

# **Using the Values-Practice Framework to adopt lifetime optimising behaviours: The case of maintenance**

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## **Abstract**

The influence that consumers have on the lifespan of products has attracted increased attention in recent years. Studies have provided an overall understanding of the factors that influence consumer attitudes and behaviours towards product longevity, categorised around the physical properties of a product, and individual and societal characteristics. However, such studies do not yet adequately explain how people could adopt product lifetime optimising behaviours.

To fill this gap, the paper analyses a range of studies on what influences product lifetimes, focusing on maintenance activities. It proposes the use of the Values-Practice framework derived from two theoretical positions, social psychology and social practice theory, to consider how to facilitate the adoption of lifetime optimising behaviours. To build this framework, it analyses studies that classify factors influencing attitudes and behaviours towards product lifetimes and then links these to the 'meaning', 'competence' and 'material' elements of practice. The framework could be used as a tool to aid designers understand the different elements and factors that engage people in maintenance activities. The paper concludes by considering the research requirements for the future application of the framework.

## **1. Introduction**

Current consumption trends are unsustainable, not least because they demand an excessively fast throughput of material and energy (Allwood and Cullen, 2012; Tukker et al., 2006; Cooper, 2005; Green and Vergragt, 2002), but also because they have resulted in unprecedented environmental, social and economic challenges (Jackson, 2005a).

The scale of change needed for sustainable patterns of consumption will only be possible if we challenge the 'throwaway' culture, which is characterised both by the production of short lived products and, equally significant, people discarding items before they fail or are broken (Cooper, 2010). Producing longer lasting products and influencing people to extend the length of time that products are kept in use can contribute to lower material throughput, with significant potential to reduce resource use and greenhouse gas emissions (Cooper, 2005; Cox et al., 2013, Allwood and Cullen, 2012). Influencing consumers to extend product lifetimes could also bring social and economic impacts, however this would not happen alone and market mechanisms would need to change (Environmental Resources Management, 2011).

Both producers and consumers are responsible for product lifetimes (Cooper, 2004). However, academic and consultancy studies have mostly focussed on consumer influences (Bayus and Gupta, 1992; Defra, 2011; Cooper, 2004; Cooper and Mayers, 2000; Cox et al., 2013; DeBell and Dardis, 1979; Evans and Cooper, 2010; Heiskanen, 1996; Van Nes and Cramer, 2005; 2006). These have demonstrated that consumer attitudes and behaviours play an important role in optimising product lifetimes but do not adequately explain why and how people do adopt such behaviours.

To fill this gap in the literature, this paper focuses on the adoption of lifetime optimising behaviours, specifically through performance of maintenance activities. The case of maintenance is particularly relevant as product lifetime optimisation at the use stage is often impeded by people failing to undertake regular maintenance to their possessions (Cooper, 2010) and a study commissioned by Defra (2011) specifically identified caring for products in use as an opportunity for intervention in attitudes and behaviours. In addition, previous research has focused mainly on influencing lifetime optimising behaviours at the acquisition and disposal stages, but not on extending product lifetimes in the use stage.

This paper considers 'maintenance' as a spectrum of activities encompassing routines of cleaning, wiping and polishing, quick-fix repairs, and more thorough-going restoration done by a specific individual or through a professional service (Gregson et al., 2009).

A willingness to maintain and keep products in use is often related to consumer behaviour in previous studies. The next section thus reviews two theoretical frameworks grounded in the social sciences to understand consumer behaviour.

## **2. Understanding consumer behaviour**

Consumer behaviour is widely considered responsible for the overall impact that society has on the environment (Jackson, 2005b). Understanding what motivates behaviour and how to bring about change is, thus, key to efforts and strategies to promote more sustainable patterns of consumption and lifestyles. Conceptual models of consumer behaviour and behavioural change draw from disciplines such as economics, psychology and sociology, and are widely used to inform policy interventions. In this paper, social psychological models of behaviour are compared and contrasted with sociological theories of practice as these offer different, if not contrasting, approaches to conceptualise pro-environmental behaviour and change (Piscicelli et al., 2014).

