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Sustainability transitions and final consumption: practices and socio-technical systems

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This article examines the significance of final consumption processes for understandings of prospective transitions towards more sustainable societies. It argues that most existing conceptualisations either place too much emphasis on technology or on 'consumer behaviour', ignoring the deeply intertwined relationships between the two. After briefly reviewing recent contributions to the technology-oriented multi-level perspective (MLP) and to social scientific explanations of 'behavioural change', we outline a practice-based approach to understanding final consumption and sustainability. Practice-based approaches reveal processes of reproduction (stasis) and change in forms of consumption, which we argue present conceptual insights into sustainability transitions. By examining the tensions and crossovers between the MLP and practice-based approaches to consumption, three specific forms of interaction are identified for further conceptual and empirical exploration: the social relations of consumption; co-dependent changes in production and consumption; and, technologies, practices and consumption.

Keywords: sustainability transitions; final consumption; sociotechnical systems; theories of practice; multi-level perspectives

1. Introduction

The environmental sustainability of final consumption is fast becoming an intractable contemporary problem. Put simply, despite some progress in reducing the ecological impacts of supply chains and some substitution by consumers of more for less sustainable goods, overall levels of consumption continue to rise with corresponding increases in the ecological impacts of everyday lives (Munasinghe et al. 2009). Recent climate science presents an ever worrying scenario of escalating emissions and temperature effects: a 2°C containment looking ever less likely (Anderson and Bows 2011). Urgent societal responses continue to be called for, with claims that climate change constitutes the most dramatic challenge that modern capitalist economies have yet faced

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(e.g. Stern 2007). The challenge is all the more because of the historically slow pace of social, cultural and technological changes that are required.

Despite the increasing weight of evidence of the relationship between escalating final consumption (by which we mean the consumption of goods and services by private consumers as opposed to business-to-business consumption) and ecological impacts (Jackson 2009), debate remains contained within relatively myopic frames of reference that concentrate primarily on efficiency gains. The mantra of simultaneously addressing the sustainability of production and consumption is well rehearsed, but the relationship between the two remains under-specified and all too easily packaged as being a matter of supply and demand (Princen 2006). From the perspective of production the challenge is framed as a matter of developing less resource intensive production technology and organisation, more environmentally benign products and services, or palliative solutions (such as solar radiation management or geo-engineering), which require no change to processes and forms of final consumption. From the perspective of final consumption, the frame of reference is even more nebulous and a matter of either consuming less or, most frequently, of making different choices in what to buy and how to live one's life. Consumption itself is treated as a relatively static affair: ways of life are, effectively, inert and responsive to external stimuli, while pro-environmental consumption is presented as a matter of voluntaristic switching of consumer choices toward more environmentally sensitive alternatives.

Arguably, attention to consumer behaviour has become a more popular option in policy rhetoric. It is hoped that changes in consumer behaviour offer a much less expensive route to more sustainable societies than massive investment in infrastructural technology development and implementation. Even in the case of 'greener' products, attention is turning towards the question of the barriers to their widespread adoption, especially in the context of overcoming habitual consumer behaviour (Dolan et al. 2010; Darnton et al. 2011).

The move away from 'pure' technological fixes is, in many respects, welcome, but runs the risk of creating a false dichotomy in which technology and behaviour are regarded as separate solutions to the climate change challenge. Research on transitions in socio-technical systems, particularly those framed in the multi-level perspective (MLP), have persistently challenged polarised views of technology and behaviour by drawing attention to the complex relational and recursive inter-connections between innovation, social life and economic organisation.

The MLP has a number of significant strengths in capturing a range of processes that both reproduce and change socio-technical systems in ways that are responsive to, and generative of, final consumption. Despite this, the MLP presents a relatively poor conceptualisation of processes of final consumption, largely reduced to *avant garde* lead users that engage with radical innovation possibilities, special interest groups that lobby against existing sociotechnical systems and the larger class of ordinary consumers who are entrenched in existing arrangements, before eventually responding to an emerging new system. More persistent mechanisms that underpin the dynamics of consumption are ignored. We begin by briefly reviewing the main mechanisms of the MLP paying particular attention to what is implied about final consumption in this approach. We then turn to a discussion of the dominant approaches to behaviour change and final consumption, which we argue are based within the 'portfolio model of action'. This discussion is used to locate our argument that a practice-based approach offers a more appropriate set of concepts for understanding processes of transition with respect to final consumption. Finally, potential crossovers and tensions between the MLP and practice-based approaches are explored through the identification of three forms of interaction that, we argue, require further conceptual and empirical analysis in order to advance understandings of pathways towards more sustainable societies, and to avoid artificially dichotomous analyses of technological and behavioural change.

