Operationalising deep structural sustainability in business: longitudinal immersion as extensive engaged scholarship

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Abstract

This paper offers an innovative perspective on engaged scholarship as multiple, cumulative interactions between academia and external organisations in the business and policy realms. A definition of longitudinal immersion is positioned relative to the extant literature on academic engagement as a dialectic relationship between academic research and the praxis of business and society. Using a case study of a specific academic theoretical concept, this paper seeks to demonstrate how over a period of some 25 years the ideas and practice of deep structural sustainability have co-evolved through a process of reflexivity. Drawing from Critical Management Studies and Design Science the paper gives a different perspective on the processes and mechanisms of engagement and the question of the nature of impact. Notwithstanding the challenges thus presented to researchers in nurturing the ability for informed creativity, the paper concludes that future opportunities for engagement and impact may be captured by a longer-term, value-driven and less episodic approach to the entire research process.

Keywords

Critical management research; case studies; reflexivity; engagement; impact; longitudinal immersion.

1. Introduction

For many years there has been a strong undercurrent of concern about the role and purpose of business academic research, expressed as a gap between theory and practice, or as a failure of engagement or relevance (Evered and Louis, 1981; MacLean et al., 2002; Fendt and Kaminska-Labbé, 2011; Alvesson, and Sandberg, 2013). In this paper 'longitudinal immersion' is presented as a reflexive meta-methodology both for research and for engagement, building on and then moving beyond a range of existing alternative methodological approaches in the literature, and combining insights from Critical Management Studies and Design Science. In this manner the paper shows how over an extended period of time engaged research has resulted in innovative solutions that are now at the leading edge of the design, manufacture and use of cars that are more durable, and of lower environmental impact, and produced in businesses that are more attuned to their social value.

As explored in section two of the paper, management scholars have been adept at achieving innovative theorisation and methodological robustness, but rather less so at achieving applicability, leading some to call for a 'new public social science' (Delbridge, 2014) and others for a cohesive professional discipline (Romme et al., 2015). The call for 'Mode 2' research (Aken, 2005) has not resolved the concerns. It is proposed here that impacts with so-called 'deep sustainability' solutions are likely to be diverse, dynamic and socially constructed, and hence contingent to place and (the passage of) time (Foster, 2001). In turn this suggests that in seeking to understand (and indeed promote) large-scale systemic transformations in business structures, markets and consumption under a broad sustainable consumption and production agenda there is a need for academic researchers to develop richly textured grounding in specific rather than necessarily immediately generalizable industrial contexts. The inter-weaving of academia and practice over an extended time period in longitudinal immersion is presented in section three as challenging both the process of academic theory building and testing, and the process and purpose of user engagement. The extended case study presented in sections four and five illustrate that the interaction between theory building, data acquisition, and engagement with industry and other research beneficiaries is convoluted, intermittent and non-linear. The research process therefore combines both instrumental and reflexive knowledge (Burawoy, 2004; Robinson and Kerr, 2015), but adds to this the idea that '…scholarship as a product is generated across a career of research, user-group engagement, teaching and professional citizenship' (Thorpe et al., 2011).

Section four therefore provides a contextual overview of the immersion process of long-term involvement by the authors and their research centre within a specific industrial sector. In section five there is a narrower focus on what is here termed 'deep structural sustainability for business model innovation', with a case study on how the concept of Micro Factory Retailing (MFR) evolved over time and in interaction with diverse practice communities. A difficulty in presenting this approach is accounting for the source of ideas and the sequence by which such ideas may be encountered, imagined, and either adopted, adapted or dismissed. An attempt is made here to illustrate the dialectic and sometimes dissonant interplay between academic research and business practice with a timeline narrative of interactions and publications 'events' that can be regarded as both as indicators or milestones of progress and as forms of impact. In so doing we take impact to have many possible forms within the broader concept of contribution emergent discourses around our themes of business, automobility and sustainability. Section six considers the processes and mechanisms of longitudinal immersion, drawing in part from the ideas of Bourdieu (Bourdieu and Wacquant, 1992; Swartz, 2002). In the concluding analysis in section seven we draw together the lines of discussion and return to the issues of relevance and engagement, and argue for a more forward-looking and visionary approach to business and management research informed by synthesis and the wisdom gleaned by immersion.

2. Business and management research: The critique in the literature

Critics of academic business and management research argue that practitioners find little value in academic research (McKelvey, 2006) and that business research lacks high impact outcomes (Alvesson and Sandberg, 2013). There is a considerable literature on the 'divide' between rigour and relevance, or between management science and theories on the one side, and practical application

on the other (Gulati, 2007; Gulati, and Bartunek, 2007; Van de Ven and Johnson, 2006; Starkey et al., 2009; Fendt and Kaminska-Labbé, 2011; Hodgkinson and Starkey, 2011). Moreover issues such as theoretical rigour or research impact are notoriously difficult to measure in the social sciences (Greenhalgh and Wieringa, 2011; Bastow et al. 2014). Aram and Salipante (2003) frame the research-practice gap as an emergent property of the dichotomy between generalisability on the one side, and particular application on the other. Thus, generalisation is likely to obscure the particularities of a specific case, while alternatively case studies may provide contextual detail but lack connectivity to other instances and settings. For Ketokivi and Choi (2014) case research validity is established by attention to idiosyncrasy (what makes the case special) and transparency of reasoning (how generalisation is made from the case). Hodgkinson and Starkey (2011) see in this debate an unhelpful bifurcation into rigour versus relevance which can be traced back to the epistemological foundations of much business and management research. Interestingly, Mingers (2015) explicitly links the sustainability 'agenda' with the relevance gap in business and management research, and to the need to adopt a critical and ethically-committed perspective (see also King and Learmonth, 2015). Such a stance may make it difficult to undertake collaborative research, supported by Shani and Coghlan (2014) for example as one solution to the rigour and relevance divide.

There is some evidence that business and management research has become more accepting of non-traditional approaches including qualitative methodologies (Gummesson, 2006), and that such methodologies may aid the quest for impact: Guercini (2014) for example argues that new qualitative methods in business research reduce the relevance gap. Examples include the use of visual ethnography in marketing research (Schembri and Boyle, 2013); the use of qualitative methods in organisational change research (Garcia and Gluesing, 2013); ethnographic studies of business-to-business relationships (Granot et al., 2012); the use of interpretative phenomenological analysis to provide an holistic account of agritourism (Ainley and Kline, 2014); and the use of ethnography in operations management research (McAdam et al., 2008). Alongside these developments has emerged a call for greater use of mixed methods (Syed et al., 2010), or what Gains (2011) has termed 'constructivist modern empiricism' in which ethnography is combined with various research methods; a line of argument supported by Watson (2011). Indeed, Watson (2011) further argues that it is important to avoid being intellectually imprisoned by an unthinking adherence to any particular theoretical perspective or research method – a freedom that can be nurtured by ethnography. Harrison (2013) in a review paper building on earlier work (Harrison and Reilly, 2011) argues that there is evidence for the use of mixed methods in business research, but that it has been conducted in a relatively unsophisticated manner.