### **2.1 Social psychological models of consumer behaviour**

Social psychological models of consumer behaviour provide frameworks for conceptualising (and predicting) behaviour by accounting for

both the social influences and psychological antecedents of behaviour. The 'rational choice model', based on traditional neoclassical economic theory, is commonly acknowledged as a starting point for modelling consumer behaviour (Jackson, 2005b; Darnton, 2008). The model assumes that individuals make decisions between different courses of action by calculating expected costs and benefits and choosing the option that maximises personal net benefits. Underlying this is an assumption that behaviour is a result of processes of cognitive deliberation driven by individual self-interest. Consumers' preferences are exogenous to the model, which does not seek to explain their origins or antecedents. Accordingly, the model has been extensively criticised for its failure to address a variety of affective (i.e. emotional) or cognitive limitations occurring in the decision process (e.g. habits, routines, mental cues, emotional attachment to products).

'Adjusted' social psychological models attempt to overcome the shortcomings of the rational choice model by considering the psychological antecedents of consumer preferences or accounting for the influence of other people's attitudes on individual behaviour, most notably in the case of Ajzen and Fishbein's 'Theory of Reasoned Action' and Ajzen's 'Theory of Planned Behaviour'. These are helpful in explaining some intentional behaviours, but arguably do not provide enough insight into cognitive (e.g. habitual), affective (i.e. emotional) and normative (i.e. moral) dimensions of behaviour. Additionally, it has been observed that some behaviours are not mediated either by attitudes or deliberate intention (Jackson, 2004b).

Moral beliefs and normative considerations are explicitly recognised as driving (or inhibiting) pro-environmental or pro-social behaviour in other theoretical models, such as Schwartz's 'Norm Activation Theory', Stern's 'Value-Belief-Norm Theory' and Cialdini's 'Focus Theory of Normative Conduct'. While these mainly focus on cognitive processes and determinants of behaviour that are internal to the individual (e.g. values, attitudes, intentions), other models add external factors (e.g. fiscal and regulatory incentives, institutional constraints, social norms) in order to provide a more comprehensive picture. Some such examples of 'integrative theories of consumer behaviour' are Stern's 'Attitude-Behaviour-Context Model', Triandis' 'Theory of Interpersonal Behaviour' and Bagozzi's 'Comprehensive Model of Consumer Action'.

In particular, Stern (2000) and his colleagues developed an integrated 'attitude-behaviour-context' (ABC) model of pro-environmental consumer behaviour that accounts for four types of causal variable: attitudinal (e.g. including values and beliefs), contextual or situational (e.g. interpersonal influences, government regulations, financial cost), personal capabilities (e.g. knowledge, skills, resources) and habits or routines.

Nonetheless, even this integrated model has strong critics such as Shove (2010), who argues that there are intrinsic limitations to social psychological understandings of behaviour and advocates the use of social and technological theories of practice and transitions, which it is consider more holistic. In particular, social practice theory is proposed as an

alternative paradigm able to re-frame academic debate and policy approaches to behaviour change and sustainable consumption.

## 2.2 Social practice theory

In contrast to social psychological understandings of consumption that are based on deliberate and rational considerations by individuals, social practice theory regards consumption as less conscious, shaped by habits and routines. It argues that people use (and consume) resources and products while engaging in a variety of mundane activities (Mylan, 2014) and thus focuses on the routine actions that people (i.e. 'practitioners' or 'carriers') perform in daily life. Showering, driving, walking and cooking are all examples of 'practices': "a routinized type of behaviour which consists of several elements, interconnected to one other: forms of bodily activities, forms of mental activities, 'things' and their use, a background knowledge in the form of understanding, know-how, states of emotion and motivational knowledge. A practice [...] forms so to speak a 'block' whose existence necessarily depends on the existence and specific interconnectedness of these elements" (Reckwitz, 2002: 249-250).

Shove et al. (2012: 14) group these elements in three categories – 'material', 'competence' and 'meaning' – and argue that "in doing things like driving, walking or cooking, people (as practitioners) actively combine the elements of which these practices are made". Therefore, "practices emerge, persist, shift and disappear when connections between elements of these three types are made, sustained or broken" (Figure 1). Specific configurations of elements making up practices are socially and culturally shared. Being geographically and historically grounded, they may vary across space and over time.