2. Multi-level perspectives on transition and final consumption

We start with the MLP on sustainability transitions because it has emerged as a dominant approach for understanding major system level shifts in social, economic and technological arrangements at a scale believed by many to be necessary to meet the present challenges of environmental sustainability. The MLP on transitions (Geels 2002; Geels and Schot 2007) presents a theoretical account, supported by numerous case studies, of the recursive ways through which innovations in technology and organisation emerge in relation to broader socio-cultural, economic and political contexts. The approach argues for a focus on the *socio-technical*, implying an inextricable linking between society and technology. Its multi-dimensional, nested hierarchical framework is succinctly outlined by Geels (2010, 495) as follows:

The MLP distinguishes three analytical levels: niches (the locus for radical innovation), socio-technical regimes, which are locked in and stabilized on several dimensions, and an exogenous socio-technical landscape. These 'levels' refer to heterogeneous configurations of increasing stability. The MLP proposes that transitions, which are defined as regime shifts, come about through interacting processes within and between these levels. Transitions do not come about easily, because existing regimes are characterized by lock-in and path dependence, and oriented towards incremental innovation along predictable trajectories. Radical innovations emerge in niches, where dedicated actors nurture alignment and development on multiple dimensions to create 'configurations that work' (Rip and Kemp 1998). These niche-innovations may break through more widely if external landscape developments create pressures on the regime that lead to cracks, tensions and windows of opportunity. Subsequent struggles between niches and regimes, and possible replacement, take place on multiple dimensions (e.g. markets, regulations, cultural meanings, infrastructure) and are enacted by interpretive actors that fight, negotiate, search, learn, and build coalitions as they navigate transitions.

Notwithstanding the explicit intertwining of society and technology that is argued for through the term socio-technical, all MLP studies place technological innovations at their core. The approach is about radical technological change that typically involves a suite of interconnected technologies that comprise a system. It stresses co-evolutionary dynamics that link technological change and changes in industrial organisation, financial institutions, cultural understandings, government policies and user practices. With the privileged position of technology in the account of regime shift, empirical studies look at examples such as the emergence of automobiles, steam ships, new farming technologies and renewable energy technology systems.

The MLP studies technology-driven creative destruction. It is focused much more on incumbent producers and the developers of radical innovations than on the shifts in patterns of consumption that are required to absorb those radical innovations. Despite this productionist focus, the MLP does recognise the significance of consumption in processes of socio-technical change. Consumers are defined as users of the key technologies in question, and it is their responses to the technologies under investigation that are taken to represent processes of final consumption. This leads analysis to focus on what can be described as 'special users' associated with radical sociotechnical innovations at the niche level. More generally in innovation studies, such users have been described as vanguard consumers (Walsh, Cohen, and Richards 2001) that are early adoptors of technologies or 'active consumers' (Bianchi 1998) that engage intensively in modifying and developing the technology ready for wider market release, an example being 'prosumers' who trial and modify software online before general release (Jurgenson 2012).

Beyond special users are, presumably, the mass of 'ordinary users'. While under-specified, the implication of MLP with respect to transitions in 'mass' consumption rest on mechanisms of contagion through the emulation and mimicry of vanguard consumers by ordinary users. In this

way, ordinary users are viewed as a relatively homogeneous group trapped within the incumbent socio-technical regime; their attachments to existing technologies provide stability to that regime and are a source of resistance to radical innovations. Changes in mass consumption, within this class of ordinary users occur in a reactive fashion only after disruption at the landscape level and when the innovative niche level work of *avant garde* producers and 'special users' has gained some momentum. More recently the MLP has been extended to incorporate special interest groups that play a pivotal role in exerting pressure on existing regimes and in advocating alternative solutions through processes of normative contestation (Elzen et al. 2011). 'Special interest groups', a broad category that captures organisations such as civil society organisations and consumer advocacy groups through to political and ethical consumers, present a second mechanism for transitions in consumption through struggles to provoke bottom-up change at the regime level (Smith, Stirling, and Berkhout 2005).

The MLP has never claimed to systematically address potential transitions in consumption and in line with the mainstream of innovation studies, the main focus has been on producers and their development and implementation of radical innovations, and on the role of political governance in orchestrating such system level transitions. This skewed focus is acknowledged as an area where the MLP could fruitfully engage in further development:

To address the analytical challenges around normativity, directionality, and social mobilization, innovation studies may need to broaden its analytical scope to include additional dynamics related to civil society, social movements and consumer behavior. Further crossovers to cultural studies, political economy, economic sociology and consumer studies may therefore be fruitful for a comprehensive study of socio-technical transitions to sustainability. (Geels 2010, 508)

Such a broadening of analytical scope would, we argue, require studying the dynamics and mechanisms of consumption beyond the confines of special users and interest groups who apply pressure to incumbent regimes through normative contestation, to take full account of how processes of consumption are configured and ordered in the first place. Recent developments in theories of practice are best placed to provide these necessary insights, but to explain why this is the case it is necessary to outline dominant approaches to consumer behaviour change and environmental sustainability in order to clarify, at the theoretical level, why a practice-based approach to consumption offers more instructive conceptual tools for analysis.

