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The 'Four Dimensions of Behaviour' framework: a tool for characterising behaviours to help design better interventions

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The 'Four Dimensions of Behaviour' framework: a tool for characterising behaviours to help design better interventions

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This paper sets out the rationale and structure of a tool for assisting policy-makers and practitioners to understand behavioural challenges and open up thinking on the design of effective 'behaviour change' interventions. The 'Four Dimensions of Behaviour' (4DB) framework is based on the theoretical and empirical research in a range of policy domains including transport and pro-environmental behaviour more generally. The 4DB framework characterises multifaceted behaviours along dimensions of actor, domain, durability and scope. Its application in workshop or structured settings opens up diverse and non-exclusive discussion on designing interventions to match salient behavioural characteristics. The use of the 4DB framework in the transport domain is demonstrated for travel behaviours of interest to policy-makers using examples of buying plug-in vehicles (PiVs), commuting by bicycle, eco-driving and making business trips by train.

Keywords: behaviour; policy; change; transport; travel; models

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1. Introduction

This paper sets out a tool that has been designed to help practitioners and policy-makers think through the complexities of behaviour in a diverse and comprehensive way that moves beyond prior beliefs or disciplinary tendencies. The 'Four Dimensions of Behaviour' (4DB) framework treats behaviours as observable actions, remaining neutral as to whether key influences are psychological, social or institutional, and even as to whether 'behaviour' is the appropriate term or framing (Wilson and Chatterton 2011).The framework characterises any behaviour (complex or otherwise) by focusing on describing any and all characteristics that are potentially relevant to the observable action, without having to infer causes, influences or even the nature of behaviour as a unit of enquiry.

The authors contend that the use of the 4DB framework in workshops and other structured discussions supports: (1) broad and diverse characterisations of behaviours; (2) open discussion around relevant theories and models for understanding behaviour; (3) the initial development of more diverse and appropriate policies or intervention strategies for addressing behavioural challenges.

The rationale for the 4DB framework lies in the history of 'behaviour change' policy thinking in the UK. This has embedded a relatively narrow understanding of individual behaviour in policy domains, particularly in national government departments, that has

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been critiqued from disciplinary standpoints (Shove 2010). The 4DB framework offers an alternative, constructive and practical approach that is designed to open up discussion beyond both conventional policy framings of behavioural challenges and favoured disciplinary approaches. Its immediate applicability, and the context of this paper, is focused on tackling behavioural challenges predominantly outside organisational or work contexts, that is those that are currently framed by policy as 'individual' behavioural problems.

2. Behaviour change in UK policy: the emergence of a universal approach

Since 2008, the term 'behaviour change' has been widely used across UK policy domains. This has emerged in relation to an increasingly centralised, top-down push towards a universalist approach for designing behaviour change interventions. Prior to this, concerns about behaviour had traditionally been the domain of specific government departments concentrated on problem-specific approaches.

The Department of Health (DoH) has long held the view that people's own cognitions and actions are a major influence on their health outcomes, although recent work has begun to take account of wider, social determinants of health (Marmot 2010). As an example, a 2006 report for DoH and the National Institute for Health and Clinical Excellence reviewed the use of four key behavioural models to 'support attitude and behaviour change at population and community levels' (Taylor et al. 2006).

The Department for Transport (DfT) has also concerned itself with the aspects of behaviour for some time, notably in relation to tightly focused problems such as speeding, seatbelt wearing and drink driving. However, the DfT's 2005 report on 'Smarter Choices: Changing the Way We Travel' signalled a broader, less context-specific approach to behaviour. The report's aim was 'helping people to choose to reduce their car use while enhancing the attractiveness of alternatives' (DfT 2005). Subsequent reports developing this behaviour change agenda further included 'Public attitudes to climate change and transport' (Anable, Lane, and Kelay 2006) and six commissioned think pieces titled 'Behaviour Change: What Works for Transport?' (DfT 2010), as well as a transport-based segmentation study and 'Behavioural Insights Toolkit' (DfT 2011a, 2011b).

Among the other government departments, the Department for Environment, Farming and Rural Affairs (Defra) has worked most extensively on 'pro-environmental behaviour', placing significant emphasis on values and attitudes as drivers of change. The department's Sustainable Development Unit commissioned a series of reports in this vein (e.g. Demos 2004; Darnton 2004a, 2004b; Jackson 2005) that culminated in 2008 with the publication of 'A Framework for Pro-Environmental Behaviours' (Defra 2008). The stated aim of this report was 'to protect and improve the environment by increasing the contribution from individual and community action' (Defra 2008). The Department of Energy and Climate Change (DECC) and the Department for Communities and Local Government (DCLG) have been relative late-comers to the within-department focus on behaviour change, although are now active in this area (e.g. RCUK 2009; Chatterton 2011; DCLG 2011).

This more recent work has taken place within an increasingly centralised, cross-departmental discussion around context-free, 'universalist' approaches to behaviour change. An early marker was the 2004 report by the Prime Minister's Strategy Unit entitled 'Personal Responsibility and Changing Behaviour' (Halpern et al. 2004), which was a high-level, top-down introduction of 'behaviour change' into government. Then in

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2008, the Government Social Research (GSR) service published an overview report on 'Behaviour Change Models and their Uses' (Darnton 2008), which was targeted more pervasively at social researchers across all departments.

Although efforts to change behaviour were not new for government, the term 'behaviour change' set out in these reports represented a particular approach to policy-making that moved away from simplified economics-based characterisations of behaviour (e.g. Lutzenhiser 1993; Guy 2006; DECC 2012a). This new approach drew on a mix of behavioural economics, and cognitive and social psychology in conceptualising individuals as responsive to both internal cognitions (values, attitudes, perceived norms) and contextual cues. Its foundations lay in a microeconomic view of individuals motivated by rational self-interests, concerned with minimising costs, and responsive to price and other contextual incentives. Ajzen and Fishbein's influential work on intentional decision-making similarly recognised the importance of preferences over decision outcomes but added perceived (internalised) social norms and capacities for action as cognitive drivers of individual behaviour (Fishbein and Ajzen 1975; Ajzen 1991).

The popularity of social marketing strategies, and their reliance on information and value-based persuasion, rose in popularity under the New Labour administration from 1997 to 2010, exemplified by the 2009 report 'Communications and Behaviour Change' by the government's Central Office of Information (COI 2009). However, this was soon to be eclipsed by a new approach (Wood 2012). In March 2010, the Institute for Government and the Cabinet Office jointly launched the report 'MINDSPACE: Influencing behaviour through public policy' (Dolan et al. 2010). Their claim was that 'New insights from science and behaviour change could lead to significantly improved outcomes, and at a lower cost, than the way many conventional policy tools are used'. The MINDSPACE report drew heavily on applied behavioural economic work popularised by the book 'Nudge' (Thaler and Sunstein 2008). Nudge advocated the provision of situational cues to help individuals make 'better choices' in line with their own preferences. This alternative to regulation and/or pricing found favour with UK politicians including David Cameron, who was claimed to have Nudge as his favourite book as early as August 2008 (Sparrow 2008). Less than two years later, and less than two months after the publication of MINDSPACE, Cameron became Prime Minister of a new coalition government. The new Coalition Agreement announced: 'Our government will be a much smarter one, shunning the bureaucratic levers of the past and finding intelligent ways to encourage support and enable people to make better choices for themselves' (HMG 2010). In July 2010, the government established the Behavioural Insights Team in the Cabinet Office. The team incorporated authors of Nudge, MINDPSACE and the earlier 2004 'Personal Responsibility and Changing Behaviour' report. The team's aim was to draw on 'the growing body of academic research in the fields of behavioural economics and psychology which show how often subtle changes to the way in which decisions are framed can have big impacts on how people respond to them' (Cabinet Office 2011). Interest in the team's work spread rapidly, with its success leading to it being the first UK government policy unit to be 'spun-off' as a commercial entity (GOV.UK 2013).

Implicit claims to the power of this universalist approach are often demonstrated by select examples in which it has proved effective. Many such examples are provided in Nudge, ranging from organ donation to saving for retirement (Thaler and Sunstein 2008). In the UK, the government often uses the case of the official tax letter, a simple

rewording of which emphasised that *most* people pay their tax on time (reinforcing a social norm) and that every late payment is a *loss* to the country (triggering aversion to losses). This subtle change to the situational cues or 'choice architecture' of completing tax returns reportedly led to an extra £200 million in income tax being collected (Hickman 2011).

The Behavioural Insights Team has applied the MINDSPACE framework in a series of reports on fraud and debt, on energy efficiency, on consumer affairs, on charity donations and on health, and has also reported on the use of randomised control trials as a standardised method for compiling an evidence base on the effectiveness of behavioural interventions. These reports have led to discussions across government departments on applying behavioural science to policy challenges, buttressed by success stories like that of the tax letter. In late 2010, the House of Lords Select Committee on Science and Technology (Sub-Committee 1) launched an enquiry into behaviour change interventions, recognising that 'governments have tried to change our behaviour before – through legislation, marketing campaigns and even "nudges"'. One motivation of the enquiry was to see whether successful interventions on seat belts, drink driving and smoking could be applied to contemporary, and broader, issues such as obesity and energy use. But the House of Lords enquiry also reflected growing concern and scepticism with the universal applicability of MINDSPACE, or any other single approach to behaviour change. The enquiry found that challenging policy objectives 'certainly won't be achieved through using "nudges," or any other sort of intervention, *in isolation*' (our emphasis, HMG 2011).