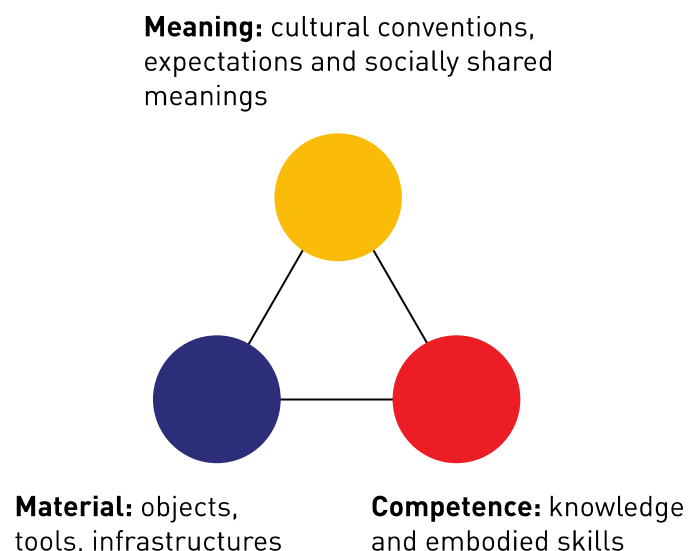


Figure 1. Elements and linkages sustaining practices. Adapted from Shove et al., 2012: 29; Spurling et al., 2013: 9.

Social practice theory shifts the focus from consumer behaviour and choice to practices and their emergent dynamics. Rather than originating from individuals' attitudes, beliefs and other motivational factors, "behaviour is the observable expression of social phenomenon (socially shared tastes and meanings, knowledge and skills, and materials and infrastructure)" (Spurling et al., 2013: 47). In shifting attention from the 'individual' to the 'social', however, social practice theory tends to reduce consumers to "more or less faithful carriers or practitioners" (Shove et al., 2012: 63) routinely reproducing "what people take to be 'normal' ways of life" (Shove, 2003: 3).

This prompts a series of considerations around agency (i.e. the role of the individual) and the way in which conceptions of 'normality' are culturally and socially shared as much as personally determined. In particular, social expectations and culturally constructed conventions (i.e. the 'meaning' element of practices) are mediated by and through personal traits, specificities and preferences (Piscicelli et al., 2014).

### **3. The Values-Practice framework**

Social psychological models of consumer behaviour and social practice theory may appear to rest upon and support two different paradigms to conceptualise behaviour and change. Although some critics reject the possibility of merging the positions and overcoming the theoretical divides (e.g. Shove, 2010, 2011), academic research in the area of sustainable consumption, at least, increasingly advocates a more fruitful dialogue between these perspectives (Boldero and Binder, 2013; Darnton et al., 2011; Whitmarsh et al., 2011; Wilson and Chatterton, 2011).

Piscicelli et al. (2014) similarly combine insights from social psychology and social practice theory in exploring the role of values in the context of collaborative consumption, an economic model, based on sharing, lending, swapping, gifting, bartering or renting products and services, which prioritises access over ownership. The study investigated the possibility that personal values, located within the individual, act upon the 'meaning' element (i.e. the bundle of cultural conventions, social norms, collective assumptions and expectations) of practices, thus contributing to (or hindering) the acceptance, adoption and diffusion of more sustainable patterns of consumption.

Drawing on Shove et al. (2012), the proposed framework positions the carrier of a practice (i.e. the individual) at the centre of the practice itself. In doing so, it highlights the existing interaction between the carrier and a specific configuration of material, competence and meaning elements. Besides connecting the elements together through the performance of that practice, the carrier interacts and negotiates with each element (Figure 2). This relationship is mediated by individual traits, specificities and preferences such as personal values. As a result, engagement in a certain practice is more likely if values, for example, are aligned with cultural conventions, social norms, collective assumptions and expectations associated with that practice.

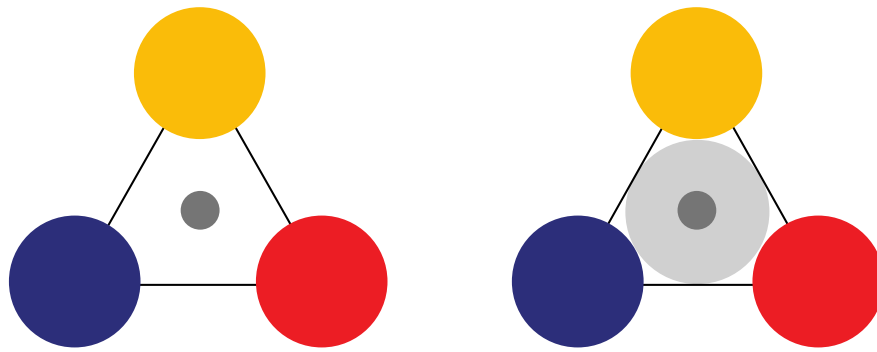


Figure 2. The Values-Practice framework. Carrier (dark grey) and interaction (light grey) with elements of practice (Piscicelli et al., 2014).