3. Consumption, behavioural change and the sustainability challenge

Final consumption is often conceptualised as a matter of relatively autonomous consumers exercising decisions or choices, often within markets, regarding the many different goods and services that they can acquire and use. This conceptualisation of the consumer is firmly rooted in an ontological position that Whitford (2002, 325) describes as 'the portfolio model of the actor . . . in which individuals carry a relatively stable and pre-existing set of beliefs and desires from context to context. Given the situation, they select from this portfolio "those elements that seem relevant and [use] them to decide on a course of action"'. According to Whitford, the portfolio model has come to gain 'paradigmatic privilege' and can be found at the core of a wide range of approaches to understanding action. With respect to final consumption, this can be applied to theories of rational choice, planned behaviour, and some accounts of reflexive and ethical consumers.

The current political fashion (at least in the UK and USA) for 'behavioural change' initiatives appears to be strongly rooted in the 'portfolio model'. Perhaps most prominent are social marketing

and information campaigns (McKenzie-Mohr 2000), which hope that individuals will conform to the model of rational actors and see that it would be only sensible to modify their ways of life and help save the planet. Where this strategy does not seem to work, recourse is had to trying to increase people's commitment to the tenets of ethical consumption (Vermier and Verbeke 2006), whether through 'bottom-up' political mobilisation (Micheletti 2003) or through an appeal to the societal responsibilities of 'citizen-consumers' (Spaargaren 2003). If people held green values tenaciously and deeply enough, they might be more assiduous in turning their general sympathy for the environment into new behavioural commitments. Yet, even where we find apparently pro-environmental values they do not necessarily translate into pro-environmental actions. For example, DEFRA (2008) report on a range of evidence which reveals that the percentage of people's attitudes to pro-environmental consumer behaviours was consistently higher than the percentage of people who took measures to change their behaviour. While some of this discrepancy can be explained by survey respondents not being sure about what steps they could take, the evidence does suggest that the relationship between 'attitudes', 'values' and 'behaviour' is not straightforward. The 'value-action gap' reveals a critical lacuna in policies for changing patterns and forms of final consumption.

These approaches to consumption and behaviour change are to a large extent based on methodological individualism. Confounding issues such as the durable or habitual nature of behaviour are taken to be properties of individuals, as limitations in their cognitive ability to appraise all alternatives in the course of their daily lives. Acknowledgement of the importance of social norms is present but, again, this is presented as *context* that influences individual decision making. Behaviour is separate from technology: the challenge is presented entirely as one of removing barriers that appear to stall the adoption of eco-innovations. Approaches under this banner appear ill suited to the scale of transition studied under the auspices of the MLP; and they are also at odds with some of the fundamental ontological building blocks of the MLP, especially the inseparability of technology and society as coevolving entities and the routine, rule based foundations of human action. Practice-based approaches to consumption offer a more compatible set of conceptual tools for understanding processes of change and the potential to identify pathways for systemic shifts in the sustainability of final consumption.

4. Final consumption: a practice-based approach

Some suggest that we have experienced 'a practice turn' in the social sciences over the last couple of decades (Schatzki, Knorr Cetina, and von Savigny 2001). The gist of this is to conceptualise human action in a rather different fashion to that presented by the portfolio model by shifting the core analytical focus away from discretionary individual actions and toward 'blocks' or 'patterns' of actions. In outlining a theory of practice, Reckwitz (2002) makes a critical conceptual distinction between practices as 'entities' and as 'performances'. Practices are configured or shaped as entities (as recognisable, intelligible and describable) by the many elements that comprise the conditions of existence of a practice. While there is no single typology of the elements that configure practices, the most frequently cited are cultural conventions and representations, material objects, normative understandings of competent performance, social and economic institutions, and spatial and temporal organisation (see, for example, Warde 2005; Southerton 2006; Shove, Pantzar, and Watson 2012). Arrangements of such 'elements' both configure how practices are conducted and make them identifiable to practitioners and non-practitioners alike.

Practices also exist as performances: it is through the 'doing' of practices that the pattern provided by the practice as entity becomes meaningful and the entity is reproduced and modified.

In this respect, practice-based approaches can be regarded as ‘meso’ level analytical constructs. In their focus on practices as entities they identify a range of relatively stable elements that configure (at a macro level) blocks and patterns of action, while practices as performances draw attention to the (micro-level) production and reproduction of the ‘doings’ of daily life. It is this recursive interaction (between entity and performance) where the dynamics of reproduction and change are located.

In this article, we are interested in how practice theory can contribute to an understanding of potential shifts towards more sustainable patterns of final consumption. As Warde (2005, 137) makes clear, ‘consumption is not itself a practice but is, rather, a moment in almost every practice’. Consequently, consumption occurs as items are appropriated in the course of performing practices. Conceptualising consumption in this way moves analytic attention away from specific goods and services and from individual expressions of preferences, towards an understanding of how products are appropriated as a consequence of the ways in which practices are socially ordered. In making such a conceptual shift, notions of demand, need and want are re-cast as the consequence of the ‘doings’ (or practices) through which daily lives consist: as Warde (2005, 137) puts it, ‘activity generates wants, rather than vice versa’. Warde (2005) identifies four themes through which practice-based approaches can advance understandings of how forms of final consumption are reproduced or change; and, in doing so, he identifies key processes that have significance for transitions towards more sustainable ways of life.

