

4. Sustainability, system innovation and the laundry

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Few would disagree that the challenge of sustainability is one of moving toward less resource-intensive ways of life built around new regimes of mobility, renewable energy or localized systems of food production. In understanding how shifts of this kind might be realized and in trying to engender them, environmentalists have much to gain from the careful analysis of comparable, large-scale transitions in the past. Following Hughes's (1983) path breaking study of the social and technical construction of networks of electrical power, it is by now usual to document the 'seamless webs' from which technological transitions like that from sail to steam, or from horse to car, have been woven and to acknowledge the institutional and political processes required in support. In this sense, much contemporary debate is genuinely 'socio-technical' in its orientation. However, there is another sense in which the agenda remains lopsided, skewed around provision rather than consumption and around the diffusion rather than the use of technological systems, tools and techniques. This chapter seeks to recover some of that missing ground and in the process develop and enrich 'transition theories' that have grown out of science and technology studies and the analysis of innovation.

The simple step of starting with convention and practice generates a substantially new menu of questions about the dynamics of system innovation. Approached in this way, the challenge is not only one of conceptualizing and steering pathways of infrastructural development like those associated with energy supply, but of also understanding the transformation of demand and the institutionalization of energy consuming services like lighting, cooling or central heating. This means thinking about the ideas and expectations that lie behind the fact that around half of domestic energy consumption in the UK is now devoted to heating and cooling. It means asking how is it that personal bathing and laundry currently account for around a third of domestic water consumption and that demand for water has risen by 70 per cent in the UK over the last 30 years (Environment Agency, 2002). Likewise, when considering mobility, the central question is how social obligations

have come to require the forms of co-presence that they do. Taken for granted patterns of daily life are surely not static, nor are they free from commercial and government influence or from the scripts embedded in specific devices or in more encompassing regimes and socio-technical landscapes. But in analysing the creep of conventions that sustain what are ultimately unsustainable ways of life, it is, I argue, necessary to push the agenda on and to think more systematically and more systemically about the relation between consumption, provision and practice. This is an important step if theories of transition are to conceptualize the transformation of 'demand'.

Although I want to consider the reconfiguration of consumption and practice and although I take this to be crucial when contemplating transitions to a more sustainable society, I do not want to fall back on simplistic models in which change is attributed to the beliefs and actions of self-consciously green consumers (Hobson, 2001). Nor do I take the job to be one of topping up on human agency, of slotting consumers into the frame alongside recognized system builders and institutions, giving free reign to consumer oriented design, or enhancing opportunities for (presumably green) citizen-consumer involvement in the shaping of provision (Spaargaren, 1997).

Following a different route, I suggest that shared understandings of 'normality' matter more. This is so because notions of what it is to be a normal and acceptable member of society have far reaching environmental implications: they carry in their wake a trail of inescapable resource requirements like those associated with daily showering, with wearing freshly laundered clothing, with not having a siesta, with eating imported food or with having foreign holidays. There are, of course, important social divisions in what constitutes 'normality' and persistent differences between nations, social classes and sub-cultures. Equally, there are observable currents of convergence about which I will say more in due course. For present purposes, I take normal practices to be those in which collective identities are anchored (Douglas and Isherwood, 1996; Bourdieu, 1984), which constitute a form of social glue, and which are, at any one point in time and in any one culture, seen to be obligatory, non-negotiable conditions of everyday life.

CHALLENGES FOR TRANSITION THEORY

There are good environmental reasons for seeking to understand transitions in service and practice as well as in the resources and technologies of provision. However, such an exercise presents a number of generic challenges for transition theory as it has developed this far. In what follows

I focus on three such questions and suggest that each can be addressed by drawing in and drawing upon other fields of social theory.

The first concerns the boundaries and phases of system development. It is clear that definitions of normal and appropriate standards (for example of housing, mobility, comfort, personal hygiene or laundry) have changed over time, but can we discern distinctive moments equivalent to those of exploration, diffusion and stabilization? And if not, what then is the relation between unfolding concepts of service and the 'careers' of technological systems on which service provision depends?

