion since it is so well-established. The explanatory value of the model for explaining Lean diffusion was explored in each of the expert interviews (see Section 4 of the Interview Schedule in Appendix C) and it is this evidence that forms the basis for the following discussion. For ease of reference during the following discussion, this model is reproduced here as Figure 19.

Figure 19 DOI Model of the Determinants of Diffusion



(Source: adapted from Rogers, 2003)

Informants commented on their impression of the overall model. Their responses were varied. Some saw benefit and utility in the model:

'I think that is a very good model' [Informant 4]

'I would say that is a perfectly understandable and plausible model' [Informant 5]

Another informant described the model as 'academic':

'This is in academic speak. If you were going to talk to an industrialist about this you would have to translate it into their language and then it might be useful. This is academics talking to each other' [Informant 8]

Another informant described the model as 'reductionist':

'I wouldn't go for that diffusion model. This is very American. And you have one Taiichi Ohno, one Nelson Mandella. They make the difference. Until another Taiichi Ohno ignores everything. Von Bertalanffy didn't believe in reductionism' [informant 7]

One informant argued that certain variables related to adoption and others to diffusion:

'I think there is a difference between diffusion and adoption. An idea can diffuse into an organisation but how do you judge that it has actually been adopted by that organisation. At what stage is it adopted?.....I would be splitting out diffusion and adoption. That [variables i, ii and v] would be important to diffusion and adoption but that [iii and iv] would be important to diffusion only' [Informant 17]

Another informant made an interesting comparison of the DOI model to Plato's ancient art of persuasion:

'...the most fantastic course I ever went on and it was called persuasion and attitude change...they talked about.....selling a concept. It referred back to the teachings of Plato.....If I can give you the Greek words: Ethos: is this perceived to be of our time? ....So ethos the ethics of the thing and of its time; Credos: the credibility of that person or body that is promoting it; Dynos: the energy that is put into; Logos: the ease of understanding of the argument, the logic' [Informant 11]

He argued that dynos and logos are equivalent to change agents' efforts and innovation attributes in the DOI model; ethos and credos however are without equivalents in the model. Several informants were critical of the model for failing to include context:

'You see this is context specific. If you want to understand the spread of a concept into a new sector, you are looking at it from that new sector's point of view, that is the context. So to me it is context specific' [Informant 5]

'I tell you what is missing from that guy's model by the way is the social system to me doesn't capture the context which involves interactions between systems. So the way that Japan interacts with America and Britain is different to the way it interacts with Europe because of different historical experiences. So there is a missing model part, social interaction, interaction between social systems. Interaction involves history in a very definite way, which is missing' [Informant 12]

'...one thing that is missing from this is the reason for action [impetus], why do something different? I think you would see that the organisatons that adopt (well diffuse meaning those that hear about it and do something] are probably those with a burning deck. In the public sector that would be a budgetary thing and then it would be about we have got a problem, how do we solve it, not wow, isn't lean a great idea, shall we try it. I think that is a really key variable. I don't think in the public sector there will ever be a lack of a crisis. Funding will always be cut.....This is a model that is taking the innovation outside of the situation. What is the situation? Why do you start?' [Informant 17]

The findings therefore suggest three areas of weakness in the DOI model regarding its' explanatory value for Lean diffusion. The first area of weakness is that the model omits contextual factors that have influenced diffusion. In the case of Lean, the timing and economic context in which Lean emerged have been found to be important to Lean's initial popularity and early diffusion. This is evidenced by the influencing factors identified in response to RQ4, in particular influencing factors 1 (promotion), 4 (practitioners response), 6 (labour mobility) and 7 (isomorphism). The second area of weakness is that the model omits impetus for change by adopting organisations. Earlier findings presented in answer to RQ2 suggested that different industrial sectors embraced Lean as a potential solution to address heightened competitive and financial pressures (see findings related to RQ4 in particular influencing factor 5, practitioner response). Organisational innovativeness is an important construct within DOI theory. It is defined as the degree of resistance or otherwise to the adoption of an innovation (Rogers, 2003). This construct does not, however, feature in the model as one of the determinants of diffusion. The third area of weakness is the model's underlying assumption that diffusion and adoption are synonymous. Informant 17's challenge of this assumption is resonant of those authors within the MF&F literature who have argued that OMIs are vulnerable to the decoupling of label and content (Benders, 1999) and that there must be clear differentiation between rhetoric and substantive adoption (Benders and Van Veen, 2001).

As well as identifying important omissions and challenging the underlying assumptions of the model, informants also critiqued individual variables within the model. Again for ease of ease of reference during the following discussion, Table 47 reproduces the model variables with a brief explanation of each.

Table 46 Summary of DOI Model Variables

Var. No.	Var. Name	Explanation
i	*Perceived attributes of an innovation*	The characteristics of innovations as perceived by individuals that explain their different rate of adoption: relative advantage, compatibility, complexity, trialability, observability.
ii	*Type of innovation decision*	Innovation decisions can be adopted or rejected by an individual member of a system, by the entire social system which can decide to adopt or reject by a collective or an authority decision. Decision types may be optional, collective or authoritative. The more persons involved in making an innovation-decision, the slower the rate of adoption.
iii	*Communication channels*	The information exchange through which one individual communicates a new idea to one or several others such as mass media or interpersonal channels.
iv	*Nature of the social system*	A social system is a set of interrelated units that are engaged in joint problem-solving to accomplish a common goal. The members or units of a social system may be individuals, informal groups, organisations and/or subsystems.
v	*Extent of change agent promotion efforts*	A change agent is an individual who influences clients' innovation decision in a direction deemed desirable by a change agency.

(Source: adapted from Rogers, 2003)

To score the utility of each variable, a simple rating scale was used to capture each informant's perceptions of how relevant each variable was in explaining *Lean* diffusion. A rating scale was used in which: 5 = very highly relevant; 4 = highly relevant; 3 = relevant; 2 = not very relevant; 1 = slightly relevant; and, 0 = no relevance. Table 48 provides a summary of their scores in which the number of informants scoring the variable **High** (ie. a score of 4 or 5) in red is compared with the number of informants scoring the variable **Low** (ie. a score of 3 or less). Within the table, score of 75% or over (in other words, 16 or more informants) are highlighted in bold and are underlined.

Table 47 Summary of Informants Scores for DOI Model Variables

Var. No.	Var. Name	Number of Informants scoring High (4/5)	Number of Informant scoring Low (0-3)
i	*Perceived attributes of an innovation*	**18**	3
ii	*Type of innovation decision*	7	14
iii	*Communication channels*	14	7
iv	*Nature of the social system*	7	14
v	*Extent of change agent promotion efforts*	9	12

Note: n = 21

(Source: the researcher)

Table 48 illustrates that most informants (18 of 21) rated *perceived attributes (var. i)* as the most highly relevant to Lean diffusion. A third of the informants (14 of 21)

rated *communication channels (var. iii)* as highly relevant to Lean diffusion. Each of the five variables within the model are briefly discussed in turn,

The first variable (var. i) of the model consists of the five *perceived attributes* of an innovation (relative advantage, compatibility, complexity, observability and trialability) which collectively form the most important variable for determining the rate at which an innovation diffuses (Rogers, 2003). Informants were asked to score Lean against each of the five perceived attributes, using the same simple scoring system that had been used for scoring the variables. They then did the same for Six Sigma, TOC and Seddon's Systems Thinking. The findings were presented in chapter 6 during the discussion of findings for RQ2 comparing the Lean OMI with others. They are not repeated in detail here. In summary, they suggested that relative advantage, lack of complexity, observability and trialability are important perceived attributes for the Lean OMI. They also cast some doubt as to the appropriateness of these five perceived attributes, which were developed from research on products, services or technology, for OMIs such as Lean.

The second variable (var. ii) of the model concerns *decision type*. This variable is a legacy from the anthropological origins of the DOI model where the adopting unit is an individual. However, where the adopting unit is an organisation, this variable is rendered superfluous. In practice, it frequently led informants to misinterpret the model as being concerned with diffusion within a single organisation as opposed to diffusion across many organisations. Two thirds of the informants did not regard this variable as relevant to Lean diffusion.

The third variable (var. iii) of the model concerns *communication channels.* DOI theory posits that different communication channels influence diffusion rates in different ways at different times (Rogers, 2003). This assertion is supported in the case of Lean. The literature review identified that different types of communication channels have shaped Lean diffusion at different times with periodic best selling management books often rejuvenating interpersonal channels. However, in the model it is assumed that there is a dominant communication channel at a single point in time. Therefore, if interpersonal channels are the main communication channels in use rather than mass media channels, diffusion may be slower. Once again, Rogers' model is limited by this static assumption. In spite of this, two thirds of

the informants were found to consider communication channels to be important to Lean diffusion. This finding is triangulated by earlier findings in response to RQ4 in which informants identified the promotion of Lean to be an important factor influencing Lean diffusion.

The fourth variable (var. iv) of the model concerns the *social system* into which an innovation is diffusing. The social system is formally defined in DOI theory as *'the set of interrelated units that are engaged in joint problem-solving to accomplish a common goal'* (Rogers, 2003). It therefore represents the entire population into which the innovation diffuses. However, the findings presented in response to RQ3 indicate that in the case of Lean, the social system has changed over time. In the diffusion of Lean in the early 90s the social system was the automotive sector. By the late 90s this Lean social system had expanded to include the entire manufacturing sector. By the early 00s this Lean social system had expanded yet further to include all organisations, both profit and non profit-making. The model is therefore again limited by its own static assumption. Two thirds of the informants did not consider the social system to be important to Lean diffusion.

The fifth variable (var.v) of the model consists of the degree to which *change agent efforts* determines adoption rate. The low scores for this variable are surprising. They may reflect the fact that many of the experts are themselves change agents but may not necessarily identify themselves as such. They may regard change agents more narrowly, as referring primarily to the government through their various initiatives promoting Lean. The findings presented in response to RQ3 indicated that views regarding the relative success and consequential importance of government promotion were mixed. This may go some way to explaining the lower than expected scores for this variable.

Overall, this study finds that the DOI model of the determinants of diffusion offers some explanatory value for Lean diffusion, particularly with regard to the perceived attributes variables. Chapter 6 described the novel use of this variable as a mechanism for deconstructing and comparing OMIs. The other variables within the model have however been found to be fraught with difficulty. Furthermore, the findings suggest there may be some variables missing from the model. Overall, therefore, the findings are broadly supportive of Wolfe's (1994) view that DOI theory

is somewhat constrained by stringent assumptions. There is clearly an opportunity for the development for an alternative explanatory model for OMIs like Lean. This opportunity is exploited in the closing chapter of this thesis.

7.2 Evaluation of Findings Related to Management Fashions and Fad Literature

The expert interview transcripts were analysed for content relevant to Management Fashions and Fads (MF&F) constructs.

Several informants made comments to suggest that they regarded Lean as one of many OMIs competing in an OMI market:

'BOHICA is a shop floor approach to all these initiatives (bend over here it comes again!), just keep your head down, this guy will be gone in two years and we can go back to normal.....I don't think buzzwords are necessarily useful. Having said that sometimes a new buzzword can open a door and get a new budget and you've got to be politically aware in an organisation, how do you get the resources? And maybe repackaging an old initiative with a new name might get you some extra resources – you've got to be very clever in how are you going to actually play the game.....an awful lot of manufacturing companies in South Wales are foreign-owned. An awful lot of them are American-owned. Maybe I am generalising or maybe it is an American problem, American companies use Welsh factories as a training ground for their managers. So every two years they rotate their managers. That's not a bad idea. But when the new manager comes in, he has a look around and see what's been happening and the last manager might have been a lean disciple, so the new manager isn't going to win many brownie points by saying I want to sustain this, carry on what you are doing boys. He's got to go in as a change agent, so how does he so that? The easiest thing is to say, well forget lean, we are going to grab a new initiative, we are going to do benchmarking, we are going to do six sigma, TOC.....' [Informant 2]

'guys try to flog MRP systems, guys try to flog TOC, you need all these things together.....I think a lot of this is fad-driven, fashion-driven and/or word-of-mouth' [Informant 4]

'I think a lot of the success of the distribution of stupid ideas has been packaging, six sigma, BPR, Investors In People, Charter Mark, TQM. These were packages, organisations like to buy packages because it's no threat to conventions, no threat to thinking' [Informant 5]

'there is a whole bunch of institutes in Japan who also wanted to capture this and brand it and so on so it's not just abroad the Japanese are just as bad as anybody else at fighting over brands that actually are about the same thing.....Companies have got to actually wise up to what they are buying and look they'll waste money on things they don't understand' [Informant 8]

'There's management philosophies and refined tools and techniques and sometime the person and, very often in America, who aggressively markets particular mathematical concepts can actually rise to

a level of prominence and consultants grab them and it can actually become the fad of the time.....Different people want to come up with their own unique selling proposition (USP). If you haven't got a USP then you are just one of a whole bunch of people offering the same thing, so how do I as MD think, who am I going to chose, this guy has got something quite different, interesting.....what is it that determines the success of some of these things? Partly marketing and partly the substance behind it.....A lot of the dumbing down is because people don't know the subject so they package that which they do know to try and flog that' [Informant 11]

'It combines what seems to very well researched empirical findings and indelibly ties that to something everyone wants (who wouldn't want it) and that's the success of it' [Informant 12]

'I wonder if there is a kind of industry building up saying oh this is systems, this is what six sigma is and this is the Theory of Constraints' [Informant 17]

'Some of the reason the other stuff has lost their way is that they have become too much of a fad' [Informant 19]

'I don't mean to imply that there aren't other ways but to some extent you do have to be up with the fashion. It wouldn't work for me to say let's try TQM because everyone has forgotten about it. Lean is the fashion.... this thing about acceptability of the ideas that you are trying to promote.....Local government, especially local government but I think it might be true of central government as well, fashion and fad counts for a lot' [Informant 20]

'a new concept is also an opportunity to make a sale. There is no reason to believe that there would not be a new concept because someone will spot an opportunity to market something.....What is needed is 95% existing ideas, 5% new ideas, a catchy name and a best practice company and a good marketing company and you are off. You need to challenge people but not too much. So if you follow these recipes you actually get there and it would be foolish to think that lean will be around forever.....The problem is that industry needs novelty' [Informant 21]

The findings support the central construct of competition in a fashion market or arena that is central to management fashions theory (see for example, Abrahamson 1991, 1996, Abrahamson and Rosenkopf, 1997, Abrahamson and Fairchild, 1999, Abrahamson and Eisenman, 2001, cited in Clark, 2004; Keiser, 1997).

Many of the informants describe Lean is an OMI that has been very successfully commercialised:

'From a diffusion point of view, systems thinking doesn't sell, lean sells, because it's got a brand.....Country by country, and it was carved up that way so Womack did the States and Jones led Europe, but Jones isn't recognised across the whole of Europe. And the American's

certainly don't know who Jones is, just some sort of bit part player who carries the bags.....Dan's book became the financial times best seller, read by members who read the FT who happen to be CEOs and you influence people who are ahead of a lot businesses and if you track his sales, that book sold 750K copies before they stopped counting. I don't know what that meant for the UK but, let's say 30K, you've got 30K FT reading senior executives reading books on lean and presumably they are asking their organisations to go away and think about it.....it fed an American anxiety. With the millions of dollars funding for the Machine book, you couldn't go wrong could you. Whatever came out of that study was going to be picked up by somebody.....by not calling it fragile production by calling it lean, they moving into a market that was just begging to be filled.....there was a whole market for that between 86 and 92, fuelled mainly by Productivity Press, who were translating Japanese texts and making a fortune from it. And they were feeding a hungry audience who were frightened lifeless.....The fashion and the trend setters, the 'Trinny's and Suzanna's' of the day, totally got behind it' [Informant 1]

'I talk to a lot of people that say that lean is nothing new and it is simply a way of commercially packaging a bunch of tools and techniques and selling books. People say what Dan Jones has done is nothing new.....I think inevitably it has been commercialised' [Informant 3]

'I've already lost the lean brand.....You want to make money in life,.....told me this, you give something a Japanese name, box it up into a toolset and then train everybody. You can make a lot of money out of training.....Unfortunately by packaging it up and giving it a label we just lost sight of what it was and Womack and Jones made the mistake which I call the successful album mistake, you know, we wrote an album, it sold millions, better write another one.....so they wrote Lean Thinking (LT) and I don't think LT adds anything conceptually to The Machine' [Informant 5]

'Jim Womack and Dan Jones, especially Jim Womack, are very good at strategising how to diffuse things, creating a network of people. So now they have got a network of LEIs around the world. They are very good at marketing, creating networks. It is very important. We live in an information age' [Informant 7]

'.....a book that people would read and our objective was to write a book you could read in 5 hours on a plane trip from.....a product that really sold..... sold it in terms of the big gap in your performance and lean is your answer.....people liked that because it wasn't very different, it was a more structured form of traditional cost cutting, OK, you've got to sell what you can sell.....People are going to try and make money out of this including our friend..... And they are going to do it badly and you know it gives lean a bad name.....So it was part of the process movement definitely but they never wanted to connect because they wanted their own brand. It's quite interesting there are several people, part of the process movement who don't want to be part of our movement, who want to distinguish themselves from the Lean brand.....I think it will outlast whatever other fads come along, because there will be. Consultants have to have fads' [Informant 8]

'Dairy was the most difficult sector to sell lean into.....we were very careful when we sold lean not to say this is a means of reducing your workforce' [Informant 10]

'choice of term because no one is going to disagree with it, nobody wants not to be lean if lean is the elimination of waste and then tying that to concrete claims and I think lean production's strength lies in the two.....They've cornered the market, they got a big sell for it.....The way the book is done is myth-making, so you go back to the foundation studies and because of the way they'd done it, it was interesting and because people missed it. For it to go from polemic - that in itself is interesting' [Informant 12]

'But it has turned into egos and what we are meant to be here for is to carry on what the industry forum did, which is to make Britain more competitive and to make customers happier, and all the rest of it. It doesn't feel like that anymore it feels like a clash of a load of egos. It's no good, its like that is the last throws of an empire' [Informant 13]

'What I see in lots of other companies including RBS and Barclays who say we do lean.....they don't do lean at all. What they do is do it in little departments, and do very well in those department but it is not reflected in the goals of the CE which make it therefore part of the organisational behaviour.....one of the things that people used to work against was TQM and BPR and oh this is the next bloody fad and it is all bollocks, whereas one of things that I don't think came at us from one of the big consultancy firms, was lean' [Informant 15]

'Lean is consultancy-led not culture change driven from inside.....In terms of value, value stream, flow, pull and perfection, they were nice branding words' [Informant 18]

'I wasn't confident this was anything other than a fad' [Informant 20]

'It has got it's lifecycle. It is a fashion. People will know about it in 20 years time but I would be very surprised if people had not invented a new term that used 95% of lean ideas, 5% of new ideas and called it something else. It is just the way that we work' [Informant 21]

The findings clearly show widespread consensus regarding the successful exploitation of the Lean OMI. They support those authors of management fashion theory who emphasise 'commoditisation' as the development of management concepts as tools and system to be universally marketed (Scarborough, 2002).

Some informants characterised Lean as highly ambiguous and generic:

'I think the word lean was attached to any type of change in the business model that was perceived to result in better performance' [Informant 1]

'I think people would be just as afraid of that as they are of something called lean. I doesn't feel like it is an easy term to try and explain. The idea of waste and value, people understand that. It has

different meanings in the industry for sure, people regard value in different ways, people regard waste in different ways but they do have some notion of what you are talking about and I think those are the easiest ways in' [Informant 10]

'It combines what seems to very well researched empirical findings and indelibly ties that to something everyone wants (who wouldn't want it) and that's the success of it. Because everybody wants rid of waste, it is viable in very many contexts.....There are very few businesses who can't who show improvements over time. At a micro level, you are almost asking someone to show you how it works and then saying that is lean production, the parts that do not work, that is not lean production.....It has chosen to show success.....how you define success. It is not a success in terms of outcomes but it is successful in terms of the production of the message. So it is a two-edge thing success. The objective is to get other outcomes, is to get performance, productivity, growth and that hasn't happened' [informant 12]

'I think lean is intelligent management' [Informant 14]

'I do think there is a real difficulty in that, from what I have seen, lean does mean different things in different contexts' [Informant 20]

These finding support those authors of management fashion theory such as Ortman (1995), Benders (1999), Benders and van Veen (2001) and Benders and Slomp (2009) who emphasise the importance of interpretive viability. These authors argue that OMIs are very different to other innovations, such as products, services and technology which DOI research typically draws upon for empirical evidence. The difference is that OMIs often exhibit interpretive viability or ambiguity of content. These authors argue that the degree of interpretive viability is an important factor determining the success or otherwise of that OMI.