The social differentiation of practices and their performance

The performance of any practice is socially differentiated such that groups both understand and engage in the same practice in variable ways. Two prominent theoretical strands offer important insights into how social relations impact on processes of consumption. The first, social worlds, provides an account of how commitments to different forms of consumption are produced and reproduced through inter-personal associations. Distinctions between insiders and outsiders, newcomers and established participants, and regular or infrequent performers within any set of practices play a critical role in shaping how those practices are understood by the different participants, and what the subjective bases of competent and satisfactory performance (including modes of consumption) are for those groups (Becker 1984; Gronow 2004). The second relates to Bourdieu’s (1984) account of social distinction, which argues that social groups are objectively positioned within any ‘field’ of consumption, and it is this positioning that structures the ways in which they engage in practices. Objective positions in social space derive from differential levels of key resources: material wealth (economic capital); cultural knowledge and know how (cultural capital); and, access to networks (social capital). Such resources produce dispositions that are internalised as ‘habitus’, and which form the basis of judgments of taste as social groups appropriate and reject different modes of consumption as being for and not for ‘us’.

Accounts of social distinction and, to a lesser extent, social worlds emphasise the relationships between social groups as dynamic mechanisms for reproducing and changing the practices through which consumption occurs. Social groups vary in their understandings of practices, of what constitutes competent performance, and which goods and services ‘should’ be appropriated in order to perform any practice in a satisfactory fashion. Such differentiation is critical for a more robust conceptualisation of the struggles (that feature in Bourdieu’s account of distinction) and negotiations (that feature in Becker’s account of social worlds) between groups over the legitimacy of performing those practices in particular ways. It is through such social interactions that practices and, therefore, consumption are reproduced (potentially creating resistance to radical innovations)

or transformed (including, potential receptiveness to innovations). To understand the dynamics of transition towards more sustainable societies requires attention to the socially differentiated ways in which groups engage in practices and, therefore, consume particular goods and services. This is not just a matter of understanding the socially stratified acquisition of new product and service innovations (important as this is), but also why different social groups vary in their performance of practices, including what they actually do with any innovations that might be adopted.

The multiplicity of practices

It is well established that tackling sustainable consumption is about more than simply switching to environmentally sensitive products and technologies, but requires also tackling escalating volumes of consumption. Portfolio models of action tend to retreat into assumptions of avarice and materialism (fuelled by the commercial interests of producers) when attempting to account for the rising volumes of consumption that mark out the contemporary period. Warde's second theme provides an alternative explanation of how such escalation occurs, namely through the multiplication and diversification of practices. The first focuses on the infiltration of products across practices. Warde provides the example of radios and CD players being inserted into cars as an illustration of how products related to 'other' practices are imported into the practice of motoring. This is a process of multiplication, both of the range of products inserted into the performance of any given practice and the multiplication of practices conducted simultaneously (in this example of driving and listening to music). The second attends to current trends of cultural omnivorousness (Peterson and Kern 1996), a process through which engagement in, and experience of, an ever-expanding repertoire of cultural practices (as opposed to detailed knowledge about a few practices) has come to feature prominently in the consumption patterns of the most affluent social groups. As such, the practice-based approach offers opportunities for analysing the mechanisms through which the range of goods and services associated with the competent performance of practices accumulate, and thus provides some capacity to deal with transitions that may seek to address volumes of consumption.

The individual at the intersection of practices

While a practice-based approach presents a strong critique of the methodological individualism that features in portfolio models of action, this does not delete the individual from social scientific enquiry. Rather, a practice-based approach presents the individual as the intersection of practices, and their pattern of consumption as being the 'sum total' of the practices in which they engage. Patterns of consumption thus provide a good indication of the social ordering of practices as entities and insights into the changing performance of, and relationship between, particular practices over time and space (e.g. Warde et al. 2007, on food consumption). Examining volumes or patterns of time devoted to a practice or set of practices, for example, thus provides some indication as to variations of commitment, to the multiplication, diversification or decline of a practice (e.g. Cheng et al. 2007 on the decline of the family meal), and of the consequences of changing ways of performing practices for the social organisation of daily life (as exemplified by Gershuny's (1978) account of the self-service economy). In this respect, practice-based approaches treat individual actions as a simple empirical observation, rather than as a unit of conceptual explanation. To understand and explain transitions in consumption requires looking beyond the individual to reveal how the myriad of practices in which actors engage are collectively coordinated, ordered and performed. This means that while experimental individual performances (new ways of doing)

are an important source of change for sustainability transitions, their significance can only be understood in the context of stabilised practices and social relations. Moreover, they will only matter in sustainability transitions if they play some part in reconfiguring collective practice, such that the new ways of participating in the practice become stabilised and recognisable in the practice as entity.