In this paper we refer to the framework as the 'Values-Practice Framework'. The next sections examine how it may be used to influence the adoption of lifetime optimising behaviours, using the case of maintenance.

#### 4. Studies on attitudes and behaviours towards product lifetimes

Research on attitudes and behaviours towards product lifetimes has covered the different consumption phases (i.e. acquisition, use and disposal). However, most attention has been paid to the point of purchase or on replacement decisions (see Bayus and Gupta, 1992; Cooper and Mayers, 2000; Cooper, 2004; DeBell and Dardis, 1979; Mugge et al. 2005; Heiskanen, 1996; Van Nes and Cramer, 2005). Only a limited number of studies considered equally the three phases of consumption (e.g. Defra, 2011; Cox et al., 2013; Evans and Cooper, 2010), with Gregson et al. (2009) giving particular attention to maintenance activities that could help prolong the lifetime of products.

To understand the influences upon product lifetimes, this section provides an overview of how studies classify the factors affecting attitudes and behaviours towards product lifetimes. Specifically, the section describes how these factors are determined in studies that contrast with those of Evans and Cooper (2010) and Defra (2011). These, devote particular attention to the factors that influence product lifetimes in the use phase and are in tune with social psychology theories, giving particular attention to influences upon individual behaviour. In addition, it considers a paper by Gregson et al. (2009) which explores maintenance drawing from social practice theory. It reviews how these studies were conducted, and the consideration they give to different product categories. Finally, it describes the value, intended as what is perceived as valuable to consumers (Cox et al., 2013), and its influence in adopting product lifetime optimising behaviours.

##### 4.1 Classifying factors that influence attitudes and behaviours

Most studies addressing influences towards product lifetimes make a classification of factors affecting consumer behaviour. Evans and Cooper (2010), for example, developed a taxonomy that identified and listed these

factors in relation to the three phases of consumption. Factors were then grouped into three categories: personal, social/situational, and product characteristics (Table 1).

<p><b>Personal Characteristics</b></p> <p>Age and Gender          Attitudes and intentions          Values          Previous experiences          Sense of individual control, responsibility and effectiveness          Personality, nature of relationship to possessions (attachment/detachment)          Intelligence, knowledge and skills          Preferences          Habit/ritual          Tasks knowledge          Desire</p>
<p><b>Social/Situational characteristics</b></p> <p>Demands of other cohabitants in the home          Family circumstances          Financial situation          Opportunity costs          Popular culture          Risk and time management          Social norms          Social progress</p>
<p><b>Product Characteristics</b></p> <p>Appearance          Character          Nature/function          Origin          Price          Time/residual life</p>

Table 1. Factors influencing product lifetimes according to Evans and Cooper (2010).

In similarly grouping factors that influence consumer behaviour in replacement decisions, Cooper (2004) noted the concept of relative obsolescence. Relative obsolescence occurs when a functional product is discarded due to technological (e.g. functional change, quality, effectiveness), psychological (e.g. aesthetic, functional or symbolic value, user satisfaction) and economic factors (e.g. financial outlay, value, depreciation). Cooper (2010) also distinguishes relative obsolescence from absolute obsolescence, the failure of a product to function, which depends on materials, quality of design, manufacture, ease of maintenance, reparability, consumer demand and the operating environment. This distinction is significant when discussing consumer behaviour in the context of optimising product lifetimes, where the focus is on relative obsolescence because many products are thrown away as unwanted rather than broken (Cox et al., 2013).

A similar classification of factors influencing product lifetimes is proposed by Van Nes and Cramer (2005, 2006) in developing a model of factors that influence replacement decisions, based on consumer characteristics, situational influences, and the actual and desired state of products. Their research suggested that replacement motives are a combination of factors that lead to product replacement and resulted in the definition of a typology of four general replacement motives based on product characteristics: wear and tear, improved utility, improved expression and new desires.