It is clear that the findings indicate support for several constructs central to management fashions theory. However, while the theory locates OMIs within a management fashions market, it offers limited insight as to the nature and characteristics of that fashion market. The findings suggest that there are three notable characteristics of the Lean fashion market. First, the exploitative role played by consultants in that market. Some informants were highly derogatory towards Lean consultants:

'I think that is what squandered all the value of lean. The consultants have squandered a lot of what's good.....So I don't think to be fair consultants have spread lean other than to be busy bees – turning it into a product and then mass marketing it to a relatively innocent and pretty dumb purchasing public' [Informant 1]

'People are going to try and make money out of this.....and they are going to do it badly and you know it gives Lean a bad name' [Informant 8]

'consultancies do it to us as well. They get a hold of one thing and they wring it to death rather that saying what is the culture of the organisation we are trying to transform? What is their business marketplace rather than saying here is one I made earlier, fit it to your business.....I am critical of every consultancy because they tend to be one club golfers and academics tend to be one club golfers as well. Rather than offering a range of solutions from a plethora of tools, it is very much here is the hammer, where are the nails? Successful transformation is always a hybrid. I have never seen a true Lean transformation. It always involves some other methodologies and solutions in it.....In the late 90s there was a saturated market for consultancy. So consultants have got a product to sell , the market is saturated, you go and find a new market.....they are now offering to come and work with us free of charge. As soon as a consultancy says free of charge and they are £15,000 a week you know they are up to something.....A lot of consultancies are very much surface rather than depth because they are in there to get their money and move on. Rapid improvement events do their piece and then drop off' [Informant 18]

'Many consultants that have transferred across will talk about lean as they would in manufacturing rather than thinking about how some of the good practices can be adapted' [Informant 19]

The second characteristic of the Lean fashion market is the blurring of traditional academic boundaries found in response to RQ1:

'it fed an American anxiety. With the millions of dollars funding for the Machine book, you couldn't go wrong could you. Whatever came out of that study was going to be picked up by somebody' [Informant 1]

'we were given tremendous freedom' [Informant 8]

'one was a senior man in Honda (known as Rocky). Rocky was the top man in Honda at the time of the MIT study and he received researchers from America and Europe and he is quite cynical about it. He said so many of these guys were just following their own agenda: 1) to get a professorship out of it 2) to find evidence to support their own theories. He said many is the time I gave them information that that was not what they wanted to hear – what do you want to hear, I'll tell you ***that'*** [Informant 11]

'lean production is the business school clatter which keeps academics half-way occupied justifying something that has been happening for 15 years anyway but dressing it up as a new

world.....I think there was a period when a lot of people were looking for chairs on the back of this stuff. I think in academia it is exhausted and are looking for the next best thing. I think with academics this is very close to being the next best thing and that is just because it is such an opportunistic profession' [Informant 12]

'If you look at Andrew Graves at the University of Bath. His specialisation in lean aerospace. Why? Because the other markets were saturated. Where else can I do this?' [Informant 18]

'academia needs new concepts to make their mark on and they will all just jump onto new headlines. I think it is just human nature. If you look into the past all concepts have come and gone by name but the thinking has really stayed' [Informant 21]

The views of these informants support those authors argue that Lean violated conventional academic scrutiny (Williams et al., 1992; Stewart, 1998; Benders and Bijesterveld, 2000; Newell et al., 2001; Coffey 2008).

A third characteristic of the conception of Lean as a fashion market is the pugilistic and territorial behaviour amongst its' fashion setters:

'Oh....., you are trying to make a market for yourself' [Informant 1]

'... was intrigued because we in South Africa seemed to be a bit ahead of anything that was going on in the UK. So he came out to South Africa and visited me. I think he stole a lot of our material' [Informant 4]

'he was a client of mine in the 1980s in Digital. He learnt a lot of my stuff from me in the 80s and then he had the audacity to completely rewrite it to avoid copyright .....having read my work, you will recognise. You can't copyright an idea.....It's the same as the Dan Brown book. Someone claimed that Dan Brown had taken his idea, you can't copyright an idea. I want to change management thinking not spend my time dealing with a .... thief.....He's got a version of my stuff as it was in the late 80s and he thinks that what we do is what happened to him in the late 80s which of course is not true. But he's got some of the essential ideas..... is a brown-tongue merchant, quite happy to live under the umbrella of.....and get a badge.....In fact they say malicious things about me.....In fact someone.....someone I work with who is a client of mine, went to a healthcare gig in which.....was going on about Lean and he said to.... well, what do you think of.....ideas about this..... said the last time I got involved with..... he was issuing lawyers letters. That is a lie. That is a lie.....If you are trying to dominate a market, ..., then you don't want people 'weeing on your strawberries'. If you can't win the argument, take out the man. That's Mandleson's school of political domination. So yeah he lies' [Informant 5]

'lean project management is just nicking Goldratt's ideas really' [Informant 7]

'So a lot of MIT staff were in the end very jealous of our success.....all of the attempts by consultants.....to try and say my type of process is different from anything else and none of the manufacturing principles would work there. I was always convinced that was bullshit and that was just simply an attempt to rebrand. I don't mind people rebranding. The agile people tried to do it twice and failed.....Other people can try and use it, the marketplace for ideas is out there and we'll see who wins.....I reached out to him a couple of times and he's basically bitten my hand off and so, fine, you are in the marketplace and you'll survive and we will see and I think in fact we've seen, the jury is very clear.....And there has been a lot of political controversy and.....has tried to stir up things and tell them they are all wrong.....He got in early in Scotland and with his pitch of don't touch the manufacturing guys cause they'll do tools to you and so on, which was simply his way of trying to keep us out, that 's fine.....it was part of the process movement definitely but they never wanted to connect because they wanted their own brand.....It's quite interesting there are several people, part of the process movement who don't want to be part of our movement, who want to distinguish themselves from the lean brand.....sat at the back of the audience and was livid, was about to go up and hit him, literally was about to hit him, for his claims about Toyota management system. He was absolutely vitriolic and.....is the most peaceful person you could possibly imagine.....I mean really the guy is an idiot. He has caused me problems occasionally. I do think he has muddied the waters, big time, but not for long, people see though it very fast' [Informant 8]

'But it has turned into egos.....It doesn't feel like that anymore it feels like a clash of a load of egos. It's no good, it's like that is the last throws of an empire' [Informant 13]

'he thinks the answer is to 'diss' all the other things' [Informant 16]

The findings are supportive of Keiser's (1997) conceptualisation of a fashion arena. However, while Keiser emphasises the importance of cooperation among the various fashion setters, these findings suggest that fierce competition, rather than cooperation, dominates the mature Lean fashion market.

Overall, the findings indicate that like DOI theory, certain constructs within management fashions theory also offers some explanatory value for Lean diffusion. Further analysis of the findings revealed the limitations of these constructs in explaining Lean diffusion.

In conclusion, this chapter has presented an evaluation of the findings related to the two bodies of work referred to as background literature. This evaluation leads the researcher to conclude that, while the bodies of work that form the background

literature are necessary for explaining Lean diffusion, they are not enough. Though highly influenced by the DOI literature and therefore not entirely new, there is a need for a model of diffusion that is specific to OMIs like Lean. A contribution towards how this model might be configured is included in the final chapter of this thesis.

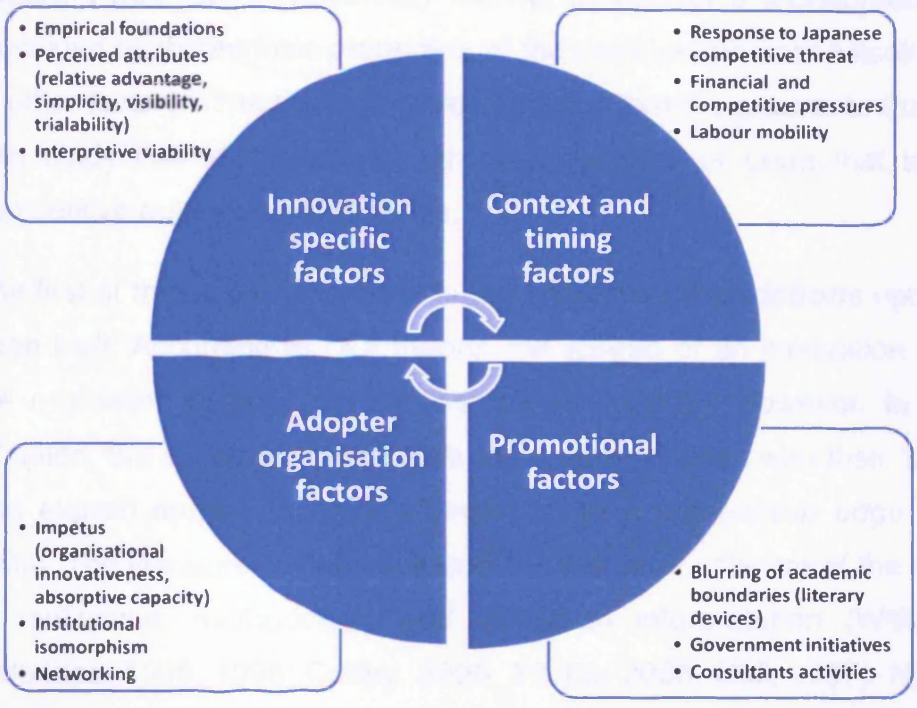
Chapter 8 Conclusions and Contributions

We now reach the end of the thesis and draw together its conclusions and contributions. The previous three chapters presented empirical evidence from the fieldwork conducted within this study. The purpose of this chapter is to evaluate the implications of these findings for the various stakeholders identified in the Introduction, and to reflect on the wider implications of this work. In this way, the various contributions and significance of this thesis are established. In order to achieve this aim the chapter is divided into four sections: The first section draws the conclusions that the researcher established from the findings. This discussion is oriented around the synthesis of a new theoretical framework designed specifically for explaining the diffusion of the Lean organisational and managerial innovation (OMI). The second section develops this theme and discusses the wider contributions to knowledge of the study and their significance to different stakeholders. The third section then provides a reflection upon the limitations of this study, both the foreseen and the unexpected. Finally, the thesis closes with a section in which areas with potential for further research are identified. Throughout this chapter, cross references are made to previous sections, figures and tables to produce an audit trail that enables the reader to refer back to the source material that was used to derive the contribution or conclusion concerned.

8.1 Conclusions from the Study

From the findings in the previous three chapters, the author concludes that the diffusion of Lean over time is complex, multi-dimensional and not easily explained. This study has drawn on two well-established bodies of literature for relevant theoretical underpinning: the diffusion of innovation (DOI) literature and the management of fashions and fads (MF&F) literature. While both bodies of work were found to offer valuable insight and useful constructs, neither was found to include a comprehensive theoretical framework suitable for understanding Lean diffusion. As a development of the that was provided in chapters 3 and 7, the researcher now presents a framework in Figure 20 which, although now entirely new, does represent as a more effective construct for explaining the nature of the Lean diffusion process.

Figure 20 Theoretical Framework for the Diffusion of Lean



(Source: the researcher)

Figure 20 illustrates that there are four interrelated categories of factors that influence Lean diffusion over time: first, factors that are either specific or intrinsic to the Lean OMI itself; second, factors that relate to the context and timing of Lean; third, factors that relate to the promotion of Lean; fourth, factors that relate to adopters of Lean diffusion. The Lean specific factors identified during this study are located next to each of the categories. Each of these are elaborated upon in the sections that follow.

First, however, it is important to note that exploratory, qualitative research is often criticised for lack of *generalisability*, meaning an inability to generalise from the study sample to the entire population. This framework is the output of exploratory research on the Lean OMI but has potential for further empirical research on other OMIs. It offers a less restrictive and prescriptive alternative to Rogers's (2003) conventional DOI model.

8.1.1 Innovation Specific Factors

One of the aims of this study was to understand what, if anything, distinguishes Lean from other similar OMIs. At the outset the researcher had only naive curiosity about

the apparent longevity and widespread diffusion of Lean. Assuming what was apparent was real, this curiosity led her to wonder if widespread diffusion may be explained by the intrinsic properties of the Lean phenomenon itself or if it is the effect of other factors? The findings have indicated that the answer to that question is both. The study has identified several characteristics of Lean that appear to afford it *competitive edge* over other OMIs.

The first of these characteristics is the ***empirical foundations*** upon which Lean has been built. According to DOI theory, the spread of an innovation is rarely based on the evaluation of scientific studies (Rogers, 2003). However, in the case of Lean diffusion, the academic credentials that underpin Lean with their 'MIT aura' (to quote one expert) appear to have afforded Lean a *competitive edge* over other similar OMIs. The literature review revealed the extent of criticism of the MIT study in terms of motivation, methodology and statistical interpretation (Williams 1992; 1994; Delbridge, 1995, 1998; Coffey, 2006, 2006a, 2008, Gall, 2007). However, during the expert interviews this criticism was often dismissed as 'professional jealousy' and anyway is primarily confined to the academic community. Representatives of the wider practitioner community appear to regard the academic credentials of Lean as a unique selling proposition (USP) that sets Lean apart from other OMIs. Furthermore, as Lean diffuses into the newer environments of the service and public sectors, the empirical foundations of Lean appear to diminish in importance anyway. Practitioners from these sectors cite the well-documented impact of Lean on the manufacturing community as *their* evidence of its efficacy. Another important aspect to the empirical foundations of Lean is the role of the Toyota Corporation and the well-documented Toyota Production Systems (TPS). In spite of recent product quality issues, Toyota has a long-standing and well-established reputation for quality, production and business excellence. Toyota has acted as a permanent 'reference model' (to quote one informant) for the Lean OMI; other OMIs do not enjoy an equivalent.

The second of these characteristics are the ***perceived attributes*** of Lean. The findings revealed that four such perceived attributes are of particular importance to the Lean OMI. First, perceived relative advantage is the degree to which Lean is perceived as being better than the idea it supersedes. The key Lean publications firmly positioned Lean as the 'antidote' to outmoded and problematic mass production (Womack *et al.*, 1990; Womack and Jones, 1996, 2004; 2005, 2005a). In

the case of other OMIs, it is often less clear as to the idea they supersede. The second perceived attribute of Lean is its' lack of complexity, or, conversely its' simplicity. Lean has a simple central mantra of waste removal. While this mantra represents an over-simplification of what this study has found to be a polymorphic and evolving phenomenon, it is one that resonates in a contemporary society preoccupied with consumer and environmental excess. One expert referred to the ethos element of Plato's art of persuasion. Ethos means *of our time*. The central mantra of waste removal is of our time and renders Lean timely, simple to understand and accessible to all. By contrast, other OMIs, in particular Six Sigma and TOC, are often perceived as overly complex and technical and therefore less accessible as a result. The third perceived attribute of Lean is visibility. Visibility means physical change to the working environment that can be seen. Visual management is integral to the Lean OMI (Bicheno and Holweg, 2009). Visibility is captured by the construct of observability in the DOI literature. Observability is defined as the degree to which an innovation is visible to others (Rogers, 2003). The fourth perceived attribute of Lean is trialability. Trialability is also a construct within the DOI literature. It is defined as the degree to which an innovation may be experimented with on a limited basis (*ibid.*). Experimentation is also integral to the Lean OMI (Leonard-Barton, 1992; Spear and Bowen, 1999). In conclusion, the perceived attributes of relative advantage, simplicity, visibility and trialability, collectively form innovation-specific attributes that serve to differentiate Lean from other similar OMIs.

The third characteristic is ***interpretive viability***. In the background literature interpretive viability is identified as necessary for the widespread diffusion of an OMI (Ortman,1995; Benders, 1999; Benders and van Veen, 2001; Benders and Slomp, 2009). Interpretive viability or ambiguity of content facilitates the application of an OMI in a wide variety of contexts. The literature review revealed the diversity of Lean implementation approaches (Bicheno and Holweg, 2009). The findings in response to RQ1 revealed Lean to be a polymorphic phenomenon that exhibits interpretive viability. Furthermore, several informants considered Lean to be less prescriptive and rigid than other OMIs: Six sigma has DMAIC; TOC has a five step plan and Seddon's systems thinking has Check, Plan, Do. While these OMIs have a rigid

improvement process path, Lean has a set of principles. As a result, Lean has a greater degree of interpretive viability than other OMIs.

The author concludes that these three characteristics (empirical foundations, certain perceived attributes and interpretive viability) are specific to the Lean OMI and that together they have influenced its diffusion over time.

8.1.2 Context and Timing Factors

Both the literature review and primary data from the expert interviews revealed the extent to which context and timing influenced the early diffusion of Lean in the UK. The omission of context was regarded by several experts as an important weakness of the DOI model of the determinants of Lean diffusion. The Lean phenomenon emerged at an unsettled and confused time in the UK business and management community. There was unease as a result of the ***competitive threat posed by Japanese*** products and the influx of Japanese manufacturing plants into the UK. Japanese manufacturers frequently selected the UK over other European countries to locate their transplant factories from which to produce goods to penetrate the vast European trade market. The UK was often selected because it is less bound by restrictive employment laws than other European countries. In addition, inward investment was a dominant and positively promoted feature of the monetarist policies of the 1980s Thatcherite government. That government offered the Japanese generous financial incentives to encourage them to locate here. The researcher concludes that Lean emerged at a time and in a context in which there was a collective psychological need amongst the manufacturing community of the early 90s. The community needed to find a solution to the Japanese threat. *The Machine* publication offered a message of both warning and hope. Lean was presented as an OMI that could be deployed in order to address the threat posed by the Japanese. Findings in response to RQ3 revealed that the trajectory of Lean diffusion follows various sectors as they too seek a ***response to heightened competitive and financial pressures***. The findings relating to the newer environments revealed that inter-sectoral labour mobility has influenced recent Lean diffusion in the service sector. The late 1990s saw manufacturing managers who had gathered experience of Lean entering into employment in the growing service sector. This inter-sectoral ***labour mobility*** may be more prominent in the UK economy than

in other European countries. In conclusion, a number of important timing and contextual factors have and continue to influence Lean diffusion.

8.1.3 Promotional Factors

The Management Fashions literature places particular emphasis on promotional factors that influence the diffusion of OMIs like Lean. For example, Keiser (1997) highlights the literary devices used in *The Machine.* The author concludes that these literary devices are just one manifestation of ***blurring of the traditional academic boundaries*** identified by this study as a particular characteristic of the Lean OMI. Lean has been represented by some authors (Rynes *et al.* 2001; Pettigrew, 2008) as an attempt to bridge the gap between organisational research and managerial practice. The authors of *The Machine* themselves describe the publication as a hybrid product that melded the two distinct cultures. The findings revealed that this melding of practitioner and academic cultures led to considerable unease and tension within the International Motor Vehicles Programme (IMVP). It resulted in a blurring of traditional academic boundaries which in turn rendered Lean contentious among the academic community. However, it was found that the practitioner community is both attracted to Lean because of its' academic heritage whilst simultaneously fairly disinterested in the details of that academic heritage. Furthermore, the same academic credentials of Lean contributed to the subsequent take up and promotion of Lean by government departments and agencies. Although this study has questioned the effectiveness of various government initiatives associated with Lean, ***the government*** has clearly played an important role in Lean diffusion. ***Consulting firms*** have also influenced Lean diffusion. A recent report published by the NAO highlights that the last decade has seen rapid and unprecedented growth in the use of management consultants. Having expanded consistently but slowly in the late 80s and first half of the 90s, the consulting industry in the UK grew exponentially between 1998 and 2005 (from £3.7 billion to £8.7). Initially most of this growth came from private sector companies (between 1994 and 2001 private sector demand for consulting grew on average by more than 30% per annum compared to an average growth of just over 10% in the public sector). However, between 2001 and 2004 the growth in private sector demand for consulting slowed to an average of just 11% per annum while at the same time

demand for consulting in the public sector rose steeply to an average of 58% per annum. The reports states that,

'While demand in private and public sector consulting is not absolutely counter-cyclical, public sector consulting has tended to grow more slowly or shrink in periods when the private consulting market is expanding rapidly, and grow when demand in the private sector is depressed. Falling demand in one part of the economy means that consulting firms have sought to maintain their growth, utilisation rates and profits by finding work elsewhere'

(NAO, 2006)

The implication is that recent years have seen the public sector become a target market for consultants looking to replace the decline in private sector demand. Furthermore, operations and process reengineering now represents the second most sizable area of spend on consultants after Information Technology and that,

'this type of consulting is closely linked to the government's agenda for improving the quality and efficiency of public services'

(NAO, 2006)

Since consulting firms profit well from continued and widespread Lean diffusion, they are likely to be highly motivated and active in promoting Lean. They have undoubtedly played a role in 'pushing' Lean into the newer environments. This is borne out by the presence of many Lean consulting firms at the recent high profile Lean event to promote the adoption of Lean in the public sector (for details, see www.publicserviceevents.co.uk).

In conclusion, various parties have promoted Lean in the past and continue to promote Lean today.

8.1.4 Adopter Organisation Factors

The final set of factors concerns the organisation(s) into which Lean diffuses and may be adopted or adapted. There are three aspects to adopter factors that are important to Lean diffusion. The first of these was touched upon by one particular informant's critique of the DOI model when he used the word ***impetus***, meaning the driving force of the recipient organisation.