Second, when analysing the respecification of convention it is as important to consider convergence between societies – perhaps fuelled by common reliance on similar technologies – as it is to detail movement between socio-technical niches, regimes and landscapes within any one society. For example, how is it that people in Singapore and Denmark have come to expect the same indoor climate and the same conditions of 'comfort' all year round (de Dear, 1994)? By switching attention from transitions in energy systems to systems of comfort it becomes possible, and indeed necessary, to track the global circulation of tools and skills, and the migration of socio-technically configured expectations and practices. This move prompts us to re-engage with questions about what sustainable ways of life might actually involve as well as about how necessary transitions might be achieved. From this perspective, the redefinition of societal functions is at least as important as the means through which they are fulfilled.

Third, the effective accomplishment of everyday life depends upon the active integration of a vast array of rules, resources and socio-technical complexes. Since the reconfiguration of 'normal' ways of doing things (cooking, washing, moving around and so on) often involves new ways of 'assembling' the ingredients of daily life, mechanisms of coordination deserve attention in their own right. Although central to any analysis of changing habit, questions about the relation between coexisting socio-technical systems are not routinely addressed by those who study bounded domains of innovation and who analyse the unfolding of such developments within specific national or social contexts.

Although challenging, these are not entirely unfamiliar issues. On the first point, there is continuing discussion about how to represent the steps and stages of innovation given what we know about 'innofusion' and the constant repositioning of technology in practice. Likewise, anthropologists, perhaps more than scholars of science and technology, have long been interested in the circulation and cross-cultural appropriation of material objects. Even more obviously, much effort has been invested in making and remaking the point that systems and technologies do not exist in isolation. It is none the less the case that the dominant concern has been to

explain how new technologies are assimilated in practice, rather than to understand how practices and conventions themselves (co)evolve.

SYSTEM INNOVATION AND THE LAUNDRY

In shifting the focus of enquiry and stepping outside the normal repertoire of cases and examples, I want to explore ways of extending transition theory so as to address the dynamics of consumption and practice.

At first sight, laundering is a curiously mundane example to take. It has not required significant public or private sector investment; it does not revolve around a clearly identifiable technological complex; it has not obviously passed through discrete phases of development nor are there any recognizable system builders. One might therefore conclude that it does not really qualify as a case of system innovation as that term has come to be understood. On the other hand, the reconfiguration of laundering has all the necessary features: it involves a wide range of actors, including firms, consumers, knowledge producers, NGOs and governments and is the result of an interplay between many factors and actors that influence each other. It also implies change at various levels: at the micro-level of individual actions, at the meso-level of structuring paradigms and rules and at the macro-level of structural trends.

Over the last century, techniques and habits of clothes washing have changed significantly, with long-term consequences for domestic electricity and water demand. In Western European countries and in the USA, something like 20 per cent of household water consumption now relates to the production of clean clothing and, in combination, the main appliances involved (the washing machine and the dryer) account for a still significant fraction of domestic energy use (DEFRA, 2000; American Water Works Association, 1999). These figures reflect a five-fold increase in the frequency with which the laundry is done. No longer a weekly activity, the average number of laundry cycles (that is the number of times that washing machines are run per year) is 274 in the UK (DEFRA, 2000), and 392 in America (Biermeyer, 2001).

At the same time, what it means to wash well has been redefined. Not so long ago, boiling was deemed essential in order to get things really clean. Now less than 7 per cent of the (UK) wash is done at 90° C (DEFRA, 2000). Mainly because of this, the energy efficiency of American washing machines increased by 50 per cent between 1981 and 1999 (Association of Home Appliance Manufacturers, 2000: 35). These developments in the meaning and practice of laundry have direct but contradictory implications for resource consumption and the case is interesting precisely because this

is an area in which increasingly efficient technologies sustain more demanding concepts of service (Shove, 2003).

In addition, and as the example of the laundry also illustrates, innovation in the way that 'societal functions' like the production of clean clothing are defined and fulfilled depends upon the practical integration of a variety of what seem to be self-contained systems. The size and content of the laundry basket is, for instance, closely related to the textile and fashion industries and the mass production of clothing. Meanwhile, the design of domestic washing machines relates to the range of fabrics in circulation, to the availability of detergent and to contemporary concepts of cleanliness and social/moral order. In so far as laundering is about cleanliness it is relevant to acknowledge the work of those who argue that boundary-making activities of this kind are, at heart, expressions and reproductions of social order. This points to an entirely different way of thinking about the dynamics of transition. As Mary Douglas has famously observed, 'dirt is essentially disorder' (Douglas, 1984: 2): it is matter out of place. Understood in these terms, washing is part of a more encompassing system of social order with the effect that transitions in practice match developments in the specification and policing of social-symbolic boundaries and distinctions. It is also the case that however people define standards of cleanliness, maintaining them is an important part of another kind of system, namely that of self identity. Kaufmann puts it this way: 'there can be no construction of identity without the affirmation of cleanliness: to be oneself, to be a self-respecting individual, is to be clean' (Kaufmann, 1998: 16).