The evaluation of impact through one stakeholder (academia) is seen as narrowly introspective by Aguinis et al (2014) and a key cause of the 'chasm' between research and practice. Cummings (2007) argues that the discipline, and its leading journals, has retreated too far into academic theorisation – but also sees this chiefly as a problem of knowledge transfer. The knowledge transfer deficit is thus seen as a structural problem rather than a critique of the quality and applicability of the research itself. Starkey et al. (2009) take a stronger line to argue that 'rigour' has no validity if there is no relevance, and hence the contrast between the two is a false one. This is echoed by Syed et al. (2010) who, in proposing a critical realist stance, argue that grounding in context and meanings provides the basis for interpreting causality.

Moreover, there may well be a difference between research on business, and research for business. The assumption that research on business will be in some sense beneficial to (i.e. for) existing business seems at best optimistic and a worse ideological. Such a distinction is of particular significance when it comes to matters of sustainability, because scholars of sustainability may consider that there is a difference between helping businesses to do things better, and doing the right thing (Mingers, 2015). In an ambiguous world, management scholars may need to work with (and even for) existing businesses (to gain access; to learn; to remain in employment as academics by generating funding) while simultaneously seeking to help create the alternatives that might entail the demise of those self-same businesses. It is a sometimes-uncomfortable identity crisis (Worrall, 2004; Empson, 2013). As Learmonth et al. (2011) observe, categorizing research as 'useful' is inherently problematic because it is contingent upon relations of power ('useful' to whom?) and because the evaluation of utility may change dramatically with the passage of time. In this regard Delbridge (2014) has argued persuasively that there should at least be 'space' for Critical Management Studies, which Kieser et al. (2015: 144) in their major review singled out as an exception in terms of seeking 'practical relevance' and which Özkazanç-Pan (2012) has identified as a problem with respect to mainstream journals. While not concerned with sustainability per se, Delbridge argues that one of the central aims of Critical Management Studies is to '…generate radical alternatives.' (2014: 100). It is our contention that longitudinal immersion may provide the means to a subtle and richly textured understanding of social phenomena that helps both inform and legitimize research and thereby provide a platform that enables a 'performativity' version of the Design Science approach to create plausible and viable radical alternatives.

The following section expands upon the issue of the temporal character of engagement as it is reported in this paper, in which attention is drawn to the ways in which engagement and impact can take multiple but often rather indistinct (and difficult to measure) forms, and unfold erratically over time.

3. Longitudinal immersion as extensive engaged scholarship

This section of the paper presents an account of longitudinal immersion as extensive engaged scholarship; defined as the situation in which the accumulative insights generated through knowledge acquisition in multiple diverse research settings, criticality, and reflexivity are repeatedly tested against multiple aspects of practice through sequential and overlapping engagements with businesses, regulators, NGOs, consultancies in the quest for applied impact on (in this case) the global automotive industry. It is extensive in the sense that the research has ranged far and wide across this particular industry, and it is engaged in the sense that the research has frequently been conducted for specific clients with non-academic interests – though, as will be argued below, the notion of engagement defined in this paper is less bounded than that usually deployed.

The engaged scholarship approach (Cheney, et al. 2002; van de Ven and Johnson, 2006; van de Ven, 2007) is one in which '…researchers and practitioners coproduce knowledge that can advance theory and practice in a given domain' (van de Ven and Johnson, 2006: 803). In the social sciences more

broadly the inter-relationship between the researcher and the subject has also been known as 'action research' and 'action-orientated research' (Pain, 2003) and 'participatory research' (Pain, 2004). Others have talked in terms of 'participative research' (Heron and Reason, 2001), or 'experiential research' (Collins and Evans, 2002) and emphasised the co-production of knowledge. Studies in the social sciences sought to propose the idea of research in communities rather than on communities, and that 'experts' external to a situation may miss important aspects of phenomena under investigation (Collins and Evans, 2002). Importantly, all forms of engaged scholarship allow for reflexivity in the research process alongside multiple interactions (Bourdieu and Wacquant, 1992; Orr and Bennett, 2009). Following Robinson and Kerr (2015) we take reflexivity to mean an awareness that researchers have an effect on the research process and are active in the social world that they seek to understand. Engaged scholarship is a form of inquiry in which the researcher seeks involvement in and with the subjects, to learn from their particular insights and perspectives, and hence to obtain greater understanding of a problem domain (Evered and Louis, 1981). It is suited to exploratory research designs investigating interconnected problems in which there is considerable import laid on negotiation and mutual trust between the researcher and the subjects (Durose et al., undated). Engaged scholarship does not seek generalizability but rather is contextually embedded and seeks relevant theorisation and explanation for a specific situation. Hence the researcher is an actor rather than an observer, and learning is interactive and emergent as a result of this involvement. As Hodgkinson and Starkey (2011; 2012) observe, however, Design Science (explored below) and critical realism offer a foundation for using techniques like engaged scholarship to both develop theory and contribute to practice.

Within engaged scholarship it is possible to distinguish two broad threads: the co-production of knowledge and intervention research. The co-production of knowledge is more concerned with description and explanation of a situation, and with theory building; whereas active or intervention research is more about co-designing solutions to problems, and in effect working 'from the inside' with a client. Thus the active form of engaged scholarship is somewhat more prevalent in business studies than other social science disciplines but may be applied in social, policy and geographic research into communities that are otherwise marginalised from e.g. the policy and planning process and whose voice is not always heard (Durose et al., undated).

Engaged scholarship of various forms is also related to the quest for impact from research (Martin, 2010). In the view of some scholars, dissemination alone is not enough to ensure impact, particularly if the research has sought answers to the wrong question. Hence, engaged scholarship is seen as a research strategy to improve the relevance of research to user communities. Extensive engaged scholarship as presented here is potentially therefore what Aram and Salipante (2003) term a 'bridging scholarship' that is problem-initiated and rests on expanded standards of validity. Longitudinal immersion provides a basis for intervention research which is not predicated on solving the problems of a single case, but which seeks to create solutions for more generic issues.