The trajectory of practices

Practice-based approaches present a recursive account of social change, the crux of which rests in the observation that practices simultaneously represent significant forms of inertia and transition. Inertia and transition are located both in practices as coordinated entities and in their performance. The ‘elements’ that coordinate practices as entities, whether historically entrenched conventions, socio-technical infrastructures, temporal organisation and so on, present forms of path dependency that reproduce existing ways of doing. Correspondingly, shifts in the arrangements of those coordinating elements can provide the impetus for change. Similarly recursive processes can be identified with respect to the performance of practices. Many performances are based on habitual forms of action (described by Camic (1986) as ‘self-actuating’ dispositions) that can appear as inertia. Yet, as Warde (2005, p. 140) observes ‘performances in the same practice are not always the same’, and ways of doing practices are often contested by new recruits who experiment, adapt and improvise around the orthodoxies of that practice in their performances (generational differences in the consumption of music being a good example).

Trajectories of the practice of washing (ourselves) provide an indication of the recursive tensions in practice transitions. Hand, Shove, and Southerton (2005) explore the processes through which showering came to be a normal, routine and widespread daily practice. In their account, three interconnected ‘elements’ help explain the emergence and reproduction of the practice. The first related to domestic infrastructures, the provisioning of water and the multiplication and diversification of spaces within homes designated for the practices of body washing. The second related to changing cultural conventions of cleanliness and well-being that re-positioned the practice as a matter of invigoration and relaxation as well as cleanliness. Finally, the shifting socio-temporal organisation of daily life, particularly in terms of emergent senses of time pressure, rendered showering a convenient and expedient mode of the practice of bodily washing. In its performance, the practice of showering is emergent in relation to a multiplicity of other practices (Hand et al. give examples of corresponding shifts in practices of personal grooming and fitness) and a diversification of the practice itself (e.g. different modes and forms of bodily washing), such that the rapidly increasing frequency and durations of bodily washing that characterise contemporary UK society appear as a static, stable, normal and necessary practice of daily life.

Practice-based approaches emphasise processes of change in consumption. Rather than reduce these processes to matters of individuals choosing goods, services and lifestyles, practice-based approaches view consumption as the outcome of unfolding, often path-dependent, practices. Individuals matter only in that they represent the intersection of practices and that they perform practices. However, even those intersections (the range of practices in which individuals perform and the ways in which they do so) should not be understood as matters of individual discretion, but located in the dynamics of social differentiation, and multiplicity and diversification of practices. Processes of change can also be found in practices as coordinated entities in that shifts in the organisation of inter-related practices over time reconfigure the meanings and performances of practices (as illustrated by the case of showering with respect to practices of bodily washing). If consumption (or consumer behaviour) is accepted to play a critical role in achieving sustainability

transitions, then a practice-based approach provides a useful set of conceptual tools for understanding the processes through which forms (and the volume) of consumption are reproduced and change.

5. Consumption, socio-technical systems and the transition to more sustainable societies

The MLP on sociotechnical transitions and practice-based approaches to the study of final consumption both offer important insights into the prospects for major transitions towards more sustainable societies. Fundamentally, they share common ground in their opposition to key assumptions based within the portfolio model of action that have come to dominate debates about pro-environmental behaviour change. They both offer accounts that emphasise significant societal change involving coordinated shifts in multiple and systemically interdependent elements. While the MLP explicitly foregrounds a hierarchical and nested understanding of change processes with increasing structuration and embeddedness from niche to regime to landscape levels, alternative practice approaches differ significantly in this respect. Schatski's (2012) call for a flat ontology in theories of practice is in marked contrast with the more socially structured and ordered approach advocated by Warde's treatment of practice as a concept for analysing consumption, and it is the latter that offers the greater scope for developing conceptual connections with the MLP. A further dimension of similarity foregrounds the routinised nature of human action, whether that relates to practitioners within firms or practitioners as consumers. The practice and MLP approaches also both assume an inseparability of technology and society: technologies are only significant and make sense when understood in the context of how they are used; and, social existence can only be properly understood when due account is taken of the technologies upon which it depends. Finally, the emphasis on recursive processes, as opposed to the 'cause and effect' models that characterise 'variance theories' such as rational choice or theories of planned behaviour (Geels and Schot 2010), presents a fundamental consistency between MLP and practice-based accounts of social change.

Given these shared conceptual foundations and the common interest in developing social scientific frameworks for understanding the dynamics of potential sustainability transitions, there would appear to be strong grounds for stimulating a dialogue between MLP and practice researchers. This article has already suggested differences between the approaches in terms of the units of analysis that are employed. So far, the application of practice approaches to sustainability transitions has largely focused on final consumption and changes in what people do in their everyday lives; there has been no equivalent analysis of changes in the organisation of production (although, practice theory has grown in significance in the management literature on organisational change). By contrast, the MLP has paid very little attention to final consumption and remains an approach that foregrounds the importance of technological change. To remedy these oversights, and drawing on both the tensions and shared conceptual foundations of the two approaches, we suggest three significant forms of interaction that require greater conceptual and empirical attention in order to advance understandings of, and the prospects for, sustainability transitions.