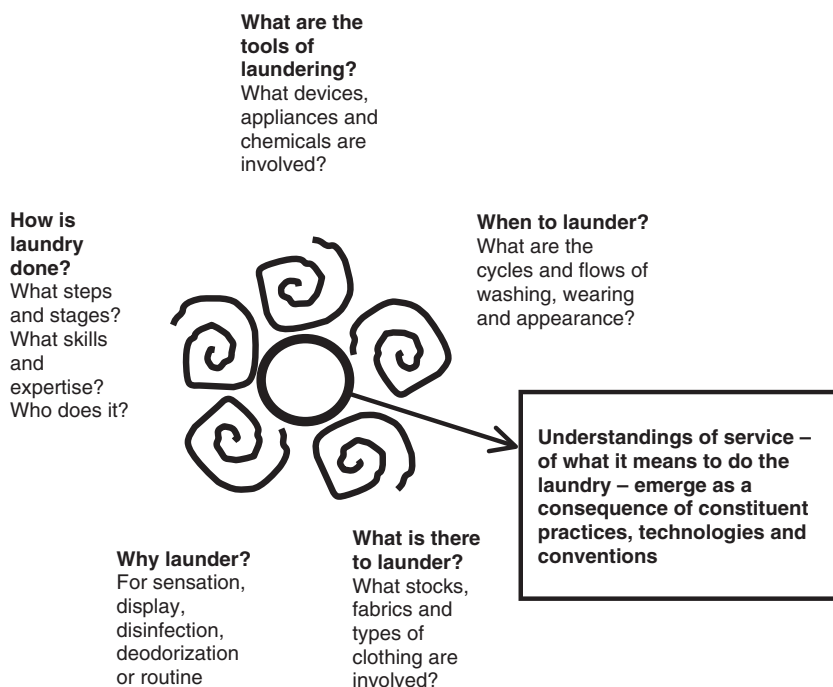
As these few observations suggest, the exercise of placing the production of 'appropriately' laundered clothing centre stage, and of viewing laundering as a system or, more accurately, a system of systems in transition, has the conceptually useful effect of broadening what are becoming 'orthodox' discussions grounded in studies of bounded, supply oriented, domains like those of energy, water, food or mobility. I therefore use laundering – and the intellectual resources of a variety of disciplines – to elaborate on the three challenges identified above. First, what are the units of system innovation, how are system boundaries conceptualized and what does this mean for the representation of phases of system development? Second, how do systems unfold *between* as well as *within* societies? In other words, what are the 'horizontal' as well as the 'vertical' dynamics at play in the formation of socio-technical regimes and landscapes? Third, what are the modes and mechanisms of system integration, and how do these influence transitions in what people take to be normal and appropriate practice? In the final section I take stock of what this discussion means for transition theory and for environmental policy.

SYSTEM BOUNDARIES AND PHASES OF DEVELOPMENT

Hughes (1983) and others have written about the typical phases of system development including those of initial exploration, take-off, diffusion, and stabilization. This framework has given shape to historical studies that have sought to capture the institutional dynamics of each 'stage' (see, for instance, Kaijser (2003) and Summerton (1994)). It is easy to see the relevance of this approach when documenting the development of infrastructural arrangements like those of electric power, mains water, telecommunications or networks of road and rail. But what about the laundry?

It is not too difficult to describe what laundering involves. As currently configured, it consists of a sequence of interdependent steps: sorting clothes, putting them in a machine, adding detergent, drying (on a line or in a tumble dryer), ironing, folding and putting away. But as a socio-technical system, it is harder to pin down. To what extent is it defined by what there is to launder, by when and why laundering is undertaken or by the tools and competencies involved? Although all these features change, there are no system builders in sight and no obviously unifying or transparently dominant forces in play. Partly because of this, it is hard to discern or describe specific states and stages of transition.