Somewhat related to this, Starkey et al., (2009) argue that management research should be regarded as a form of 'Design Science', an approach echoed by authors such as Holmström and Ketokivi (2009) and Aken (2006). That is, there is a process of discovery and problem-solving as opposed to the accumulation of theoretical knowledge. Design Science recognises that the relevance

gap is not reducible to a problem of knowledge transfer per se, but that academics and the management professionals they seek to study may have divergent interests and indeed different ways of producing knowledge. Interestingly, Holmström et al. (2009) assert that it is management practitioners that engage in basic research (and innovation) in realms such as operations management, which academic researchers subsequently investigate and codify into novel theoretical insights. They explain that design scientists do not confine themselves to merely explaining and predicting, but rather want to shape their subject of interest (Holmström and Ketokivi, 2009: 66). This Design Science approach in business and management research is strongly influenced by the engineering approach to academic work in that it aims to provide solutions, rather than confining itself to highlighting and identifying problems as phenomena worthy of study (Holmström and Ketokivi, 2009). In the case of the research discussed in this paper, however, the design solution proposed (the MFR concept) represented a radical challenge to the status quo. Put another way, powerful institutional and organisational forces would have a profound interest in ensuring that the design solution did not have an impact.

The treatment of time with regards to research, engagement and impact is often implicit, with some notable exceptions. It is significant, for example, that Pascal et al. (2013) present what they define as an 'integrative' design methodology in which there is a co-evolution of practical and scientific knowledge through a series of design cycles, though with a relatively narrow focus on organizational context and a limited single-project duration. In contrast, Thorpe at al. (2011) argue that relevance can emerge over the course of an entire career rather than the episodic duration of a single project. Longitudinal immersion describes the process under which relevance can emerge out of multiple engagements with diverse research funders, as is described in sections four and five.

4. Longitudinal immersion: a contextual account

This section presents evidence for longitudinal immersion. Following Bartunek (2007) some of the collaborations with external stakeholders are not reducible to joint or relevant research, but build upon wider patterns of activity. The research history of the two authors in Figure 1 presents the extent and degree of longitudinal immersion.

Figure 1: Automotive industry immersion: Funded projects and academic integrational concepts

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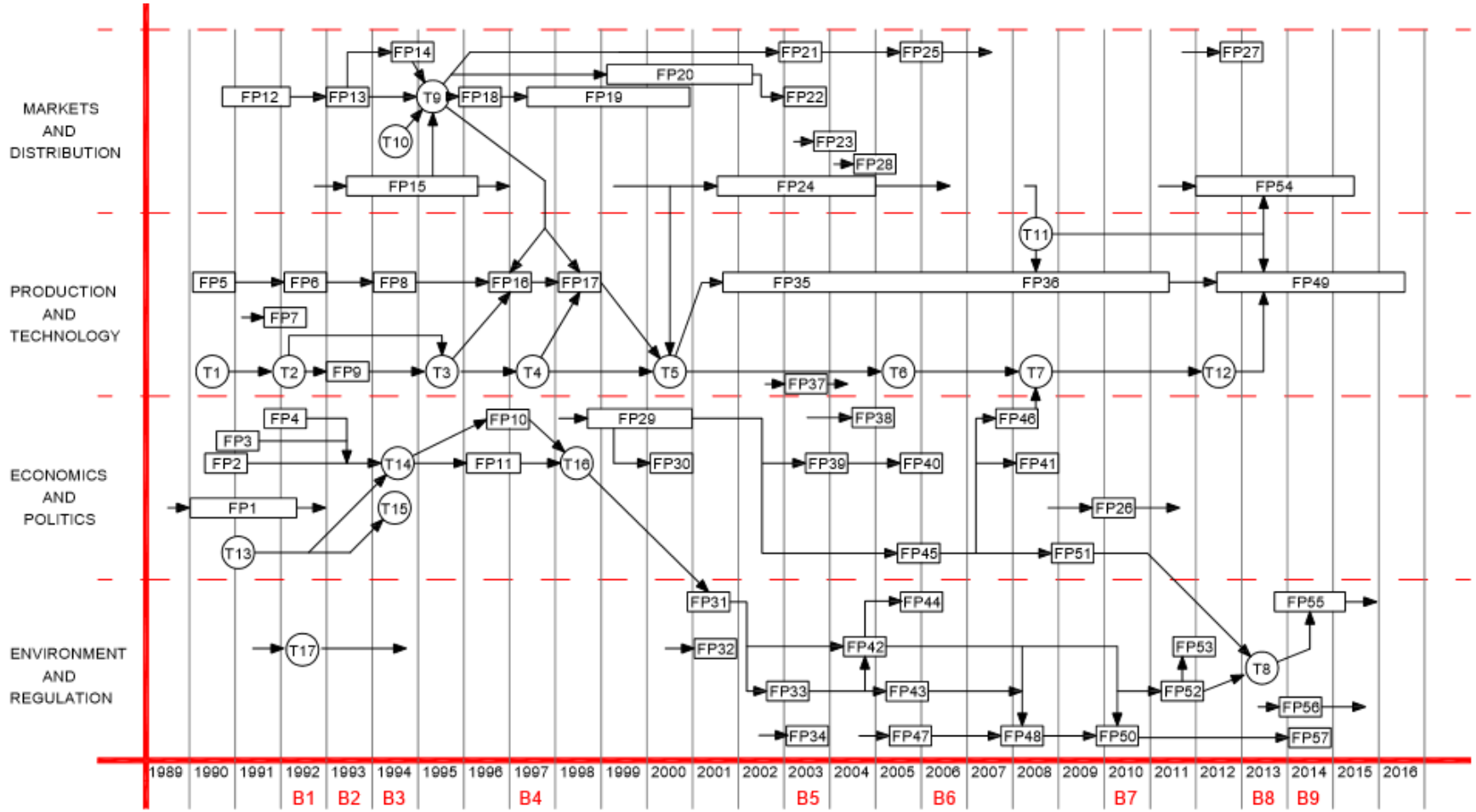


The research has proceeded along several lines of inquiry and utilised a range of specific research methods. Figure 1 illustrates the funded projects (FPs) over time, along with milestones (T1, etc.) that signify academic theories adopted or integrational concepts being developed. Projects ranged widely in size, scope and value, a pattern recognised by Bastow et al. (2014: 115-116), who distinguish ten main forms of business-university linkages, as well as five models of government-university linkages. Alongside our observation of facilities and processes, and many thousands of (often confidential) conversations, interviews and surveys, this research experience has resulted in a vast but unquantifiable range of 'softer' information sources in the form of promotional leaflets, company reports, conference presentations, test drives, photographs, trade show attendances, expert witness work, participation in industry management training events, and more. In this we follow the reasoning of Bourdieu and Wacquant (1992: 227) who contend that there is no requirement to follow an 'approved' methodology or technique to create accepted evidence, but rather researchers should '…mobilize all the techniques that are relevant and practically useful, given the definition of the object and the practical conditions of data collection'. A list of the project titles and integrating academic concepts is provided in Appendix 1 to accompany Figure 1.