By contrast, Defra (2011) and Cox et al. (2013) concluded that attitudes and behaviours towards product lifetimes are determined in two dimensions: product 'nature' and 'nurture'. The former is dependent on product's inherent properties such as durability, functionality, reliability and overall quality or performance, while product 'nurture' is an interrelated set of influences on attitudes and behaviours situated within the individual (i.e. the role that products play in meeting personal needs) or the wider market and societal environment (i.e. price, information, quality, availability, social norms).

Studies such as those conducted by Van Nes and Cramer (2005; 2006) and Evans and Cooper (2010) have concluded that consumer attitudes and behaviours relating to product lifespans depend on product categories. What is distinctive of the research commissioned by Defra (2011) is that the findings allowed products to be grouped into categories defined by differences in attitudes and behaviours: 'up-to-date' products susceptible to being updated due to their look or changes in technology (such as clothes or mobile phones), 'workhorse' products valued for the service they provide (such as large appliances) and 'investment' products perceived as special and worth investing in (such as quality electronics). To be able to group products into these categories, the researchers considered a comprehensive range of products, including clothing, electronics, furniture/interiors, small and large appliances. Cox et al. (2013) confirmed that the product categories allowed opportunities to encourage consumers to keep products in use for longer to be identified.

Socio-demographic variables such as age, socio-economic group, geographical location and gender have been considered, but Evans and Cooper concluded that such factors were weak when related to product lifetime behaviours and Defra (2011: 27) confirmed this, suggesting that "socio-demographic characteristics should be treated only as indicative." Despite this, situational change, such as changes in personal life, should be considered (Van Nes and Cramer, 2005). In particular, Defra (2011) revealed that income, age and life stage (i.e. living with parents, family, empty nester) could be strong influences. Cox et al. (2013) suggested that research by Evans and Cooper (2010) gave conflicting evidence on the influence of age and gender.

Other factors requiring consideration are changes in market mechanisms that lead to a decline on product lifespans (Park, 2010). Cox et al. (2013) argue that the rapid discard of functional products could be due to



manufacturers 'building-in' obsolescence as part of their business models. This has caused consumers to feel locked into frequent upgrades due to the speed of new technologies coming into the market. Another market mechanism that acts as an influence is product price, leading to cheap but stylish products taking priority over long life expectancy (Evans and Cooper, 2010). The original product price and the cost of repair in relation to replacement also influence the point at which people consider maintaining practices as an option (Cooper, 2010).

Despite market and socio-demographic variables being considered important in their study, Evans and Cooper (2010) concluded that psychological variables might be even more significant. Cox et al. (2013: 27) supported this by concluding, "product durability on its own is unlikely to overcome the very significant psychological, emotional and social factors which underpin the rapid discard of products". To this end, it is important to understand how product lifetimes relate to what consumers value.

#### **4.2 Perception of value and its influence in adopting lifetime optimising behaviours**

According to Cox et al. (2013), people's willingness to keep in use an owned product is intimately bound up with the perception of its value, which derives from the interplay of various individual and wider influences, as well as its properties. Research commissioned by Defra (2011) found that there is a difference in the way consumers value functional reliability and durability. Functional reliability was expected in all products, including those likely to be kept in use for a short time. Cooper (2004), Cooper and Christer (2010) and Defra (2011) mention price, function, brand, and quality as proxies for consumers to judge the reliability of a product, while agreeing that none of these alone are necessarily an adequate guide.

Value could be seen as an economic characteristic, in which people's expectations of durability are based on achieving good value. Defra (2011) found that in repair decisions people assess value by comparing price with expected lifetime. The reasons for keeping products in longer use could also be emotional or social (Chapman 2005, 2010; Park, 2010). Van Nes and Cramer (2005) refer to social and emotional value, although they do not provide a clear definition of these concepts. Emotional value may relate to function and aesthetics: Evans and Cooper (2010) found that these product characteristics created a degree of attachment. For example, attachment to a product may result from the emotional experience delivered by it. Moreover, attachment goes beyond monetary value, as emotional meaning is enhanced (Chapman, 2010). Social value could be seen as how value is shaped by social norms; as noted by Chapman (2005), people express who they are and to which group they belong through the objects they own.