The problem with universalism is captured in a phrase attributed to the humanistic psychologist, Abraham Maslow: 'It is tempting, if the only tool you have is a hammer, to treat everything as if it were a nail'. The prevailing approach to behaviour change risks creating a narrow set of tools for understanding behaviour (a hammer) poorly matched to what may be varied and highly specialised challenges (nails, screws, thumb-tacks, staples, blu-tack™ and so on). Can challenges such as encouraging modal shifts to public transport, cycling and walking really be framed, understood and tackled in the same way as the wording of a tax letter?

Behavioural challenges as defined by Nudge, MINDSPACE and the Behavioural Insights Team largely relate to sub-conscious, automatic decision-making processes and heuristics (shortcut decision-making rules). Resulting behaviour can be changed through situational cues such as default settings, reciprocity and normative messages. This approach to behaviour change recognizes contextual influences more than earlier models of rational choice and intentional decision-making, but it still retains the individual framing of behavioural challenges. This positioning of individuals at the centre of the problem stems from the historical foundation of policy-relevant 'behavioural science' in economics and psychology.

Policymakers are not unaware of these disciplinary and framing biases. The 2009 Central Office of Information report recognises: 'Many disciplines have something to say about human behaviour, including economics, psychology, sociology and anthropology. Within government, "behaviour change" tends to be dominated by social psychological and (behavioural) economics thinking' (COI 2009, 7). Academics have similarly observed how much of the social sciences are marginalised and ignored, from social theories of consumption and cultural theory, to theories of practice and socio-technical transition (Shove 2011a).

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3. Moving beyond universalism: the use of multiple models

The 2008 government report on 'Behaviour Change Models and their Uses' (Darnton 2008) identified over 60 different models and theories for understanding behaviour. Most of these are oriented around individual decision-making processes, but some wider sociological and socio-technical approaches were also included. As indicated above, policy-makers in the UK addressing behavioural challenges have tended to hone in on a narrow set of psychological and (behavioural) economic models. But even these are many and varied, and the need for bespoke or adapted variants is recognised: 'sometimes, it will be appropriate to adapt an existing model; at other times, you will need to create a model specifically for the task in hand' (COI 2009, 48). Faced with such a wide range of options, pertinent questions are not only 'why do I need more than one model?' (or 'why is my problem not a nail?') but also 'which model(s) should I use'?

Choosing which sort of model might be the most applicable to the behavioural challenge of interest reveals the tension between the universal applicability of (for example) MINDSPACE and the need to carefully match a model to a behaviour. As statistician George Box observed in the case of mathematical and physical modelling: 'All models are wrong, [but] some of them are useful' (Box 1987). In a behaviour change context, useful models should not just descriptively fit the target behaviour, but should also draw out possible approaches and targets for the design and implementation of effective interventions.

In this paper, the 4DB framework is presented as a tool for identifying salient characteristics of behaviours as a basis for selecting appropriate models or understandings of the problem. The 4DB framework is explicitly designed to open up discussions on interventions and policy design beyond prevailing approaches or disciplinary tendencies.

The rationale for the 4DB framework lies in two propositions:

(1) The characteristics of behaviours vary widely, and a single behaviour (or observable action) can be described by different models and analysed using different frameworks. The validity of a particular model depends on the problem as defined, or the question being asked. Different challenges or questions can therefore be framed in relation to a particular behaviour. These questions will not necessarily apply to other behaviours.
(2) Explicitly thinking through how a behaviour is understood, and so how a policy problem is framed, helps design interventions that match the characteristics of the behaviour. It also provides an opportunity to re-frame the problem that in turn opens up different ways of tackling it.

From these propositions, we conceptualise the 4DB framework for characterising behaviours. The framework is designed to be robust across a wide range of theoretical or analytical approaches to behaviour and behaviour change. Using the 4DB framework helps to examine and characterise behaviours through different lenses (proposition 1) and opens up thinking around intervention design and problem definition (proposition 2). Unlike a universalist or disciplinary approach, the framework aims to broaden the ideas and experiences brought to bear on how behaviour might be changed through interventions using 'multiple models' (Chatterton 2011). We do not argue that competing or contrasting models are compatible, as strongly critiqued by Shove (2011b). Nor do we propose a grand integrative synthesis. Rather, we suggest that different models or approaches are complementary. Using a multiple-model approach, it is possible to come

at a problem from very different angles and shed light on less-considered characteristics of a behaviour or aspects of a problem.

Working across different models and theoretical traditions raises problems with the use of terms that are accepted or interpreted differently. 'Behaviour' itself is one such term that may, to some, mean a psychologically mediated individual response to a stimulus, or that may, by others, be rejected outright in favour of taking the constitutive elements of social practices like cooking or entertaining as the meaningful units of analysis (e.g. Warde 2004). The 4DB framework sidesteps these distinctions by using 'behaviour' to mean simply observable actions, with no prior inferences about their psychological, social and other elements or influences. This approach thereby avoids theoretical discussions regarding different approaches taken to 'behaviour' by psychological and sociological disciplines (Shove 2011b; Whitmarsh, O'Neill, and Lorenzoni 2011) until the characterisation has been made and an informed judgement can be made on the suitability and relevance of different theoretical approaches. Wilson and Chatterton (2011) provide a more detailed elaboration of this position. In a behaviour change context, it is observable actions (not invisible drivers) that give rise to the social and environmental costs (such as resource use or downstream emissions) and thus justify policy-makers' attention.

4. The 4DB framework for characterising behaviours

The 4DB framework is summarised in Figure 1. It comprises four dimensions, with a spectrum of five levels along each dimension. The dimensions and levels of the framework are parsimonious and simple, yet can comprehensively and richly characterise behaviours. They have been identified through an extensive review of the major government reports described above (including Halpern et al. 2004; Jackson 2005; Defra 2008; COI 2009; Dolan et al. 2010) and additional reviews of both practitioner and

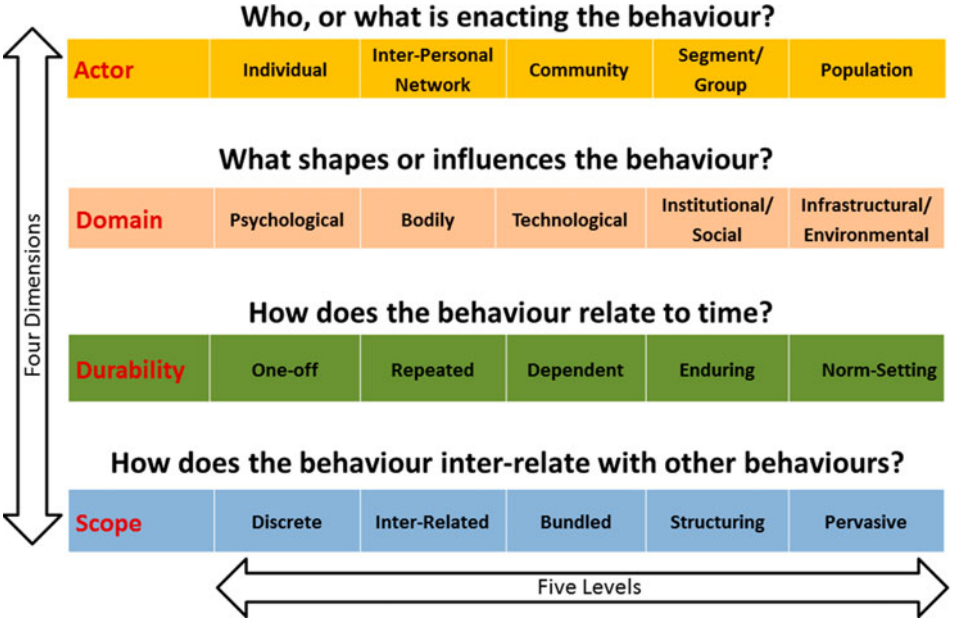

Figure 1. The 4DB framework.

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academic literatures in public health, transport and energy domains (including Abrahamse et al. 2005; Wilson and Dowlatabadi 2007; Michie, van Stralen, and West 2011; Osbaldiston and Schott 2012; DECC 2012b). Practitioner is used here to mean both policy-makers and intervention designers working in an applied context to understand and change behaviour.

Dimensions and levels were selected using four criteria so the framework could:

(1) characterise salient features of behaviours identified by practitioners in a range of policy domains;
(2) capture key elements of a wide range of behavioural models and disciplinary approaches;
(3) help differentiate behaviours;
(4) be simple to understand and easy to apply in structured discussions.

All four criteria guided selection and refinement of the levels along the four dimensions; the first two criteria were also particularly useful in defining the dimensions themselves.