DOI theory includes the construct of organisational innovativeness. Organisational innovativeness is defined as the degree of resistance, or otherwise, to the adoption

of an innovation (Rogers, 2003). However, this construct does not feature as one of the determinants of diffusion in the DOI model that was empirically tested as part of this study. Authors of MF&F literature also highlight a construct relevant to impetus. Scarborough and Terry (1998) argue that the organisation's ability to translate discourse into practice depends on its' absorptive capacity. Absorptive capacity is the organisation's ability to evaluate and put into practice externally sourced knowledge. The concept of absorptive capacity was first proposed by Cohen and Levinthal (1990) who argued that the ability of a firm to recognise the value of new, external information, assimilate it and apply it to commercial ends is critical to its innovative capabilities. Organisational innovativeness and absorptive capacity are similar though not identical constructs. They inform the notion of impetus.

Impetus is internal to the recipient organisation, while institutional ***isomorphism*** is external to it. Isomorphism is a central tenet of institutional theory which asserts that organisations sharing the same environment will employ similar practices in order to gain legitimacy (Meyer and Rowan, 1977; Powell and DiMaggio, 1991; Talbot and Zucker, 1996; Grint, 1997; Sturdy, 2004; Ashworth *et al.,* 2007). Though some authors such as Sturdy (2004) criticise institutional theory for ignoring eclectic sectors or regions, the findings in reponse to RQ4 suggest that institutional isomorphism influenced early Lean diffusion.

The findings also revealed that ***networking*** has and continues to influence Lean diffusion. Some organisations are more embedded in social networks than others. Some of the authors of the management fashions literature, such as Abrahamson and Rosenkopf (1997) emphasise the role of social networks in influencing the extent of 'bandwagon' pressure. In addition, DOI theory includes the construct of interconnectedness which is defined as the degree to which the units in a social system are interlinked by interpersonal networks (Rogers, 2003). However, this study revealed that the DOI model of the determinants of diffusion is constrained by the static construct of the social system. In the case of Lean diffusion, the social system has been dynamic over time. The role of networking in diffusion, and in particular peer-to-peer networking, however, is clearly important but remains poorly understood and offers considerable potential for further exploratory research.

8. 2 Study Contributions and Significance

The theoretical framework illustrated in Figure 20 and discussed in the preceding section has been synthesised as a culmination of this study. The researcher is aware that the status of contribution to knowledge is determined by others. From this point onward, however, contribution is used as shorthand for *potential contribution*. With this caveat in mind, this section details the other contributions made by this study. There are three categories of contribution; each of relevance to different stakeholders. There are: theoretical contributions to knowledge that are of particular relevance for the academic community; practical contributions to knowledge that are of particular relevance for practitioners and policy makers; and finally, personal contribution to the researcher herself.

Table 49 lists the contributions of the study together with an assessment of breadth of stakeholders for whom they have relevance. These stakeholders are categorised into three groups. The first of these is the academic community, which is further divided into those three areas of literature of relevance to the study. The second stakeholder group is the Lean practitioner and related consultancy communities. The third and last stakeholder group is policymakers tasked with allocating taxpayers money wisely.

Table 48 Summary of Contributions and Breadth of Relevance

Major contributions	Location in this thesis	Academic			Pract-titioners/ Consult ants	Policy-makers/ tax-payers
		Lean liter-ature	DOI liter-ature	MF&F liter-ature		
Listing of Lean definitions/brief explanations	**Chapter 2 (Table 1)**	Y			Y	Y
Lean has certain characteristics that render it indefinable and have a bearing on it's diffusion	**Chapter 6 (RQ1)**	Y			Y	Y
Provision of empirical evidence of the spread of the Lean movement over time	**Chapter 6 (RQ3)**	Y			Y	Y
Analysis of distinguishing features of three disparate bodies of literature and conceptual framework	**Chapters 1 to 4**	Y	Y	Y		
Provision of empirical evidence on an OMI to contribute to DOI literature	**Chapter 7**	Y	Y			
Provision of empirical evidence to inform management fashion theory	**Chapter 7**	Y		Y		
Providing a conceptual model of the factors determining Lean diffusion	**Chapter 8**	Y	Y	Y	Y	Y
Methodological contribution through the critique of a DOI model of the determinants	**Chapter 7**		Y			
Novel use of perceived attributes of an innovation as a mechanism for comparing OMIs	**Chapter 6 (RQ1)**	Y	Y			

(Source: the researcher)

While Table 49 identifies the various contributions and the stakeholder groups for whom they have relevance, the discussion that follows identifies the claims of contribution to knowledge.

8.2.1 Contributions to Knowledge

The researcher established that the Lean phenomenon has three key characteristics that have an important bearing on its subsequent diffusion: Lean is polymorphic or takes on many forms; it is dynamic or evolving over time; it has attracted and continues to attract criticism and contention. These characteristics render Lean indefinable thereby explaining the lack of clear definition (consolidated in Table 1 of Chapter 2) in the extant literature. The identification of these three characteristics represents a contribution to knowledge. The researcher defined *Lean diffusion* as the spread of the Lean movement over time. Figure 14 (see Chapter 6, RQ3) established that publications on Lean have risen over the two decade time period under inquiry. Drawn from the Lean Publications Database (LPD), this figure offers hard evidence of the spread of the Lean movement over time and represents another contribution to knowledge.

The novelty value of the research lies with the fresh perspective it brings to a well-established topic. Lean is a well-known and well-documented phenomenon. However, Lean research is often focused on the finer nuances and manifestations of application within various organisational contexts. Little research has been conducted that focuses on Lean as an object of innovation that has spread through a population over time. In order to address this gap in knowledge, three disparate bodies of knowledge were brought together: the extant literature on Lean together with two related but distinct bodies of literature that do focus on objects of innovation and their diffusion over time. The characteristics of the three literatures were compared and contrasted and summarised in Table 18 of Chapter 3. This analysis represents another contribution to knowledge. Research gaps and opportunities were located within each body of literature: the Lean literature (referred to as the Core literature) has been criticised by some for lack of theoretical development; the DOI literature (referred to as the Background literature) is largely based on research that is focused on product, process and technological innovations rather than a managerial and organisational innovations (OMIs) like Lean; the management fashions literature (referred to as the Background literature) is based on sparse empirical evidence. This research study addresses each of those research opportunities: It contributes to the Lean literature by offering a new perspective on

the Lean phenomenon with the aim of theoretical development; it contributes to the DOI literature by focusing on an OMI as opposed to the usual hard technological innovations; it contributes to the management fashions literature through the inclusion of qualitative evidence to partially address the dearth of empirical studies. The analysis (summarised in Table 18) also allowed the development of a conceptual framework (see Figures 2 and 9) in which the study is located at the intersections of the three literatures, drawing upon the two areas of Background literature for theoretical underpinning. The research study culminated in the development of a theoretical framework conceptualising the determinants of Lean diffusion during the period 1988 to 2010 (see Figure 20). This framework represents the main contribution to knowledge of this research study.

The research design incorporated two primary data collection instruments: bibliographic data and expert interviews. Both are well established methods within the MF&F literature and DOI literatures respectively. The execution of the expert interviews involved two methodological contributions through the novel inclusion of a critical examination of the DOI theory of the determinants of diffusion. (Rogers, 2003):

First, Rogers (*ibid.*, p. 223) makes the point that little research has been conducted to determine the relative contribution of each of the five variables within the model. During the critical examination of the model, informants were asked to score each of the variables for their relative importance. The findings confirmed perceived attributes to be the most important of the five variables. Other variables were found to be problematic in explaining Lean diffusion.

Second, during the expert interviews, the variable of perceived innovation attributes was used as a mechanism for the deconstructing and comparing of OMIs. Informants scored Lean and other OMIs against each of the perceived innovation attributes. This identified perceived attributes of Lean that appear to differentiate it from other OMIs.

8.2.2 Practical Contributions

Lean diffusion concerns the spread of the Lean movement over time. Lean is a phenomenon that has led to much activity in a great many organisations, therefore research that offers insight into this elusive phenomenon is likely to be of interest to

the practitioner community for different reasons. Lean diffusion was found to have broadened over time from its origins in car manufacturing to wider manufacturing and now into the newer environment of the service and public sectors. The study generated a number of the research findings specific to the newer environments into which Lean has diffused more recently:

The service sector is one such environment where Lean is attracting considerable debate and dissent. Seddon is critical of the Lean movement for failing to fully appreciate subtle differences between service and manufacturing environments. Although he initially allied himself with the movement, Seddon now presents his own approach as a superior alternative for service organisations. Today, Seddon leads a splinter movement to the broader Lean movement. The findings of this exploratory research found no evidence to support Seddon's primary criticism of Lean implementation in service organisations (the tendency to over standardise and thereby inhibit variety absorption). More novel findings of this study suggested two potential explanations for Lean diffusion into the service sector: first, that Lean may be a reaction to the legacy of previous decisions towards task fragmentation based on economies of scale logic; second, that Lean in the service sector may be the result of inter-sectoral labour mobility, particularly in the early 1990s. These findings will be of particular interest to practitioners with a particular interest in the application of Lean in the service sector.

The public sector is another area into which Lean has diffused more recently. The research generated a number of findings specific to different areas of the public sector. These findings will be of particular interest to public sector practitioners and policymakers alike, who will need to be discerning in how they allocate spending in the future. For example, the research found that market characteristics rather than efficacy determine perceptions of an OMI. Furthermore, the research found a polarisation of preferred improvement methodologies with Lean as the favoured improvement methodology in Central government and Seddon's Systems Thinking approach in Local government. Policymakers currently commit large sums of taxpayers money on research designed to evaluate of the efficacy of various OMIs based on the assumptions of objectivity and independence. The findings of this study may lead them to question those assumptions. The year 2010 sees the UK entering a new decade with a fragile coalition government without a clear mandate and a

national deficit of unprecedented proportions. Many government departments have been tasked with reducing costs by over a quarter (Radio 4, 24th June, 2010). Lean is uniquely poised to play a dominant role in these imminent and severe public sector cutbacks. Some public practitioners may draw on the Lean OMI, others may offer up the Lean OMI for sacrifice. Research that offers insight into the elusive Lean phenomenon will be relevant to these practitioners.

8.2.3 Personal Contribution

Research is a process of discovery (Creedy, 2008). The researcher began the process armed only with a general curiosity about a phenomenon and the apparent widespread appeal of that phenomenon. The researcher has some personal history and emotional attachment to the phenomenon and had often been struck by the highly emotive reaction the phenomenon appears to evoke in others. However, framing that curiosity in to a researchable topic was challenging. The first step in meeting that challenge was to consult literature with obvious relevance. This led to the development of a conceptual framework for locating and justifying the study. The next stage was to select research methods that would yield meaningful data. Bibliographic data collection has been widely used in similar types of study and so seemed an obvious choice. However, further reading revealed that it was a method that had been criticised for limited explanatory value. The decision was made to triangulate the findings with in-depth expert interviews. The intention was for the two methods to be complementary with the publications data providing evidence that Lean diffusion has occurred and the interview data providing evidence of why Lean diffusion had occurred. During the execution of the research both methods revealed their limitations: publications data could only provide a proxy of Lean discourse rather than Lean diffusion; the interviews would rely on Lean experts being able to articulate meaningful explanatory alternatives for Lean diffusion when in practice, some could, others could not. The most difficult part of the discovery process was pulling everything together into a cohesive whole. You only really discover what you do and do not understand when you have to write it down and explain it to others! The author of this thesis reflects that while research is difficult and challenging, it is simultaneously enriching and rewarding. Without doubt, however, the research process has contributed to the betterment of the researcher herself.

In retrospect, it is now possible to reflect on the particular role of researcher bias in this study, in particular, its role in data collection during the expert interviews. It was stated in the Introduction chapter that the research aimed to use this study to question some of her own assumptions, bias and opinions about Lean. During the expert interviews, the researcher found that her personal opinions sometimes had to be expressed and sometimes had to be concealed in order maximise the opportunity to gather as much data as possible. From this point of view the researcher's personal experience and knowledge of Lean proved to be advantageous. For example, the material in support of the claim that the Lean fashion market is territorial and pugilistic, or material is support of Lean's blurring of academic boundaries, may not have been gathered without it. On the other hand, a more naive researcher may have explored different aspects of Lean diffusion which, in retrospect, the researcher now thinks she may have under-explored. More information could have been gathered, for example, on the role and benefits of peer-to-peer networking. Researcher bias has been both advantageous and disadvantageous to this study. On reflection the researcher concludes that the advantages have generally outweighed the disadvantages.

8.3 Limitations of the Study

Like all research, this study has limitations. Some of these were anticipated during the research design phase; others were not and have emerged during the research execution. Three types of limitations have been identified: those related to the scope and boundaries of the study, those related to the research methods deployed and one that emerged as a result of the execution of the research. Table 50 summarises these limitations by type, their particular manifestations, the implication of this manifestation and any countermeasures deployed to counteract their effect.

Table 49 Overall Study Limitations and Countermeasures Deployed

Limitation Type	Manifestations	Implication	Countermeasure deployed
Scope and boundaries	Study breadth	The broad research topic was methodologically challenging.	Some boundaries were imposed to limit the scope of the study.
	Nature of the phenomenon	The nebulosity of the research phenomenon under inquiry was methodologically	A working definition developed for the purpose of the study. The nature of the phenomenon formed an integral part of the research

		challenging.	study.
	Imposed boundaries	The research was bound geographically, temporally and conceptually.	Literature beyond the geographical and temporal boundaries was included in the review.
	Discourse versus adoption	Publications can only be a measure of discourse not adoption.	Since publications could only provide a proxy for diffusion, this research method was triangulated with expert interviews.
Research methods	Bibliographic analysis	Publications were drawn from only one online database.	None it was considered that using multiple databases would have been overly time-consuming.
	Informant pro-Lean bias	Pro-innovation bias due to the dominance of the rational or efficient choice perspective.	Some informants were selected for their dissenting views.
	Informant recall bias	Informant's memories may have been unreliable.	Multiple informants.
	Gender bias	All informants were male.	None due to time constraints.
	Number of interviews	Data collection was limited to twenty-one in-depth interviews.	None due to time constraints.
Research execution	Lean experts versus diffusion experts	Informants were selected for their expertise of Lean rather than their expertise of diffusion	None since identified after data collection.

(Source: the researcher)

The ***scope and boundaries*** of the study presented certain difficulties and generated limitations as a result. The breadth of the study was identified and justified at the outset (see Introduction chapter) where it was explained that the study would be delimited by the imposition of temporal, geographical and conceptual boundaries for pragmatic reasons. Such self-imposed boundaries themselves introduced constraints to the study. In particular, by conceptually bounding the study and positioning it within three bodies of literatures, important insights from other literatures may have been overlooked. Furthermore, the nebulous nature of the phenomenon under investigation presented another further scope and boundary constraint to the study. Consensus on a definition of the Lean phenomenon could not be found in the literature. A working definition was devised for clarity. However, why the phenomenon is such a poorly defined construct became the basis of the first research question so that the nature of the phenomenon itself formed an integral part of the inquiry. Finally, the scope and boundaries of the study would be further hindered by the differentiation between discourse and diffusion. At the outset of the study, the intention was for publications data to provide a proxy for the extent of

Lean diffusion. However, the literature review identified that publications data would only provide a barometer for discourse. As a result, the focus of the study steered away from the extent of Lean diffusion and towards an exploration of various explanatory possibilities for Lean diffusion.

Some of study limitations are derived from the ***research methods*** deployed. The bibliographic analysis come from the Lean publications database which was derived from only one online electronic database. It was considered that the use of multiple databases would have been overly time-consuming with limited additional benefits. Informants were purposively selected for broad representation of Lean diffusion, however, more interviews would undoubtedly have increased both the quantity and quality of data collection. For example, during the analysis it became apparent that the healthcare sector, an important area of the public sector, seemed to have been under or poorly represented during the expert interviews. One particular expert had been selected specifically for healthcare expertise, however, the quality of this interview proved disappointing. Time constraints prevented further countermeasures being deployed. Other methodological limitations included pro-innovation and recall bias. Both were recognised as potential limitations during the research design. Purposive selection of certain dissenting informants was deployed as a countermeasure to limit the effects of pro-innovation bias. However, no countermeasure for recall bias could be deployed. It is noteworthy, however, that informants were generally questioned for their views and opinions rather than their recall of events and occurrences. Finally, all experts were male thereby generating the possibility of gender bias in the data.

One limitation emerged from later reflection on the practical ***execution*** of the research. It became apparent during the interviews that while informants were experts on Lean, they were not experts on diffusion. While some had given the reasons underlying Lean diffusion considerable previous consideration, others were thinking about the issue for the first time during the interview. While their spontaneous responses were of some value, the data collected may have been enriched by the inclusion of some experts of diffusion rather than of Lean.

8.4 Areas for Further Research

Several areas with potential for further research have been identified and in part these follow naturally from the limitations.

This exploratory research focused on a particular OMI (Lean) in a particular geographical location. A natural and logical extension of the study would be a comparative study of other OMIs in the UK. This research drew heavily on the well-established DOI body of literature for some if its' theoretical underpinning. In particular, a highly relevant DOI model was critiqued as part of the study. It was established that certain variables within the model were inappropriate for Lean and possibly for other OMIs. The study culminated in the development of a Lean diffusion framework as a starting point for the identification of variables appropriate to OMIs. However, further empirical research is needed to fully understand the extent of the framework's generalisability to other OMIs, or even to all types of innovation.

The nebulosity of the Lean OMI formed an integral part of this study. It was established that Lean exhibits certain characteristics; however, the inter-relationships between these characteristics remain unclear. A further research opportunity lies in the disentanglement of these inter-relationships. A related strand of the research involved the comparison of Lean with other OMIs. This included the novel use of the perceived attributes variable of a well-established DOI model. The research established perceived attributes of Lean that appear to differentiate it from other OMIs. This strand of the research presents another opportunity for further empirical research.

This study highlighted the importance of networking in Lean diffusion. Networking, particularly peer-to-peer networking was particularly important in early Lean and remains so today. Networking presents a research challenge but also a considerable research opportunity.

This study explored other improvement methodologies being deployed by the service sector. The efficacy of different improvement methodologies in the service sector presents an obvious area for further research. A particular point of interest that emerged from this strand of the research involved the identification of the importance of inter-sectoral labour mobility. Previously unrecognised in the Lean literature, this finding presents a significant opportunity for further research.

This study also explored the diffusion of Lean into the public sector. It was established that Lean is currently perceived as an important means for the government to achieve their efficiency goals. In the current climate of severe austerity, this represents the most topical area for further research of all. Time alone will reveal whether Lean will be ultimately deployed, distorted or destroyed through its' application in the public sector.

One of the limitations of the study lay with its self-imposed geographical boundaries. Context and timing were clearly identified as important in the diffusion of Lean in the UK. Comparative studies in other countries, for example, other European countries would offer valuable insight into the relative importance of these context and timing factors.

Another limitation of the study was its' failure to include Lean adopters. The inclusion of this important set of stakeholders in the diffusion process was regarded as being beyond the scope and boundaries of the study. Their role and experience of Lean offers broad scope for further research.

Finally, this research has made clear that the impact and influence of the Lean OMI in the UK has been profound and far-reaching. It will be compelling to observe whether it will shape the service and public sector landscape in the future as much as it has the manufacturing landscape in the past.

References

Abdi, F., Shavarini, S. and Hoseini, S. 2006. Glean Lean: How to Use Lean Approach in Services Industries. *Journal of Services Research* 6(special), pp. 191-206.

Abrahamson, E. 1991. Managerial Fads and Fashion: the Diffusion and Rejection of Innovations. *Academy of Management Review* 16(3), pp. 586-612.

Abrahamson, E. 1996. Management Fashion. *Academy of Management Review* 21(1), pp. 254-285.

Abrahamson, E. and Eisenman, M. 2001. Why Management Scholars Must Intervene Strategically in the Management Knowledge Market. *Human Relations* 54(1), pp. 67-75.

Abrahamson, E. and Fairchild, G. 1999. Management Fashion: Lifecycles, Triggers and Collective Learning Processes. *Administrative Science Quarterly* 44, pp. 708-740.

Abrahamson, E. and Rosenkopf, L. 1997. Social Networks Effects on the Extent of Innovation Diffusion: A Computer Simulation. *Organisation Science* 8(3), pp. 289-309.

Ackoff, R. 1981. *Creating the Corporate Future*. Wiley, NY.

Ackoff, R. 1994. *The Democratic Orgnanisation*. Oxford University Press, NY.

Ackroyd S., Burrell, A., Hughes, M. and Whitaker, A. 1988. The Japanisation of British Industry? *Industrial Relations Journal* 19, pp. 11-23.

Ackroyd, S. and Fleetwood, S. eds. 2000. *Realist Perspectives on Management and Organisations*. Routledge Taylor and Francis, London.

Advice UK. 2008. *It's The System, Stupid! Radically Rethinking Advice*. Report of Advice UK's Radical Project 2007-2008, supported by the Baring Foundation.

Allen, J. 2000. Making Lean Manufacturing Work For You. *Journal of Manufacturing Engineering* 2000, pp. 1-6.

Allway, M. and Corbett, S. 2002. Shifting to Lean Service: Stealing a Play from Manufacture's Playbooks. *Journal of Organisational Excellence* 21(2), pp. 45-54.