The work has crossed boundaries in three important respects. First, it has crossed the functional boundaries typically found in business organisations. Second, the work has crossed academic discipline boundaries drawing on economics, economic geography, logistics and operations management, industrial ecology, technology policy, transport and mobility, and marketing and strategy, but increasingly over time concerned with sustainability. That is to say, we have not just embraced the sort of post-disciplinarity advocated by Delbridge (2014), we have internalised it. Third, it has crossed boundaries in terms of theoretical frameworks, bringing in discourses on socio-technical transitions, business model innovation, life cycle analysis, varieties of capitalism, resilience and regional geography. Table 1 presents a summary of automotive-related outputs with regards to the two authors of this paper.

Table 1 Automotive industry immersion: An overview (1990 to 2014)

Item	Peter Wells	Paul Nieuwenhuis	Of which, joint work
Research projects	57	37	24
Academic journal papers	57	23	9
Academic (co) authored books	5	3	2
Academic book chapters	22	14	7
Academic edited books	3	3	2
Non-academic books	0	3	0
Reports (public domain)	75	17	18
Academic conference papers	72	47	11
Industry/ Policy conference papers	51	49	5
Industry journal papers	270	117	42

Internet / website publications	60	20	2

Table 1 gives a broad sense of the accumulated outputs to diverse audiences over an extended time period. Of particular note are the industry journal papers (combined total of 387 outputs) and industry or policy conference papers (combined total of 100 outputs). This is clear evidence of the ability to 'speak the language' of the industry in which we specialise, and of a demand for our accumulated expertise. It is, therefore, impact in a diffuse sense, being contributory to discussion of the contemporary issues of the day but also challenging received wisdom (as Delbridge (2014) advocates). One means of understanding this diffuse impact more clearly is to focus on a specific example, which is presented in the following section by use of the Micro Factory Retailing concept. It should be noted that different examples could be woven into Figure 1 and explicated more clearly (such as the example of the rating of the environmental performance of cars; or the development of regulatory controls for CO_2 emissions from cars), but for clarity just one instance is documented here.

5. Deep structural sustainability: a business model perspective for Micro Factory Retailing

The conceptual coherence of our understanding of sustainability and the automotive industry ultimately was first crystallised in industry journal papers (Wells and Nieuwenhuis, 1999a; Wells and Nieuwenhuis, 2000) in which the concept of the Micro Factory Retailing (MFR) business model for the automotive industry was articulated. Academic conference papers then followed (Wells, 2001a; 2001b; 2006; Wells and Williams, 2006) with some modest journal papers and book chapters (Wells, 2004a; 2008a). The most important feature of this concept is that it did not exist anywhere in the world; there was no specific empirical evidence or case study that could be cited in support of the concept. We did not use the language of business model innovation per se, but spoke rather of innovation in 'product, process and structure' to convey the challenge to the prevailing regime that we described (Wells and Orsato, 2003; 2005). We thought it important to break away from the faltering 'fire and forget' business model of the major vehicle manufacturers, whose need for economies of scale in turn demanded that markets absorbed ever-larger quantities of cars (Wells, 2005a). What was needed, we argued, was a rethink of the entire system whereby personal private mobility was provided, from original component and material supply through to remanufacturing and closed loop systems (Wells and Seitz, 2004; 2006; Seitz et al., 2004). Our research into the early history of mass car production told us that the distinctive business model that had served the industry so well since the 1920s had become a substantial impediment to further progress (Nieuwenhuis and Wells, 2007; Orsato and Wells, 2007). Hence subsequent research focussed on business model and technology innovation to achieve a more sustainable car industry, but also did so with a distinct spatial component that emphasised the sustainability benefits of localisation (Wells and Nieuwenhuis, 2003). Just as the mass industry served as the basis for our critique, we took the inspiration for a redesign of the car industry from many niche car manufacturers (Wells and Nieuwenhuis, 1999b).

MFR brought together into one concept many distinct elements that had been observed in one or more instances, or which had been identified in principle in other industry settings. Thus the potentials identified in the study of small scale vehicle manufacturers helped to create the idealised

MFR concept, while study of the existing high-volume mass vehicle manufacturers helped in terms of understanding both how mass manufacturers were able to maintain their market, and the limits to transforming such businesses as they were constituted into deep sustainability. Note also that the concept develops over time. The initial focus on small-scale, combined manufacturing and retail operations in a network of related sites was retained while new ideas such as car-sharing clubs, not envisaged originally, were added. Equally, the potential of eco-industrialism and bio-materials was not initially considered, but emerged later after research into sugarcane ethanol in Brazil (Wells and Faro, 2011; Wells and Zapata, 2011; 2012). Along the way, lessons were learned from other observed attempts at business model innovation in the automotive industry, including Smart, the MDI Air Car (Wells, 2002c), RIDEK (Wells, 2003; 2005b), the GM AUTOnomy car (Wells, 2002a), the Bolloré/Pininfarina Bluecar (which forms the basis of the Paris Autolib scheme)(Wells, 2005c), Indego (Wells, 2005d), Eco-Motors (Wells, 2010a), Eco-Rover (Wells, 2004b), Local Motors, THINK (Wells and Nieuwenhuis, 1999b; Wells, 2002b; 2009b; 2010b), Tata Nano (Wells, 2008b; 2009a; 2009c), Gordon Murray Design, Better Place (Christensen et al., 2012) and Tesla. None of these examples exactly replicated the MFR concept, but all of them could be analysed through the frame offered by MFR and contained elements from our original conceptualisation. What unites these examples is the underpinning concept of aligning business model innovation with technological innovation to varying degrees, thereby offering improved sustainability performance.