An initial version of the framework outlined in Wilson and Chatterton (2011) was iteratively tested and refined over a two-year period. The development process was conducted in collaboration with a steering group comprising representatives from three government departments who provided comments and suggestions throughout. The process included:

- Double-blind consistency testing by the authors using 12 test behaviours provided by the steering groups across transport, energy and environmental domains;
- Presentation and discussion in small group seminars with practitioners including Brook Lyndhurst, Policy Studies Institute and the London Sustainability Exchange;
- Presentation and application in workshop and conference settings with practitioners and academics including Changing Lives: Changing Society (University of the West of England, UK, June 2012), International Energy Agency DSM Task XXIV Workshops (Oxford, UK, October 2012 and Wellington, New Zealand, February 2013), Energy at the Crossroads Conference (Wellington, New Zealand, February 2013), University Transport Studies Group (Oxford, UK, January, 2013) European Council for an Energy Efficient Economy Summer Study (Hyeres, France, June 2013) and Behaviour Energy and Climate Change (Sacramento, USA, November 2012).

The development process led to numerous revisions of the emphasis and labelling of the dimensions, and particularly the levels along each dimension. The final version shown in Figure 1 has proven robust to the challenges put to it, given its design criteria and purpose. Differentiating behaviours (criterion 3) was particularly challenging. Practitioners sometimes argued during testing that certain behavioural characteristics fell between dimensions, or more commonly, between levels. Yet after group discussion, it was always possible to use one or more levels to adequately describe those characteristics. And in helping to identify and discuss the salience of these characteristics, the framework fulfilled its other functions (criteria 1 and 4).

A good example of the influence of the testing process is the *psychological* level in the *domain* dimension. This is a final aggregation of cognitive, rational, emotional, conscious and automatic characteristics tested in various combinations. The complex

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interaction between these aspects of cognition and decision-making, and their shared representation of internal processes, made them hard to disentangle. Their aggregation in a single *psychological* level also allowed different viewpoints and attributions of salience to be clearly understood and discussed by non-experts (criterion 4).

Labelling the five levels along each dimension was critical for ensuring all relevant and meaningful behavioural characteristics could be attributed to part of the framework (criteria 1 and 2). This required some aggregation under higher-order descriptors as illustrated above with the *psychological* level. As another example, relating to the *durability* dimension, there are many time-frames in which a behaviour might be *repeated*, daily (e.g. eating breakfast), weekly (e.g. going to a supermarket), annually (e.g. cooking Christmas dinner) or less frequently still (e.g. purchasing a car). However, these all bear some hallmark of being a *repeated* action in being influenced by previous experience which sets them aside from *one-off* behaviours.

It is important to emphasise that the 4DB framework is intended to be used for *characterising* behaviours not *categorising* them. The framework is designed to identify and discuss the nature and relative strength or importance of different characteristics that might (to some extent) be shared by almost all types of behaviour. As such, no levels within the 4 × 5 framework should be seen as excluding or being incompatible with any other level. The term 'level' has been used to emphasise that these are more like points on a continuous spectrum, rather than discrete boxes. It is also of note (particularly with regard to Domain) that determining causality is not a key focus of the framework. The key to using the framework is simply in describing the observable action. Particularly in a discussion context, the underlying reasoning as to why a particular level is descriptively relevant may involve causality or influence, but this is not integral or necessary for the mapping.

Although tested and refined in applied settings, the 4DB framework is grounded in both practitioner and academic literatures as noted above and expanded upon here.

4.1. Actor

The *individual* framing of prevailing approaches to behaviour change (Dolan et al. 2010) makes who (or what) is enacting behaviours the most obvious dimension. It is also clear that many decisions are made within small *interpersonal networks* such as households (e.g. Hargreaves, Nye, and Burgess 2010). Early versions of the framework considered using household as a level, but this was widened to *interpersonal networks* to characterise other possible family, friendship or activity-based networks relevant to social behaviours in particular. Two larger groupings of people also stood out. *Community* describes people who share some common purpose, bond or identity that means they might act consistently or as a single unit. It is also a widely used term in the policy domains reviewed earlier, including health and well-being (Taylor et al. 2006; DCLG 2011) and environment (Defra 2008). Research and practice on local energy projects and other grassroots initiatives have identified the importance of community, especially with respect to seeking identity and fulfilment through shared participation (e.g. Seyfang and Smith 2007; Seyfang and Haxeltine 2012). This active sharing of identity sets *community* aside from *segments/groups* that describe people who are objectively similar in some way (e.g. socio-demographic characteristics, or values/attitudes) but who do not necessarily share an identity, nor exchange ideas and actions. Identifying specific segments can be particularly helpful in targeting appropriate messaging and interventions (Defra 2008;

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DfT 2011a). Finally, *population* is the widest possible set of actors and corresponds with undifferentiated, mass or generic approaches to behaviour change such as the Act on CO_2 campaign (DirectGov 2010).

4.2. Domain

The domain dimension captures the varying scales of influence and analysis in the literature reviewed. The MINDSPACE approach to behaviour change focuses on *psychological* aspects. Earlier versions of the 4DB framework separated out automatic and reflective systems (Thaler and Sunstein 2008) or fast and slow thinking (Kahneman 2011), and also disaggregated cognitions such as attitudes, opinions and values (Bergman 1998). Theoretical difficulties in disentangling complex interactions, along with practical considerations regarding numbers of levels, eventually led to all *psychological* aspects being grouped in a single level. Considerations of *bodily* characteristics came from work on the uptake of non-motorised transport with associated issues of physical fitness (Hassmén 1990) and the 'embodiment of habits' (Schwanen, Banister, and Anable 2012). Bodily characteristics of behaviour are also clear in public health work on physical addictions such as drinking, smoking and drug taking (Webb, Sniehotta, and Michie 2010). The *technology* level recognises the importance of material objects and technical knowhow that enable or are integral to many behaviours. The technological and material are prominent in work on socio-technical systems and social practices, as well as in psychological models dealing with issues such as user-interfaces, technology adoption and use, and default settings (e.g. Venkatesh and Morris 2000; Dolan et al. 2010; Lockton, Harrison, and Stanton 2010). Two further levels – *infrastructure/environmental*, and *social/institutional* – characterise wider conditions shaping behaviours. Both these levels draw on the '3 Elements' version of social practice theory set out by Shove (Shove 2011a; Shove, Pantzar, and Watson 2012). 3 Elements emphasises materials (including physical *infrastructure*), meanings and competences (including shared knowledge, culture and other constitutive elements of social practices). From a contrasting theoretical standpoint, Michie, van Stralen, and West (2011) classify interventions in the public health domain, and similarly cover *social/institutional* factors (fiscal, regulation, legislation, social planning, service provision) and *infrastructural/environmental* factors (which extend to the natural as well as built environments).

4.3. Durability

The durability dimension was initially prompted by Defra's work distinguishing behaviours as one-off, occasional, regular, everyday or habitual (Defra 2008). These labels highlighted the importance of the temporal characteristics of behaviour and have been simplified into the *one-off* and *repeated* levels in the 4DB framework. Drink driving policies had a strong influence on the need for a *dependent* level, with the removal of a licence being (in theory) a removal of the ability for someone to drive. Loft insulation was a good example of an *enduring* behaviour which is carried out once but with an ongoing, if uncertain, consequence or effect (Herring and Roy 2007). Finally, the potential for behaviours to spread and be sustained by becoming social norms has become apparent with localised energy efficiency schemes under the government's Carbon Emissions Reduction Target programme (DECC 2011), or clustering effects within the uptake of Feed-In Tariffs for photo-voltaic electricity generation (Snape 2013). This can also be linked to Rogers' work on the Diffusion of Innovations (1962/2010) and the

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impact of 'innovators' or 'early adopters' on shaping uptake of technologies or behaviour by the 'majorities' and 'laggards'. Norm-setting may also relate to personal norms, linking to emerging literature on intrinsic motivations and the potential for behavioural 'spillover' (Thøgersen and Crompton 2009).

4.4. Scope

The scope dimension considers whether behaviours are linked or entangled with other actions. This helps characterise the complexities and inter-dependencies that may hinder behaviour change efforts, or, more constructively, provide additional targets for intervention designers. The *discrete* level sees the behaviour as free from any significant reliance, interactions or follow-on impacts with other behaviours. One might consider actions such as 'turning a light off in an empty room' as having the characteristic of being discrete as the empty room strongly suggests that little else will be impacted by it. Discrete behaviours or choices typify many economic and psychological experiments. *Inter-related* behaviours are illustrated nicely by Hargreaves, Nye, and Burgess (2010) in their study of households and how the use of in-home energy displays has got to be closely linked to appliance use and their being turned on and off. *Bundled* behaviours differ from interrelated ones on the strength of the links between activities, and the coherence of the overall grouping. The term is borrowed from social practice theory (Schatzki 2011; Rettie and Harries 2013) in which it is used to describe how a practice is comprised of a 'bundle' of different actions, meanings, rules, things and skills. In the 4DB framework, bundles may have some sort of identity formed around them. For example, being a cyclist often conveys something more than simply owning, using and maintaining a bicycle. This identity aspect, where relevant, would also strongly link to the *psychological* level of the Domain dimension. *Structuring* behaviours have a strong constraining or enabling effect on future activity. A one-off decision to become a no-car household will significantly affect or structure the possibility space for a wide range of future actions. The broadest level under the scope dimension is *pervasive*. This had initially been labelled 'lifestyle' and characterises those behaviours that encompass thorough and extensive changes. An example is downshifting to describe a lifestyle shift to a smaller, cheaper house, often in the countryside and the consequent shedding of possessions and changing of work and transport patterns.