Anderson 1992. *The Lean Enterprise Report*. London: Anderson Consulting.

Anderson 1994. *Worldwide Manufacturing Competitiveness Study: The Second Lean Enterprise Report*. Anderson Consulting, London.

Anderson, J., Cleveland, G. and Schroeder, R. 1989. Operations Strategy: A Literature Review. *Operations Management* 8(2), pp. 133-158.

Andersson, R., Eriksson, H. and Torstensson, H. 2006. Similarities and Differences Between TQM, Six Sigma and Lean. *The TQM Magazine* 18(3), pp. 282-296.

Antony, J. 2008. What is the Role of Academic Institutions for the Future Development of Six Sigma? *International Journal of Productivity and Performance Management* 57(1), pp. 107-110.

Antony, J. Escamilla, J. and Caine, P. 2003. Blending the Best of Lean Production and Six Sigma for Achieving and Maintaining Operational Excellence. *Manufacturing Engineer* 82(2), pp. 40-42.

Appleyard, B. 2009. Books that Helped to Change the World. *The Sunday Times, July 19th*.

Archer, M., Sharp, R., Stones, R. and Woodiwiss, T. 1999. Critical Realism and Research Methodology. *Journal of Critical Realism* 2(1), pp. 12-16.

Ashworth, R. Boyne, G., and Delbridge, R. 2007. Escape from the Iron Cage? Organizational Change and Isomophic Pressures in the Public Sector, *Journal of Public Administration Research and Theory* 19(1), pp. 165-187.

Atkinson, P. 2004. Creating and Implementing Lean Strategies. *Management Services* 482, pp. 18-33.

Backer, T. and Singhal, A. 2005. Forum: The Life and Works of Everett Rogers, Some Personal Reflection. *Journal of Health Communication* 10, pp. 285-288.

Bagley, A. and Lewis, E. 2008. Why Aren't We All Lean? *Public Money and Management,* Chartered Institute of Public Finance and Accountancy, February, pp.10-11.

Baker, P. 2004. Aligning Distribution Center Operations to Supply Chain Strategy. *International Journal of Logistics Management* 15(1), pp. 111-123.

Banathy, B. ed. 1997. *A Taste of Systemics.* International Electronic Seminar on Wholeness 1/12/96 to 31/12/97. The Primer Group Project, a special Integration Group of the International Society for the Systems Science (ISSS), http://www.newciv.org/ISSS_Primer/seminar.html.

Barley, S. and Kunder, G. 1992. Design and Devotion: Surges of Rational and Normative Ideologies of Control in Managerial Discourse. *Administrative Science Quarterly* 37(3), pp. 336-400.

Bartezzaghi, E.1999. The Evolution of Production Models: Is a New Paradigm Emerging? *International Journal of Operations and Production Management,* 19(2), pp. 229-250.

Bass, F. 1969. A New Product Growth Model for Consumer Durables. *Management Science* 13(5), pp. 215-227.

Bateman N and David A. 2002. Process Improvement Programmes: a Model for Assessing Sustainability. *International Journal of Operations & Production Management*, 22(5), pp.515 – 526.

Bayou, M. E. and Korvin, A. d. 2008. Measuring the Leanness of Manufacturing Systems: A Case Study of Ford Motor Company and General Motors. *Journal of Engineering & Technology Management* 25(4), pp. 287-304.

Beer, S. 1979. *The Heart of the Enterprise*. Wily, Chichester.

Beer, S. 1981. *Brain of the Firm*. Wily, Chichester.

Benders, J. 1999. Tricks and Trucks: A Case Study Of Organizational Concepts at Work. *The International Journal of Human Resource Management* 10(4), pp. 624-637.

Benders, J. and Bijsterveld, M. V. 2000. Lean on Lean: The Reception of Management Fashion in Germany. *New Technology, Work and Employment* 15(1), pp. 50-64.

Benders, J. and Morita, M. 2004. Changes in Toyota Motors Operations Management. *International Journal of Production Research* 42(3), pp. 433-444.

Benders, J. and Slomp, J. 2009. Struggling with Solutions; A Case Study of Using Organisation Concepts. *International Journal of Production Research* 47(18), pp. 5237-5243.

Benders, J. and Veen, K. V. 2001. What's in a Fashion? Interpretive Viability and Mangaement Fashions. *Organisation* 8(1), pp. 33-53.

Berggren, C. 1992. *Alternatives to Lean Production: Work Organisation in the Swedish Auto Industry*. ILR Press, Cornell University, NY.

Bergmiller, G. and McCright, P. eds. 2009. *Lean Manufacturers' Transcendence to Green Manufacturing*. Industrial Engineering Research Conference. Miami Florida.

Bergstrom, R. 1995. Towards Lean Success. *Production*, pp. 1-4.

Bertalanffy, L. V. 1968. *General Systems Theory: Foundations, Development, Applications*. Braziller, NY.

Bertalanffy, L. V. 1956. General Systems Theory. *General Systems* 1, pp. 1-10.

Bhasin, S. and Burcher, P. 2006. Lean Viewed as a Philosophy. *Journal of Manufacturing Technology Management* 17(1), pp. 56-72.

Bhaskar, R. 1979. *The Possibility of Naturalism: A Philosophical Critique of the Contemporary Human Sciences*. Harvester, Brighton.

Bhuiyan, N. and Baghel, A. 2005. An Overview of Continuous Improvement: from the Past to the Present. *Management Decision* 43(5/6), pp. 761-771.

Bicheno, J. 1994. *Cause and Effect JIT: The Essentials of Lean Manufacturing*. Buckingham: Picsie Books.

Bicheno, J. 2008. *The Lean Toolbox for Service Systems*. Buckingham: Production and Inventory Control, Systems and Industrial Engineering. Picsie Books.

Bicheno, J. and Holweg, M. 2009. *The Lean Toolbox: The Essential Guide to Lean Transformation*. Buckingham: Production and Inventory Control, Systems and Industrial Engineering. Picsie Books.

Bikhchandani, S., Hirshleifer, D. and Welch, I. 1992. A Theory of Fads, Fashion, Custom and Cultural Change as Informational Cascades. *Journal of Political Economy* 100(51), pp. 992-1026.

Birkinshaw J., Hamel G. and Mol M. 2008 Management Innovation. *Academy of Management Review* 33(4), pp. 825-845.

Blaikie, N. 1993. *Approaches to Social Enquiry*. Polity Press, Cambridge.

Blanchard, D. 2007. Lean Green and Low Cost. *Industry Week/IW* 256(10), pp. 37-39.

Blaug, M. 1992. *The Methodology of Economics*. Cambridge University Press.

Bogner, A., Littig, B. and Menz, W. 2009. *Interviewing Experts*. Palgrave Macmillan, UK.

Boulding, K. 1956. General Systems Theory - The Skeleton of Science. *Management Science* 2(3), pp. 197-209.

Bowen, D. and Youngdahl, W. 1998. Lean Service: In Defense of a Production-line Approach. *International Journal of Service Industry Management* 3(9),pp. 207-225.

Bowers, R. 1937. The Direction of Intra-Societal Diffusion. *American Sociological Review*, 2. pp. 826-836.

Bowers, R. 1938. Differential Intensity of Intra-Societal Diffusion. *American Sociological Review* 3, pp. 21-31.

Bresnen, M. and Marshall, N. 2001. Understanding the Diffusion and Application of New Management Ideas in Construction. *Engineering, Construction and Architectural Management* 8(5/6), pp. 335-345.

Bryman, A. and Bell, E. 2003. *Business Research Methods* Oxford University Press, UK.

Burgess N. 2011. A Lean Presence. *Lean Management Journal* (8). SayOneMedia.

Burrell, G. and Morgan, G. 1979. *Sociological Paradigms and Organisational Analysis.* Aldershot: Gower.

Bylinski, G. 1983. An Efficiency Guru with a Brown Box. *Fortune* 108, pp. 120-132.

Calloway, L. and Knapp, C. 1995. Using Grounded Theory To Interpret Interviews. In: *AIS Americas Conference on Information Systems.*

Carson, P., Lanier, P., Carson, K. and Birkenmeier, B. 1999. A Historical Perspective on Fad Adoption and Abandonment. *Journal of Management History* 5(6), pp. 320-333.

Cassell, C. and Symon, G. 2006. Taking Qualitative Methods in Organisation and Management Research Seriously. *Qualitative Research in Organisations and Management* 1(1), p. 4-40.

Catherwood, P. 2002. What's Different About Six Sigma. *Manufacturing Engineer.* August.

CBI 2010. *Leaner and Fitter: Boosting Productivity in Public Services.* Confederation of British Industry.

Chaneski, W. 2009. Lean Concepts Really Do Apply in All Industries. *Modern Machine Shop* 81(11), pp. 34-36.

Chapman, J. 2004. *System Failure: Why Governments Must Learn To Think Differently.* DEMOS, London.

Chapman, T. 2010. Collaboration for Continuous Improvement - a Public Sector Story. *Lean Management Journal* (4), pp. 22-24.

Charmaz, K. 1994. *Grounded Theory in Denzin and Lincoln (eds) Hand book of Qualitative Research, second edition, Sage publications.*

Charvet, F., Cooper, M. and Gardner, J. 2008. The Intellectual Structure of Supply Chain Management: a Bibliometric Approach. *Journal of Business Logistics* 29(1), pp. 47-73.

Chase, N. 1999. Loose the Waste, get Lean. *Quality* 38, pp. 2-6.

Chase, R. 1978. Where does the Customer fit in a Service Operation? *Harvard Business Review* 56(4), pp. 137-142.

Chase, R. and Apte, U. 2007. A History of Research in Service Operations: What's the Big Idea? *Journal of Operations Management* 25.

Checkland, P. 1981. *Systems Thinking, Systems Practice.* Wiley, Chichester.

Checkland, P. and Holwell, S. 1998. Action Research: Its Nature and Validity. *Systemic Practice and Action Research* 11(1), pp. 9-21.

Checkland, P. and Scholes, J. 1990. *Soft Systems Methodology in Action*. Wiley, Chichester.

Christopher, M. and Towill, D. 2000. Supply Chain Migration from Lean and Functional to Agile and Customised. *Supply Chain Management: An International Journal* 5(4), pp. 206-213.

Churchman, C. W. 1968. *The Systems Approach*. Delacorte Press, NY.

Churchman, C. W. 1979. *The Systems Approach and Its Enemies*. Basic Books, NY.

Clark, T. 2004. The Fashion of Management Fashion: A Surge Too Far? *Organization* 11(2), pp. 297-306.

Clark, T. and Salaman, G. 1998. Telling Tales: Management Gurus' Narratives and the Construction of Managerial Identity. *Journal of Management Studies* 35(2), pp. 137-161.

Coffey, A. and Holbrook, B. and Atkinson, P. 1996. Qualitative Data Analysis: Technologies and Representations. *Sociological Research Online* [Online] 1(1). Available at: http://www.socresonline.org.uk.

Coffey, D. 2006. *The Myth of Japanese Efficiency: The World Car Industry in a Globalizing Age*. Edward Elgar Publishing Limited, Cheltenham.

Coffey, D. 2007. Lean Beginnings. *Manufacturing* (June/July), pp. 18-19.

Coffey, D. and Thornley, C. 2006a. Automation, Motivation and Lean Production Reconsidered. *Assembly Automation* 26(2), pp. 98-103.

Coffey D. and Thornley C. 2007a. *Can Japan Compete? Reconsidered in Bailey, Coffey and Tomlinson (eds) Crisis or Recovery in Japan: State and Industrial Economy.* Edward Elgar, Cheltenham.

Cohen, M. 2009. Beyond Debate. *Times Higher Education Supplement*, 10th December.

Cohen, W. and Levinthal, D. 1990. Absorptive Capacity: A New Perspective on Learning and Innovation. *Administrative Science Quarterly* 35, pp. 128-152.

Cohene, T. and Easterbrook, S. eds. 2005. *Contextual Risk Analysis for Interview Design*. 13th IEEE International Requirements Engineering Conference. Paris, France, Aug 29-Sep 2 2005.

Cole, R. 1998. Learning from the Quality Movement: What Did and Didn't Happen? *California Management Review* 41(1), pp. 43-73.

Cole, R. 1999. *Managing Quality Fads: How American Business Learned to Play the Quality Game*. Oxford University Press, NY.

Coleman, J. and Katz, E. and Menzel, H. 1966. *Medical Innovation: A Diffusion Study*. Bobbs-Merrill, NY.

Collins 1999. *Family English Dictionary*. Glasgow: HarperCollins.

Collins, H. and Evans, R. 2007. *Rethinking Expertise*. University Of Chicago Press, Illinois.

Contu, A. and Wilmott, H. 2005. You Spin Me Round: The Realist Turn in Organisation and Management Studies. *Journal of Management Studies* 42(8), pp. 1645-1662.

Convis, G. 2001. Role of Management in a Lean Manufacturing Environment. *Automotive Manufacturing and Production* 7, pp. 1-7.

Cook, D. 1994. A Simulation Comparison of Traditional JIT and TOC Manufacturing Systems in a Flow Shop with Bottlenecks. *Production and Inventory Management Journal* 35(1), pp. 73-78.

Cooney, R. 2002. Is "Lean" a Universal Production System? Batch Production in the Automotive Industry. *International Journal of Operations and Production Management* 22(10), pp. 1130-1147.

Corbett, S. 2007. Beyond Manufacturing: The Evolution of Lean Production. *McKinsey Quarterly* (3).

Corbett, T. 1998. *Throughput Accounting*. North River Press. Massachusetts.

Corbett, T. 2000. Throughput Accounting and Activity-Based Costing. *Journal of Cost Management* January/February, pp. 37-45.

Creswell, J. 1994. *Research Design: Qualitative and Quantitative Approaches*. Sage Publications US.

CRG 2008. *Developing a National Approach to Business Change in Welsh Local Government: Final Report*. Cardiff: Welsh Assembly Government.

Crute, V., Ward, Y., Brown, S. and Graves, A. 2003. Implementing Lean Production in Aerospace - Challenging the Assumptions and Understanding the Challenges. *Technovation* 23, pp. 917-928.

Cummings, L. 1983. The Logics of Management. *Academy of Management Review* 8(4), pp. 532-538.

Cusumano, M. 1994. The Limits of Lean. *Sloan Management Review* 35(4), pp. 27-32.

Cusumano, M. and Takeishi, A. 1991. Supplier Relations and Management: A Survey of Japanese, Japanese-Transplant, and US Auto Plants. *Strategic Management Journal* 12(8), pp. 563-588.

Czarniawaka-Jeorges, B. 1990. *Merchants of Meaning: Managing Consulting in the Swedish Public Sector in Turner B. (ed.) Organisational Sybolism*. De Gruyter, NY.

Czerniawska, F. 2006. *Central Government's Use of Consultants: Market Analysis.*

Dahlgaard-Park, S. and Dahlgaard, J. 2007. Excellence - 25 years evolution. *Journal of Management History* 14(4), pp. 371-393.

Dale, B. 1999. *Managing Quality*. Blackwell Publishers, Oxford.

Damanpour, F. and Evan, W. 1984. Organizational Innovation and Performance: The problem of organisational lag. *Administrative Science Quarterly* 29, pp. 392-409.

Darlington, J. 2010. Accounting for Lean. *Lean Management Journal.* (7) SayOneMedia.

Darlington, J., Found, P. and Jones D. 2011. Finding the Financial Impact. *Lean Management Journal* (8) SayoneMedia

Darlington, J. forthcoming. Flow Accounting, Lean Accounting and an Inconvenient Truth.

Darlington, J., Francis, M., Found P. 2008. Flow Accounting Effective Performance Assessment for the Lean Enterprise. *Proceedings of 13th International Symposium on Logistics*, Bangkok, Thailand, 6-8th July 2008, pp. 53-61.

Delbridge, R. 1995. *British Factory: Japanese Transplant; an Ethnographic Study of Workplace Relations,* Cardiff University, PhD Thesis.

Delbridge, R. 1995a. Surviving JIT: Control and Resistance in a Japanese Transplant. *Journal of Business Studies* 32(6), pp. 802-817.

Delbridge, R. 1998. *Life on the Line in Contemporary Manufacturing*. Oxford University Press, Oxford.

Delbridge, R. and Lowe, J. eds. 1998. *British Manufacturing in Perspective.* Routledge, Oxford.

Delbridge, R. and Oliver, N. 1991. Narrowing the Gap? Stock turns in the Japanese and Western Car Industries. *International Journal of Production Research* 29(10), pp. 2083-2095.

Delbridge, R., Turnbull, P. and Wilkinson, B. 1992. Pusing Back the Frontiers: Management Control and Work Intensification Under JIT/TQM Factory Regimes. *New Technology, Work and Employment* 7(2), pp. 83-148.

Deming, W. 1982. *Out of the Crisis*. MIT Press, Massachusetts.

Denzin and Lincoln eds. 2000. *Handbook of Qualitative Research.* second ed. Sage, NY.

Denzin, N. 1978. *The Research Act: A theoretical introduction to sociological methods.* McGraw-Hill, NY.

Deutschmann, P. and Danielson, W. 1960. Diffusion of Knowledge of the Major News Story. *Journalism Quarterly* 37, pp. 345-355.

DiMaggio, P. and Powell, W. 1983. The Iron Cage Revisited: Institutional Isomorphism and Collective Rationality in Organisational Fields. *American Sociological Review* 48(2), pp. 147-160.

Dimancescu, D., Hines, P. and Rich, N. 1997. *The Lean Enterprise*. Amazon, NY.

Dinero, D. 2005. *Training Within Industry: The Foundation of Lean*. Productivity Press, NY.

Doeringer, P., Lorenz, E. and Terkla, D. 2003. The Adoption and Diffusion of High-Performance Management: Lessons from Japanese Multinationals in the West. *Cambridge Journal of Economics* 27(2), pp. 265-286.

Donaldson, L. 2001. *The Contingency Theory of Organisations*. Sage Publications, London.

Doorewaard, H. and Bijsterveld, M. V. 2001. The Osmosis of Ideas: An Analysis of the Integrated Approach to IT Management from a Translation Theory Perspective. *Organisation* 8, pp. 55-76.

Dore, R. 1973. *British factory, Japanese factory: The origins of national diversity in industrial relations*. Allen & Unwin, London.

DTI 2006. *Report on the Industry Forum Adaptor Programme*, Department of Trade and Industry.

DTZ 2007. *Evaluation of the Manufacturing Advisory Service*. DTZ Consulting and Research.

Dyer, J. and Nebeoka, K. 2000. Creating and Managing a High Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal* 21, pp. 345-367.

Easterby-Smith, M. and Thorpe, R. and Lowe, A. 2002. *Management Research: An Introduction*. Sage, London.

Ebert, R. 1989. Announcement on Empirical/Field-Based Methodologies in JOM. *Journal of Operations Management* 8(4), pp. 294-296.

Eckes, G. 2001. *The Six Sigma Revolution: How General Electric and Others Turned Process into Profits*. Wiley and Sons Inc. NY.

EEF 2001 *Catching Up with Uncle Sam*. Engineers Employers Federation.

Egan, J. 1996. *Rethinking Construction*. London: Construction Task Force report to Deputy Prime Minister, John Prescott.

Egan, J. 2008. I'd Give Construction About 4 Out of 10. [Online]. Available at: www.bre.co.uk/filelibrary/pdf/CLIP/SirJohnEgan21-05-08.pfd.

Ehrlich, B. 2006. Service with a Smile: Lean Solutions Extend Beyond the Factory Floor. *Industrial Engineer* 38(8), pp. 40-44.

Eisenhardt, K. 1989. Building Theories from Case Study Resaerch. *Academcy of Management Review* 14(4), pp. 532-549.

Elgar, T. and Smith, C. 1994. *Global Japanization? The Transnational Transformation of the Labour Process.* Routledge, London.

Eriksson, D. 1998 *Managing Problems of Postmodernity: Some Heuristics for Evaluation of Systems Approaches.* Laxenburg, Austria: International Institute for Applied Systems Analysis.

Ettorre, B. 1997. What's The Next Business Buzzword? *Management Review* (September), pp. 33-35.

FCC 2007. *Completion Report.* Food Chain Centre.

Fichman, R. and Kemerer, C. 1999. The Illusory Diffusion of Innovation: An Examination of Assimilation Gaps. *Information Systems Research* 10(3), pp. 225-275.

Fillingham, D. 2008. *Lean Healthcare: Improving the Patient's Experience.* Kingsham Press Ltd.

Fineman, S. 2001. Fashioning the Environment. *Organisation* 8(1), pp. 17-31.

Fischer, C. and Carroll, G. 1986. The Diffusion of the Telephone and the automobile in the US 1902-1937.*Working paper OBIR-8.* Graduate School of Business, University of California.

Fleetwood, S. and Ackroyd, S. eds. 2004. *Critical Realist Applications in Organisational and Management Studies.* Routledge Taylor and Francis Group London and New York.

Flood, R. 1999. *Rethinking the Fifth Discipline.* Routledge.