Finally, it could be said that each individual has a different perception of value influenced by personal characteristics such as age, gender, life stage, income and financial situation, attitudes, values and beliefs, amongst others.

## 5. Adaptation of the Values-Practice framework to influence lifetime optimising behaviours

Despite the Values-Practice framework being originally built to study individual values in relation to social practices (see Piscicelli et al., 2014), it is useful to the study of product lifetime optimising behaviours as it combines social psychology theories with theories of practice, capturing the interaction between the individual, his/her behaviour and the elements of the practice.

This section explains how factors affecting consumer influences upon product lifetimes relate to the Values-Practice framework. In considering the potential use of the Values-Practice framework to influence consumers to perform maintenance activities, factors influencing product lifetimes suggested by Evans and Cooper (2010) and presented in Table 1 were used as the basis and then supplemented by other factors identified from similar studies (Section 4.1, above). These were then related to the three elements of 'material', 'competence' and 'meaning' in the Values-Practice framework (Figure 3, below). Personal characteristics and their influence to the perception of value, were set within the 'carrier' of the practice at the middle of the framework.

The list of factors included in the framework should be considered as indicative. Although drawing from an extensive literature review, other factors might be added after further empirical research.

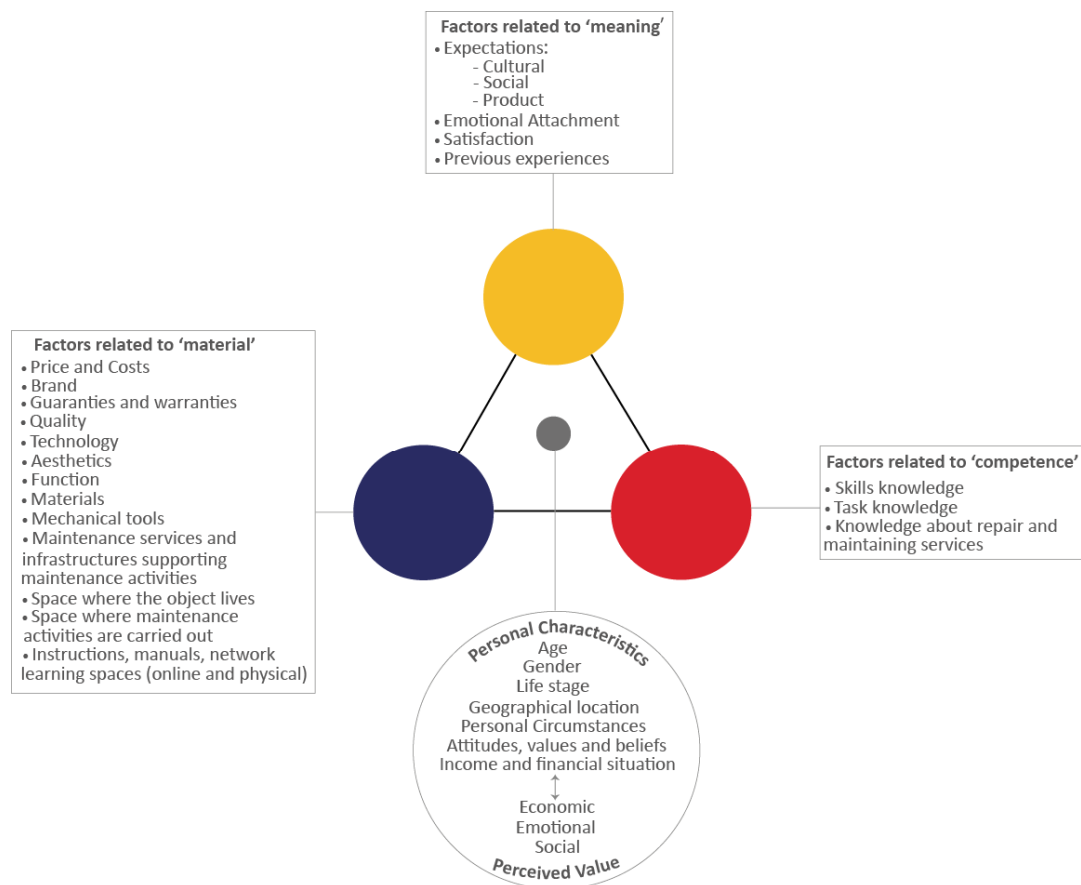


Figure 3. Relating factors that influence product lifetimes to the Values-Practice framework.