5. Applying the 4DB framework to transport-related behaviours

The 4DB framework was designed as an introductory workshop tool to structure and facilitate open discussion around the most important characteristics of a behaviour as a basis for thinking through and designing appropriately matched behaviour change interventions. The remainder of this paper draws on experiences applying the 4DB framework to transport-related behavioural challenges in a range of structured discussions with practitioners in workshop settings (see testing process above). Box 1 summarises the type of questions used to prompt consideration and discussion of each of the dimensions and their constituent levels.

Four behavioural challenges identified by the DfT – buying a plug-in vehicle (PiV), commuting by bicycle, making business trips by train and eco-driving – are illustrated in detail. Further application of the framework to domestic energy behaviours can be found in Chatterton and Wilson (2013) with analyses of: upgrading electrical appliances and

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Box 1. Questions to prompt discussion of each level along the four dimensions in workshop settings.

Actor – Who or what is carrying out the behaviour?

Individual – is the behaviour carried out or done by single individuals in isolation?

Inter-Personal Network – does the behaviour involve close networks of people, such as families, households, or social groups?

Community – does the behaviour involve 'communities' of people who share values or activities which identify them closely with one another?

Segment/Group – does the behaviour involve specific groups of people such as a neighbourhood or a socio-demographic segment who do not necessarily have any personal connection nor shared self-identity?

Population – is the behaviour more or less universal, done by all irrespective of any of the above distinctions?

Domain – What shapes or influences the behaviour?

Psychological – is the behaviour the result of processes such as rational analysis or emotional responsiveness, or factors such as values, personal norms, or attitudes?

Bodily – is the behaviour significantly constrained, enabled of affected by the body or physical activity?

Technological – does the behaviour depend on or involve interaction with physical hardware, devices or appliances?

Institutional/Social – is the behaviour shaped by 'invisible', institutional features of supply chains, businesses and markets, policies and laws, or by other social phenomena?

Infra-structural/Environmental – is the behaviour shaped by 'visible', physical features of supply chains, infrastructures, or aspects of the broader built and natural environments?

Durability – How does the behaviour relate to time?

One-off – is the behaviour only under taken once, or so infrequently that it can be viewed as an isolated occurrence?

Repeated – is the behaviour repeated (over any time-frame) whether or not it might be considered 'habitual'?

Dependent – can the behaviour continue only as long as other conditions remain in place?

Enduring – once carried out and completed, does the behaviour have consequences that persist, either through its own impacts or through related behaviours?

Norm-Setting – does the behaviour propagate over time, leading to more of the same behaviour either by the same actor or by new, different actors?

Scope – How does the behaviour inter-relate with other behaviours?

Discrete – does the behaviour have limited or no interaction with, or impact on, other behaviours?

Inter-related – is the behaviour closely linked to one or more other behaviours, either as an activity, or in terms of its context or meaning?

Bundled – is the behaviour part of a tightly woven package of behaviours that are difficult to separate out?

Structuring – does carrying out the behaviour strongly enable or constrain which behaviours are possible in the future?

Pervasive – is the behaviour a characteristic or representative feature of the broader life or lifestyle of its actor?

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lighting; replacing heating boilers, taking shorter showers and delaying the start of the heating season.

Figures 2–5 show how the four illustrative transport behaviours can be characterised or 'mapped' using the 4DB framework. These behaviours have many characteristics in similar, particularly with respect to technology and infrastructure. Indeed, these shared characteristics are common for transport-related behaviours in general. The figures are followed by text explaining the basis and rationale of the characterisation. This reasoning is an essential consequence of using the 4DB framework to structure discussion among practitioners. By designing in a lower, more manageable number of characteristics, the 4DB framework ensures that open and broad discussion is more likely than a tick box, yes/no response. Some participants commented that all five levels of all four dimensions could be relevant in some way to any behaviour. This is certainly possible, and the emphasis that we place on the framework as a discussion tool rather than a rigid analytical structure in no way precludes its use in this way. However, experience of testing the framework in workshop settings also shows that certain levels are typically more relevant or salient than others (see Figures 2–5), and that certain levels are more emphasised than others by particular theoretical traditions or analytical backgrounds (as discussed below).

As the figures and their accompanying text also demonstrate, using the 4DB framework can facilitate a very broad-ranging discussion. This is consistent with the aim of the framework to characterise behaviour in manifold ways and to facilitate and open up discussion around the behaviour itself, what influences it, and how important in relative terms these influences are.

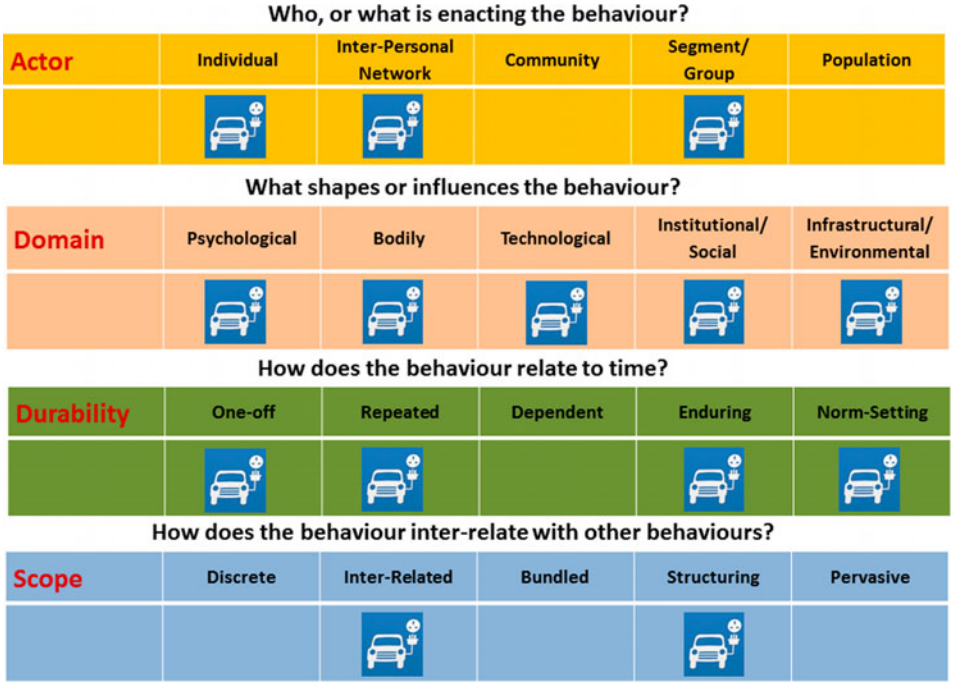

Figure 2. Characteristics of 'buying a PiV'.

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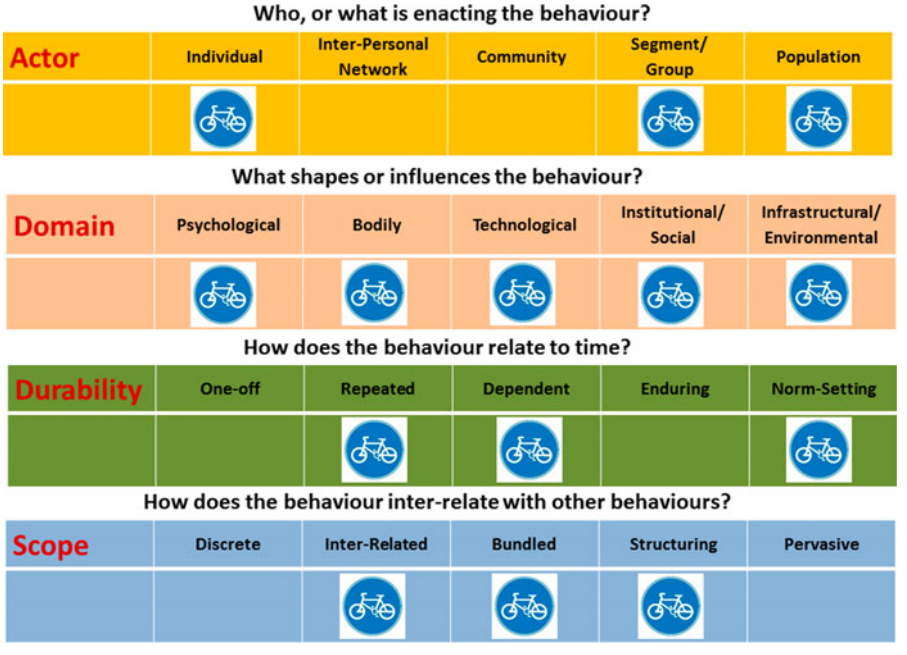

Figure 3. Characteristics of 'Commuting by Bicycle'.