While laundering has a history, it is not one built around the sequential construction of a readily identifiable system. Some commentators claim that laundry standards have increased over time (Cowan, 1983; Forty, 1986), but there is no clear metric of progression. Looking back, the history of washing clothes is marked by sometimes substantial shifts in what the process is thought to be about and in how it is evaluated. As a result there are different ways of characterizing 'phases' of innovation. One option is to track the history of ideas. Taking this route, Vigarello (1998) distinguishes between periods in which laundering was understood as a means of cleaning the body (changing the shirt reputedly took the place of refreshing and washing oneself in mid-16th-century France (Vigarello, 1998: 58)) or conceptualized as a form of clothing care (in which case, the purpose is to restore clothing that has been contaminated through contact with the body or the outside world (Sams, 2001)). Other histories focus on what there is to wash. Bode (2000), for example, highlights the practical consequences of the transition from linen to cotton while Handley (1999) documents the development of synthetic fabrics and what this entails for the wash (see also Anson, 1988). In detailing the rise and fall of the steam laundry and the privatization of a once collective practice, Mohun (1999) takes yet another approach, this time focusing on the allocation and management of laundry as a form of work. Although the careers of specific devices – the domestic



Source: Shove, 2003.

Figure 4.1 *Laundering as a system of systems*

washing machine, the electric iron or the tumble dryer – can be described and analysed in terms of their development, introduction and establishment (Strasser, 1982; Cowan, 1983; Parr, 1999), this terminology does not work for laundering as a whole.

There is no sense in which laundering has become more embedded or entrenched, or in which the practice has stabilized. Instead, the picture is one of a more or less continual de- and restabilization of the different elements that together make up the enterprise as a whole. In fact, one might even conclude that it is this interaction between contributory systems that generates transitions and transformations in the meaning and practice of washing well.

Figure 4.1 illustrates these points, showing laundry to be a system of systems defined and energized by changing relationships between one whorl and another.

Patterns of conceptual and technical path dependency mean that certain features set the scene in which others do (and do not) develop and in prac-

tice the contributory whorls are unlikely to be of unequal weight. However, the central point is that we need to analyse the transformation not of one part of the system or another, but of the concepts and understandings of service that emerge through and from the integrative practice of 'doing' the laundry.

In this section I have argued that it is inappropriate to think about the development of laundering, as a whole, in terms of phases and stages of innovation. Other ideas are needed to describe the transformation of what amounts to a system of systems. One possible solution is to position and analyse emergent concepts of service and normal practice in terms of the levels and layers of innovation.

LEVELS AND LAYERS OF INNOVATION

Rip and Kemp (1998) and Rip and Groen (2001) consider the dynamics of innovation with the help of a three-layered model in which the development of novel arrangements and configurations structures and is structured by a patchwork of socio-technical regimes that defines and is in turn defined by the contours of a macro-level socio-technical landscape. This tiered model promises to be of real value in analysing the socio-technical coevolution of what people take to be normal and necessary forms of laundering. In other words, composite concepts of service – of what it is to wash well – appear to have a comfortable and intelligible home at the meso-level plane of the socio-technical regime.

The layered scheme is, for sure, useful in analysing the relationship between developments in washing technology and in users' and consumers' understandings of cleanliness. Framed in this way, an historical review of reports from the British Consumers' Association (from 1957 to 2001) and from the American Consumers Union (from 1937 to 2000) shows how washing machine manufacturers have redefined cleanliness as whiteness rather than an absence of bacteria, and how they and the appliances and categories they produce, have reconstructed laundering around new concepts of freshness and sensation (Shove, 2003). In this respect novel technologies have evidently reconfigured important aspects of the laundry regime.

Other writers describe how new laundry-related technologies are accommodated and appropriated within existing regimes or maybe even landscapes of convention and social order. In the course of her research, Joy Parr found that 'many who owned dryers continued to use their lines regularly even after they had invested in a machine' (Parr, 1999: 264). Rather than replacing the line, the dryer offered distinctive qualities of its own; hence its adoption was not just a matter of trading between convenience, speed, fragrance, texture and ease of ironing. Instead, users' rationales and

actions demonstrated the positioning of both devices (and attendant practices) within highly elaborate systems of personal and domestic propriety.

As the preceding paragraphs indicate, it is possible and useful to position and analyse emergent practices of laundering in terms of the 'vertical' interaction between novel configurations, niches, regimes, and landscapes.