The dynamics of social relations in final consumption

The practice approach to understanding consumption offers a focused view on explanations of what people do in their everyday lives and why they do it. Logically therefore, it also provides a useful platform for examining the environmental burdens of the consumption that occurs in the course of performing practices. The MLP has yet to take seriously the dynamics of final

consumption beyond some recognition of the role of special users and interest groups. Moreover, MLP studies have a tendency to understand these groups of users only as they appear in specific empirical examples of socio-technical change. In other words, the MLP offers limited theoretical or conceptual explanation for the social dynamics that occur between different groups of users that might help to explain their different orientations towards major transitions.

This point is perhaps best illustrated by the lack of systematic conceptual clarity within the MLP regarding the appropriation and diffusion of technologies. The MLP implies that this occurs through two mechanisms: emulation and struggles between agents with particular interests. On the one hand, the implications of attention to special users is that mechanisms of emulation operate such that niche forms of consumption are eventually adopted by ordinary users as the technological innovation takes grip in the socio-technical systems at the regime level. This may involve initial struggles between agents within socio-technical systems as niche technologies challenge the incumbent system, but when it comes to processes of adoption and diffusion the principal mechanism is assumed to be one of emulation. On the other hand, emphasis on 'interest groups' such as advocacy agencies and civil society organisations assumes principal mechanisms of struggle, as particular groups seek to influence and purposively shape the socio-technical regime in order to generate 'windows of opportunity' for niche or alternative technologies. While not necessarily contradictory mechanisms, these processes are considered in the absence of any conceptual explanations of the social relations that present particular social groups as special users or the dynamics that exist between different groups.

By contrast, the practice-based approach presents two specific mechanisms of social differentiation and comparison that highlight the relationship between struggles and negotiations, and between reproduction and change, in the trajectories of practices. The first is that subjectively acceptable performances of practices, and thus the consumption of goods and services, are explained in relation to historically embedded cultural conventions, social networks, and forms of reputation that result from interactions between groups within social worlds or communities of taste. This is not a matter of emulation but of co-evolution between 'ways of doing' and 'understanding' practices, as presented by social groups who perform those practices from different social positions. In this sense, cultural conventions and social norms that generate similarities and differences in the performance of practices across social groups result from social interactions and associations that simultaneously contain mechanisms of emulation and struggle. Indeed, theories of social worlds present the dynamics of social interaction and association as the key mechanisms of social change. Second, and related, are Bourdieusian accounts of social differentiation that emphasise the power relations between social groups and the distinctions (both subjective and objective) that result. This raises the spectre that some social groups reject the consumption activities of others (e.g. special users) as being 'not for us' – neither seeking to emulate nor to consciously struggle against the consumption behaviours of others but simply dismissing them. Such mechanisms of distinction present clear consequences for any understanding of the potential for society wide shifts to more sustainable ways of living.

A more systematic conceptual grasp of social relations would help shed light on the different user groups identified within the MLP and provide a more critical account of the capacity to identify, or target, particular groups in order to facilitate sustainability transitions (a core objective of the MLP approach). Whether particular social groups share orientations, understandings and judgments of appropriate conduct across a range of practices is an important consideration in this respect. Accounts of taste in consumption present some insights into the apparent 'homology' between generic orientations toward ways of engaging in practices and social position. In his analysis of tastes and practices in the fields of clothing, home décor, travel, movies, reading, food

and socialising in the USA, Holt (1997) identified four principle antinomies of orientations that were consistent across all practices: autotelic vs self-actualising pursuit of the given practice; favouring function and utility over style; conformity vs originality and individuation; and, critical versus referential appreciation. Applied to observations in MLP research of different types of user, principled orientations towards cultural understandings and performances of practices may well present special users or the members of interest groups as representing particular segments of the population. Indeed, if, as Holt (1997) reveals, the professional middle classes tend to have orientations towards practices that are self-actualising, stylised, which embrace originality and individuation, and present forms of critical appreciation, then it stands to reason that it is from this social group that special users and members of interest groups will most likely emerge as supporters of pro-environmental socio-technical innovations. If other social groups define themselves in opposition, or systematically draw on different principal orientations, then mechanisms of emulation and struggle alone present particularly weak conceptual explanations of transitions with respect to final consumption.

A final consideration is that practice-based approaches provide insights into the escalation of consumption in everyday life, a subject that is conspicuous by its absence in MLP approaches. That needs and wants (and therefore demand) emerge from the performance of practice presents an important starting point. The inter-play and connections between different practices and the range of practices in which people engage (captured within Warde's 'multiplicity of practices' theme), present two mechanisms for understanding the processes through which goods and services come to be appropriated into an ever-expanding range of daily practices. This is a critical point: to foster sustainability transitions requires some understanding of how innovations, whether in technologies or practices, will impact on a range of activities in daily life and not just those specific to that innovation (and particular social groups).

Co-dependent changes in production and consumption

The overarching schema of the MLP is well suited to understanding connections between production and consumption, but cannot fully achieve this until it develops a clearer explanation of the dynamics of final consumption. This critique can be reflected by the inverse claim that practice-based approaches have yet to systematically consider processes of production, at least when it comes to studying sustainability transitions. Clearly, there is scope for movement in both directions, but what of the mechanisms that integrate production and consumption and their significance for understanding processes of change?