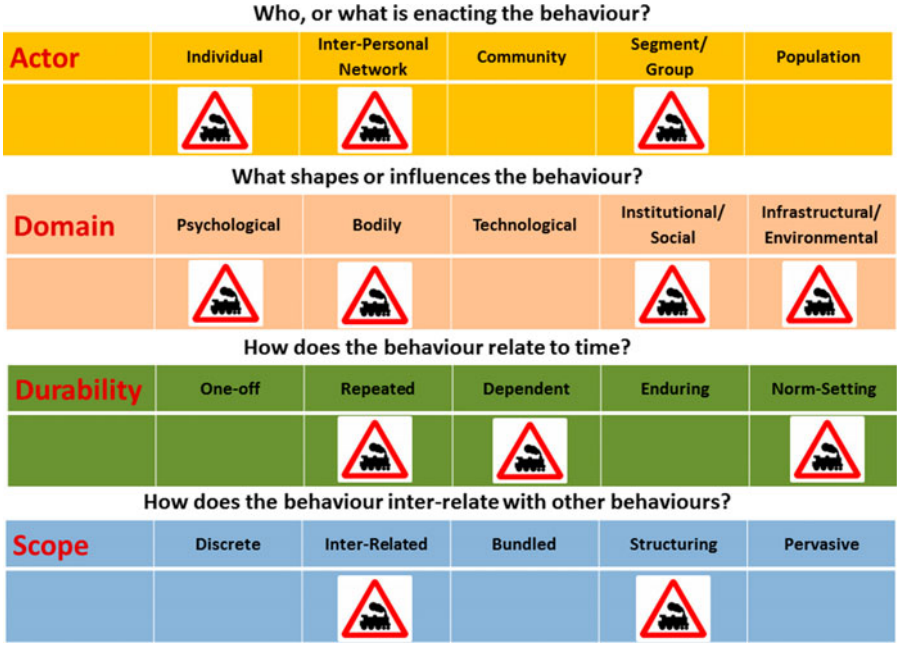

Figure 4. Characteristics of 'making business trips by train'.

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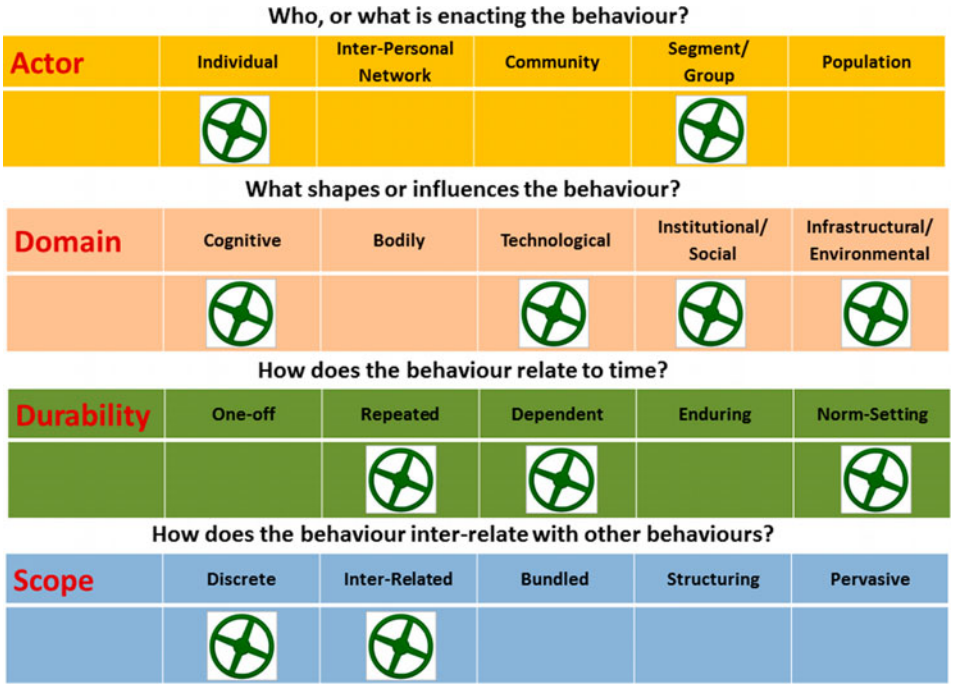

Figure 5. Characteristics of 'eco-driving'.

5.1. Buying a plug-in vehicle

5.1.1. Actor

Choice of vehicles is sometimes dominated by a single person/*individual*, but may be much more likely to be a household/family decision, and at least involve consideration of how the vehicle can serve the activities of a wider set of people/*inter-personal network* (N.B. As indicated in the introduction, the focus of this work is on what are often taken to be 'individual' behaviour challenges not those of organisations – and this example is therefore focussed on personal PiV purchase, rather than company/fleet purchase which makes up the majority of new car purchases). Close personal networks, such as friends and colleagues, are also likely to be involved in decisions relating to uptake of new technologies and in supporting considerations of status. There is a potential role of *community* within schemes such as community car clubs that may be one of the early adopters of PiVs. This is likely to be a minor consideration, but should not be forgotten. There are several relevant *segments* and *groups* that may relate differently to the idea of PiVs, including drivers, likely new-car purchasers, homeowners with driveways/garages, early adopters, 'affluent empty nesters', 'town and rural heavy car use' (the last two of these are from DfT's segmentation work, DfT 2011a).

5.1.2. Domain

There will be a range of *psychological processes* involved during the purchase of a new-vehicle, including rational, value and emotive assessments to be made (costs, environment, status and identity etc.). There are a range of interactions with the *body*, especially regarding the viability of non-motorised alternatives, fears of the consequences of a flat

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battery, dealing with charging leads and connections. The *technology* of PiVs is central to the behaviour, and key factors relating to the decision include range, power, speed, carrying capacity, environmental benefits, safety, for example fires, vehicle lifetime and battery lifetime, charging points (home, work, public), charging leads. There are a significant range of *institutional and social* factors, including available grants (such as DfTs Plug-in Car Grant), differential tariffs for Vehicle Excise Duty, local government parking or city centre access schemes favouring Low Emission Vehicles, as well as the sales practices of dealerships and vehicle manufacturers (especially in relation to comparative marketing of traditional internal combustion engine [ICE] vehicles). There are a range of *infrastructural* issues, relating predominantly to charging of the vehicles. These include not just the high profile issues around provision of public charging points (and in particular places to charge when 'caught short' on the highway) but also around charging at home in terms of the availability of off-street parking, driveway versus garage, and whether dual-tariff metres are already installed.

5.1.3. Durability

Although buying a PiV (at least under current conditions) can be considered as a *one-off* decision, there are elements of car buying behaviour which may be more habitual/*repeated* (e.g. 'I have always bought this class/make of car – why should I change?'). The average length of car ownership in the UK has been found to be only around four years (Liebling 2008) and so it is important to try and consider future purchases of replacement, or additional PiVs as a possibility that should be fostered. The impacts of the behaviour *endure* as the purchaser of a PiV becomes a PiV owner and user. The purchase also has *norm-setting* potential in terms of both the actors' attitudes to new/environmental technologies, and in terms of other people (both inside and outside buyers personal network).

5.1.4. Scope

The purchase of a PiV is *interrelated* with a complex web of travel practices and expectations that are associated with car ownership and use. These define what the car needs to do in able to be accepted as a replacement for an ICE vehicle. This inter-relation is important to consider in terms of whether purchase of a PiV is seen as an opportunity to re-frame these expectations, or whether PiVs are marketed simply as a 'slot-in' replacement? Purchase of a PiV is also a *structuring* behaviour as it determines a range of other activities, for example the shift of 're-fuelling' to the home, street or workplace rather than at filling stations, a change in distances travelled and time taken to refuel, and possible changes to accessibility of areas (e.g. central London) due to clean vehicle regulations.

5.2. Commuting by bicycle

5.2.1. Actor

The context of commuting immediately puts the focus of bicycle riding more squarely on the *individual*, than the promotion of cycling as a leisure activity might do. *Inter-personal networks* and sense of *community* may have some role to play, but these are not especially significant as the particular behaviour in question happens within a realm of no-mans-land between the workplace and home. While the uptake of cycling to work is something that essentially the entire (healthy and working) *population* could take up,

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there will be very different relationships to cycling and work for different *segments/groups* within the population.

5.2.2. Domain

There are a range of *psychological* factors that will come into play (attitudes towards money, time, health, the environment, etc.). The (perception of) ability to cycle will potentially be affected by *bodily* issues around health and fitness. Bicycles constitute a significant *technological* element, particularly with regard to choice of styles, features, maintenance and repair. Then there is all the associated 'kit' such as lights, lycra, racks and panniers and so forth. There are a number of ways in which *institutional* and *social* factors come into play, including financial schemes such as Tax-Free Bike schemes and mileage expense rates for bicycles, as well as job-specific requirements for some people to use a car for work, or the influence that schemes such as the Workplace Parking Levy might have on the desirability of other options. Finally *infrastructure and environment* have a major impact, from the provision or availability of cycle paths and parking, through facilities such as showers and lockers, and then hills and gradients and local climate.

