# The role of emotions for the usage intention of the electric car: a longitudinal perspective in the Belgian context


## Abstract

An extension of the Decomposed Theory of Planned Behaviour (DTPB) is proposed. It integrates emotions towards car driving and electric cars as well as car driving habits. The longitudinal empirical validation of this extended model in two Belgian online samples (n=1200 and n=1023) investigates the relative importance of these emotional factors and habits compared to the traditional cognitive dimensions in the DTPB. It further explores how the determinants of the usage intention evolve over a time period of two years. The results show that in this early adoption stage, emotions towards the electric car and emotions towards car driving have a strong effect on usage intention. Moreover, emotions towards the electric car mediate the effect of most other DTPB factors on usage intention at both moments in time. Car driving habits and perceived behavioural control do not affect usage intention.



**Key words:** *Decomposed theory of planned behaviour, emotions, habits, electric car, longitudinal perspective*

## Introduction and objectives

The development and the successful introduction of new products are important for companies as they are aware that this is a key factor for their existence and future success (Bayus, Erickson, & Jacobson, 2003). Nowadays product innovations are often triggered by growing concerns about the changing resources needed to produce and use products (sustainable product development). In recent years, there is consensus about the large potential for achieving environmental benefits, from altering users' behaviour and the way they interact with products (Ehrenfeld, 2008, Sitarz, 1994). An important contribution towards reaching a more sustainable future can be found in improving our mobility system. Smith (2008) claim that: 'Rising transport demand is likely to be the biggest hurdle to reducing our greenhouse gas emission.' Furthermore, the biggest part of the energy used in transport comes from burning petrol products. Cars will not be easily given up just because they are dangerous to health and life, environmentally destructive, based on unsustainable energy consumption, and damaging to public life and civic space. Too many people find them too comfortable, enjoyable, exciting, and even enthralling. They are deeply embedded in ways of life, networks of friendship and sociality, and moral commitments to family and care for others (Sheller and Urry, 2000). One of the options to counter this trend of deploying the natural sources and polluting the air is the partial or complete shift to electric vehicles. Environmentally regulations in Europe and the United States also incited a change in the attitude of well-established car manufacturers. The vast majority of them have adopted a proactive approach in order to improve environmental effects in car manufacturing and car use. Different car brands, such as Tesla (2003), Reva (1994) and DIVA (2009), Nissan Leaf and Opel Ampera developed fully electric car alternatives that are already for sale.

The introduction of a technological innovation such as the electric car may fail because of lack of acceptance by the consumer. It must accurately respond to consumer needs and appeal to them if it is to succeed in the marketplace. 'Altering consumption patterns is one of humanity's greatest challenges in the quest for environmentally sound and sustainable development' (Sitarz, 1994, p. 39). What will make or break the successful introduction of electric mobility in the real world is consumer acceptance (Feitelson & Salomon, 2000; Verhoef, Bliemer, Steg, & Van Wee, 2008). Therefore insights into the motivations and barriers of this acceptance are important for a successful introduction of the electric car. What are the determinants of the usage intention of an electric car? Besides rational considerations such as relative advantage, compatibility, complexity, attitudes, subjective norm and source

constraints and facilitators, habit formation and the emotional side of a new product and of product use may be at least as critical to a product's success than its rational or practical elements (McLean, 1990; Norman, 2004). Especially emotions are an important component of consumer response (Richins, 1997). However, the role of affect in the adoption decision process of this type of product has rarely been investigated. As Loewenstein (1996 p.289) states: 'With all its cleverness, however, decision theory is somewhat crippled emotionally, and thus detached from the emotional and visceral richness of life'. The single utilitarian (cognitive) viewpoint of most consumer decision making models may be traced to the traditional economic perspective of products as objects.

The present study integrates emotional responses towards the electric car, emotional responses towards car driving, and car driving habits into the Decomposed Theory of Planned Behaviour (DTPB), and empirically investigates the importance of these factors and traditional DTPB variables in the electric car usage intention process. This extended DTPB model is tested in two different periods (end 2009 and early 2012) to investigate how the relative importance of these determinants have shifted over time during the pre-adoption phase of the electric car. The study was carried out in two samples of 1202 (December 2009) and 1043 (March 2012) Belgians and contributes both to theory and practice. The main theoretical contribution is the study of the role of emotions in the usage intention decision process of a new and more sustainable high involvement durable consumer product, and their relation to rational considerations and habits, and the evolution of the determinants of usage intention over time in the early stages of the introduction of an innovation. The contribution to practice is that it provides marketers of sustainable products such as the electric car and policy makers with a deeper insight into the main determinants of electric car usage intentions and how they evolve over time. This should enable them to better fine-tune their persuasive efforts in marketing and supporting this new technology.