But in environmental terms, such an approach misses a hugely important part of the picture. Just seven manufacturers (Weiss and Gross, 1995) make around 70 per cent of all laundry appliances. Although machines are customized and detergents coloured to suit the traditions and preferences of different markets, the mechanisms through which commercial interests colonize meanings of cleanliness are much the same. In the UK, over 90 per cent of households own a washing machine (DEFRA, 2000) and, as hinted at above, those who use such devices are bought into an increasingly dominant technological repertoire. Since similar machines are used and sold around the world, these technologies exert a powerful force for cross-cultural convergence, slicing across what are routinely, if implicitly, analysed as nationally or at least culturally bounded socio-technical regimes and landscapes.

Consistent with its roots in innovation studies, the three-tiered model represents the trajectories of novel arrangements born of and diffused through self-contained environments. But what happens when something like a fully formed washing machine, complete with inscribed concepts of cleanliness, comes crashing into such a scene, as it does in parts of Brazil today? How does the vocabulary of niche, regime and landscape help in making sense of the consequent standardization of laundering and the convergence of attendant notions of service (and resource demand)? Likewise, how might these ideas be used in explaining other codetermining parts of the laundry system like the global proliferation of lightweight machine washable clothing or the valuing of some but not other fragrances (Corbin, 1986)?

These questions remind us that system-relevant, regime-shaping ingredients (that is ideas and/or technologies) circulate between societies. In thinking about innovations of service it is important to analyse processes of cross-cultural regime formation, and the details of configuration and appropriation. In other words, how are standardized washing machines, automobiles, and convenience foods in fact deployed in different societies? As the laundry example suggests, regimes and even landscapes may converge between societies (with potentially damaging environmental consequences) despite exhibiting and being held in place by distinctive, locally and historically-specific path dependencies. Transition theorists have concentrated on specifying movement in the vertical dimension, that is between one level and the next. Partly because of this, they have much less to say about 'horizontal' developments of the type illustrated in Figure 4.2.

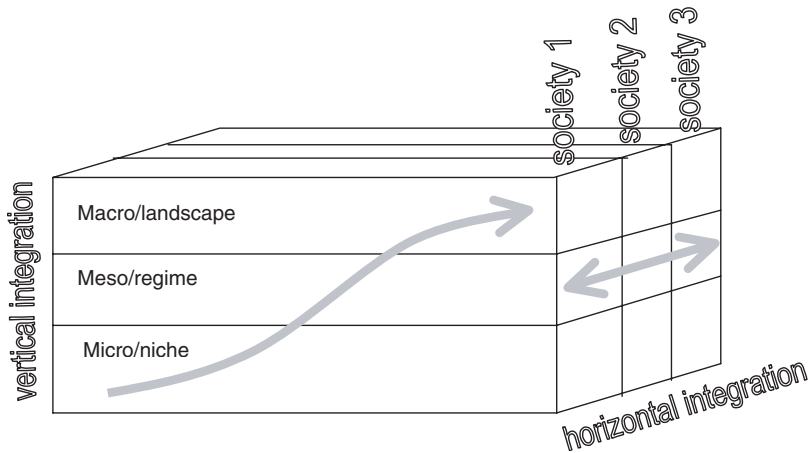


Figure 4.2 Horizontal and vertical dimensions of socio-technical change

As this figure suggests, technological systems carry concepts, classifications, scripts and framings of problems between socio-technical regimes and landscapes. That said, the cultural and environmental ramifications of horizontal trends, like the mass marketing of identical washing machines, are inherently unpredictable given that local contexts of appropriation are of defining importance (Miller, 1998). Writing about the arrival of these appliances in Soweto, Meintjes makes the point that their symbolic and practical significance varies depending upon how they are positioned in terms of existing regimes of cleanliness, gender, identity and propriety (Meintjes, 2001). There is more that could be said about the relation between the horizontal and vertical dimensions of system innovation but for present purposes I want to underline the point that transitions toward sustainability depend partly on system innovation but also on system *integration*.

SYSTEMS OF SYSTEMS AND MODES OF INTEGRATION

What is it that holds systems of laundering together and do modes of integration themselves differ over time and between one society and another?