In some instances the focus was primarily technology (e.g. GM AUTOnomy) but

Table 2 illustrates a simplified version of how academic and practice work evolved over time with regard to the MFR concept. It can be seen that the concept itself was initially formulated in 1999, and that several studies could be considered as precursor works that informed aspects of this initial formulation. Thereafter a series of interactions occurred in which the concept was simultaneously further developed and also aspects were communicated to user communities via a range of outputs.

Table 2 MFR: the academic and practice interactions over time

Academic funding	Non-academic funding	Date	Comment	Related outputs (author A)
	Study into the European presswork sector for Camford.	1991	Precursor project informing understanding of economics of all-steel vehicles	Client report
	European automotive presswork industry study for British Steel.	1992	Precursor project informing understanding of economics of all-steel vehicles	Client report 1 academic book chapter
		1993		

	Study on the future of car retailing and distribution in Europe for the Economist Intelligence Unit. Contributed as a team member on the International Car Distribution Programme Assessment of future global demand for sheet aluminium in the automotive industry in the light of environmental pressures, for CRU Ltd.	1994	Precursor projects informing understanding of economics of retail and distribution in the automotive sector. Management report sold by EIU Precursor project informing understanding of economics of alternative material vehicles	1 edited academic book 1 academic conference paper Client report
	The future for wide strip steel in automotive applications; for British Steel.	1995	Precursor project informing understanding of economics of steel use and proliferation of steel types	Client report 1 public report 7 news features
	A study into the workings of the daily rental industry and its effect on the market in the UK for Avis.	1996	Precursor project giving insights into remarketing and depreciation in mass production vehicles.	Client report 1 academic conference paper
		1997		I academic book 5 news features 2 industry conferences
	CO_2 reduction strategy for Lex Vehicle Leasing	1998	Early funding project on vehicle environmental performance	Client report 1 academic conference paper 3 news features
	Creation of an environmental rating system for new cars on behalf of a leading vehicle manufacturer (Volvo).	**1999**	More comprehensive project to understand vehicle environmental performance	Client report 2 academic conference papers 3 news features 1 industry conference. **MFR concept first published**
	Feasibility study into Life Cycle Analysis for	2000	Literature review and policy	Client report

	cars, on behalf of the Department of Environment, Transport and the Regions Impact of the End of Vehicle Life Directive, for the Motor Vehicle Dismantlers Association.		recommendations on vehicle environmental performance. Precursor study to understand current practice on end of life vehicles	Client report 1 public report 3 news features
Five-year study into Micro Factory Retailing, funded by the ESRC as part of the BRASS Centre		2001	First academic funding into the MFR concept provided the basis to look deeper into theoretical issues such as industrial ecology	1 academic paper 1 academic book chapter 1 academic conference paper 1 public report 5 news features 1 industry conference
BRASS 1		2002		1 public report 5 news features
BRASS 1	Phase 1 and Phase 2 studies for the European Commission into CO_2 reduction policies for cars, in collaboration with IEEP (UK-Belgium consultants) and TNO (the Netherlands).	2003	Along with other less overtly relevant policy work, this helped provide understanding of how policies can shape opportunities or constrain change	1 academic book 3 academic conference papers 3 news features 1 industry conference
BRASS 1		2004	Initial interest in Industrial Ecology to inform business model design, eventually leading to renewable eco-industrialism.	2 academic papers 1 academic conference paper 3 news features
BRASS 1		2005		2 academic papers 1 public report 8 news features
Phase 2 funding for BRASS, 2006 to 2011 into eight research themes under the broad scope of sustainable mobility		2006	More substantial funding this time, with more work with a focus on sustainable business models as an academic concept	2 academic papers 1 academic book chapter 1 edited academic book

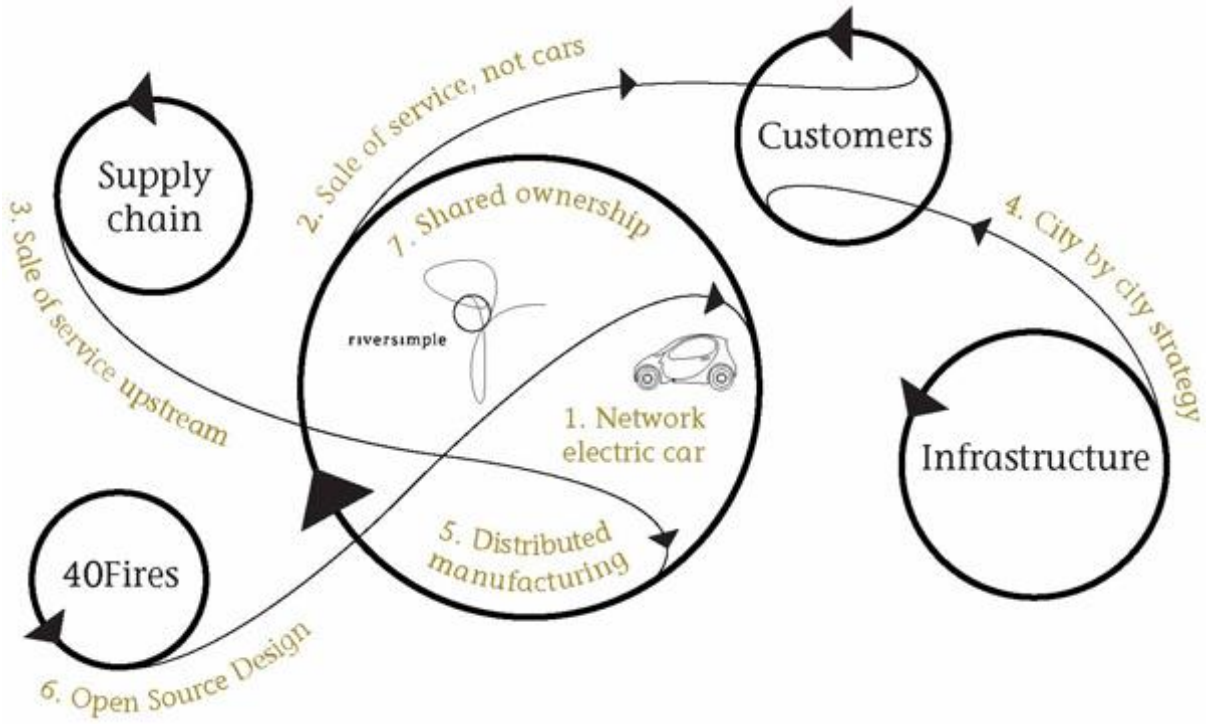
				2 academic conference papers 2 news features
BRASS 2		2007		2 academic papers 1 academic conference paper 4 news features
BRASS 2		2008	Initial research on sugarcane ethanol, leading to renewable industrial ecology concept. Also re-involvement in socio-technical transitions.	l academic paper 2 academic book chapters 1 academic conference paper 3 news features 1 industry conference
BRASS 2	Research for Greenpeace International into the feasibility of achieving an average of 80 g/km CO2 emissions in European new car sales by 2020.	2009	Largely technical report but offered insights into how technologies and downsizing could yield low emission cars	Client report 3 public reports 2 news features
BRASS 2		2010		1 academic paper 1 academic book 1 academic conference paper 1 public report 2 news features 3 industry conferences
BRASS funding ended after an additional 1 year extension		2011		1 academic book chapter 2 academic conference papers
		2012		2 academic papers 2 academic book chapters 1 academic conference paper 2 industry conferences