## Literature study and conceptual framework

### *The Decomposed Theory of Planned Behaviour and its extensions*

A framework that has often been used to predict the acceptance (intention) of innovations is the Decomposed Theory of Planned Behaviour (DTPB) (Taylor and Todd, 1995). It describes how beliefs and cognitions lead to the acceptance of innovations. The core of this framework is the Theory of Planned Behaviour (Ajzen, 1991). The TPB predicts

behavioural intention based on three dimensions: the **attitude** towards the behaviour, the **social influence** (subjective norm) on the behaviour and the **perceived behavioural control** in conducting the behaviour. Attitudes are evaluative responses to the behaviour; the subjective norm stands for perceived social pressure by different reference groups. Perceived behavioural control over performing the behaviour is a person's perception about different aspects of the behaviour in his or her control or being easy or difficult. It is related to the perceived ability and the external source constraints and facilitators of the behaviour (Ajzen, 1991). The DTPB decomposes the three main antecedents of behavioural intention as proposed in the Theory of Planned Behaviour into a set of salient beliefs based on the Innovation Diffusion Theory (IDT, Rogers 1983) and the Technology Acceptance Model (TAM, Davis, 1989). In the DTPB three antecedents of the **attitude** construct are defined based on the three innovation acceptance drivers defined by the IDT: **complexity, relative advantage and compatibility**. Complexity is similar to the Perceived Ease of Use construct of the TAM and relative advantage is comparable with Perceived Usefulness of the TAM (Moore and Benbasat, 1991). Compatibility is the degree to which the innovation fits with the potential adopter's existing values, previous experiences and current needs (Rogers, 1983). Additionally, the **subjective norm** is decomposed into different reference groups. A reference group can be defined as a group, which serves as a comparison point and the opinion of which is perceived as important for the individual (Ajzen, 1991). For **perceived behavioural control**, Taylor and Todd (1995) follow Ajzen's (1991) conceptualization and relate this control factor to the perceived ability to perform the behaviour and the external source constraints and facilitators that inhibit or facilitate it.

Although the (D)TPB has been widely used to predict behaviour (intentions), various authors question its completeness by lacking emotions and habits which are important components of consumer responses (e.g., Bagozzi, 1997; Richins, 1997). One of the most often suggested improvements is extending the DTPB with measures of emotional responses to the product or the issue for which the behavioural intention is predicted (e.g., Pham, 2004; Peterson et al., 1986). Notwithstanding the overwhelming evidence of the role of affective reactions in consumer decision making, conceptual models and empirical research on the adoption (intention) of innovations or (new) behaviour have largely ignored the role of emotions (Perlusz, 2011; Bagozzi et al., 1999; Richins, 1997; Kim et al., 2007). Visceral states, emotions and cravings can have a disproportionate effect on behaviour (Loewenstein, 1996). However, the connection between emotions and behaviour may be stronger and more direct than between attitude and behaviour (Bagozzi et al., 2002) and in certain situations,

spontaneously evoked affective reactions rather than cognitions tend to have a greater impact on choice (Shiv & Fedorikhin, 1999).

In fact, two conceptual systems tend to operate in parallel: affective and rational (Shiv and Fedorikhin, 1999). This is explicitly recognized in dual processing models, such as the Elaboration Likelihood Model (ELM, Petty & Cacioppo, 1986). Standard expectations of the ELM imply that in high-involvement situations people would centrally and predominantly cognitively process stimuli or messages, while in low-involvement situations, peripheral processing would take place, and peripheral cues such as affective reactions to the stimulus would determine responses. However, emotions can also be a strong determinant of consumer behaviour in high involvement situations. For instance Pham (1998) found that emotions strongly determine behaviour, provided they are relevant and diagnostic. Forgas' (1995) Affect Infusion Model (AIM) posits that there are two underlying mechanisms of affect infusion: affect-as-information and affect priming. The affect-as-information theory suggests that rather than forming a judgment on the basis of features of a target, individuals may ask themselves: 'How do I feel about it?' and in doing so, may be guided by their feelings to judge a message or a stimulus. In the affect priming theory, affect can indirectly inform judgments by facilitating access to related cognitive categories (Bower, 1981; Isen, 1987). Within the AIM model, it is implied that it is in the course of substantive, constructive processing that affect is most likely to play a significant role in what is perceived and how a stimulus is interpreted (Forgas, 1995). The AIM also implies that judgments about more complex stimuli (substantive processing context), requiring more elaborate processing and made without the benefit of objective evidence, should show greater affective effects. Previous research (e.g., Petty et al., 1993) reported that positive affect produces more positive judgments in both high- and low-elaboration conditions. In the context of car purchase and use, a relatively high involvement decision about a complex product for most people, it is well recognized by both academics and practitioners, that emotions play an important role in consumers' decision making (Sheller, 2004; Steg et al., 2001; Carsalesprofessional, 2011).