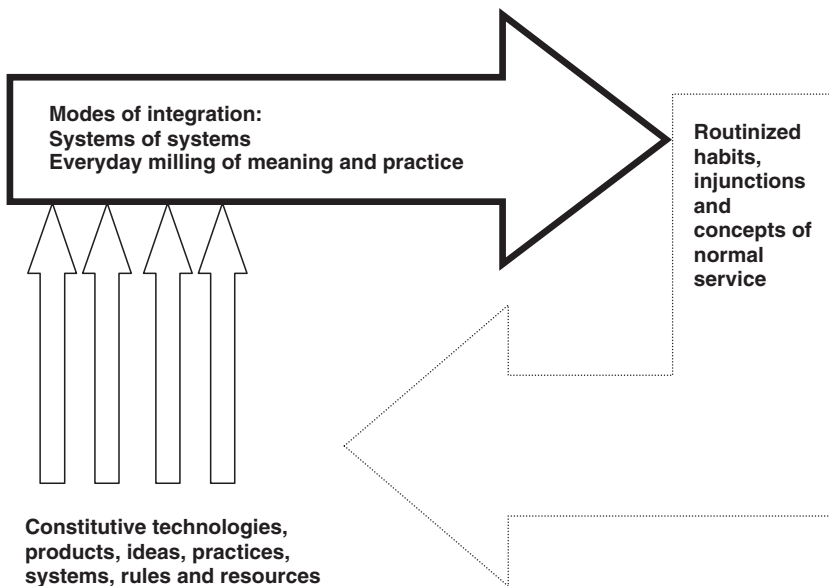
In some cases there are clear patterns of interdependence. For example, washing machines are currently designed to cope with a contemporary diet of machine washable clothing. As international 'fabric care' symbols indicate, textiles and garments are in turn designed to be machine-washed. These networks of technical coherence have arguably absorbed much of the

skill involved in literally doing the wash. As long as fabric labels and washing machine programmes match up, and provided the right doses of detergent are added (and even these now come in tablet form), the scene is pretty much set for a standardized result.

On the other hand, studies of how people actually wash demonstrate the existence of other integrative frameworks. A 1988 survey showed that people in the UK frequently disregarded or failed to read instructions or fabric labels: they rarely used more than three programmes and routinely mixed materials in a single load. Their actions were guided not (or not only) by technical advice and instruction but by all kinds of tacit rules about when and how things like towels, pyjamas, sheets, underwear, jeans and shirts should be washed. These rules, sometimes shared, sometimes idiosyncratic, coalesced to form unique packages of normal practice that in turn engendered an array of 'injunctions'. In Kaufmann's words, an injunction is 'a social construction (historical, family based, personal) which has produced the framework of assumptions triggering the action – the thing that simply has to be done' (Kaufmann, 1998: 21). Triggers like those that prompt people to wash their hair, have a shower, change their shirt or water the lawn are located within the realm of what Giddens (1984) describes as practical consciousness: they are done without further thought or reflection. In arguing that that rules and resources (structures) are sustained and recreated through just such routine accomplishments, Giddens claims that 'the structural properties of social systems are both medium and outcome of the practices they recursively organize' (1984: 25). By implication, transition theorists need to think about how systems are transformed at the level of practical consciousness. Exactly how do new injunctions break through layers of engrained habit and how are novel arrangements normalized?

The notion that people have a 'way' of doing things is useful in conceptualizing the coexistence of stability and change (Lie and Sørensen, 1996; Silverstone *et al.*, 1992). To return to laundering, the very complexity of the system – what is to be washed, when and why – permits extensive customization of practice around a range of standardized products and appliances. Although washing machines are running at an increasingly uniform 40°C all around Britain, each is positioned within a relatively distinctive domestic regime of sequence, timing, purpose, performance, hygiene, freshness and appearance.

What counts as appropriately laundered clothing depends, in this analysis, on the coordination of socio-technical arrangements (in what was earlier described as a 'system of systems') and on their integration through also coordinative frameworks of meaning and practice. Figure 4.3 illustrates some of these features. It shows how technologies and practices are combined in the course of everyday life and it positions personal and



Source: Shove, 2003.

Figure 4.3 Modes of integration

societal concepts of normal service as the outcome of these integrative processes.

In figuring out how concepts of normal service change, the key questions have to do with how suites of technology interact and how they are actively deployed together. For all its power and relevance, Giddens's theory of structuration takes little heed of the material world or of the tools and technologies of daily life. In Latour's terms, the masses are indeed missing (1992). In trying to fit them back into the scheme, and so find a way of relating technological transitions to transitions of practice and service, I have made much of the notion of integration. I have also distinguished, somewhat tentatively, between two modes: one that has to do with the interdependence of socio-technical systems and another that relates to the way in which things (machines, materials, etc.) are fitted together in the course of daily life. Before drawing this section to a close I want to make one further point.