		2013		2 academic papers 1 academic book 1 public report 1 industry conference

(Note: All outputs are listed in the year they materialised rather than funding dates)

As of 2016, one of the most intriguing examples of a company using MFR ideas is that of Riversimple Movement Ltd (see www.Riversimple.com). The essence of the Riversimple approach is summarised in Figure 2.

Figure 2 The Riversimple business model



(Source: www.Riversimple.com)

An initial meeting was held with the founder of Riversimple, Hugo Spowers, in 2000. He had read about our MFR concept and wanted to exchange ideas. As in the original MFR concept, Spowers envisaged small-scale factories. Crucially, the cars, sourced with open design, remain on the company balance sheet from drawing board to end-of-life, and are returned to the factory on a regular cycle for refurbishment, repair and updating, again largely in line with the MFR proposal. Later in 2000, Spowers organised a meeting at the Royal Institute of British Architects in London attended by one of the authors of this paper, in which it was decided to establish a company called OSCar Ltd to develop the technology (Finnamore, 2010). Following some technology development

projects co-funded by industry and government, which were closely followed and reported on by the authors, OSCar became Riversimple and the concept became a prototype car in 2016. The car, able to deliver the equivalent of at least 200 mpg, is itself a carrier of a range of radical technological innovations some of which were different to our original thinking. From the hydrogen micro-fuel cell power source and the lightweight carbon fibre reinforced plastic composite body shell, to the 'Network Electric' system of hub-motors driving the wheels via hybrid ultra-capacitors with regenerative braking capability, the car concept combined a suite of radical breakthroughs in a way that the mainstream car manufacturers have been unable or unwilling to do. The customer proposition is simple: A monthly 'performance contract' covers all the insurance, service and vehicle running costs, crucially including the hydrogen refuelling which gives the business an enormous incentive to invest in efficiency. In this way, Riversimple is a pioneer in genuinely selling mobility as a service. An important aspect of the Riversimple model, and one that goes beyond the original conception of Micro Factory Retailing, is the governance structures created for the business (Wells, 2016). Hence the process has been one of iterative learning and the exchange of ideas, which continues to this day.

Along this research journey, the MFR concept has been used by us as an idealised metric against which to compare subsequent developments, in a form of 'field testing' (Pascal et al., 2013:266) over a period of about 18 years. In this manner a more critical stance has been taken of, for example, purely technical innovations in powertrain that have emerged in more recent times but which have not sought to be part of a broader challenge to existing concepts of automobility or of the industry model that supports those existing concepts. In turn such insights have supported further engagement and impact in other areas such as carbon emissions reduction policies (Brink et al., 2005; Wells et al., 2013; Chase et al., 2014), policies and business models to support electric vehicles and associated infrastructures (Wells, 2010c; 2010d; 2013; Wells and Nieuwenhuis, 2012; Hill et al., 2013a; 2013b; ENEVATE, 2013), local economic opportunities around electric vehicles (Wells, 2012; ENEVATE, 2013; Newman et al., 2014a; 2014b; 2014c), and the interaction between incumbents and new entrants in the industry around technological innovations such as autonomous cars (Wells and Nieuwenhuis, 2012; Steinhilber et al., 2013; Wells and Xenias, 2015). These activities have included industry conference events and corporate training workshops (for example in Wells, 2014a; 2014b).

6. Analysis: Longitudinal immersion processes and mechanisms

We argue that longitudinal immersion gives rise to 'scholarship as expertise' to the point where the knowledge bases of that expertise have melded over time and cannot be attributed to a particular event or research project. The significant long-term participation in industry and policy is partly illustrated by Table 1 in which it can be seen that industry journals and conferences, and non-academic reports in the public domain, are a significant part of our collective output. As is shown in the MFR case, there is an iterative dynamic here in which ideas continue to be dropped, or developed or added to as new information, new ideas and new interactions occur. In a sense, therefore, longitudinal immersion does not refer to a single research methodology so much as a compendium of projects or studies in which various methodologies may have been employed in a way that allows a cumulative understanding to be aggregated over time. We are confronted with living with contradictions or disparities between our idealistic aspirations (deep structural

sustainability) and the everyday reality of rather more mundane and limited research projects. We understood our research object as a field, and an instance of what Bourdieu refers to as 'habitus' in which human actions (of management for example) are not reducible to rational calculation or adherence to externally imposed 'rules', but are capable of individual agency (Swartz, 2002). Many of our ideas and insights came from managers inside the automotive industry, even though these were expressions that were in conflict with the mainstream or 'official' view.

The approach described here is not passive, nor is it necessarily concerned with the objective accumulation of data in order to verify or nullify a hypothesis. Inside the specific research projects we largely have client objectives to meet but used the experiences to further a more normative and prescriptive series of innovative solutions to embed sustainability in this most challenging of industrial settings. Moreover there is a combination of idealism, pragmatism and opportunism in longitudinal immersion: it is part purposive and part serendipity. As self-funding contract researchers it was necessary to accept work from the very industry and government agencies we sought to challenge, yet as Figure 1 illustrates the various projects were then mobilised as pieces of the whole that we sought to understand and change. In this sense the approach is not as logical, sequential or as structured as the well-known CIMO framework developed by Denyer et al. (2008). The CIMO approach has four components: context, intervention type, generative mechanisms, and intended outcomes. In this framework, design propositions are grounded in research, which is to say that propositions connect with a scholarly body of knowledge in the literature, and are then tested in practice (Pascal et al., 2013). In contrast, while the MFR concept was indeed 'designed' as a consequence of acquired knowledge it also emerged as an idealised answer to the question: what would the automotive industry look like if designed with a clean slate and premised on minimizing negative sustainability impacts? The concept was not initially grounded in the literature on e.g. business model innovation as Pascal et al. (2013) advocate. Thereafter the concept provided the metric against which to evaluate new technologies, business models, social practices or other events that in turn could enrich and validate the concept. The concept also became a lens through which to analyse academic literature that has subsequently emerged. An important feature to highlight is illustrated by T17 in the bottom left corner of Figure 1. This marks the initiation of (published) work on sustainability and the automotive industry several years in advance of any funded research work, which laid the foundations for the credibility to win such work when the opportunities later arose. The strategic opportunity was identified, while simultaneously it spoke to normative values regarding the desire to work on sustainability issues and to be impactful. The 'mechanism' to realise this process was frequently pragmatic in that information or insight was obtained indirectly while undertaking funded work for clients with rather different interests.