Flynn, B. and Sakkakibara, S. and Schroeder, R. and Bates, K. and Flynn, J. 1990. Empirical Research Methods in Operations Management. *Journal of Operations Management* 9(2), pp. 250-284.

Fogarty, D. and Blackstone, J. and Hoffman, T. 1991. *Production and Inventory Management.* Cincinnati: South- Western Publishing Company.

Fontana, A. and Frey, J. 2000. *The Interview: from Structured Questions to Negotiated Text in Denzin and Lincoln (eds.) Handbook of Qualitative Research.* Sage.

Forrester, J. 1961. *Industrial Dynamics.* MIT Press, Cambridge.

Forrester, J. 1969. *Principles of Systems.* Wright-Allen Press, Cambridge.

Forza, C. 1996. Work Organization in Lean Production and Traditional Plants: What are the Differences? *International Journal of Operations & Production Management* 16(2), pp. 42-62.

Fox, R. 2005. The Theory of Constraints - Fad or Future? The TOC Center Inc., www.toc.com.

Francis, M. 2002. *Understanding Lower Innovation Project Development Processes in the UK Fast Moving Consumer Goods Sector.* Cardiff University, PhD thesis.

Freeman, F. 1984. Books That Mean Business: The Management Bestsellers. *Academy of Management Review* 10. Pp. 345-350.

Freitas, I. 2008. Sources of Differences in the Pattern of Adoption of Organisational and Managerial Innovations from Early to Late 1990s, in the UK. *Research Policy* 37(1), pp. 131-148.

Fry, G. 2007. Where have all the engineers gone? *IET Engineering Management.*

Fujimoto, T. 1989. *Organisations for Effective Product Development - the Case of the Global Automobile Industry.* Harvard Business School, PhD thesis.

Gall, G. 2007. *Lean and Job Design*. Public and Commercial Services Union.

Gass, G. 2011. The Unions and Lean. *Lean Management Journal* (8). SayOneMedia.

George, M. 2002. *Combining Six Sigma Quality with Lean Speed*. McGraw-Hill, NY.

Geroski, G. 2000. Models of Technology Diffusion. *Research Policy* 29, pp. 603-625.

Gershon, P. 2004. *Releasing Resources to the Front Line: Independent Review of Public Sector Efficiency*. HMSO.

Ghauri, P. and Gronhaug, K. 2002. *Research Methods in Business Studies*. second ed. Prentice Hall, London.

Ghoshal, S. 2005. Bad Management Theories Are Destroying Good Management Practices. *Academy of Management Learning and Education* 4(1), pp. 75-91.

Gibbons, M., Limoger, C. Nowotny, S., Swartzman, S., Scott, P. and Traw, M. 1994. *The New Production of Knowledge: The Dynamics of Science and Research in Contemporary Societies*. Sage, London.

Gill, C. 2003. Worker Job Stress Effects of Just-In-Time/Lean Production: Design and Operating Policies. *EPRSC Funded Research Project,* CG/R39184/01, University,. Cambridge.

Gill, J. and Johnson, P. 1991. *Research Methods*. Paul Chapman, London.

Gill, J. and Whittle, S. 1992. Management by Panacea: Accounting for Transience. *Journal of Management Studies* 30(2), pp. 281-295.

Glaser, B. and Strauss, A. 1967. *The Discovery of Grounded Theory: Strategies for Qualitative Research*. Aldine, Chicago.

Goh, T. 2002. A Straategic Assessment of Six Sigma. *Quality and Reliability Engineering International* 18, pp. 403-410.

Goldratt, E.1996. My Saga To Improve Production. The Avraham Goldratt Institute, UK.

Goldratt, E. and Cox, J. 1986. *The Goal: A Process of Ongoing Improvement*. Great Barrington: North River Press.

Goldstein, D. 1997. Clashing Paradigms? Total Quality, Financial Restructuring and the Theories of the Firm. *Industrial and Coporate Change* 6(3), pp. 665-700.

Graham, I. 2001. Japanisation as Mythology. *Industrial Relations Journal*, pp. 69-75.

Graupp, P. and Wrona, B. 2008. Training Within Industry (TWI) Essential Skills for Supervisors.

Graves, A. 1991. *International Competitiveness and Technology Development in the World Automotive Industry*. University of Sussex, PhD thesis.

Green, S. 1999. The Missing Arguments of Lean Construction. *Construction Management and Economics* 17(2), pp. 133-137.

Green, S. and May, S. 2005. Lean Construction: Arenas of Enactment, Models of Diffusion and the Meaning of 'Leanness'. *Building Research and Information* 33(6), pp. 498-511.

Greenhalgh T., Robert G., Macfarlane F., Bate P. and Kyriakidou O. 2004. Diffusion of Innovations in Service Organisations: Systematic Review and Recommendations, *The Millbank Quarterly* 82(4), pp. 581-629.

Grint, K. 1997. TQM, BPR, JIT, BSCs and TLAs: managerial waves or drownings? *Management Decision* 35(10), pp. 731-738.

Guba, E. ed. 1990. *The Paradigm Dialog.* Sage, California.

Guba, E. and Lincoln, Y. eds. 1998. *Competing Paradigms in Qualitative Research Denzin and Lincoln (eds.) The Landscape of Qualitative Research.* Sage, California.

Gummesson, E. 1991. *Qualitative Methods in Management Research.* Sage, London.

Hackman, J. and Wageman, R. 1995. Total Quality Management: Empirical, Conceptual and Practical Issues. *Administrative Science Quarterly* 40(2), pp. 309-342.

Hagerstrand, T. 1952. *The Propogation of Innovation Waves.* Studies in Geography. Lund, Sweden.

Hamer, R. 2010. Justifying Lean. *Lean Management Journal* (4), pp. 9-14.

Hammer, M. 2002. Process Management and the Future of Six Sigma. *Sloan Management Review* (Winter).

Hankinson, G. and Cowking, P. 1993. *Branding in Action: Cases and Strategies for Profitable Brand Management.* McGraw-Hill, London.

Harari, O. 1997. Ten Reasons Why TQM Doesn't Work. *Management Review* 86(1), pp. 38-44.

Harber, D., Samson, D., Dohal, D. and Wirth, A. 1990. Just In Time: The Issue of Implementation. *International Journal of Operations & Production Management* 10(1), pp. 21-30.

Hardy C. 2010. Doing Discourse Analysis. Powerpoint presentation to Cardiff University by Cynthia Hardy, Department of Management & Marketing, University of Melbourne, Australia.

Hardy C., Phillips, N. and Clegg, S. 2001. Reflexivity in Organization and Management Theory. *Human Relations* 54, pp. 531-560.

Harrison, A. 1992. *Just in Time Manufacturing in Perspective*. Prentice-Hall, NY.

Harrison, A. and Storey, J. 1996. New Wave Manufacturing Strategies: Operational, Organisational and Human Dimensions. *International Journal of Operations & Production Management* 16(2), pp. 63-76.

Henderson, B., Larco, B. and Martin, S. 1999. *Lean Transformation: How To Change Your Business into a Lean Enterprise*. Oaklea Press, Virginia.

Herron, C. and Hicks, C. 2008. The Transfer of Selected Lean Manufacturing Techniques from Japanese Automotive Manufacturing into General Manufacturing (UK) through Change Agents. *Robotics & Computer-Integrated Manufacturing* 24(4), pp. 524-531.

Hines, P. 1994. *Creating Worldclass Suppliers*. Pitman, London.

Hines, P. 2006. Contingent Approaches to Quality Based Pricing in the Agrifood Industry. *The International Journal of Logistics: Research and Applications* 9(3), pp. 223-236.

Hines P., Found P., Griffiths G. and Harrison R. 2011. Staying Lean: Thriving , Not Just Surviving, second ed. Productivity Press, NY.

Hines, P., Found, P., Griffiths, G. and Harrison, R. 2008. Staying Lean: Thriving, Not Just Surviving. *Lean Enterprise Research Centre Publication*. Cardiff University.

Hines P., Francis M. and Bailey K. 2006. Quality Based Pricing: A Catalyst for Collaboration and Sustainable Change in the Agrifood Industry. *The International Journal of Logistics Management* 17(2), pp. 240-259.

Hines, P., Holweg, M. and Rich, N. 2004. From Strategic Toolkit to Strategic Value Creation: A Review of the Evolution of Contemporary Lean Thinking. *International Journal of Operations and Production Management* 24(10), pp. 994-1011.

Hines P., Lamming, R., Jones, D., Cousins, P. and Rich, N. 2000. *Value Stream Management: Strategy and Excellence in the Supply Chain*. FT Prentice Hall, London.

Hines, P. and Lethbridge, S. 2008. New Development: Creating a Lean University. *Public Money and Management*. Chartered Institute of Public Finance and Accountancy, February.

Hines, P. and Rich, N. 1997. The Seven Value Stream Mapping Tools. *International Journal of Operations & Production Management* 17(1), pp. 46-64.

Hines, P., Rich, N., Bicheno, J., Brunt, D. and Taylor, D. and Butterworth, C. and Sullivan, J. 1998. Value Stream Management. *The International Journal of Logistics Management* 9(1), pp. 25-42.

Hines, P. and Taylor, D. 2000. *Going Lean.* Lean Enterprise Research Centre. Cardiff University.

Holt, J. 1999. *Candid Comparison of Operational Management Approaches.* Washington State University.

Holweg, M. 2007. The Genealogy of Lean Production. *Journal of Operations Management* 25(2), pp. 420-437.

Holweg, M., Schab, L. and Meyer, A. D. 2009. *Lean and Six Sigma: Friends or Foes?* Judge Business School, Cambridge University.

Hornsell, M. 2007. The £7million Guide to a Tidy Desk. *The Times*, 5th January.

Huczynski, A. 1991. *Management Gurus: What Makes Them and How to Become One.* Oxford University Press, NY.

Huntzinger, J. 2002. The Roots of Lean - Training Within Industry: The Origin of Japanese Management and Kaizen, *Target*, 18 (4), pp. 6-9.

Huntzinger, J. 2006. Why Standard Work is not Standard: Training Within Industry Provides an Answer. *Target* 22(4), pp. 7-13.

Hutchinson, S., Kinnie, N. and Pursell, J. 1996. People Management Issues of Lean Ways of Working. *Issues in People Management,* Institute of Personnel and Development (15).

Innes, J. and Mitchell, F. 1991. *Activity Based Costing: A Review with Case Studies.* Chartered Institute of Management Accountants, London.

Jackson, M. 1990. Beyond a System of Sytems Metholodogies. *Journal of Operational Research Society* 41(8), pp. 675-668.

Jackson, M. 2000. *Systems Approaches to Management.* Kluwer/Plenum, NY.

Jackson, M. 2003. *Systems Thinking: Creative Holism for Managers.* Wiley, Chichester.

Jackson, M., Johnston, N. and Seddon, J. 2008. Evaluating Systems Thinking in Housing. *Journal of the Operational Research Society* 59, pp. 186-197.

Jackson, M. and Keys, P. 1984. Toward a System of System Methodologies. *Journal of Operational Research Society* 35(6), pp. 473-486.

James-Moore, S. and Gibbons, A. 1997. Is Lean Manufacture Universally Relevant. *International Journal of Operations and Production Management* 17(9), pp. 899-911.

Jina, J., Bhattacharya, A. and Walton, A. 1997. Applying Lean Principles for High Product Variety and Low Volumes: Some Issues and Propositions. *Logistics Information Management* 10(1), pp. 5-13.

Johnson, H. 2007. Management by Financial Targets isn't lean. *Manufacturing Engineer* (December), pp. 1-5.

Johnson, H. and Kaplan, R. 1987. *Relevance Lost: The Rise and Fall of Manaegment Accounting.* Harvard Business School Press, Boston.

Johnson, P., Buehring, A., Cassell, C. and Symon, G. 2006. Evaluating Qualitative Management Research: Towards a Contingent Criteriology. *International Journal of Mangement Reviews* 8(3), pp. 131-156.

Johnson, R., Kast, F. and Rosenzweig, J. 1964. Systems Theory and Management. *Management Science* 10(2), pp. 367-384.

Johnston, R. 1999. Service Operations Management: Return to Roots. *International Journal of Operations & Production Management* 19(2), pp. 104-124.

Jones, D., Hines, P. and Rich, N. 1997. Lean Logistics. *Internal Journal of Physical Distribution and Logistics Management* 27(3/4), pp. 153-157.

Jones, D. and Mitchell, A. 2006. *Lean Thinking for the NHS*. NHS Confederation.

Jones, D. and Womack, J. 2002. *Seeing the Whole*. Massachusetts, US: Lean Enterprise Institute.

Jones, D. M. ed. 2000. *Globalization, Nationalism and the Modernization of the United Kingdom of Great Britain* Singapore: Institute of Southeast Asian Studies.

Jorgensen, B. 2008. Lost in Transition: the Transfer of Lean Manufacturing to Construction. *Engineering, Construction and Architectural Management* 15(4), pp. 383-398.

Junor, A. 1996. Critical Realism Comes to Management. *Journal of Critical Realism* 4(1), pp. 30-33.

Kamata, S. 1982. *Japan in the Passing Lane*. Allen and Unwin, Boston.

Karlsson, C. and Ahlstrom, P. 1996. Assessing Changes Towards Lean Productionduction Management. *International Journal of Operations and Production Management* 16(2), pp. 24-41.

Kast, F. and Rosenzweig, J. 1985. *Organisation and Management: A Systems and Contingency Approach*. McGraw-Hill, NY.

Katayama, H. and Bennett, D. 1996. Lean Production in a Changing Competitive World: A Japanese Perspective. *International Journal of Operations and Production Management* 16(2), pp. 8-23.

Katz, E. 1961. *The Social Itinerary of Social Change: Two Studies on the Diffusion of Innovation in Schramm W. (ed.) Studies of Innovation and of Communication to the Public*. Stanford University, California.

Keiser, A. 1997. Rhetoric and Myth in Management Fashion. *Organisation* 4(1), pp. 49-74.

Kenney, M. and Florida, R. 1993. *Beyond Mass Production: The Japanese System and Its Transfer to the US*. Oxford University Press, NY.

Kimberly, J. 1981. *Managerial Innovation in Nystrom P. and Starbuck W. (eds.) Handbook of Organisational Design*. Oxford University Press, NY.

Kollberg, B., Dahlgaard, J. and Brehmer, P. 2007. Measuring Lean Initiatives in Healthcare Services: Issues and Findings. *International Journal of Productivity and Performance Management* 56(1), pp. 7-24.

Krafcik, J. 1988. The Triumph of the Lean Production System. *Sloan Management Review* 301, pp. 41-52.

Krizner, K. 2001. Manufacturers Adopt a Lean Philosophy. *Frontline Solutions*, pp. 1-5.

Kumon, H. 2000. From the Diffusion of Lean Production to the Hybridisation Perspective. *Journal of International Economic Studies* (14), pp. 27-40.

Lamming, R. 1992. *Supplier Strategies in the Automotive Components Industry: Development Towards Lean Production.* University of Sussex, PhD thesis.

Lamming, R. 1993. *Beyond Partnership: Strategies for Innovation and Lean Supply.* Hemel Hempstead: Prentice Hall.

Lamming, R. 1996. Squaring Lean Supply with Supply Chain Management. *International Journal of Operations & Production Management* 16(2), pp. 183-196.

Lansing, S. 1987. Balinese 'Water Temples' and the Management of Irrigation. *American Anthropologist* 89, pp. 326-341.

Lansing, S. 1991. *Priests and Programmers: Engineering the Knowledge of Bali.* Princeton: Princeton University Press.

Lathin, D. and Mitchell, R. 2001. Learning from Mistakes. *Quality Progress*, pp. 1-8.

Law, J. 1992. Notes on the Theory of the Actor-Network: Ordering, Strategy, and Heterogeneity. *Systemic Practice and Action Research* 5(4), pp. 379-393.

Lazarus, I. and Butler, K. 2001. The Promise of Six Sigma. *Managed Healthcare Executive* (October).

Lebow, J. 1999. The Last Word on Lean Manufacturing. *IIE Solutions* (September).

Lee, B. and Jo, H. 2007. The Mutation of the Toyota Production System: Adapting the TPS at Hyundai Motor Company. *International Journal of Production Research.* 45(15/16), pp. 3665-3679.

Legge, K. 1996. *On Knowledge, Business Consulting and the Selling of TQM.* University of Lancaster, Lancaster.

Leonard-Barton, D. 1992. The Factory as a Learning Laboratory. *Sloan Management Review.*

LERC. 2010. *Business Improvement Approaches in the Public Sector in Wales.* Lean Enterprise Research Centre.

Levitt, T. 1972. Production-line Approach to Service. *Harvard Business Review* (Sep-Oct).

Levitt, T. 1976. The Industrialisation of Service. *Harvard Business Review* 54(5), pp. 63-74.

Levy, D. 1997. Lean Production in an International Supply Chain. *Sloan Management Review* Winter.

Lewis, J. 2001. Set the Stage for Success. *Upholstery Design and Mangement* 14(9), pp. 1-4.

Lewis, M. 2000. Lean Production and Sustainable Competitive Advantage. *International Journal of Operations and Production Management* 20(8), pp. 959-978.

Liker, J. 2004. *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer*. McGraw-Hill, NY.

Liker, J. and Fruin, M. and Adler, P. eds. 1999. *Remade in America: Transplanting and Transforming Japanese Management Systems.* Oxford University Press, NY.

Lillrank, P. 1995. The Transfer of Management Innovations from Japan. *Organization Studies* 16(6), pp. 971-989.

Lincoln, Y. and Guba, E. 1985. *Naturalistic Inquiry*. Sage, California.

Lubitsh, G. and Doyle, C. and Valentine, J. 2005. The Impact of Theory of Constraints (TOC) in an NHS Trust. *Journal of management Development* 24(2), pp. 116-131.

Mabin, V. and Balderstone, S. 2000. *The World of the TOC: A Review of the International Literature*. American Production and Inventory Control. The St. Lucie Press/APICS.

MacDuffie, J. 1995. Human resource bundles and manufacturing performance:organisational logic and flexible production systems in the world auto industry. *Industrial and Labor Relations Review*.

MacDuffie, J. and Pil, F. 1996. The Adoption of High-Involvement Work Practices. *Industrial Relations: A Journal of Economy and Society* 35(3), pp. 423-455.

Maddern, H., Maull, R., Smart, A. and Baker, P. 2007. Customer Satisfaction and Service Quality in UK Financial Services. *International Journal of Operations & Production Management* 27(9), pp. 998-1019.

Magnusson, K., Kroslid, D. and Bergman, B. 2003. *Six Sigma - The Pragmatic Approach*. Lund: Studentliteratur.

Mahajan, V. and Peterson, R. 1985. *Models for Innovation Diffusion*. Sage, California.

Majek, T. and Hayter, R. 2008. Hybrid Branch Plants: Japanese Lean Production in Poland's Automobile Industry. *Economic Geography* 84(3), pp. 333-358.

Marmor, T. R. 2008. *Fads, Fallacies and Foolishness in Medical Care Management and Policy*. World Scientific Publishing, Singapore.

Maskell, B. 1991. *Performance measurement for world class manufacturing: a model for American companies*. Productivity Press, NY.

Maskell, B. and Baggaley, B. 2004. *Practical Lean Accounting: A Proven System for Measuring and Managing a Lean Enterprise*. Productivity Press, NY.

Mason, J. 2002. *Qualitative Researching*. Sage, London.

May, M. 2005. Lean Thinking for Knowledge Work. *Quality Progress* 38(6), pp. 33-40.

Mayleff, J. 2006. Exploration of International Service Systems Using Lean Principles. *Management Decision* 44(5), pp. 674-689.

McCullen, P., Towill, D. and Harris, C. eds. 2007. *From the Unmanned Factory to Lean-Sigma: The Role of Manufacturing Improvement Programmes from 1980-2005.* 12th International Symposium on Logistics. Budapest.

McCutcheon, D. and Meredith, J. 1993. Conducting Case Study Research in Operations Management. *Journal of Operations Management* 11, pp. 239-256.

McDonnell, D. 2000. Bigger and Better. *Flight Magazine*, pp. 1-4.

McNabb, D. and Sepic, F. 1995. Culture Climate. *Public Productivity and Management Review* 18, pp. 2-13.

McQuade, D. 2008. New Development: Leading Lean Action to Transform Housing Services. *Public Money and Management,* Chartered Institute of Public Finance and Accountancy. 28(1), pp. 57-60.

Mehta, V. and Shah, H. 2004. Characteristics of a Work Organisation from a Lean Perspective. *Engineering Management Journal* 17(2), pp. 14-20.

Meier, H. and Forrester, P. 2002. A Model for Evaluation the Degree of Leanness of Manufacturing Firms. *Integrated Manufacturing Systems* 13, pp. 1-7.

Meredith, J. 1998. Building Operations Management Theory Through Case and Field Research. *Journal of Operations Management* 16, pp. 441-454.

Meuser, M. and Nagel, U. 1991. ExpertInneninterviews - vielfach, erprobt, wenig bedacht. [Online]. Available at: http://www.ssoarinfo/ssoar/files/2008/731/meuser_expertinneninterviews.pdf.