People also have feelings about (new) technology and innovations (Perlusz, 2011). Venkatesh (2000), studied the effect of computer anxiety on the adoption intention of new information technology, and found it a very relevant factor. Also Chaudhuri et al. (2010) argue that the innovation literature has often overlooked emotions as a cause of successful diffusion. They argue that the role of emotions is particularly eminent in the context of new products that represent radical innovations. One of the examples they give is the adoption of hybrid cars. They develop a model of information processing for initial exposure to radical

innovations that includes consumers' emotional responses. The results illustrate the importance of emotions in the process of innovation diffusion and evaluation. Affect thus plays an important role as a determinant of intentions to use (new) products or to adopt (new) behaviour both in high involvement and in low involvement contexts.

Perugini and Bagozzi (2001, p.81) argue that 'although there is little question that the TPB offers a parsimonious account of purposive behaviour, its sufficiency can be questioned'. Bagozzi (2007) states that the TPB has seemingly seduced researchers into overlooking the fallacy of simplicity. Therefore, various authors suggest extending the TPB with other factors (e.g., Pavlou & Fygenson, 2006). One of the most often suggested improvements is extending the TPB with measures of emotional responses to the product or the issue for which the intention to use is predicted. In the TPB, emotions are only a background factor without direct effect on intention and behaviour (Mazzon, 2011). However, the anticipation of emotions or stimulus-induced affect are important in the elicitation of behavioural intentions (Bagozzi et al., 1999; Shiv & Fedorikhin, 1999). According to Wood and Moreau (2006) the affective influence is often stronger and more far-reaching than previously considered and the addition of emotional responses benefits traditional models of diffusion. Therefore, many authors argued for integrating feelings into extant decision models (Pham, 2004; Holbrook & Hirschman, 1982; Hirschman & Holbrook, 1982; Peterson et al., 1986; Parker et al., 1995; Richard et al., 1995).

Are emotional responses to a (new) product or behaviour equally relevant in all situations? Emotions have been added to the TPB for various products and issues, and have consistently been found to be highly relevant for predicting behavioural intentions and continuance behaviour. For instance, Hsu et al. (2006) found that continuance intention of online shopping could be predicted by TPB components enriched with feelings of disconfirmation and satisfaction. Kim et al., (2007) integrated pleasure and arousal as main dimensions of feelings in their model. They found that affective dimensions as well as cognitive (rational) components had a positive effect on the intention to continue using mobile internet services. Wang (2011) predicted physical activity intentions by means of TPB components and anticipated negative emotions. Negative emotions explained behavioural intentions over and above TPB variables, especially for people with low physical activity.

In spite of the many examples of the added value of emotional factors to the more cognitive TPB model, the evidence for their relevance in case of a relatively high involvement environmentally-friendly new durable consumer product in the early stage of its introduction (such as an electric car) is circumstantial. However, this circumstantial evidence suggests that

emotions may also in these situations be an important factor. First of all, various studies on the role of emotions in the TPB relate to issues or behaviours that are relatively *highly involving*. Bae (2008) found that emotions enhance the explanatory power of the TPB in predicting intentions to cornea donations. Hynie et al. (2006) found that self-conscious emotions like shame and guilt had a significant effect on condom use, above and beyond the TPB variables. Perugini and Bagozzi (2001) established that anticipated emotions appeared to be highly significant in explaining body weight regulation and studying effort.

Electric car usage intention reflects *environmentally-friendly behavioural* intention. In the area of mobility decisions, for instance Duran et al. (2011) extended the TPB with emotional aspects to predict low vehicle use behaviour. The anger emotion appeared to be more important to predict behaviour than, for instance, perceived behavioural control. In the domain of car use, previous studies have explicitly established the role of affect in explaining environmental behaviour (Gatersleben & Appleton, 2007). Emotional factors have also been shown to be very important in the context of sustainable mobility (www.trendy-travel.eu/emotions/start.phtml?link=project, 2011). There appears to be support for the idea of including emotional factors in predicting the behaviour with regard to relatively highly involving and environmentally-friendly products or issues.