Hence when it comes to the issue of impact this process of longitudinal immersion is also much less sequential and short-term than is typically expected – particularly with regard to work that has informed policy debates and where the outcomes observed are heavily mediated by multiple participants over extended time periods. Direct impact can come in multiple forms or forums, including: Interviews and research visits; commercial research; policy, strategy or operational outcomes and changes; and post-research consulting. Indirect impact may arise through: Student teaching; executive training courses; media appearances, interviews and other measures to inform debates; industry conference presentations; industry journal papers. Engagement does not necessarily result in impact, and not all impact is necessarily beneficial to the industry.

Research methodologies in the social sciences have long recognised the contribution of ethnographic studies, and embedding in user groups, but the tendency is to regard each research project as a one-off event or episode in which there are articulated research philosophies, aims and methods around which theory may be built, elaborated, confirmed or refuted. There is certainly immersion with ethnographic methodologies - a deep but temporary immersion in an individual setting, using techniques such as participant observation that allow underlying meanings and values to be understood. Longitudinal immersion again is different; it is not about participant observation or such discrete contextualisation, but it allows themes to emerge from multiple engagements of varying duration. It is part serendipity, part purposive action. It is partly continuous exploratory case study research in which idealised constructs such as the Micro Factory Retailing concept discussed in section five are tested, adjusted and elaborated in an approach somewhat related to that proposed by Ketokivi and Choi (2014).

With longitudinal immersion then there may be a combination of both instrumental and reflexive knowledge. As 'experts' on an industry the dialogues conducted with managers, policy-makers and others were, we recognised, shaped both by our ontological and normative framing, and by the perceptions others had of us. Additionally, there is a certain conflictual duality in the research process. Repeated entries into the world of the automotive industry (the 'habitus' Bourdieu would call it) has provided legitimacy and further access, and the work often entailed resolving the short-term problems members of that world faced, and hence to a degree involved helping to perpetuate that world. Simultaneously, the information so gleaned contributed to furthering the radical alternative that, if successful, would jeopardize that world. Thinking reflexively along this timeline, it is apparent that the partisan (or critical) Design Science approach adopted meant that an understanding of the industry (the phenomenon under study) had both strengths and weaknesses while we sought to be active participants in the industry we studied. The work also required an ability to develop creative, radical, effective and plausible solutions that were significantly different to mainstream industry thinking. Hence there is a need for synthesis and the ability to see how different elements, not in in one place, could when combined make MFR a reality.

Longitudinal immersion of the sort discussed here, informed by a normative vision of an idealised future, can also give rise to distinct problems. For example when considering reflexively our own actions and biases over this time period it is apparent that we did not understand sufficiently the ability of the industry to (repeatedly achieve) temporary resolution to the economic and environmental crises we had anticipated. Moreover, enthusiasm, optimism and a desire to see such radical change may also lead to bias in responses from interviews, etc. or in our selectivity in deciding which 'evidence' we wished to consider.

There are equally some similarities and differences with the realm of grounded theory, in which theory building is held to emerge out of the research experience. O'Reilly et al. (2012) are rather critical of the use of grounded theory in business academic research, taking the view that a rather cavalier approach has undermined the rigour of the method. This is in direct contradiction to the view taken by Fendt and Sachs (2008) who argue that too rigid an adherence to the procedures of grounded theory can undermine its pragmatic application value. However, in principle, with

grounded theory the process of testing can then proceed in a more quantitative and empirical fashion leading to results that are held to be statistically robust, verifiable, repeatable and generalizable. In the case of our particular form of longitudinal immersion the pattern is more one of sequential grounded theory experiences, or multiple instances of exploratory research without the purpose of generalisation per se. As noted above, a weakness that arises from this immersion is that of observer bias and the difficulty of controlling for errors of perception and judgement.

7. Conclusions: revisiting engagement and relevance in academia

The case presented in this paper is that long-term adherence to some core values around the theme of sustainability provided the coherence to tie the work together, without the explicit intention to be relevant to existing management practices and industry structures. We have combined the 'criticality' of Critical Management Studies with the solutions orientation of Design Science. In this sense it was not the intention of our research to enhance business performance in practice, although sometimes of course that was the result of individual projects. Rather, such activities were vehicles to enable deeper understanding in support of a more value-laden perspective on sustainability and mobility.

The MFR concept was always considered as a forecast, precisely because when the concept was initiated there was no extant example. Interestingly, some 18 or so years later elements of this forecast appear to be coming to pass, and not just in the automotive industry. As Holmström et al. (2016) describe, profound localisation and scale shifts are occurring around the possibilities of direct digital manufacturing. If academics are to be contributory to the future of management and business, in a world where the pace of change is accelerating, then there would seem to be a case for finding ways to lead change rather than simply record and document change led by managers and others in business. Delbridge (2014:104) argues that '…critique must involve an affirmative movement…' or that, in other words, it is incumbent upon critical scholars of management to offer up positive alternatives alongside negative critiques. In turn we would argue that longitudinal immersion may be one means to provide a legitimacy of understanding, and hence the foundation for purposive and anticipatory interventions.

In research teams the interaction and relationships between team members are a crucial element of the longitudinal immersion process. It is worth noting that the two authors had distinctly different positions regarding cars: with one being an avowed car 'fan' and the other very much not. In turn this contrast of perspectives assisted in sparking creative debate on many issues and, in settings involving industry members or policy-makers often resulted in differences in lines of questioning and debate. Typically, for example, individuals drawn from industry would have a more innate rapport with the car enthusiast researcher whose insights and interests were more aligned with the implicit position of those individuals. Alternatively, underlying assumptions and world views would be more likely to be challenged by the researcher who had no real interest in cars. We would argue that the research overall had some inbuilt checks and balances arising out of the relationship dynamics, and

this has helped improve the industrial credibility, policy applicability and academic robustness of the research.