## 5.1 Linking factors to the Values-Practice framework: The case of maintenance

### ***Factors related to 'material'***

'Material' factors are related to the nature of the product (Defra, 2011), product characteristics (Evans and Cooper 2010), factors that lead to absolute obsolescence (Cooper, 2004), and to the market mechanisms mentioned in Section 4.1, above.

*Price* and *cost* are important factors to consider, as consumers evaluate the cost of maintenance, for example how much a repair will cost in comparison to the cost of replacement (Cox et al., 2013; Evans and Cooper, 2010) and the product's monetary value (Defra, 2011).

*Brand* reputation may be associated with *guaranties* and *warranties*, which provide an assurance of maintenance, at least in the first few years of a product's life. Consumers may take the length of guarantees as a guide to how much faith manufacturers have in their products (Defra, 2011). However, Cox et al. (2013) noted that warranties can cause mixed feelings to consumers, as some manufacturers offer a replacement rather than a repair.

*Quality* tends to be linked with *brand* and *price* and is often used to judge the durability of a product. Research on product attachment (Chapman, 2005) indicated that maintenance could be encouraged by the aesthetics and functionality of a product, unless there is a technological advance that will discourage people to undertake maintenance activities.

Ease of maintenance will depend on the availability of repair *services* and spare parts, the use of *materials* that resist 'wear and tear' and the available mechanical *tools* to conduct repairs (Cooper, 2004). The practice of maintenance will depend on the type and quality of each product and on each material the product is made of; when products are in use they will age, damage and be cared for differently (Fisher, 2004). In addition, the space where the object lives or where restoration happens will influence how maintenance activities are carried out (Gregson et al., 2009). Access to maintenance services and infrastructures (e.g. network learning spaces, service manuals and instructions, DIY spaces, repair centres) could also support maintenance activities. (Cox et al., 2013).

### ***Factors related to 'competence'***

Maintenance activities require the necessary *knowledge, skills and ability*. Evans and Cooper (2010) mention that *task knowledge* (i.e. technical understanding) may be needed to enable people to conduct maintenance, while Gregson et al. (2009) write that '*having the skills*' will be a determinant. Evans and Cooper mention the need for access to *knowledge* about maintaining services, including repair. Instructions, manuals and network learning spaces (listed as factors of the material element in figure 3) should

be comprehensive, user friendly and easy in order for consumers to gain the necessary skills through doing and learning (WRAP, 2011).

### ***Factors related to 'meaning'***

Practices consist of the active integration of material, competence and meaning elements (Shove et al., 2013) and this is clearly shown in the context of maintenance activities, as many of the 'meaning' elements interact directly with material and competence elements.

*Cultural expectations* around product maintenance are determined by societal factors such as fashion and living in a 'throwaway society' (Cooper and Evans, 2010:19). *Social expectations* are linked to societal norms. Gregson et al. (2009) describe how care and cleaning of possessions lies at the heart of social respectability, as certain levels of maintenance are expected. Other expectations are related to the *product itself in relation to its price, brand, quality and functionality* (i.e. material element). Evans and Cooper (2010) and Defra (2011) suggest that lower expectations are found on products considered cheap and of low quality, thus resulting in reduce maintenance. Conversely, in products considered as an 'investment', higher maintenance was conducted (Cox et al., 2013).

*Emotional attachment* is related to the functional, aesthetic, cultural, social and other characteristics that give meaning to objects. The attachment that consumers have with their objects will influence the success or failure of maintenance. Mugge et al. (2005) argue that memories evoked through products can enhance the attachment experience and encourage greater care of products, such that people repair them if they break and postpone their replacement. Emotional attachment could be built into objects to reflect a sense of identity and belonging (Chapman, 2010). If products are designed to be exclusive and express personal identity, it is likely that they will be better taken care of (Mugge et al., 2005).

Conducting new tasks, learning new skills, taking care of the object, can provide satisfaction. The more satisfied people are, the more likely is that they will engage in maintenance activities. Previous experiences could also hinder or enable conducting maintenance activities. For example, a positive experience of repair services could encourage people to undertake further repairs, while negative experiences could deter people (Evans and Cooper, 2010).