One way that MLP proponents have addressed this is by recognising the importance of mediators (marketing agencies, retailers, consumer advocacy and advisory groups, and cultural commentators) that occupy the 'space' (mediation junction) between producers and users (Schot and de la Bruhère 2003). While conceptually useful, and worthy of further analysis, the notion of mediators runs the risk of again identifying special groups or actors who articulate consumer 'demands' to producers and/or communicate and condition information about the various offerings of the market for consumers. Alone, such an approach is limited in its capacity to fully explore and explain the interdependencies between production and consumption.

The second and more fundamental potential contribution from the MLP to this issue is through the concept of sociotechnical regime, which stresses the overarching rules and understandings that coordinate and order the actions of producers, policymakers and consumers within a particular sociotechnical system. Such regimes are conceived of as durable sociotechnical arrangements that involve a high degree of complicity between producers and ordinary consumers, which explains

their relative stability and durability. Resistance manifests itself through the actions of special consumers and special interest groups beyond the dominant regime.

The practice approach shares some common ground with this thinking, by conceiving of practices (as entities) as a nexus between producers and consumers. Not only is it useful to think of wants and needs as emergent from the performance of practices, but also that practices as entities represent a terrain that can be difficult to interpret or influence for producers. As Warde (2005, 141) suggests, 'because practices have their own distinct, institutionalized and collectively regulated conventions, they partly insulate people, *qua* consumers, from the blandishments of producers and promotional agencies'. These difficulties are most clearly evident in the high proportion of innovations that are never absorbed into practices and are thus considered as failures.

This is certainly not to say that producers have no ability to intervene in and mould consumption. Spaargaren (2003) proposed a model that also views practices as intersecting and integrating between consumption and production, which suggests that everyday practices of consumption are strongly ordered by the structure and institutionalisation of economic systems responsible for the provision of goods and services. The logic of production systems in particular product areas accounts for what is available to consumers for their participation in associated practices and how those products and services are acquired. For example, the emergence of a supermarket system has profoundly affected eating practices (Harvey, Quilley, and Beynon 2002), just as it has brought about a shift towards buyer-driven commodity chains in the organisation of food production (Gereffi 1994).

A further illustration is provided by returning to the practice of showering. In this case, a nexus of practices including washing, but also exercising and modes of relaxing and invigorating the body, developed to create the conventions that recursively structured both the opportunities for producers to innovate and how people performed showering practices. It is in relation to this changing nexus of practices as entities that producers developed new domestic water infrastructures, shower technologies and a proliferation of shower products. Equally, the increased frequency, duration and resource intensity (water and cosmetics) of showering as an everyday practical performance can neither be adequately explained through a focus on behaviour nor socio-technical systems alone, but in terms of the emergent organisation of a nexus of practices that were both directly (e.g. personal grooming) and indirectly (e.g. time pressures in daily life) related to the performance of washing the body using showering technology.

Establishing stronger conceptualisations of interdependencies between production and consumption processes in sustainability transitions is critical because environmental burdens are distributed across the production and use of goods. As such, the prospects for sustainability transitions necessarily require changes in products, infrastructures, manufacturing processes and in the manner in which goods are used in the course of performing practices. One approach would be to extend conceptualisation of the role of mediators in terms of their ability to shape elements within the nexus of practices that occupy the space between producers and consumers. An extension of this would be a fuller account of the institutional space between producers and consumers, to account for the significance of alternative modes of provision, i.e. provision through markets, states or communities and households. The significance of this for understandings of sustainability transitions rests on which modes of provision will come to dominate for which practices (thereby defining how goods and services are acquired) and what this means for how new needs and wants that emerge from practices are articulated and recognised by producers in such a way that they pursue strategies for reducing environmental burdens. More fundamentally, further conceptual work is required to tease out similarities and differences between the notions that practices as

entities provide a nexus between production and consumption, and that sociotechnical regimes coordinate and bind producers and consumers.

How technologies are intertwined with practice and consumption

The MLP and practice-based approaches to final consumption share an interest in technological change as an important component of change processes. For the MLP, technology is core to both the theoretical account of historical transformations and also as a lens for empirical study. Transitions are always about how one set of technologies come to be replaced by another. Indeed, even in its excursions into more cultural aspects of social life, such as the transition to rock and roll (Geels 2007), the technologies of records and radios take centre ground. Practice approaches accord much less analytic privilege to technology, which is understood as one of several key elements that comprise a practice as an entity. Empirical research using practice approaches to investigate changes in final consumption would consequently start by looking at the elements that comprise the practice in question or at the doings that constitute the practice as performance.

Despite the importance of technology in MLP analysis, there has not been any significant analysis of how consumers (whether special or ordinary users) interact with technologies. This is somewhat puzzling, given the early work in science and technology studies, and provides an obvious path for extending the MLP. Equally, there is scope for practice-based studies to further develop insights from early STS and related studies to better understand how and why new products and technological infrastructures are acquired and how they affect practices as they are absorbed into everyday ways of living.