Washing machines are now positioned as normal and necessary appliances and it is commonly accepted that whatever emerges from them is clean. The washing machine therefore operates as a kind of meta-device: not only is it something to be integrated, it is also something that influences how

other elements of laundering are combined. In this respect, appliance manufacturers arguably function as meta-system builders, providing the terms and tools with which personal and societal concepts and practices are constructed. Following this kind of reasoning it may be possible to identify and perhaps shape the development of other comparably pivotal entities (sometimes technologies, sometimes ideas), which also influence the manner and mode of integration and hence the (re)production of more or less sustainable understandings of service.

INTEGRATION, STANDARDIZATION AND TRANSITION

I chose to consider transitions in laundering as a means of exploring the qualities and properties of service-related innovation. Instead of looking at the development and institutionalization of infrastructures and systems of supply I turned the tables round in order to consider the systemic reconfiguration of consumption and demand. This meant dealing with different elements and questions. In practice, people do not consume energy, water or gas. Instead, units of consumption and change relate to the specification and reproduction of normal conventions like those of comfort, copresence or cleanliness. From this perspective, the transition to a more sustainable society is not just a matter of fulfilling stable and taken for granted needs in a more efficient manner. It is, in addition, a question of understanding what people take to be the necessary conditions of everyday life and of understanding how these concepts change and how they are socio-technically configured.

In this final section I reflect on what this exercise has revealed and what it has added to the discussion of system innovation. I also comment on how policymakers and others might intervene to shape transitions in systems of service and convention.

Taking a long-term view, it is clear that firmly held concepts of normal practice are immensely malleable. A few hundred years ago it was quite common for the children of certain social groups to be sewn into their clothes for the winter. Less than a hundred years ago, 'boiling was considered essential for getting the wash really clean and germ-free' (Zmroczek, 1992: 176). Laundering is today represented as a process of freshening up tired or stale clothing, and who knows what it might become tomorrow. In environmental terms, this essential fluidity is encouraging. There is no inescapable logic of escalatory pressure and no unremittingly path dependent narrative of increasing demand.

At the same time, this apparent lack of path dependency is something of

a puzzle. If infrastructures can be usefully analysed with reference to phases of emergence, development and stabilization, how is it that conventions and practices, which might be expected to coevolve with systems of provision, do not fit these frameworks? This was one of the three questions with which I began. Part of the answer lies in the fact that meanings of what it is to wash well are generated through the intersection of a number of interdependent yet relatively self-contained systems. Even if we agree that the details of laundering are but the expression of another 'higher level' system of social order (Douglas, 1984), it is still relevant to notice the changing tools and materials through which distinctions are made real. More than that, it is important to acknowledge that laundering is not only about cleaning and that other contributory 'systems' (of gender, textiles or temporal order) are also involved. As I have described it, laundering is best understood as a system of systems that has an emergent dynamic of its own. Is it then the case that the enterprise of laundering only 'exists' or can only be analysed at the meso- or regime-level, as defined by transition theory? And if so, is this also true of other composite practices? These questions suggest the need for further analysis of distinctively 'regime level' dynamics across different sectors.

When thinking about transitions of service and practice and about forms of regime-level change it is necessary to think about how relatively self-contained systems relate to each other and how they are related together in the course of everyday life. While various authors have written about the 'appropriation' of new technologies within the domestic sphere, few have explicitly attended to the modes and forms of integration that lie behind what people talk of as 'their way' of doing things. This is a significant omission and an important opportunity. For Reckwitz (2002) and Schatski (1996), the existence of a practice depends on the specific interconnectedness of many elements – forms of bodily activities, mental activities, things and their use, background knowledge in the form of understanding, know-how and notions of competence, states of emotion and motivational knowledge (Hand *et al.*, 2003). And for Giddens, the practical consciousness and knowledge of all competent members of society is not 'incidental to the persistent patterning of social life but is integral to it' (1984: 27). Framed in this way, the very business of doing the laundry is a process of temporarily stabilizing and reproducing something like a regime (in terms of transition theory) or society (for Giddens). In emphasizing the constitutive and essentially integrative nature of enterprises like 'laundering', theories of practice have much to offer those interested in the making and breaking of resource-intensive ways of life. What is missing, but what might easily be included, is a more explicit recognition that the contemporary reproduction of routine goes on with and within an also stabilizing, also integrative, environment of coexisting socio-technical

systems. In short, a selective blending of theories of practice and of technological transition promises to be of real value in describing and analysing the transformation of entire complexes of activity.