### ***Personal characteristics, socio-demographic variables and value***

Personal characteristics such as values, attitudes, beliefs, and socio-demographic variables including age, gender, geographical location, income and financial situation, life stage and personal circumstances are attributed to the individual at the centre of the Values-Practice framework in Figure 3. These will influence the three elements of material, competence and meaning, thus determining different lifetime optimising behaviours. At the same time, they also have an impact on the individual perception of value.

## **5.2 Factors as barriers and enablers**

Many of these factors may be considered as barriers to engaging consumers to adopt product lifetime optimising behaviours according to Evans and Cooper (2010) and Defra (2011), particularly when consumers do not want to take responsibility for extending the lifetime of products during use (Cox et al., 2013). Despite this, Cox et al. (2013) argue that they may be drivers for positive behavioural change. Thus the Values-Practice framework considers these factors to be equally barriers and enablers in order to understand what elements can be influenced in order to encourage maintenance.

Having a large list of factors that act as barriers and enablers is criticised by Shove (2010:1275) in her review of Stern's ABC Model (cf. Section 2.1) on the grounds that the more factors that are considered, the more it is difficult to "qualify which is a driver or a barrier." However, as demonstrated in this paper, past research on attitudes and behaviours towards product lifetimes has considered a wide range of different factors. In addition, adding factors influencing attitudes and behaviour towards product lifetimes to the elements of practice may enrich the understanding of the practice under evaluation and help to define what encourages the performance of different maintenance activities in specific contexts and product categories.

## **6 The Values-Practice framework as a design tool**

Different studies have focused on the role of design towards optimising product lifetimes. Research by Park (2009) examines the potential of design to 'defy' obsolescence. Van Nes and Cramer (2005) focused on the role of design in influencing replacement decisions. Mugge et al. (2005) take a similar approach but focus on the role of design to develop greater product attachment. Chapman (2005, 2010) has focussed on emotional attachment. However, up to now there has not been any research focusing on the role of design to enable maintenance activities that could help to optimise product lifetimes.

Two design approaches that address sustainability issues and are linked to social practice theory and social psychology have so far been developed: practice-oriented design (Kuijter and De Jong, 2009; 2011; Scott et al., 2012 Liedtke et al., 2012), grounded in social practice theory, and design for sustainable behaviour (Lilley, 2009; Lockton, et al., 2008; Tang and Bhamra, 2012; Zachrisson and Boks, 2012), based on social psychology theories. However, these approaches have mainly focused on everyday practices such as bathing (Kuijter and De Jong, 2009) or food preparation and storage (Bhamra, Lilley and Tang, 2011) and have not yet been used to study how people could be encouraged to adopt lifetime optimising behaviours such as maintenance.

It is thus proposed to use the Values-Practice framework as a design tool to aid designers to understand the different elements and factors that might encourage people to engage in maintenance activities to optimise product lifetimes during the use phase. The framework offers a holistic understanding of the elements and factors that could influence the adoption of lifetime optimising behaviours. In addition, it is envisaged that it could be used to analyse how people conduct their maintenance activities, whether to brainstorm new ideas or test already developed ideas.

To use the Values-Practice framework for this purpose, each product category should be considered separately, as attitudes and behaviours might change. Also, each activity within the maintenance spectrum (i.e. cleaning, polishing, quick fix repairs, and major restoration) should be considered on its own.

## **7 Future application and conclusions**

The paper has presented how the Values-Practice framework was built as a tool to facilitate the adoption of lifetime optimising behaviours, using maintenance activities as a case. It describes how the Values-Practice framework is based on two theoretical approaches, social psychology and social practice theory. Although these approaches had been linked to design, they have not previously been combined to develop a design framework that could be used to influence behavioural change. As such, this paper proposes the Values-Practice framework as a design tool to understand and facilitate the adoption of lifetime optimising behaviours by relating factors influencing product lifetimes to the elements of practice.

To facilitate the application of the Values-Practice framework as a design tool further empirical research is needed. The proposed research will be used to develop further the framework to aid designers to use it to influence people to adopt lifetime optimising behaviours and keep and maintain products for longer. Finally, further research will also see this tested in workshops with designers.

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