5.2.3. Durability

Commuting is fundamentally a *repeated* activity. It is *dependent* on a number of factors, primarily place of work/residence being consistent (or else new patterns have to be established) and on physical health. It also has significant potential for *norm-setting* both in terms of increasing the likelihood of the individual undertaking other trips by cycle, and by influencing the behaviour of others (see e.g. Heinen, Maat, van Wee 2011).

5.2.4. Scope

The framing of the behaviour in terms of commuting, immediately links and *interrelates* the activity to other behaviours around home and work (e.g. possibilities for cycling will be linked to timing of other morning activities such as taking children to school, and expectations of arrival time at work) and even with the choice of home location. There is an aspect of cycling that is linked to a *bundle* of other bits and pieces and activities that give rise to the notion of being a 'cyclist' (particularly clothing, equipment and accessories, but also things like knowledge regarding good cycle routes). Whether or not it is always desirable to link these is questionable, however they are important to consider. Commuting by bike is also *structuring*. As indicated above, it may limit the availability of a car for work, and it might also limit opportunities to run errands in the lunch hour or on the way to/from work.

5.3. Making business trips by train

5.3.1. Actor

Decisions on how to make business trips will involve a combination of the *individual* and the *networks* of people that they work with/around (e.g. travelling companions, or people setting up meeting locations). The number of people who actually make 'business trips' represents quite a select *segment* of the population.

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5.3.2. Domain

Deciding to take the train involves a range of *psychological* processes relating to cost, efficiency (time and ability to work while travelling), environmental attitudes and so on. The efficiency of train travel may well be affected by *bodily* factors such as levels of physical ability, especially where the business function might involve carrying of equipment. Behaviour will be constrained or encouraged by a range of *institutional* processes, including specific company travel policies, and arrangements for ticket purchasing and expense claims. The accessibility of suitable *infrastructure* such as stations and routes from home, place of work and/or trip destination will also affect behaviour. Suitability of the train itself for working while travelling (e.g. table space, wireless networks, noise etc.) might also be considered here.

5.3.3. Durability

The framing of this behaviour sets it out as a *repeated* activity as it is framed in terms of the general pattern of making business trips by train, rather than any single journey. However, the ability or practicality of making business trips will be *dependent* on maintaining suitable work/workplaces. There are a range of factors that are likely to be *norm-setting* with regard to both increased use of trains for non-work purposes (familiarity and knowledge of routes and fares etc.) and in terms spreading or encouraging the behaviour in others (both through setting an example, and encouragement to hold meetings in train accessible destinations).

5.3.4. Scope

Business train travel *interrelates* with a range of other activities, both in terms of working practices, and scheduling with domestic routines. Making trips by train can be seen as *structuring* to the extent that it will constrain these interrelated activities through timetabling, routing and the ability to carry cumbersome items.

5.4. Eco-driving

5.4.1. Actor

Decisions about personal driving styles will generally come down to the *individual* at the wheel. There may be significant (positive or negative) effects due to fellow-passengers/back-seat drivers who are likely to be part of a range of *interpersonal networks* (e.g. family and friends). Drivers themselves are clearly identifiable as a *group*, and within this there are particular *segments* that may have different patterns of behaviour (e.g. younger/older, male/female, parents etc.)

5.4.2. Domain

There are a number of relevant *psychological* aspects to decisions about driving style, involving relevant knowledge, attitudes and preferences and emotive factors such as values. *Technology* can play a role, especially in-car devices such as gear-change indicators but also in over-all car design (e.g. maximum speeds and gear ratios). There are also influences from a range of *institutional and social factors*, including driving test criteria, fuel prices, speed limits and media messaging as well as *infrastructural/environmental* elements such as road layouts, traffic signals and other vehicles.

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5.4.3. Durability

Eco-driving is something that should be standard 'everyday' driving behaviour for people, and is thus *a repeated* behaviour. It is *dependent* (legally) on ownership of a valid driving licence. It can have the power to influence the way other people drive so can also be considered *norm-setting*.

5.4.4. Scope

In general, it might be reasonable to assume that eco-driving itself is a *discrete* behaviour that does not significantly impinge on or facilitate other behaviours. There may be two potential points for considering it to be *interrelated* though. Firstly through drivers' perceptions of how eco-driving might influence journey times and thus be linked closely to other activities around the start and end points of journeys. Secondly, with any behaviour that is linked to money-saving messages, there is a need to consider how rebound effects might relate to this, e.g. where money saved from one activity is used to increase other unsustainable behaviours (Wengraf 2012).

6. Discussion

The examples above demonstrate how the 4DB framework can be useful in stimulating a broad discussion about particular behavioural challenges without becoming overly focussed on certain characteristics or approaches (such as environmental attitudes, knowledge/information or pricing). The overall complexity of behaviours is revealed not just by the levels considered relevant but by the relationships between these, and more importantly, the discussions that the headings (both dimensions and levels) steer users towards. The framework covers many more characteristics of behaviour than are commonly dealt with in UK policy circles and aims to prompt open and wide ranging discussion (see Box 1). The framework thus creates an arena in which individual decisions about, for example, purchasing plug-in hybrid vehicles are discussed alongside tax and cost implications, technological challenges and charging infrastructure. This leads to significant complexities and interdependencies being identified much more readily. Once the complexity of the target behaviour is mapped out using the framework as a tool, it becomes easier for practitioners to consider the relative importance of different characteristics, how they inter-relate with each other, and how they might change over time and at different speeds.

The framework itself is not bound by any particular model or analytical approach. Rather, it has been designed to support the use, or at least consideration, of multiple models (Wilson and Chatterton 2011). It achieves this by highlighting the broad range of factors that can, but do not always, play a strong role in bringing into being the observable actions that give rise to adverse collective consequences. The decision as to which factors are relevant is one that lies with the practitioners using the framework as a tool (as would also be the case in the absence of the tool). However, the framework is specifically designed to broaden thinking beyond that which would be prompted by a single approach such as MINDSPACE (Dolan et al. 2010) with its emphasis on behavioural economics and social psychology.

Each different theoretical understanding or analytical model of behaviour brings its own emphasis. Figure 6 uses the 4DB framework to map out and compare the principle concerns of micro-economics, MINDSPACE and social practice theory.

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Most likely to be emphasised by Micro-Economics

Actor	**Individual**	Inter-Personal Network	Community	**Segment/ Group**	**Population**
Domain	**Psychological**	Bodily	Technological	**Institutional/ Social**	Infrastructural/ Environmental
Durability	**One-off**	Repeated	**Dependent**	Enduring	Norm-Setting
Scope	**Discrete**	Inter-Related	Bundled	Structuring	Pervasive

Most likely to be emphasised by MINDSPACE

Actor	**Individual**	**Inter-Personal Network**	Community	**Segment/ Group**	**Population**
Domain	**Psychological**	Bodily	**Technological**	**Institutional/ Social**	Infrastructural/ Environmental
Durability	**One-off**	**Repeated**	**Dependent**	Enduring	**Norm-Setting**
Scope	**Discrete**	**Inter-Related**	Bundled	**Structuring**	Pervasive

Most likely to be emphasised by Social Practice Theory

Actor	Individual	**Inter-Personal Network**	**Community**	Segment/ Group	Population
Domain	Psychological	**Bodily**	**Technological**	**Institutional/ Social**	**Infrastructural/ Environmental**
Durability	One-off	Repeated	Dependent	**Enduring**	**Norm-Setting**
Scope	Discrete	Inter-Related	**Bundled**	**Structuring**	**Pervasive**

Figure 6. Mapping of different behavioural theories and approaches using the 4DB framework.

Micro-economics tends to focus on individual decision making, based on rational choices in one-off and discrete situations (something strongly reinforced by the nature of many economic choice experiments). By emphasising a relatively homogenous set of costs and benefits (typically monetary) which inform choices, what applies to individuals can be scaled up to cover whole populations with some, but not a lot, of accounting for different segments or groups. The role of institutions (such as markets) in determining pricing or incentives structures is key, and decisions and behaviour are likely to be constant so long as prices and other elements of the cost-benefit calculus remain equal.

The combination of behavioural economics and social psychology within MINDSPACE builds on and extends these microeconomic emphases. For example, psychological characteristics include not just deliberative decision making but also, for example, 'automatic' and sub-conscious processes and decision heuristics. In addition to the emphasis on the individual (generalisable to the population), MINDSPACE also emphasises social networks through its focus on the role of messengers and norms. Technology is given greater weight, particularly with regard to the role of default options

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which technologies 'elicit' from users. With the inclusion of automatic rather than just reflective cognitive processes, MINDSPACE also pays attention to repeated, inter-related and emotive aspects of behaviour.

Social practice theories take an approach that expressly moves away from the individual as the unit of enquiry and so also from psychological motivations and drivers. Instead social practice theories emphasise the way that patterns of behaviour are tied up in shared meanings and skills within inter-personal networks, communities and other social institutions, as well as how physical materials constrain, permit, enable and shape practices though technology, infrastructure and even the physical body. Practices often come attached to others practices in 'bundles', and instead of focussing on one-off and discrete actions, social practice theories emphasise the enduring, structuring and pervasive aspects that 'lock-in' patterns of behaviour into the routines and rhythms of everyday life.