The aspiration to intervene via design but with a critical perspective as we have shown combines a sometimes uncomfortable balance of both learning from industry and yet also using this knowledge in part to derive alternatives that may supersede that industry. It might be argued that a truly 'critical' sustainability perspective would seek simply the end of this particular industry and so seeking to design a viable alternative is a reformist rather than radical solution. In accepting the challenge to create an alternative while retaining a critical perspective, however, the design canvass is much more open than a business-as-usual mind-set. Crucially, it is important to remain relevant. Design solutions that are ill-informed, no matter how elegant, will have no traction with users who can dismiss the ideas as utopian. Hence a measure of the quality of the research that emerges from the duality of criticality and design is the extent of the engagement and impact that both precedes and follows the research process. A critical perspective may in this manner provide the impetus to an innovative reconceptualization of the problem space, and hence of the design ideas offered.

We may further conclude that in the context of business engagement with the increasingly important sustainability agenda (Guthey et al., 2014), the past is not a guide to the future. A different analytic approach is needed combining a deep and broad understanding of business and multiple academic disciplines. Prolonged expertise-building immersion in a specific sector results in an ability to add intellectual capital to that sector, as well as to business disciplines. As noted above, Mingers (2015) links the sustainability 'agenda' with the relevance gap, and argues that researchers should have a distinct ethical and critical stance. However, we would also draw attention to the difficulties of such puritanical views when faced with the everyday requirements to generate funding for research centres, often from the very entities one might seek to be critical of. With longitudinal immersion there is an attempt to do both, to be relevant to the existing industry and yet also to retain the normative stance advocating radical change, despite the cognitive dissonance this may involve. Existing metrics and perspectives on engagement and impact overwhelmingly privilege and value short-term, measureable, episodic encounters that fail to challenge what Delbridge (2014) defines as the '…underlying structures of domination and inequity.' As a direct consequence the notion of expertise or wisdom accumulated through multiple, diverse research encounters is equally devalued. If management research is to be part of the wider public value social science then immersion and the resultant expertise are key to offering positive, progressive and imaginative solutions to societal problems.

A similar duality exists with regards to impact. Some of the project work conducted through this process of longitudinal immersion certainly had impact of the expected and mainstream sort, but most of our impact is diffuse, difficult to quantify and, in the case of MFR, distinctly marginal. So far. Perhaps in a further twenty years the concept will be seen as enlightened and visionary, a template for sustainable production and consumption. If nothing else, it suggests that we should not be too hasty to rush to judgement on whether impact has been made.

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Appendix 1: Key to Figure 1.

FP1 Ford Fellowship

FP2 Foreign Direct Investment (automotive) for the Black Country Development Corporation

FP3 Foreign Direct Investment (automotive) for the Ireland Development Authority

FP4 Foreign Direct Investment (automotive) for the Merseyside Development Corporation

FP5 Presswork sector study 1

FP6 Presswork sector study 2

FP7 Training needs / robotics study for the Welsh Development Agency

FP8 Future of wide strip steel (automotive) study

FP9 Aftermarket components supply sector

FP10 Foreign Direct Investment (automotive) 1 for Scottish Enterprise

FP11 EU Single Market programme evaluation

FP12 EU training needs and qualifications in retail and distribution

FP13 Future of retailing in the EU

FP14 International Car Distribution Programme

FP15 Retail and market futures

FP16 Future material choice for car bodies

FP17 Future material choice for cars

FP18 Daily rental industry (UK) for rental company

FP19 Daily rental industry (EU) for rental company

FP20 Road Traffic Advisor (EPSRC)

FP21 Shipping used cars (for Ugland)

FP22 UK rental and leasing market (BVRLA)

FP23 Two-wheel market (EU) for vehicle manufacturer

FP28 Toyota (European citizen) study

FP29 Vehicle manufacturer profiles (FT)

FP30 Targeting Honda suppliers for the Welsh Development Agency

FP31 Environmental Rating System for Volvo Cars

FP32 Life Cycle Analysis review for UK DETR

FP33 Lex Automotive carbon emissions reduction policy

FP34 Impact of End of Life Vehicle Directive for MVDA

FP35 Micro Factory Retailing project (BRASS 1) (ESRC)

FP36 Business models and sustainability project (BRASS 2) (ESRC)

FP37 McKechnie strategy

FP38 China 5 year plan input (UNIDO)

FP39 Commercial vehicle regulation study (ACEA)

FP40 Euro V regulation study (ACEA)

FP41 Hidden innovation study (NESTA)

FP42 EU carbon emissions regulation 1

FP43 EU carbon emissions regulation 2

FP44 Carbon emissions zone study (Transport for London)

FP45 Contract R&D sector study (SMMT)

FP46 UK engine production sector study (SMMT)

FP47 4x4 urban areas study (Greenpeace)

FP48 Carbon emissions study (Greenpeace)

FP49 PLACE research centre (funded research assistant)

FP50 Cost of regulation (EU)

FP51 R&D intensity in the automotive industry (EU)

FP52 Low carbon technology and job creation (ECF)

FP53 EU Regulation review – fitness for purpose (CSE)

FP54 ENEVATE (Intereg IV programme) electric vehicles

FP55 Downweighting project (EU)

FP56 Best Environmental Management Practice (EU)

FP57 Low Carbon Vehicle policies (LowCVP)

Integrating concepts and academic theories

T1 Brakes and friction materials

T2 Supply chain management and linkages

T3 Procurement strategies

T4 Buddism

T5 Micro Factory Retailing

T6 Industrial ecology of business models

T7 Sociotechnical transitions

T8 Policy intermediaries (Technology innovation systems)

T9 Future of car markets and automobility

T10 Advertising and marketing (green marketing)

T11 Business models

T12 Renewable eco-industrialism

T13 Corporate alliances for FDI and Eastern Europe

T14 Local economic development

T15 FDI and UK regional development

T16 Regulation and collaborative R&D

T17 Cars and the environment

Books authored or edited

B1 Green car guide

B2 The new European automobile industry

B3 The automotive industry and the environment

B4 The death of motoring

B5 Motor vehicles in the environment

B6 The business of sustainable mobility

B7 The automotive industry in an era of eco-austerity

B8 Business models for sustainability

B9 Sustainable automobilty – understanding the car as a natural system