Meyer, J. and Rowan, B. 1977. Institutional Organizations: Formal Structure as Myth and Ceremony. *The American Journal of Sociology* 83, pp. 340-363.

Miles, M. 1979. Qualitative Data as an Attractive Nuisance: The Problem of Analysis. *Administrative Science Quarterly* 24, pp. 590-601.

Miles, M. and Huberman, A. 1994. *Qualitative Data Analysis: An Explanded Sourcebook*. Sage, London.

Miller, D. 2005. *Going Lean in Health Care*. Cambridge: Institute for Healthcare Improvement.

Minton-Eversole, T. 2010. Lean Overtakes Six Sigma. *HR Magazine*, (April).

Miyai, J. 1996. The Redesign of Japanese Management Systems and Practices. *APO Productivity Journal* (Summer), pp. 2-11.

Monden, Y. 1983. *Toyota Production System: Practical Approach to Production Management*. third edition ed. Institute of Industrial Engineers, Atlanta, Georgia.

Monden, Y. 1992. Target Costing and Kaizen Costing. University of Tsukuba, Working paper series.

Monden, Y. and Sakurai, M. eds. 1989. *Total Cost Management Systems in Japanese Automobile Corporations* Portland: Productivity Press.

Moore, R. and Schienkopf, L. 1998. *TOC and Lean Manufacturing: Friends or Foes?* Chesapeake Consulting Inc.

Morgan, G. 1986. *Images of Organisation*. Sage, Beverley Hills.

Mort, P. 1957. *Principles of School Administration*. McGraw-Hill, NY.

Nair 2006. Meta-Analysis of the Relationship between Quality Management Practices and Firm Performance - Implications for Quality Management Theory. *Journal of Operations Management* 24, pp. 948-975.

Nakamura, M., Sakakibara, S. and Schroeder, R. 1996. Japanese Manufacturing Method at US Manufacturing Plants: Empirical Evidence. *Canadian Journal of Economics* 29(2), pp. 468-474.

NAO. 2006. *Central Government's Use of Consultants*. National Audit Office report.

Naslund, D. 2002. Logistics Needs Qualitative Research - Especially Action Research. *International Journal of Physical Distribution and Logistics Management* 32(5), pp. 321-338.

Nave, D. 2002. How to Compare Six Sigma, Lean the Theory of Constraints. *Quality Progress* March 2002, pp. 73-78.

Naylor, J., Naim, M. and Berry, D. 1999. Leagility: Intergrating Lean and Agile in Manufacturing Paradigms. *International Journal of Production Economics* 62(1-2), pp. 107-118.

Neboeka, K. 1988. *Strategy of Japanese Automobile Manufacturers: A Comparison between Honda Motor Co., Ltd. and Mazda Motor Corporation.* MIT, PhD Thesis.

Nelson, R.. Peterhansi, A. and Sampat, B. 2004. Why and How Innovations get Adopted: A Tale of Four Models. *Industrial and Coporate Change* 13(5), pp. 679-699.

New, S. 2007. Celebrating the Enigma: The Continuing Puzzle of the Toyota Production System. *International Journal of Production Research*. 45(16),pp. 3545-3554.

Newell, S., Robertson, M. and Swan, J. 2001. Management Fads and Fashions. *Organization* 8(1), pp. 5-15.

Newell, S., Swan, J. and Kautz, K. 2001a. The Role of Funding Bodies in the Creation and Diffusion of Management Fads. *Organisation* 8(1), pp. 97-120.

Newell, S., Swan, J. and Robertson, M. 1998. A Cross-National Comparison of the Adoption of Business Process Re-engineering: Fashion-setting Networks. *Journal of Strategic Information Systems* 7, pp. 299-317.

NHC 2006. *A Systematic Approach to Service Improvement - An Update: Evaluation the Sustainability of Systems Thinking in Housing*. Northern Housing Consortium.

Nishiguchi, T. 1990. *Strategic Dualism: An Alternative to Industrial Societies.* University of Oxford, PhD thesis.

Norton, J. and Bass, F. 1987. A Diffusion Theory Model of Adoption and Substitution for Successive Generations of High Technology Products. *Management Science* 33(9), pp. 1069-1086.

O'Carlson, R. 1965. Adoption of Educational Innovations.Oregon: Centre for the Advanced Study of Educational Administration, University of Oregon.

ODPM 2005. *A Systematic Approach to Service Improvement.* Office of the Deputy Prime Minister.

Ohno, T. 1988. *Toyota Production System – Beyond Large Scale Production.* Productivity Press, Massachusetts.

Oliver, N. 2008. Rational Choice or Leap of Faith? The Creation and Defence of a Management Orthodoxy. *The Learning Organisation* 15(5), pp. 373-387.

Oliver, N. and Delbridge, R. and Jones, D. and Lowe, J. 1994. World Class Manufacturing: Further Evidence in the Lean Production Debate. *British Journal of Management* 5(Special Issue), pp. 53-63.

Oliver, N. and Hunter, G. 1998. *The Financial Impact of 'Japanese' Manufacturing Methods in Delbridge R. and Lowe J. (eds.) Manufacturing in Transition.* Routledge, London.

Oliver, N. and Shab, L. and Holweg, M. 2007. Lean Principles and Premier Brand: Conflict or Complement. *International Journal of Production Research* 45(16), pp. 3723-3739.

Oliver, N. and Wilkinson, B. 1988. *The Japanization of British Industry.* Blackwell, Oxford.

Olsson, M. and Sjostedt, G. eds. 2004. *Systems and Systems Theory in Systems Approach and Their Application: Examples from Sweden.* The Netherlands: Kluwer Academic Publishers.

Ortmann, G. 1995. Formen der Produktion; Organisation und Rekursivitat. *Opladen: West-deutscher Verlag.*

Panizzolo, R. 1998. Applying the Lessons Learned from 27 Lean Manufactuers: The Relevance of Relationships Management. *International Journal of Production Economics* 55, pp. 223-240.

Papadopoulos, T. and Merali, Y. 2008. Stakeholder Network Dynamics and Emergent Trajectories of Lean Implementation Projects: A Study in the UK National Health Service. *Public Money and Management*, Chartered Institute of Public Finance and Accountancy (February), pp. 41-48.

Papadopoulou, T. and Ozbayrak, M. 2005. Leanness: Experiences from the Journey to Date. *Journal of Manufacturing Technology Management* 16(7), pp. 784-805.

Papahristodoulou, C. 1994. Is Lean Production the Solution? *Economic and Industrial Democracy* 15(3), pp. 457-476.

Pardi, T. 2005. Where Did It Go Wrong? Hybridization and Crisis of Toyota Motor Manufacturing, 1989-2001. *International Sociology* 20, pp. 93-118.

Parker, V. 2003. Burt's Bees Implementation of Production Processes. *Tribune Business news* 1-3, pp. 2-4.

Parry, S. *Managing and Measuring for Value.* Cranfield School of Management.

Pascale, R. 1990. *Managing on the Edge.* Simon and Schuster, NY.

Patel, S. 2009. *The Evolution of Lean Thinking in the NHS.* Atos Healthcare.

Pepper, M. and Spedding, T. 2010. The Evolution of Lean Six Sigma. *International Journal of Quality and Reliability Management* 27(2), pp. 138-155.

Pettigrew, A. 1997. What Is Processual Analysis? *Scandanavian Journal of Management* , 13(4), pp. 337-348.

Pettigrew, A., Woodman, R. and Cameron, K. 2001. Studying Organizational Change and Development: Challenges for Future Research. *Academy of Management Journal*, 44(4), pp. 17-39.

Pettigrew, A. 2008. 'Scholarly impact' and the Co-production of Hypothesis. *EFMD Global Focus* 2(2), pp. 8-12.

Pfeffer, J. 1982. *Organizational and Organizational Theory*. Pitman, Massachusetts.

Piercy, N. and Rich, N. 2009. Lean Transformation in the Pure Service Environment: the Case of the Call Centre Service. *International Journal of Operations & Production Management* 29(1), pp. 54-76.

Pilkington, A. 1998. Manufacturing Strategy Regained: Evidence for the Demise of Best-Practice. *California Management Review* 41(1), pp. 31-42.

Prizinsky, D. 2001. Lincoln Looks Leaner in its Manfuacturing Processes. *Crains Cleveland Business*, pp. 1-8.

PS 2010. Staff Morale is Rock Bottom at HMRC. Pubic services website www.publicservice.co.uk.

Pullin, J. 2002. In Pursuit of Excellence, Professional Engineering. *Professional Engineering* 15, pp. 1-6.

Radnor, Z. and Boaden, R. 2008. Lean in Public Services - Panacea or Paradox? *Pubic Money and Management*, Chartered Institute of Public Finance and Accountancy, (February), pp. 3-7.

Radnor, Z. and Bucci, G. 2007. Evaluation of Pacesetter Lean, Senior Leadership and Operational Managemnet within HMRC Processing. *HMRC*.

Radnor, Z. and Bucci, G. 2008. *Literature Review of Business Process Improvement Methodologies: Executive Summary* for National Audit Office.

Radnor, Z. and Bucci, G. 2011. Evaluation of the Lean Programme in HMSC Final Report. Her Majestey's Courts Service (HMSC).

Radnor Z. 2010. Review of Business Process Improvement Methodologies in Public Services, Advanced Institute of Management Research.

Radnor, Z., Walley, P., Stephens, A. and Bucci, G. 2006. *Evaluation of the Lean Approach to Business Management and Its Use in the Public Sector*. Warwick Business School, Scottish Executive Social Research.

Rahman, S. 1998. TOC: A Review of the Philosphy and Its Applications. *International Journal of Operations & Production Management* 18(4), pp. 336-355.

Raisinghanl, M. and Ette, H. and Pierce, R. and Cannon, G. and Daaripaly, P. 2005. Six Sigma: Concepts, Tools and Applicatins. *Industrial Management and Data Systems* 105(4), pp. 491-505.

Ramsay, M. and Brown, S. and Tabibzadeh, K. 1990. Push, Pull and Squeeze Shopfloor Control with Computer Simulation. *Industrial Engineering* 22(2), pp. 39-45.

Rapley, T. 2001. The Artfulness of Open-Ended Interviewing: Some Considerations on Analysing Interviews. *Qualitative Research* 1, pp. 303-323.

Rapley, T. 2004. *Interviews in Seale et al., (eds.) Qualitative Research in Practice*. Sage, London.

RBG 2006. *An Evaluation of the Society of Motor Manufacturers and Traders Industry Forum and the Industry Forum Adaptation Initiative*. Reading Business Group.

Reed, M. 2009. *Critical Realism: Philosophy, Method or Philosophy in Search of a Method? in D. Buchanan and A. Bryman (eds), The Sage Handbook of Organisational Research Methods*. Sage, London.

Reed, M. 2005a. Doing the Loco-Motion: Response to Contu and Wilmott's Commentory on 'The Realist Turn in Organisation and Management Studies'. *Journal of Management Studies* 42(8), pp. 1663-1673.

Reed, M. 2005. Reflections on the 'Realist Turn' in Organisation and Management Studies. *Journal of Management Studies* 42(8), pp. 1621-1644.

Rich, N., Bateman, N., Esain, A., Massey, L. and Samuel, D. 2006. *Lean Evolution: Lessons from the Workplace*. Cambridge University Press, Cambridge.

Rio. R. 2005. Metrics for Your Lean Manufacturing Prgram. ARC Insights, September 22nd.

Rogers, E. 2003. *Diffusion of Innovations*. fifth edition ed. Free Press, NY.

Rogers, E. and Shoemaker, F. 1971. *Communication of Innovations: A Cross Cultural Approach*. Free Press, NY.

Rogers, H. and Silvester, K. and Copeland, J. 2004. NHS Modernisation Agency's Way to Improve Healthcare. *British Medical Journal* 328(7437), p. 463.

Ross, D. 1958. *Administration for Adapability*. New York: Metropolitan School Study Council.

Rother, M. 2010. *Toyota Kata*. McGraw-Hill, NY.

Rother, M. and Shook, J. 1998. *Learning to See*. Lean Enterprise Institute Massachusetts.

Rowlands, H. 2003. Six Sigma: A New Philosophy or Repackaging Of Old Ideas? *Engineering Management* (April), pp. 18-21.

Ryan, B. and Gross, N. 1943. The Diffusion of Hybrid Seed Corn in Two Iowa Communities. *Rural Sociology* 8, pp. 15-24.

Rynes, S. and Bartunek, J. and Daft, R. 2001. Across the Great Divide: Knowledge Creation and Transfer between Practitioners and Academics. *Academy of Management Journal* 44(2), pp. 340-355.

Sanchez, A. and Perez, P. 2001. Lean Indicators and Manufacturing Strategies. *International Journal of Operations and Production Management* 21(11), pp. 1433-1451.

Saunders, M., Lewis, P. and Thornhill, A. 2007. *Research Methods for Business Students*. Fourth edition ed. FT Prentice Hall, London.

Sayer, A. 1992. *Method in Social Science: A Realist Approach*. second ed. Routledge, London.

Scarborough, H. 2002. The Role of Intermediary Groups in Shaping Management Fashion. *International Studies of Management and Organisation* 34(4), pp. 87-103.

Scarborough, H. and Swan, J. 2001. Explaining the Diffusion of Knowledge Management: the Role of Fashion. *British Journal of Management* 12, pp. 3-12.

Scarborough, H. and Terry, M. 1998. Forget Japan: The Very British Response to Lean Production. *Employee Relations* 20(3), pp. 224-236.

Schmenner, R. and Swink, M. 1998. On theory in operations management. *Journal of Operations Management* 17, pp. 97-113.

Schonberger, R. 1996. *World Class Manufacturing*. Free Press, NY.

Schonberger, R. 2007. Japanese Production Management: an Evolution - with Mixed Success. *Journal of Operations Management* 25, pp. 403-419.

Schonberger, R. 2008. *Best Practices in Lean Six Sigma Process Improvement: A Deeper Look*. Wiley, New Jersey.

Schroeder, R., Linderman, K., Liedtke, C. and Choo, A. 2008. Six Sigma: Definition and Underlying Theory. *Journal of Operations Management* 26, pp. 536-554.

Seale, C. 1999. Quality in Qualitative Research. *Qualitative Inquiry* 5(4), pp.465-478.

Seddon, J. 2005. *Freedom from Command and Control: a better way to make the work work, the Toyota system for service organisations*. second ed. Vanguard Education Ltd.

Seddon, J. 2008. *Systems Thinking in the Public Sector: The Failure of a Reform Regime and a Manifesto for a Better Way*. Triarchy Press.

Seddon, J. and Brand, C. 2008. Systems Thinking and Public Sector Performance. *Public Money and Management,* Chartered Institute of Public Finance and Accountancy (February), pp. 7-9.

Seddon, J. and Caulkin, S. 2007. Systems Thinking, Lean Production and Action Learning. *Research and Practice* 4(1), pp. 9-24.

Seddon, J., O'Donovan, B. and Zokaei, K. forthcoming. *Rethinking Lean Service*.

Senge, P. 1990. *The Fifth Discipline: The Art and Practice of the Learning Organisation*. Century, London.

Sewell, G. and Wilkinson, B. 1992. Someone to Watch Over Me: Surveillance, Discipline and the Just-In-Time Labour Process. *Sociology* 26(2), pp. 271-289.

Shah, R., Goldstein, S., Unger, B. and Henry, T. 2008. Explaining Anamalous High Performance in a Health Care Supply Chain. *Decsion Sciences* 39(4), pp. 759-789.

Shah, R. and Ward, P. 2003. Lean Manfacturing Context, Practice Bundles and Performance. *Journal of Operations Management* 21, pp. 129-149.

Shah, R. and Ward, P. 2007. Defining and Developing Measures of Lean Production. *Journal of Operations Management* 25(4), pp. 785-805.

Shingo, S. 1989. *A Study of the Toyota Production System from an Industrial Engineering Viewpoint*. Productivity Press, Massachusetts.

Silverman, D. 2005. *Doing Qualitative Research*. second edition. Sage, London.

Skinner, W. 2007. Manufacturing Strategy: The story of its evolution. *Journal of Operations Management* 25(2), pp. 328-335.

Smith S., Tranfield D. Foster M. And Whittle S. 1994. Strategies for Managing the TQ Agenda. *International Journal of Operations and Production Management* 14(1), pp. 75-88.

SMMT Industry Forum. 2002. *A Unique Partnership: The Story So Far.* Channel Publications/SMMT Industry Forum

Snee, R. 1999. Why should Statisticians Pay Attention to Six Sigma? *Quality Progress* September, pp. 100-103.

Snee, R. and Hoerl, R. 2009. Turning to Service Sector. *Industrial Engineer* (October).

Sobek, D. and Jimmerson, C. eds. 2004. *A3 Reports: Tool for Process Improvement and Organisational Transformation*. Industrial Engineering Research Conference. Houston, Texas.

Sohal, A. 1996. Developing a Lean Production Organisation: an Australian Case Study. *International Journal of Operations & Production Management* 16(22), pp. 91-102.

Sohal, A. and Eggleston, A. 1994. Lean Production: Experience amongst Australian Organisation. *International Journal of Operations and Production Management,* 14, pp. 1-17.

Soriano-Meier, H. and Forrester, P. 2002. A Model for Evaluating the Degree of Leanness of Manufcturing Firms. *Integrated Manufacturing Systems* 13(2), pp. 104-109.

Souder, S. and Quaddus, A. 1982. A Decision-Modeling Approach to Forecasting the Diffusion of Longwall Mining Technologies. *Technological Forecasting and Social Change* 21, pp. 1-14.

Sousa, R. and Voss, C. 2008. Contingency Research in Operations Management Practices. *Journal of Operations Management* 26(6), pp. 697-713.

Souza, L. B. d. 2009. Trends and Approaches in Lean Healthcare. *Leadership in Health Services* 22(2), pp. 121-139.

Spear, S. 2005. Fixing Health Care from the Inside, Today. *Harvard Business Review* (September).

Spear, S. 2009. *Chasing the Rabbit*. McGraw-Hill, NY.

Spear, S. and Bowen, H. 1999. Decoding the DNA of the Toyota Production System. *Harvard Business Review* (Sep-Oct).

Spell, C. 1999. Where do Management Fashions come from? *Journal of Management History* 5(6), p. 334.

Spencer, C. and Guide, V. 1995. An Exploration of the Components of JIT - Case Study and Survey Results. *International Journal of Operations and Production Management,* 15(5), pp. 72-83.

Sprague, L. 2007. Evolution in the Field of Operations Management. *Journal of Operations Management* 25(2), pp. 291-238.

Sprigg, C. and Jackson, P. 2006. Call Centers as Lean Service Environments. *Journal of Occupational Health Psychology* 11(2), pp. 197-212.

Standard, C. and Davis, D. 1999. *Running Today's Factory: A Proven Strategy for Lean Manufacturing*. Society for Manufacturing Engineers. Michigan.

Appendix A Research Methodology Terminology

Term	Meaning
Constructionism or constructivisms	An ontology that asserts that social phenomena and their meanings are continually being accomplished by social actors.
Critical realism	A philosophy of social science that sets out a general framework of assumptions concerning the nature of the world (ontology) and principles specifying how that world is to be understood (epistemology) and explained (theory).
Deductivism	Knowledge is arrived at through the gathering of facts that provide the basis for laws.
Empiricism	A general approach to the study of reality which suggests that only knowledge gained through experience and the senses constitutes acceptable knowledge.
Epistemology	Branch of philosophy concerned with the nature of knowledge. The theory of knowledge.
Interpretivism	An epistemology that advocates that it is necessary for the researcher to understand the difference between humans in our role as social actors.
Naturalism	An anti-positivist approach which challenges the denial of the independence of the social world from subjective interpretation. A reluctance to impose meaning.
Objectivisism	An ontological position that asserts that social phenomena and their meanings have an existence that is independent of social actors.
Objectivism	Science must be conducted in a way that is value free.
Ontology	Branch of philosophy concerned with the nature of social phenomena or entities. The theory of being.
Paradigm	A basic set of beliefs that guide action.
Phenomenology	An ontology that asserts that the world is socially constructed and subjective, the observer is part of what is observed and science is driven by human interests.
Positivism	A natural science epistemology which advocates the application of the methods of the natural sciences to the study of social reality.
Post-modernism	Seeking to deconstruct the concepts of the subject.
Realism (direct or empirical)	An epistemological position that what we experience through our senses portrays the world accurately.
Reflexivity or reflectivity	Reflecting on the way in which research is carried out and understanding how the process of doing research shapes its outcomes.
Research philosophy	An overarching term that relates to the development of knowledge and the nature of that knowledge.
Theory	An ordered set of assertions about a generic behaviour or structure assumed to hold throughout a significantly broad range of specific instances.