The simple characterisation of these three contrasting analytical approaches in Figure 4 demonstrates how the 4DB framework can be used to consider not just the characteristics of a behaviour but also the appropriateness and likely suitability of particular theories or models for understanding it in a behaviour change context. Further work is being undertaken with the International Energy Agency Demand Side Management Programme (http://www.ieadsm.org/) to try and catalogue and characterise a much larger set of models taken from the GSR review (Darnton 2008).

To date, the 4DB framework has proven to be successful as a workshop tool simply in opening up discussion around the varying characteristics of different behaviours, and providing a structured and coherent process for recording and reviewing these. The framework is intended to be flexible in its use, emphasising discussion and elicitation of varied viewpoints, rather than rigorous categorisation and analysis. Attempting to design the framework as a 'perfect fit' for every possible eventuality would be to completely over-engineer what needs to remain a simple tool, accessible to people across a range of different policy domains and levels of practice. It is important to state that there are no right or wrong answers with regard to which levels are thought to most characteristic of any particular behaviour. Within a workshop environment, it is expected that people from different institutional contexts or research traditions may use the framework differently, for example with respect to whether it is seen as desirable to explore the relevance of every single level, or simply the ones perceived as being of greatest relevance. In any case, the final design of the tool reinforces and supports Shove's (2010) call to '*move beyond the ABC* [Attitude-Behaviour-Choice]' approach to behaviour, by explicitly steering users to a wide-range of levels and dimensions beyond the *individual* and *psychological*. In doing so, the opportunity is provided for reflection on whether individual behaviour is actually the problem itself, or a symptomatic manifestation of other issues and problems that lie elsewhere. Only when this broad picture of the behaviour has been explored does it become possible to identify what may be the most appropriate targets and methods of intervention.

7. Conclusion

Over the last decade, there have been substantial advances in the way that the UK government has approached the issue of 'behaviour' and 'behaviour change'. Although much of government thinking is still dominated by an understanding of individual behaviour which emphasises the role of rationality, information and technology, both the

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New Labour and Coalition administrations over the last decade have embraced more nuanced understandings of behaviour grounded in behavioural economics and social psychology. However, these still maintain a strong emphasis on behaviour as predominantly individual and psychological, and they fail to incorporate a rich understanding of (social) context. This leads to a tendency to view the models as being universally applicable, with little difference in the way they might be applied to different behaviours. However, despite the many different models or theories of behaviour available, and the wide range of strategies or types of intervention that might be employed to try and achieve behaviour change, there has been little work done to identify how various behaviours might differ from each other and thus which tools might best be used for understanding causal processes or for effectively achieving change.

The 4DB framework was developed to characterise any behaviour along four dimensions: actor, domain, durability and scope. Each dimension is described by a spectrum of five levels (see Figure 1). The framework helps practitioners to think more broadly about what the key aspects of behaviour are that they might target in order to promote and effect change. By highlighting the rich variation between different behaviours, the framework can make a significant contribution to the practical experience of understanding behaviours and designing policies and interventions to change them. Given the size and scale of the environmental and public health challenges we currently face, and the limited success to date in creating mass public behaviour change, particularly in the environmental arena, the 4DB framework represents a new way of developing more diverse and potentially more effective strategies to bring about change.

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References

Abrahamse, W., L. Steg, C. Vlek, and T. Rothengatter. 2005. "A Review of Intervention Studies Aimed at Household Energy Conservation." *Journal of Environmental Psychology* 25 (3): 273–291. doi:10.1016/j.jenvp.2005.08.002.

Ajzen, I. 1991. "The Theory of Planned Behavior." *Organizational Behavior and Human Decision Processes* 50 (2): 179–211. doi:10.1016/0749-5978(91)90020-T.

Anable, J., B. Lane, and T. Kelay. 2006."An Evidence Base Review of Attitudes to Climate Change and Transport." Report for the UK Department for Transport, London. http://www.dft.gov.uk/publications/review-of-public-attitudes-to-climate-change-and-transport-summary-report/.

Bergman, M. M. 1998. "A Theoretical Note on the Differences Between Attitudes, Opinions, and Values." *Swiss Political Science Review* 4 (2): 81–93. doi:10.1002/j.1662-6370.1998.tb00239.x.

Box, G. E. P. 1987. "Empirical Model-Building and Response Surfaces." Co-authored with Norman R. Draper, p. 424, ISBN 0471810339.

Cabinet Office. 2011. *Behavioural Insights Team Website*. http://www.cabinetoffice.gov.uk/behavioural-insights-team.

Chatterton, T. 2011. "An Introduction to Thinking About 'Energy Behaviour': A Multi-Model Approach." Department for Energy and Climate Change, London. http://www.decc.gov.uk/assets/decc/11/about-us/economics-social-research/3887-intro-thinking-energy-behaviours.pdf.

Chatterton, T., and C. Wilson. 2013. "Improving Opportunities for Energy Reduction from 'Behaviour Change' through the Use of Multiple Models and a Better Characterisation of Behaviour." Proceedings of the European Council for an Energy Efficient Economy (ECEEE) Summer Study on Energy Efficiency, June 2013.

COI. 2009. *Communications and Behaviour Change*. Central Office of Information, Government Communications Network.
Darnton, A. 2004a. "Driving Public Behaviours for Sustainable Lifestyles." Report for Defra, May 2004. http://collections.europarchive.org/tna/20080530153425/http://www.sustainable-development.gov.uk/publications/pdf/desk-research2.pdf.
Darnton, A. 2004b. "The Impact of Sustainable Development on Public Behaviour." Report for Defra, March 2004. http://collections.europarchive.org/tna/20080530153425/http://www.sustainable-development.gov.uk/publications/pdf/desk-research1.pdf.
Darnton, A. 2008. "Reference Report: An Overview of Behaviour Change Models and Their Uses." Report for GSR Behaviour Change Knowledge Review Centre for Sustainable Development, University of Westminster, July 2008. http://www.civilservice.gov.uk/wp-content/uploads/2011/09/Behaviour_change_reference_report_tcm6-9697.pdf.
DCLG. 2011. "Inspiring Communities – Changing Behaviour, A Practical Guide to Delivering Local Campaigns to Change Behaviour and Benefit Young People." Report for DCLG, June 2011. https://www.gov.uk/government/publications/inspiring-communities-report.
DECC. 2011. "Evaluation of the Delivery and Uptake of the Carbon Emissions Reduction Target." Research report by Ipsos MORI, CAG consultants and BRE for DECC, October 2011.
DECC. 2012a. "Factors Influencing Energy Behaviours and Decision-Making in the Non-Domestic Sector – A Rapid Evidence Assessment." Report for DECC by Centre for Sustainable Energy and University of Oxford Environmental Change Institute. http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65601/6925-what-are-the-factors-influencing-energy-behaviours.pdf.
DECC. 2012b. "What Works in Changing Energy Using Behaviours in the Home? A Rapid Evidence Assessment." Report for DECC by RAND Europe, November 2011. http://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69797/6921-what-works-in-changing-energyusing-behaviours-in-.pdf.
Defra. 2008. *A Framework for Pro Environmental Behaviours*. London: Department for the Environment, Farming and Rural Affairs, Stationery Office.
Demos. 2004. "Carrots, Sticks and Sermons: Influencing Public Behaviour for Environmental Goals." Demos and the Green Alliance, Report forDefra, December 2004. http://www.demos.co.uk/files/CarrotsSticksSermons.pdf.
DfT. 2005. "Smarter Choices - Changing the Way We Travel." Accessed June 24, 2005. http://www.dft.gov.uk/publications/smarter-choices-changing-the-way-we-travel-main-document/#.
DfT. 2010. "Behaviour Change: What Works for Transport?" Thinkpiece Project. http://webarchive.nationalarchives.gov.uk/20100413203302/www.dft.gov.uk/pgr/scienceresearch/social/behaviour-changes/.
DfT. 2011a. "Behavioural Insights Toolkit." http://www.dft.gov.uk/publications/behavioural-insights-toolkit/.
DfT. 2011b. "Climate Change and Transport Choices: Segmentation Study Final Report." Accessed July 28, 2011. http://www.dft.gov.uk/publications/climate-change-transport-choices-segmentation.
DirectGov. 2010. "Act On CO_2 Website." Accessed July 30, 2013. http://webarchive.nationalarchives.gov.uk/20101007164856/http://actonco2.direct.gov.uk/home/what-you-can-do.html. [archived 06/10/2010]
Dolan, P., M. Hallsworth, D. Halpern, D. King, and I. Vlaev. 2010. *MINDSPACE: Influencing Behaviour Through Public Policy*. London: Cabinet Office and Institute for Government.
Fishbein, M., and I. Ajzen. 1975. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*. Reading, MA: Addison-Wesley.
GOV.UK. 2013. "Government Launches Competition to Find a Commercial Partner for the Behavioural Insights Team." Press Release, 1/5/2013, [online] [cited 24 September 2013]. https://www.gov.uk/government/news/government-launches-competition-to-find-a-commercial-partner-for-the-behavioural-insights-team.
Guy, S. 2006. "Designing Urban Knowledge: Competing Perspectives on Energy and Buildings." *Environment and Planning C: Government and Policy* 24 (5): 645–659. doi:10.1068/c0607j.
Halpern, D., C. Bates, B. Geales, and A. Heathfield. 2004. "Personal Responsibility and Changing Behaviour: The State of Knowledge and its Implications for Public Policy." February 2004. http://webarchive.nationalarchives.gov.uk/+/http://www.cabinetoffice.gov.uk/media/cabinetoffice/strategy/assets/pr2.pdf.