In my brief review of laundering I also noticed the cross-cultural standardization of technologies (and attendant scripts), and the multiple contexts and conditions in which devices and ideas are appropriated. Although theories of technological transition have yet to deal with 'horizontal' mechanisms of regime or landscape-level convergence between societies, similar themes have been addressed by writers interested in the globalization (or Americanization) of commodities and values and in 'local' processes of customization and adaptation (Hannertz, 1996; Burke, 1996). These debates are of some significance when contemplating the possibility of local, national or international transitions toward more sustainable forms of 'normal' practice. This, then, is another arena in which the reach and range of transition theory might be extended.

Re-read in terms of environmental strategy, my discussion of clothes washing generates a number of practical, policy relevant insights. The first concerns the relation between resource and service. Governments and environmental groups typically focus on efficiency and patterns of *resource* consumption, for instance, introducing energy labelling schemes, offering consumer advice, setting technical regulations, fostering the development of more efficient appliance standards, facilitating investment in renewable energy and so on. Meanwhile, commercial activity revolves around the construction of new concepts of *service*: new ideas of hygiene, new concepts of 'freshly laundered' clothing, new visions of domesticity and propriety.

This split between resource and service has important implications for the types of actors involved in different forms of system innovation. Though willing to advise consumers to wash a full load at a time, national policymakers rarely venture into the domain of fashion, appearance and body odour. That is not to say that governments have no interest in the provision and social construction of cleanliness. As histories of sanitation and public health reveal (Melosi, 2000; Ogle, 1996; Tones, 1998), such institutions have been extremely important in promoting technologies and ideologies that, in combination, sustain what Cowan describes as the 'senseless tyranny of spotless shirts' (Cowan, 1983: 216). Even so, contemporary policymakers are unlikely to get involved in directly specifying the 'sniff test' despite the fact that this measure influences the amount of washing done and hence the consumption of energy and water. Because of this reluctance, a good part of the potential for system innovation lies beyond their normal reach.

On the other hand, there is some connection between the definition of service and how it is achieved. The fact that boiling laundry is no longer

normal practice, and that the majority of UK laundry is now done at 40°C is a good example. Since washing machines have never been able to sustain a prolonged simmering of the kind traditionally required for a 'proper' wash, the first manufacturers introduced and established other criteria of cleanliness, measures of whiteness being the most common. With whiteness, not heat, as the point of reference a more environmentally benign, or at least energy efficient, range of technological options came into view, including those that depend on the use of detergents designed to operate at low temperatures. Because manufacturers have been obliged and able to dissociate laundering from disinfection, governments have been able to push for more resource efficiency. In this instance, resource efficiencies have gone hand in hand with the redefinition of normal practice.

It is none the less clear that commercial rather than government organizations dominate the specification of service. This has further consequences for the scope and scale of possible intervention. Major appliance manufacturers and detergent producers concentrate on constructing and developing mass markets around the world. That is the lateral arena in which they operate. By comparison, resource-based initiatives are generally national, or at best European. This is important in considering the type of effort that might be made to introduce and engender new practice. There is a tendency to think about ways of engineering and managing *resource*-based system transition through the careful cultivation of socio-technical experiments located within protected spaces and strategic niches. Approached in this way, the policy challenge is to build the networks and alliances required to gradually embed novel arrangements into the regimes and landscapes of wider society.

But in so far as new concepts of *service* are deliberately fabricated, their development appears to involve the rapid diffusion of convention leaping, culture defying commodities, use of which draws consumers into new paradigms (in this case of laundering). What part do policymakers have to play in this alternative dynamic of typically transnational service specification? Do they contribute at all to the formation of collective conventions of ordinary practice and if so, how? Never mind government involvement in steering modes of provision, or in managing markets and forms of system innovation, how do national and international modes of policy making shape and structure the formation of routinized and taken for granted expectations, conventions and habits? Following this question through, and doing so with respect to mobility, to diet, to personal hygiene or to laundering, would help determine both the limits and possibilities of engendering regime and landscape-level transitions toward sustainability.

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