(Source: the researcher , based on a variety of sources)

Appendix B Underlying Concepts within Critical Realism

Concept	Further explanation.....
Something is real if it has an effect or makes a difference	For example, fairies are not real but entities such as the discourse of fairies are real
Many things are real and they are real in different ways	There are four modes of reality: material (eg. mountaints), ideal (eg. discourse), artefactual (quasi-objects eg. cosmetics) and social (eg the market mechanism).
The world exists independently of our knowledge of it	An entity can exist independently of our knowledge of it.
Knowledge develops neither wholly continuously nor wholly discontinuously	It develops neither the steady accumulation of facts within a stable conceptual framework nor through simultaneous and universal changes in concepts.
The world is differentiated and stratified	There are social structures, positioned practices, powers, mechanisms and tendencies.
Entities possess powers	Entities (natural or social) have particular causal powers and particular susceptibilities.
Causal powers or mechanisms	Powers are dispositions, capacities and potentials to do certain things but not others The relationship between causal power or mechanisms and their effects is not fixed but contingent.
Concept mediation	There is no unmediated access to the world, when we reflect on an entity our sense data is always mediated by a pre-existing stock of conceptual resources which we use to interpret and make sense of it. Our knowledge of the world is fallible and theory-laden, however, knowledge is not immune to empirical check.
Retroduction	The process of identifying what causal powers are active in a given situation.
There is a need to differentiate between the researcher and the human actors studied	To recognize that certain entities are activity-dependent does not imply that all of us are involved in their reproduction/transformation.
Double hermeneutic of social science (versus the single hermeneutic of natural science)	Understanding is like reading is not a matter of being able to identify what causes a particular text but of making sense of its meaning.
Normative judgements	Critical realism contradicts the common taboo in contemporary science against normative judgements
Action is continuous, cyclical and flows over time	The starting point for an cyclical phenomena is always arbitrary but we have to break the cycle at some point and impose an analytical starting point Our knowledge of the world is fallible and theory-laden, however, knowledge is not immune to empirical check
Critical realism is a philosophy of social science not a social theory	It is unreasonable to expect critical realism or any other philosophy to provide a litmus test for distinguishing truth from false or better from worse.
The production of knowledge is a social practice	For better or worse, and not just worse, the conditions and social relations of the production of knowledge influence its content.
Criticality is key	Social science must be critical of its objects. To be able to explanation and understand social phenomena we have to evaluate them critically.

(Source: the researcher, adapted from Sayer, 1992, Fleetwood and Ackroyd, 2001 and Ackroyd and Fleetwood, 2004)

Appendix C Interview Schedule

Section 1: What is lean?

There is no clear definition of lean and so it can often mean different things to different people. The purpose of this section is to tease out what you understand lean to be all about, how you conceptualise it and to look for potential patterns among the answers gathered from different groups of people. The following questions are for guidance only:

- ☑ What has your involvement with lean been, both currently and in the past?
- ☑ How do you understand or conceptualise lean?
- ☑ How would you describe what it is?
- ☑ What is lean in comparison to other, similar concepts such as Theory of Constraints (TOC), six sigma or systems thinking?

Section 2: The diffusion of lean over time?

Lean (and its influence) has spread over time from car manufacturing to general manufacturing and more latterly to the service and public sectors. The purpose of this section is to tease out your understand of how and why that spread has occurred, what you think are the important contextual factors that have influenced the spread of lean over time and the extent to which you think lean has penetrated into different sectors. Again the following questions are for guidance only:

- ☑ What role or involvement have you had in the spread of lean over the last 20 years?
- ☑ To what extent has lean penetrated into other areas? eg. into manufacturing more broadly, into construction and into different part of the service and public sectors.
- ☑ What are the reasons for lean becoming prominent in some sectors and not in others?
- ☑ Why do you think that lean has spread in the way it has?

Section 3: The role of government in the diffusion of lean?

In the past the government has played a significant role in promoting lean and its diffusion into other sectors, eg. setting up industry fora through the DTI and promoting lean through the regional manufacturing advisory services. The purpose of this section is to tease out your perception of how important or unimportant you feel their role has been in the spread of lean over time. Again the following questions are for guidance only:

- ☑ What role has the government and other intermediary bodies played in promoting lean in the past and in the present?
- ☑ How successful has that role been?

- ☑ How influential has that role been?
  Would lean have diffused so widely if had not been for the government's role? What if TOC or six sigma had been promoted instead?

Section 4: The applicability of diffusion of innovations theory to lean

There is a fairly well-established body of work on the diffusion of innovations (mostly hard or technological innovations). One of the aims of this study is to explore the extent to which this theory applies to the diffusion of a managerial and organisational innovation such as lean. Attached (next page – apologies for the complexity of the diagram but lots of explanation has been included within it so you can address the questions that follow!) is an adaptation of a key model taken from this theory. It states that there are 5 important variables that influence the extent to which an innovation (in this case lean) will diffuse. The purpose of this section is to tease out whether you think this model is reasonable in explaining the diffusion of lean. The following questions are for guidance only:

- ☑ The first variable concerns the nature or attributes of the innovation itself (in our case lean), to what extent do the five attributes identified in the model apply to lean?
- ☑ If you were asked to rate the relevance of the five attributes to lean (5 = highly relevant, 1 = hardly relevant) how would you rate them?
- ☑ If you were asked to rate the relevance of the five variables identified in the model (5 = highly, 1 = hardly) how would you rate them?
- ☑ Are there other variables that you feel have impacted the rate of diffusion of lean which are not included in the model?
- ☑ What do you think of this model in terms of explaining the rate at which lean has diffused/spread?

Section 5: What has been missed?

The purpose of this section is to sweep up anything else that we have not discussed so far that you think may be relevant or important to the study. The purpose of this section is to be mindful that in offering structure to our discussion there is always the risk of omitting important data. If there is anything else you feel to be important, please say now!

I realise time is precious, thank you so much for taking time out to talk to me – I will be eternally grateful!

Variables Determining the Rate of Adoption of Lean

Variables Determining the rate of adoption

i. Perceived Attributes of Innovations

- Relative advantage (degree to which lean is perceived as being better than the idea it supersedes) + related
- Compatibility (degree to which lean is perceived as consistent with the existing values, past experiences and needs of potential adopters) + related
- Complexity (degree to which lean is perceived as relatively difficult to understand and use) - related
- Trialability (degree to which lean may be experimented with on a limited basis) + related
- Observability (degree to which the results of an innovation are visible to others) + related

ii. Type of Innovation-Decision

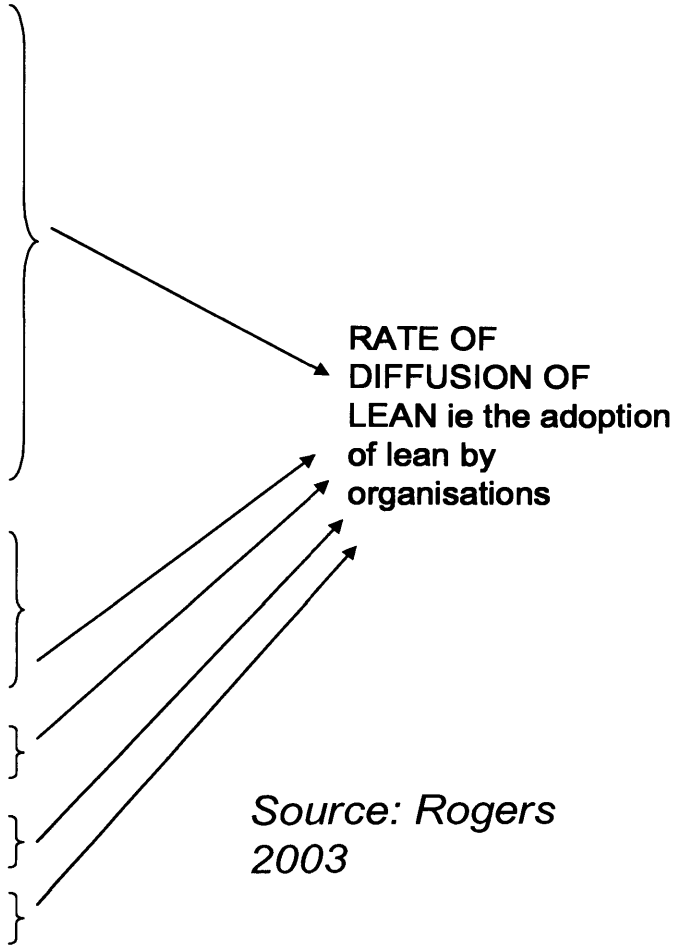
- Optional (choices to adopt or reject are made by a unit of adoption independent of the decisions made by other members of a system)
- Collective (choices to adopt or reject are made by consensus among members of a system)
- Authority (choice to adopt or reject made by a few units in a system who possess power, high social status or social expertise)

iii. Communication channels (eg. Mass media or interpersonal)

iv. Nature of the social system (eg. Its norms, degree of network interconnectedness etc.)

v. Extent of change agents' promotion efforts

Dependent Variable that is explained



Source: Rogers 2003

Appendix D Perceived Benefits and Failings of Six Sigma

Perceived Benefits of Six Sigma

'So from 2001 to 2005 I took the lead in managing the 6 sigma programme in Wales. It gave us 15m of profit we recorded.....I think the idea of having well trained project managers, who have had some formal training and what they are really doing is trying to make decisions on evidence' [Informant 2]

'If you ask me the question why has six sigma gone mad – that's different. Six sigma went potty because people went six sigma did it for Jack. Jack doesn't have a bloody clue what it is, consultants wrapped it all up. So if you want what GE got here it is all in a box' [Informant 5]

'Just as these guys in Motorola were achieving a lot of improvements in the company and were able to spin it off as a business in its own company in it's own right and six sigma then became.....it just flourished in America because if you look at the structure of six sigma it just fits so well in the American psyche and it doesn't fit in Japan because it is hierarchical (elitist), it panders to the intelligentsia, the intellectual, I come a greenbelt, you become a blackbelt, I become a master blackbelt' [Informant 13]

'I wasn't a mathematical Sigma man, there are a load of people who run around talking about the sum of the xs and no one can understand a bloody word they say. But what it did do was to give you a simple measure in the startpoint of: were you doing it right first time for the customer?' [Informant 15]

'I used to go to the GE conference in Puerto Rico when I was there Jack Welch came and he had a 40 minute slot and he spend the whole 40 minutes talking about variation. Around me were people who sort of got it but always questioned how serious was this or is this the latest fad. At the end of it they said this is probably here to stay. Just by his sheer charisma, he creates that' [Informant 16]

'DMAIC is a good thinking process, it gets you to focus. Blind adherence to it is craziness' [Informant 18]

'In a process industry where you bring in many ingredients and you need to optimize, Six Sigma will work. You can improvise it, it is very peculiar. I wouldn't say Six Sigma.....in more discrete industries, its' value is less. Most industries are discrete industries.....Six sigma is very applicable where it is very high volume or very high error rates and you need to get down to the bottom of why these error rates are happening and you can do so by clever analysis' [Informant 19]

'The big benefit Six Sigma has against any of the others is the qualification in a hierarchy. It is the think that in lean would have made all the difference, a certified lean professional grade 1 second lieutenant would have been very helpful to people in showing a level of competence. If you look at the individual, you know someone has been through green belt training, you know what that person has done' [Informant 21]

Perceived Failings of Six Sigma

'There is a lot of bullshit around Six Sigma. Really it is tools and techniques, dressed up to be a methodology, dressed up to be an approach to business. Systems thinking would tell you, you have to maximise your inputs for your outputs so that implies quality anyway. Sigma is just a modern dressing up of TQM.....Anything that can be boiled down to maths, typically devalues itself into a technique. Six sigma is well loved in the financial services market but they are doing basic problem-solving but then you could argue that isn't basic problem-solving part of the lean toolkit.....TOC and six sigma are too mathematical – they are into heavy uses of algorithms and a lot of business executives aren't very maths literate. Lean is conceptual and dealt with a business model' [Informant 1]

'Six Sigma sounds more complicated.....Observability – you can't see Six Sigma. It might be +a great project but it may be that you just altered the settings on your machine to get a better quality

product. Like in an oven you might change the temperature combination or how long the piece is in there for. But with lean because you are talking about waste and inventory, you're talking about clarity and flow, you can go into a factory and say, oh that is lean. You can see the clutter, the flow and see how far things are going and say, that's not value added' [Informant 2]

'I still regard Six Sigma as sitting below. It is just one arm of what Lean contains' [Informant 3]

'Motorola is not anywhere near as prominent' [Informant 4]

'six sigma is in the bag of toolbox, OK. It is a classic illustration of how clever the American marketers are, Womack is in the same box in my view. You take something, package it up. The something in this case was Taguchi's work on nominal value, applied in manufacturing, Motorola. The question then became, how do we get more people to do this because it's good, and it is good, reduction in variation will increase the quality. But then the question they are addressing is an intervention one, how do we get lots more people to do this? And they took a command and control answer, package it up, give them the training, give them targets, give them reporting structures and bang off you go. And so you get a top down, enforced.....One of my clients this year employed IBM to do lean six sigma, which is, don't worry about the label it's just another box of fucking tools and after 3 years and paying billions of pounds every month, someone twigged that all the reported improvements from lean six sigma tools, if you add them all up ain't coming through on the bottom line.....This is just TQM on steroids' [Informant 5]

'It promises the world. I just find the idea of sixth sigma as vaguely bazaar and therefore for me, in that section, I think the reason it is not more universally adopted is people see through the idea. Its fine having an aspiration, I would like to run the marathon. The suggestion that I'm going to beat Paula Radcliffe, the sixth sigma of it, is a bit bazaar when it's a struggle to run six miles. It's so far out it puts me off and I don't think I'm alone in that. It promises an advantage that noone really believes can be delivered.....So I don't think it scores as high as Lean on accessibility, understanding, participation.....I would say that lean is much closer to TOC than Six Sigma is to either of them.....My perception is that that Lean is the world's leading methodology, TOC runs it close, particularly in certain areas and I find it difficult to put Six Sigma in the same frame' [informant 6]

'Six Sigma and TOC definitely not innovative' [Informant 7]

'six sigma suffered from the same thing as lean which was it got captured by a group of experts, the statisticians in this case, it got overblown and turned into an overblown product, applied randomly everywhere, a set of tools, for point solutions, applied everywhere.....It has no strategic focus really at all.....It wasn't a big leap over total quality it was just a repackaging of total quality, an elaboration' [Informant 8]

'it just flourished in America because if you look at the structure of Six Sigma it just fits so well in the American psyche and it doesn't fit in Japan because it is hierarchical, elitist, it panders to the intelligentsia, the intellectual, I become a greenbelt, you become a blackbelt, I become a master blackbelt.....I think six sigma is too complex' [Informant 11]

'Karel William's most recent book rubbishes the Welch phenomena. He has a whole chapter on Jack Welch and GE/Motorola saying that none of the performance data matches the claims' [Informant 12]

'Six sigma: we find six sigma less accessible because it is more numerical.....I find it quite command and control, it is a top-down cascade.....We find it a variety reduction premise, we think it therefore far more relevant to manufacturing than to service which is effectively where we are today.....I think it fits into sadly the ultimate management fad that is read on the in-flight magazine.....I think that the Motorola GE experience, particularly as Motorola fails and GE even unwinds itself now.....it [Lean] captures the imagination in a way in which a sigma control chart never will.....The question is would it [Lean] have been so widely if it had not been for the government's role? Probably,no. What if it TOC or six sigma had been promoted instead, I think less successful because it is less relevant and less accessible' [Informant 13]

'The problem with six sigma, green belts, black belts and so on, you are creating a hierarchy of knowledge.....Six Sigma with the belt system is absolutely crazy' [Informant 14]

'In 2003 we started to think about the Lean stuff because we realised Sigma wasn't everything' [Informant15]

'The way I describe it if you can't count, you can't do Six Sigma.....My view is that if you can't understand your process, then you are in a very dangerous place if you then start to apply things like Six Sigma tools to take variation out, because you don't understand variation' [Informant 16]

'I don't see six sigma as a pure thing. It is weak academically' [Informant 18]

'[Six Sigma and TOC] I very much see them as a subset of Lean.....Some of the reason that some of the other stuff has lost their way is that they have become too much of a fad' [Informant 19]

'Something like six sigma does involve performance improvement to a process but would be much less visible, it could be in one small area where the rest of the organization knew nothing about it' [informant 20]

'It [Lean] has certainly been the most influential [compared to other management concepts] in terms of changing practice. It has itself gone through phases. It has certainly changed practice. I think it is not as limiting as Six Sigma, and that is why it is enjoying a longer life.....The quality tools have not disintegrated but have been integrated. So they have been subsumed into other approaches. So if you were critical of Six Sigma, you could say is TQM on steroids, it is not much else. But now six sigma claims to be everything' [Informant 21]

Appendix E Perceived Benefits and Failings of TOC

Perceived Benefits of TOC

'People enjoyed the book, it was a novel. Maybe some people might have employed a bit of .....the three measures stick in my mind really well' [Informant 2]

'I think the generic thought processes is great' [Informant 3]

'Goldratt does a wonderful selling job of what's the goal; the goal is about making money whereas what is lean about?' [Informant 4]

'He made a major contribution to the problems of financial management. His argument with the accountants was, don't manage costs, cost is in flow.....Important because it was a theoretical contribution and TOC in particular has lots of immediate relevance to anyone manufacturing things .....Has no application in service organisations, well you haven't got that problem to solve.....it's an important contribution because its good theory as well as good applied practice' [Informant 5]

'Where TOC scores for me is its ability to focus. It is the more powerful focusing methodology that I have come across.....I have to prioritize. TOC is a methodology for, amongst other things, for doing that better than the other two. It is superior in that sense.....the real distinction is that TOC is likely to change policy.....So that is an unwritten policy constraint. You are prepared to invest serious money with an expensive consultant, knowing it is likely to break down because you are happy to let people move on within or over a two year period. And that is never flushed out. That's just inherently accepted by all of them, possibly because they rather enjoy it but there are consequences to that. Now I think TOC would bring that out and lean would try to build a countermeasure, increase the training of the new recruits or something, which for me is treating the symptoms and not the root cause.....It's not a tools based approach, the tools are almost irrelevant and would become redundant within time.....What he is trying to teach people is cause and effect relationships and I think it is awfully hard to deny that that is a powerful.....there is danger that TOC just became a tools based approach so Goldratt's efforts to try and get the thinking process understood, get to the root cause, find out whether there are poor assumptions in the way you are trying to run the business.....drum, buffer, rope can be superior in certain situations.....by putting Lean so firmly on the agenda, I think there was a knock-on beneficial effect to TOC as well. So I think it was a fantastic service'.....Why TOC has not broken into the UK with the same vigour, is completely beyond me. TOC is bigger in the US, I suspect you could easily prove that it is still smaller than Lean, but it's got a big following and presence that it hasn't got in the UK and never has had' [Informant 6]

'The only thing I know from TOC is drum buffer rope and I apply that. That makes a lot of sense' [Informant 14]

'TOC is brilliant from the point of if you have got a constraint maximize it, but finding the constraint is the hard part' [Informant 18]

Perceived Failings of TOC

'TOC entertains people who like to be slightly different.....It is a great idea of how your run a business, a value chain but there are no exemplars. There are no companies you can hold up these are the.....TOC is not a theory, it is a technique'.....TOC is quite an elitist group, never been proven and seems to fall flat on its face. TOC doesn't have the underlying management and enterprise logic that lean has.....Lean is quite seductively attractive. It is easy to understand, TOC isn't.....The problem with The Goal.....a lot of people say we loved it as a story, what a great story. But with the greatest respect, the only time you understand what the goal talks about is afterwards when someone tells you what it all meant. I struggled with that book until someone told me what it all meant.....TOC and six sigma are too mathematical – they are into heavy uses of algorithms and a lot of business executives aren't very maths literate. Lean is conceptual and dealt with a business model.....Anything that can be boiled down to maths,

typically devalues itself into a technique.....the exact same problem that Goldratt faced. It is his own very nature pisses people off.....he frightens the crap out of people' [Informant 1]

'Toyota provided a communication mechanism and there wasn't an equivalent for TOC or Six Sigma' [Informant 2]

'the initial understanding of TOC is relatively straightforward, the view of looking at the internal constraint and then the external is fine but the way in which it is structured beneath that is far more complex in trying to broaden it out to the production lines.....TOC perceived as too technical' [Informant 3]

'Goldratt his book was that was the most brilliant piece of marketing around but also at the same time he was flogging software and it was a black-box. So you put all your stuff into this and out came the solution and you either accepted it or not. So it was all a bit of magic. To do it is a bit more complicated. Even today it is not such an easy thing to get going, you've got to know a lot about capacity and variation.....it is not as simple' [Informant 4]

'TOC is more accessible than Six Sigma but possibly not as much as Lean.....My perception is that that [Lean] is the world's leading methodology, TOC runs close.....We learn by repetition and I think there has been a lot more written on Lean particularly in the UK. It's one of the reasons why it's superseded TOC. I think there is a UK vs USA divide on that' [Informant 6]

"TOC has had limited success in addressing policy as a constraint.....It is not as inspiring as maybe Lean is.....a bit too technical and so is TOC.....TOC definitely not innovative' [Informant 7]