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Hargreaves, T., M. Nye, and J. Burgess. 2010. "Making Energy Visible: A Qualitative Field Study of How Householders Interact with Feedback from Smart Energy Monitors." *Energy Policy* 38 (10): 6111–6119. doi:10.1016/j.enpol.2010.05.068.

Hassmén, P. 1990. "Perceptual and Physiological Responses to Cycling and Running in Groups of Trained and Untrained Subjects." *European Journal of Applied Physiology and Occupational Physiology* 60 (6): 445–451. doi:10.1007/BF00705035.

Heinen, E., K. Maat and B. van Wee. 2011. "The Role of Attitudes Toward Characteristics of Bicycle Commuting on the Choice to Cycle to Work Over Various Distances." *Transportation Research Part D: Transport and Environment* 16 (2): 102–109. doi:10.1016/j.trd.2010.08.010.

Herring, H., and R. Roy. 2007. "Technological Innovation, Energy Efficient Design and the Rebound Effect." *Technovation* 27 (4): 194–203. doi:10.1016/j.technovation.2006.11.004.

Hickman, M. 2011. "Nudge, Nudge, Wink, Wink … How the Government Wants to Change the Way We Think." *The Independent*, January 3.

HMG. 2010. *The Coalition: Our Programme for Government*. London: HM Government.

HMG. 2011. http://www.parliament.uk/business/committees/committees-a-z/lords-select/science-and-technology-committee/inquiries/parliament-2010/behaviour/.

Jackson, T. 2005. "Motivating Sustainable Consumption – A Review of Evidence on Consumer Behaviour and Behavioural Change." Report for Defra. http://www3.surrey.ac.uk/eng/data/staff/rp/JacksonSDRN-review.pdf.

Kahneman, D. 2011. *Thinking, Fast and Slow*. Macmillan. ISBN 978-1-4299-6935-2.

Liebling, D. 2008. "Car Ownership in Great Britain." Report for the RAC Foundation, October 2008.

Lockton, D., D. Harrison, and N. A. Stanton. 2010. "The Design with Intent Method: A Design Tool for Influencing User Behaviour." *Applied Ergonomics* 41 (3): 382–392. doi:10.1016/j.apergo.2009.09.001.

Lutzenhiser, L. 1993. "Social and Behavioral Aspects of Energy Use." *Annual Review of Energy and the Environment,* 18 (1): 247–289.

Marmot, M. 2010. "The Marmot Review, Fair Society, Healthy Lives." February 2010.

Michie, S, M. M. van Stralen, and R. West. 2011. "The Behaviour Change Wheel: A New Method for Characterising and Designing Behaviour Change Interventions." *Implementation Science* 6 (1): 42. doi:10.1186/1748-5908-6-42.

Osbaldiston, R., and J. P. Schott. 2012. "Environmental Sustainability and Behavioral Science: Meta-Analysis of Proenvironmental Behavior Experiments." *Environment and Behavior* 44 (2): 257–299. doi:10.1177/0013916511402673.

RCUK. 2009. "Individuals' and Communities' Energy Behaviour." *UK Research Council's Energy Programme and DECC Recruitment Specification for Social Science Policy Fellowship*. http://www.epsrc.ac.uk/SiteCollectionDocuments/Calls/2009/DECC-SOCIALSCIENCE09.pdf.

Rettie, R., and T. Harries. 2013. "Notes on Practice Theory." CHARM Research Summary 7, Behaviour and Practice Research Group, Kingston University. http://www.projectcharm.info/.

Rogers, E. M. 2010. *Diffusion of Innovations*. New York: Simon and Schuster.

Schatzki, T. 2011. "Where the Action Is: On Large Social Phenomena Such as Socio-Technical Regimes." Sustainable Practices Research Group, Working Paper 1, November 2011. Accessed July 31, 2013. http://www.sprg.ac.uk/uploads/schatzki-wp1.pdf.

Schwanen, T., D. Banister, and J. Anable. 2012. "Rethinking Habits and Their Role in Behaviour Change: The Case of Low-Carbon Mobility." *Journal of Transport Geography* 24: 522–532. doi:10.1016/j.jtrangeo.2012.06.003.

Seyfang, G., and A. Haxeltine. 2012. "Growing Grassroots Innovations: Exploring the Role of Community-Based Initiatives in Governing Sustainable Energy Transitions." *Environment and Planning C: Government and Policy* 30 (3): 381–400. doi:10.1068/c10222.

Seyfang, G., and A. Smith. 2007. "Grassroots Innovations for Sustainable Development: Towards a New Research and Policy Agenda." *Environmental Politics* 16 (4): 584–603. doi:10.1080/09644010701419121.

Shove, E. 2010. "Beyond the ABC: Climate Change Policy and Theories of Social Change." *Environment and Planning A* 42 (6): 1273–1285. doi:10.1068/a42282.

Shove, E. 2011a. "Materials From 'How Social Science Can Help Climate Change Policy: An Extraordinary Lecture and Accompanying Exhibition of Ideas' Held at the British Library January 17, 2011." http://www.lancs.ac.uk/staff/shove/exhibits/finalcards.pdf.

Downloaded by [31.52.4.229] at 04:59 11 November 2013

Shove, E. 2011b. "On the Difference Between Chalk and Cheese – a Response to Whitmarsh et al.'s Comments on Beyond the ABC: Climate Change Policy and Theories of Social Change." *Environment and Planning A* 43 (2): 262–264. doi:10.1068/a43484.

Shove, E., M. Pantzar, and M. Watson. 2012. *The Dynamics of Social Practice: Everyday Life and How it Changes*. London: Sage.

Snape, J. R. 2013. "Smart Grids, Local Adoption of Distributed Generation and the Feed in Tariff Policy Incentive." *Proceedings of the European Council for an Energy Efficient Economy (ECEEE) Summer Study on Energy Efficiency*, June 2013.

Sparrow, A. 2008. "Speak 'Nudge': The 10 Key Phrases from David Cameron's Favourite Book." *The Guardian*, August 22, 2008. http://www.guardian.co.uk/politics/blog/2008/aug/22/davidcameron.conservatives.

Taylor, D., M. Bury, N. Campling, S. Carter, S. Garfield, J. Newbould, and T. Rennie. 2006. *A Review of the use of the Health Belief Model (HBM), the Theory of Reasoned Action (TRA), the Theory of Planned Behaviour (TPB) and the Trans-Theoretical Model (TTM) to Study and Predict Health Related Behaviour Change*. Report for DoH and NICE. http://www.nice.org.uk/nicemedia/live/11868/44524/44524.pdf.

Thaler, R., and C. R. Sunstein. 2008. *Nudge: Improving Decisions About Health, Wealth, and Happiness*. New Haven, CT: Yale University Press.

Thøgersen, J., and Crompton, T. 2009. "Simple and Painless? The Limitations of Spillover in Environmental Campaigning." *Journal of Consumer Policy* 32 (2): 141–163. doi:10.1007/s10603-009-9101-1.

Venkatesh, V., and M. G. Morris. 2000. "Why Don't Men Ever Stop to Ask for Directions? Gender, Social Influence, and Their Role in Technology Acceptance and Usage Behavior." *MIS Quarterly* 24 (1): 115–139. doi:10.2307/3250981.

Warde, A. 2004. "Theories of Practice as an Approach to Consumption." Cultures of Consumption Working Paper Series, No.6, Birkbeck College, London. http://www.consume.bbk.ac.uk/working_papers/Warde%20work%20paper%201.doc.

Webb, T. L., F. F. Sniehotta, and S. Michie. 2010. "Using Theories of Behaviour Change to Inform Interventions for Addictive Behaviours." *Addiction* 105 (11): 1879–1892. doi:10.1111/j.1360-0443.2010.03028.x.

Wengraf, I. 2012. "Easy on the Gas: The Effectiveness of Eco-driving." Report for the RAC Foundation, August 2012.

Whitmarsh, L., S. O'Neill, and I. Lorenzoni. 2011. "Climate Change or Social Change? Debate Within, Amongst, and Beyond Disciplines." *Environment and Planning A* 43 (2): 258–261. doi:10.1068/a43359.

Wilson, C., and T. Chatterton. 2011. "Multiple Models to Inform Climate Change Policy: A Pragmatic Response to the 'Beyond the ABC' Debate." *Environment and Planning A* 43 (12): 2781–2787. doi:10.1068/a44404.

Wilson, C., and H. Dowlatabadi. 2007. "Models of Decision Making and Residential Energy Use." *Annual Review of Environment and Resources* 32 (1): 169–203. doi:10.1146/annurev.energy.32.053006.141137.

Wood, M. 2012. "Marketing Social Marketing." *Journal of Social Marketing* 2 (2): 94–102. doi:10.1108/20426761211243937.

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