A starting point would be to reconsider the early ideas of ‘scripting’ introduced by Akrich: ‘Like a film script, technical objects define a framework of action together with the actors and space in which they are supposed to act’ (Akrich 1992, 208). Latour’s hotel key fob (1988) and Winner’s account of Long Island bridges (Winner 1980) serve as the more memorable examples of this interaction. In the case of the former, a large fob is attached to the key to script hotel guests to return their keys to the front desk before leaving. Winner’s bridges were more pernicious: low level bridges put in place on the road to Long Island beach to prevent the passage of public buses, thereby denying access to the beach for poor Americans.

Technologies and their scripts can be a powerful force in the dynamics of practice, although it is by no means certain that design scripts will be followed by all if any consumers. As Warde suggests, participants within practices often adapt and improvise their performances. As technologies are absorbed into everyday practices, new meanings and uses are developed, often far beyond those that had been imagined by designers. Silverstone and colleagues developed the idea of *domestication* to capture the process through which technologies become integrated into everyday ways of living. The process of domestication is not, however, simply a matter of consumers actively seeking to reinterpret the meaning of goods for specific ends. Rather, Silverstone (1993) emphasises how the domestication of technologies is a matter of their integration within practices, which simultaneously changes the performance of those practices. He identifies the impact on household temporalities of the widespread diffusion of the video-recorder as an example. Pre-video recorder, Silverstone observes how the temporal rhythms of household activities were, in part, coordinated around television schedules, with dinners eaten and dishes cleared so that the family could watch their favourite TV shows together. The adoption of video-recorders, which allowed TV programmes to be stored and watched at the time of individual viewers choosing, undermined those temporal rhythms and reconfigured the moral economy of households. While a simple example, the domestication of the video-recorder illustrates how changes in the social

organisation of practices (in this case principally the relationship between technologies and temporal rhythms) have a significant impact on the performance of practices that spread far beyond simply watching television.

Considering potential transitions towards more sustainable patterns of consumption, this discussion suggests that there is more at stake than the simple adoption of more eco-efficient technologies. Significant challenges and opportunities arise from potential shifts in the practices within which new technologies are absorbed; indeed, the absorption of technologies into practices must be amongst the most significant forces in changes to practices as performances and entities. This reinforces how important it is to look beyond the purchase of new products into how those products are actually used and embedded within existing nexuses of practices, and what the ecological impacts are of those practice nexuses. To take one cautionary example, the promotion and marketing of energy-saving light bulbs has had positive impacts on purchasing behaviour, which on face value would appear to be promising. However, cultural understandings of appropriate household ambience led to a simultaneous increase in the number of lightbulbs per household, thereby partially off-setting any resource efficiency gains from energy saving light bulbs (Southerton, McKeekin, and Evans 2011). This example not only re-emphasises the importance of looking beyond the technology to consider the other elements (in this case cultural understandings) that configure practices, but it also reveals that attempts to change consumer choice toward greener product alternatives often fail to take account of how the associated elements of practices might be changing.

6. Conclusion

This paper began with the well-observed claim that significant transitions toward more sustainable forms of consumption are required if the risks of human induced climate change and other environmental problems are to be averted. The MLP on socio-technical systems has emerged as a promising approach for understanding prospective sustainability transitions. However, as its principal proponents have recognised, the approach has not yet explored trajectories in processes of final consumption that will also be of critical importance in developing pathways for societal transitions toward more sustainable ways of life.

Approaches to behaviour change with respect to sustainable consumption are currently dominated by portfolio models of action which treat behaviours and technologies as discrete mechanisms for rendering consumption more sustainable, where one becomes a barrier to the development of the other (i.e. behaviour resists uptake of more efficient technologies or technologies constrain pro-environmental behaviours). Furthermore, such approaches to behaviour change, which draw on variance theories of cause and effect, are at fundamental odds with the process theoretical orientation of MLP. Rather, this article has argued that practice-based approaches to understanding processes of final consumption, with their emphasis on the recursive relationship between practices as socially ordered entities and as performances, present a more robust and suitably nuanced set of conceptual tools for advancing understandings of sustainability transitions.

Whether it is possible or useful to develop unifying theories for sustainability transitions is a matter for further empirical and theoretical exploration, but this article has argued that more detailed attention to what people *do* in their everyday lives and how this is socially ordered will be a necessary part of the analysis. In thinking through potentially fruitful lines for further research, we also suggested attention to three forms of interaction that will be critical to major sustainability transitions: (1) dynamics of social relations between social groups as a basis for understanding

processes of final consumption; (2) interdependencies between production and consumption; (3) relationships between technologies and consumers, with the context of everyday practices. Attention to these forms of interaction represents an opportunity to systematically interrogate insights from the MLP and practice-based approaches, and to explore the theoretical tensions that emerge. In doing so, the risk of reifying the separation of technology and behaviour in debates regarding environmental sustainability can be averted to develop an account that fully, and simultaneously, recognises the interconnections between social relations, production and consumption, and socio-technical systems. Such conceptual and empirical work is necessary if large-scale systemic transitions toward more sustainable ways of life are to be achieved.

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