'I think there are significant differences with TOC. Actually there is a management system based upon optimising activities and there is a management system based upon optimising processes.....TOC is also about is an attempt to think about prioritisation and think about process and Six Sigma is also about scientific method to prioritise problems but also just to solve the root cause of problems in the process and it is the whole scientific method for PDCA for solving problems. But both of them are actually point solutions. They're not actually system solutions.....TOC suffered from the fact that Goldratt tried to turn it into a consulting product that only he could sell and so you read his books and they are very insightful but actually in the end you have to go and ask Goldratt for the answer. His answer is a big algorithm. It is a computer solution to prioritisation on bottlenecks. That is essentially what it is. And so it doesn't go anywhere, people have tried that' [Informant 8]

'I have used it in the past but nobody ever asks us about it' [Informant 9]

'I suspect constraints theory doesn't simulate constraints they are facing because firms can't do much about it, government has no intention of doing anything about it, so it's just not an appealing framework' [Informant 12]

'I probably wouldn't put it as movement, in the same way as sigma, Lean, I would want to bring it down a level. In the UK it is almost as a tool but in the US it is definitely bigger.....What if it TOC or Six Sigma had been promoted instead, I think less successful because it is less relevant and less accessible' [Informant 13]

'[Six Sigma and TOC] I very much see them as a subset of Lean'.....TOC is a bit convoluted and clever and therefore suits people who are a little bit convoluted and clever and like complexity' [informant 19]

'I don't know anybody in the public sector who could tell me about TOC' [informant 20]

Appendix F Perceived Benefits and Failings of Seddon's Systems Thinking

Perceived Benefits of Seddon's Systems Thinking

'Seddon's approach is so good because it doesn't try to be prescriptive' [Informant 2]

'ST is superior. ST is a theory.....ST is scientific and proven scientifically.....'systems theory is broader than a management concept' [Informant 7]

'his insight came from call centres and the key part in call centres of course is analyse the demand. So I think that is a real contribution he has made' [Informant 8]

"I agree with him that a lot of what has happened centrally out of government has been poisoned by mass production thinking, scale, targets, so I absolutely 100% agree with the spirit of that, so it is attractive.....So my view on ST is very useful but it is reactionary' [Informant 13]

'What effect has John Seddon's writings had in central government? I know that it is probably more accepted in local government. A lot of his case studies talk about local government examples' [Informant 17]

'Systems Thinking is more dominant in local government because local government is very much the intangible delivery stuff' [Informant 18]

'Vanguard are very prominent in the public sector. There are maybe one or two other beginning to make some inroads into the market but I would still say Vanguard are the main ones' [Informant 20]

'Nearly everybody had used Vanguard' [Informant 20]

'What I like about Seddon's work is failure demand, I think it is very clever concept. Targets I agree with him.....Clearly someone who runs a large consultancy firm and has the ability to put this into practice has a great advantage of learning from doing.....I admire John Seddon for his influence and promoting his ideas' [informant 21]

Perceived Failings of Seddon's Systems Thinking

'his general thesis of this is what makes a manager of culture a moron, the fact that they act this way because they are part of a management factory and they've got to measure people and tell people off, is a line of argument that holds some credibility but it shows a lack of thinking as well.....the exact same problem that Goldratt faced. It is his own very nature pisses people off.....he frightens the crap out of people' [Informant 1]

I do have some reservations about John's perceptions of capacity.....That's a medium to longterm capacity decision. Some poor bugger has to make that with incomplete data. Should we be building another reservoir in Wales now or not? The future will always laugh at your decisions.....You are working with incomplete data and the further forward you look the less certain you about the future. Someone has got to get off the pot in the first place, now if he acknowledged that then I would have no trouble with all the rest of it' [informant 6]

'Britain has an anti-systems culture. We like packages, we don't really want to think through the system' [Informant 12]

'I see John's approach as two things. One is as an ego-driven frustrated guru who just cannot get on with anybody including his clients. A second is that he is just pathologically.....he's got some blockages in his head about command and control and doesn't have an alternative.....We had such a fight with Seddon over the use of failure demand. And if this chap is going to be so much trouble sending us letters and threatening, he is a completely irrational person' [Informant 8]

'We were getting feedback from Seddon's clients complaining about the way he treats them and about the fact that he doesn't have a answer to the management question. He says any form of standardisation is evil and yet the whole principle of using the scientific method depends upon agreeing a baseline, not imposing it but agreeing it and then evolving it.....His personal style is just offensive.....He's done a lot of silly things like claiming it was the Toyota service system, which doesn't exist. We know the guys that built the Toyota retailing system, the Toyota Production System. Read his website. He tried to say I've learnt all this from Ohno. Ohno built the production system and had nothing to do with retailing, service or whatever. So, just of lot of just bullshit from John, unfortunately.....systems thinking was again another attempt to think about an organisation as a system and John Bicheno, he came from that background. It never kind of went anywhere, whereas here we are talking about an actual system that we are deconstructing and trying to understand and we are trying to build the principles on which the system works rather than starting with theory and all we've done is learnt from practice.....He is gradually less using the term lean because he has caricatured Lean as manufacturing toolheads and so he tried to brand what he was doing lean service, as that lacked any credibility, he is now saying it's systems thinking.....I mean really the guy is an idiot. He has caused me problems occasionally. I do think he has muddied the waters, big time, but not for long, people see through it very fast.....I've got letters from Chief Execs complaining about John Seddon, saying it is a gross misrepresentation of lean, it is appalling and so on.....He upsets everyone, every single client because he doesn't have an answer of what to do.....All he says is you've got to be instantly responsive to changes in demand'.....All he's got is a load of negative things, don't dos. Don't set targets, don't standardise anything, don't use tools. I think he is an emperor with new clothes.....I am staggered at how little contribution systems theory has made to understanding lean.....I think you can articulate a system using ST, I don't think you can understand it using ST, you can only understand it by actually looking at the detail' [Informant 8]

'It is not so much him because I think he has got quite a lot of charm and humour'.....The problem is, there is a French expression called the fils du père, which is the son of the father. The father gets away with it but the son who copies him, who hasn't got the same charm.....I have a few reservations, more about the evangelical zeletry around it because it does smack of if you are not with me you are my enemy, which is quite personality driven.....Vanguard are quite vocal on what they think about clients, competition and other people and we have been on the receiving end of that in the past. My view of that is say nothing, that is the oxygen that certain people need. So just keep your head down and do a good job, we don't even want to go there.....we see it as a bit of an evangelical cult.....it has disciples who are very very strong believers or it does polarise opinion, it has people who are absolutely turned off by it' [informant 13]

'Seddon seems to say you shouldn't standardize and I would say that is really untrue. There does need to be standards and a process flow' [Informant 14]

'They had paid this consultancy hundreds of thousands of pounds to deliver nothing but they had indoctrinated them in the world of systems thinking. It was disgraceful really. They have spent yonks mapping out end to end processes persuading people that to improve customer service you have to eradicate the need for a back office or eradicate the waste that is created because your forms are not right or whatever.....I think they jump a step too far to the end to end stuff'.....Their argument is that they want to serve the customer right and if you get it right you won't need the back office or the telephony because all you will be doing in the back office is exceptions.....they indoctrinate people to try and stop people like OEE who are their absolute nemesis.....The people that work for John Seddon in Vanguard are saying that lean is all about cost saving, when you talk to people in HBOS about lean they will say it is a useless thing and all about saving and not about the customer' [informant 15]

'I think JS is a tit.....I think his approach is interesting and he probably has a lot of good things going for him but at the same time there is a lot of luddite. I think he has a closed mind to some other forms of thinking.....He is just being dogmatic in his own way, he is just a toolhead in his own way. If he thinks systems thinking is his bag and he thinks his answer is to diss all the other things.....I get confused by the antipathy or the anger that Seddon promulgates. I just think that is self-serving. He is just trying to prove that his version is best, give me more business. So some of my guys in Vodaphone used to read his newsletter, I just thought some of that was nonsense' [Informant 16]

'he can get better access to the seniors in government? And I said well stop attacking the front door because you are not going to get anywhere……..John Seddon attacks doors and try and attacks the Ministers. Ministers don't have any power. The power is with the civil service……..JS has got a product to sell. He is a one club golfer' [Informant 18]

'demand will vary but that doesn't get away from 80% of the time these are the 8 questions I am going to be asked and there should be a standard way of approaching that' [Informant 19]

'I have simply identified a group of organizations that provide something slightly different and something a little less evangelical' [Informant 20]

'Now the problems with ST is it is not a toolbox and it is not a theory……...ST is not in the strictest sense an improvement methodology……I think he is overdoing a point that manufacturing tools can't be translated one-to-one to services……...In my view he is too opinionated to be a good source……'His writing and style I take issue with' [Informant 21]

Appendix G 'Industry Forum' Initiative

Vignette of Industry Forum (IF) Government Initiative

IF was preceded by a 'localization programme with Nissan. A gentleman's agreement was struck between Nissan and the UK government that the financial inducements Nissan had been given to set up a manufacturing plant in the UK should be met with a pledge that over time that Nissan componentry would be sourced in Europe:

'the government couldn't say the UK.....the gentleman's agreement had to be with the British government on behalf of Europe' [Informant 11]

The agreement struck was that within 5 years from the start of production at Nissan 80% of the value of the finished product had to be sourced in Europe. Nissan UK formed a supplier development group to meet the challenge of the localization programme. Several reports were produced in the early 90s: the two Anderson reports, a report by Professor Laming on supply chain relationships, the DTI Learning From Japan report and the Competitiveness White Paper. These reports, together with pressure from Nissan, led MP Michael Helseltine to consult the 'captains of industry' in order to understand why the UK did not appear to be benefiting from Japanese transplants as expected. This consultation led to direct intervention by the government. Key personnel from Honda, Toyota, Nissan, Rover and Ford were seconded to the government as advisors. A series of meeting with the Japan government's Ministry of International Trade and Industry (MITI) and the Japan Automotive Manufacturing Association (JAMA) led to the formation of IF. IF was positioned under the neutral banner of the UK automotive Trade body, the Society of Motor Manufacturers and Traders (SMMT). Under IF, engineers from Nissan, Toyota and Honda were brought together to train UK engineers. The improvement methodology developed within the IF programme was called Masterclass (see Bateman, 2001 for details).

IF was regarded by successive UK government administrations as highly successful. Later, MP Peter Mandelson was instrumental in securing government funding to spread the initiative into other industrial sectors:

'I don't think the logic was at fault. If you were to say to me could you do what you are doing in the auto industry in aerospace, in shipbuilding, in ceramics, in food? Yes we can, because we really know how to do it, some of the other trade associations recruited people, they weren't really being trained and the people going into the member companies weren't able to persuade. It was poor implementation' [Informant 11]

Appendix H Manufacturing Advisory Service

Vignette of Manufacturing Advisory Service (MAS) Government Initiative

MAS was launched in 2002 following MP Steven Byers's investigation into the US Manufacturing Extension Programme (MEP), so called since it was an extension of their longstanding agricultural programme. MAS is a national programme that is delivered by regional consortia and targets assistance to Small to Medium Enterprises (SMEs), defined as organizations of less than 250 employees and with a turnover of less than 50m euros. MAS services are an adaptation of the IF offering. MAS is a low cost (approximately £30-40m over 3 years) and high yielding programme (approximately £250-300m in the same period. It is therefore perceived by successive governments as a political success:

'I think every political party has gone on record as saying MAS is something we will keep, whatever we do with other government departments' [Informant 9]

Appendix I Food Chain Centre

Vignette of Food Chain Centre (FCC) Government Initiative

Most other industrial sectors were sponsored by the DTI (now BIS and formerly BERR), but the food industry is sponsored by the Department for the Environment, Food and Rural Affairs (DEFRA). Some of the DTI IF grant was reserved for the food industry. The Red Meat Industry Forum (RMIF) was established first to provide MP Don Curry with a group of experts to consult without the constraints of the Meat and Livestock Commission (MLC) committee structures. The RMIF gave evidence to inform the Curry inquiry which had been set up following the outbreak of foot and mouth in UK farming in 2000/2001.The Curry inquiry was strategically focused on the sustainability of farming. One of the recommendations of inquiry was for the Institute of Grocery Distribution (IGD) to set up the FCC. The FCC offered assistance to the four key sectors of the food and agricultural industry: meat, dairy, cereals and produce. This assistance included a range of improvement services including traditional IF Masterclass methodology. One service offered emerged from IGD's tendency to favour holistic supply chain approach to improvement as a result of their experience with the wider Efficient Consumer Response (ECR). ECR is a broader food industry movement that originated in the US in 1993 and in Europe in 1996. The FCC, in conjunction with Lean specialists at Cardiff University, developed a whole supply chain improvement methodology known as value chain analysis (VCA). Derived from Lean mapping tools, VCA was based on the assumption that the most improvement opportunities are realized through supply chain collaboration. Pilot projects were conducted to test this assumption in a sector where collaboration across the supply chain was not the normal mode of practice. Consequently companies had to be persuaded to participate:

'...the job we had in the four sectors.....was to go out and sell VCA, to get companies to participate in whole chain programmes.....Dairy was the most difficult sector to sell Lean into. The sector that had come across Lean more than anywhere else was the cereal sector, the big millers, the big maltsers' [Informant 10]

The success of the VCA projects was measured by asking participating companies what they had saved,

'we knew from what we had heard that there were some huge wins being secured by some of the participants, not in every case, but certainly in a lot of cases' [Informant 10]

The financial savings that resulted from the FCC initiative, reported in the FCC completion reports, were £14.4 million. The FCC initiative provided a mechanism for the diffusion of Lean into the food and agricultural sector,

'I think the success is measured to a large extent in how the industry has adopted Lean and I think there is evidence, we know of a lot of companies who have been through one of the pilots, be it VCA or Masterclass, who have gone on and said that this has been so powerful for us, we will go on and pay for it. So I know that there had been a lot of that happening. I can't give you facts and figures. It is a gut feel that that has happened based on what people had told me from businesses and from SMMT and from commentators. I'm not saying that we changed the world but I am saying that we did a bit of good in terms of helping the industry adopt and apply Lean to it's benefit, but I can't quantify that' [Informant 10]

However, there is some doubt as to the effectiveness of the FCC initiative,

'I could be very cynical and say the reason why most companies took part in this was not because they expected to get something huge out of it, but because it was funded, because they didn't have to pay for it and because we were badgering them. In food the extent of change agents efforts was strong' [Informant 10]

Appendix J Government's Role in Lean Diffusion

Perceptions of Government's Role in Lean Diffusion

Government has played a good role in diffusing Lean	Government had played a bad role in diffusing Lean
'I think the government has played a massive part in launching IF and MAS' [Informant 9]	*'Government has delegated responsibility in a clumsy manner, low money and getting low impact.... I don't have the data but I think it could have been so much better handled'* [Informant 6]
'we had a programme called the localization agreement between Nisan and the British government that some some financial inducements they may have enjoyed to set up in the UK had to be met by a pledge that over time there would be product sourced in Europe, the government couldn't say the UK.....The challenge was five years from the start of production there had to be 80% of the value of the finished product local content' [Informant 11]	*'In a way it was compounded by the governments interference in that they messed around with the natural market that would have got the best consultants doing the best jobs, but by interfering with the market process in that way they ended up with poorer quality consultants doing more damage than they might have done'* [Informant 6]
'...the DTI. They had established an automotive division and they were fascinated and they used to come up regularly and have plant tours' [Informant 11]	*'Some of these other Trade Associations recruited people, they weren't really being trained and the people going into the member companies weren't able to persuade. It was poor implementation'* [Informant 11]
'We said to the DTI think, we think you have a responsibility also.....There are lots of other companies out there.....then there is the tier two and tier three and we're not touching them. The DTI said, mm, we think you might be right, we think we have a responsibility there' [Informant 11]	*'Wales as a case study is a global example of how government can promulgate a fad'* [Informant 12]
'There was a kind of pressure within government to do something' [Informant 11]	*'I think the government has been important in a good sense and a bad sense. The bad sense is that the target culture has been catastrophic. Mass production thinking has been prevalent in terms of what the ministerial offices have mandated out there, I think that has been a real problem'* [Informant 13]
'If you looked at what was purchased in the UK, which was the biggest single country of purchase of product, but then you added up Germany, France and just called them other, then that was as much if not more than the UK and as far as the government was concerned there was a lost opportunity' [Informant 11]	*'the target culture has undermined their credibility'* [Informant 13]
'Lord Mandleson.....ten years ago he was the Head of the DTI.....he got very enthused by this and said, this has got to be spread into other sectors, so it was him who announced the funding to allow this to spread into other sectors and he said I want to cascade this into 12-15 other sectors' [Informant 11]	*'The thing about the role of government – one is that it is obsessed with targets'* [Informant 14]
'Generally speaking what the government has done is provide better education for people in industry' [Informant 19]	*'I agree that Lean has been pushed much harder than any other methodology'* [Informant 13]
'What we had was tremendous support from DEFRA, in terms of the funding, in terms of wanting this to happen.....by making money available, by wanting the FCC to be a success, they played a big role in making it happen in food without really knowing what they were doing and what they were applying' [Informant 10]	*'The government has played an important role but it has been disjointed because there have been conflicting messages'* [Informant 13]
'Source Wales, which was set up to try and encourage the larger companies in Wales to by their parts from the smaller companies, to keep the supply chains in Wales' [Informant 2]	*'I think that the WDA were seen by many and certainly the WA were seen as grants'* [Informant 2]
'The biggest impact the government have made is by Thatcher's government bringing in all the foreign companies like Toyota, Honda, Nissan, many others.....I think that having blue chip companies in the UK, that has been in my opinion the biggest impact we've had in trying to diffuse best practice, whether it be Lean or something else' [Informant 2]	*'The Source Wales portfolio was trying to make smaller companies aware of initiatives. There were problems with that, the fact that we gave programmes to consultants and if you've got a hammer, any problem looks like a nail....'* [Informant 2]
'The government has got an important role, it certainly has.....their job is to improve industry. We pay tax, they have to pay it back. So I think that is their role. It is a good thing they do. But this is maybe the symptom. Lean was already out there and they went and picked it up and diffused it' [Informant 7]	*'I originally wrote down that it's been reasonably effective but is you take the case I'll focus on is the Rover case, the DTI thrust in terms of the Lean element which was predominant in the way Rover looked at the problem, Lean could help....was the challenge to produce a defect-free Rover 45 or was it to get a marketplace to a buy a Rover vehicle.....I wondered if the tools and techniques were so focused on that levels, they never looked outside of this bubble'* [Informant 3]
	'There w as huge levels of enthusiasm from other Trade Associations and other sectors to say, phaw, there is some government funding there, I'll have some of that' [Informant 11]
	'They saw this access to funds' [Informant 11]
	'Never confuse need with demand. You can look around the shopfloor and say, look at the state of this place, they really

	need it. They don't think so, we are making money...' {Informant 11] *'I don't think the logic was at fault.....It was poor implementation'* [Informant 11] *'It happened in HMRC, the lean tools stuff, which has been a disaster for HMRC, its morale, Its TU relations.....central government is now promoting the same into DWP and others'* [Informant 5] *'The question is what are you being bullied to do and how are you going to get your stars and comply. If you don't comply you are in trouble'* [Informant 5] *'I think the industry fora in the food sector that I know of, RMIF, dairy, cereals. They wasted a lot of money'* [Informant 7]
Government has played a role in diffusing Lean but it has not been significant	**Government has not played a role in diffusing Lean**
'I don't think the government's role was that significant to be honest. I think there were times when the government gave it a push. The key things were Maggie's invitation to the Japanese to come in the first place, to Nissan initially and later on to Toyota. Then the sector was the setting up of IF, we really did get the government's attention to do that' [Informant 8] *'Clearly they have had a role, whether it is effective, I've got pretty severe doubts about that....I think the role of government is exaggerated'* [Informant 4] *'...throughout history all efforts by government to promote things have been a total and utter complete catastrophic waste of money and their effect is almost zero. It is like throwing money down the drain'* [Informant 4] *'Lean would have spread anyway and intriguingly would have spread more without that'* [Informant 4] *'Government's role is to promote economic prosperity'.....the government's role is to promote best practice, I think. I don't think they have promoted Lean. They have been open to promoting Lean through EPSRC grants....industry forum, but frankly that is Lean and other things, it is not just Lean'* [Informant 21] *'I think we have had very little impact in government in diffusing anything into industry. The biggest impact has been bringing in companies like Toyota into the UK'* [Informant 2]	*'My perception is that the government is doing very little indeed to promote Lean'* [Informant 20] *'The Labour government isn't saying let's do Lean'* [Informant 17] *'Is the government saying Lean is the way forward, no it is not, but what it is saying is that organizations have tried this and have seen some good results. Lean is one of the approaches that people can take'* [Informant 17] *'Absolutely no messages have come from the government, not in banking'* [Informant 15] *'During my whole time at the ministry, I never one heard of Lean.....I've got no evidence to think that there was any awareness of Lean within that government department at the time I was there'* [Informant 10] *'My knowledge of this is that the government's role in promoting Lean into other sectors is limited'* [Informant 17] *'I think in terms of government directly influencing businesses, I think it is marginal'* [Informant 2]