Is it particularly relevant to include emotions in a model of *early stage usage* intention for a technological innovation such as the electric car? Wood and Moreau (2006) claim that emotional influences are the greatest during the early learning stages of product usage. Moreover, they argue that the emotional (anticipation of) experience is more influential for technological or functional innovations (e.g. computer programs, GPS) than for simple experiential or aesthetic products. Also Kwortnik and Ross (2007) state that emotions are particularly important early in the decision process. The pleasure of consumption can begin before the act of consuming. Emotions are motivators that influence goal-directed behaviour. Consequently, there also seems to be a case for including emotional reactions to the anticipated use of a new technological product in the early stages of its introduction.

Besides electric-car specific emotions, also more product-category related emotions can be relevant for decision making. Richins (1997) states that emotions that result from consumption of the product category itself are an important research focus. Gärling and Thogersen (2001) argue that for a new product, benefits are compared to the benefits of other products within the individual's evoked set. For instance, they argue that car drivers who prefer prestigious, sporty or off-road cars are less likely to perceive an electric vehicle as a satisfactory substitute and that many car lovers don't like the electric vehicle idea. On the

other hand, people who feel bad about the negative environmental impact of their car use are more likely to perceive that there exists a social norm about changing to the electric vehicle. Joireman et al. (2004) argue that the consideration of future consequences of using a product can have a significant effect on the choice between travel modes. Therefore, besides specific emotional responses to the idea of using an electric car, we also include various dimensions of emotional responses towards car driving into the TPB. These emotions can be triggered at three processing levels (Norman, 2004): **visceral, behavioural and reflective**. Visceral affect is perception-based and corresponds with visceral aspects that are related to product appearance. Behavioural emotion is expectation-based and corresponds with behavioural aspects that have to do with the pleasure and effectiveness of use. Reflective emotion is intellectually based and corresponds with reflective dimensions that are concerned with self-image, personal satisfaction and memories. All in all, there is a strong case for studying the role of emotions in the early usage stage of a technological innovation for a high involvement environmentally-friendly consumer durable such as the electric car.

The DTPB is dealing conscious decision behaviour. However, car driving may also be considered as a habit that is hard to change (Thorgesen, 2006). Habits are conceptualized as a form of automaticity in responding that develops as people repeat actions in stable circumstances with rewarding consequences. Many researchers (e.g., Verplanken et al., 1998) state that car use is a prototypical example of a habitual behaviour, and this provides an explanation for the failure of the introduction of new travel modes. Therefore, including car driving habits into the DTPB is relevant.

***The evolution of motivational determinants of electric car usage intention over time***

Consumer acceptance and adoption of a new product is a process that is described as taking place in stages (Rogers, 1995) with typical motivational determinants in each stage. Longitudinal studies that explore these different influences of the determinants in the process over time are relatively scarce (Karahanna et al., 1999). Researchers mostly examine the antecedents of adoption behaviour and propose a multiphase, sequential adoption process. They report shifts in the impact of the different antecedents of the DTPB on the adoption intention according to different adoption stages (Thompson et al., 1994). Most studies thereby stress the impact of direct experiences with the investigated product. In general, longitudinal studies support the idea that the influence of subjective norms on the adoption intention decline over time and the influence of attitudes on behavioural intention become stronger.

They explain this effect by the lack of information in the early adoption stage and the increasing knowledge as adoption increases. In the process, consumers internalize decision making, and motivations shift from external to internal (Venkatesh & Davis, 2000). Also Rogers (1995) emphasizes the importance of communication in the early adoption phases to spread the diffusion of the product. Mass media should provide consumers with information about the electric car. Peers should reassure consumers that it is ok to use the electric car. This effect is expected to diminish as adoption rates increase. On the other hand, facilitating conditions and constraints (perceived behavioural control) are expected to have a more substantial influence on the adoption intention in later stages of the adoption process (Venkatesh et al. , 2003).

With respect to the relative importance of emotions and habits in developing usage intentions for new products, to our knowledge no longitudinal research has been reported. However, it could be assumed that in the early stages of the introduction of an innovative new car technology, car driving habits prevent consumers from envisaging the adoption of a new technology. However, it could be assumed that the more a new car type becomes mainstream as it is adopted by increasingly more consumers, the less habits will have a constraining role on the usage intention. As to the shifting role of emotions in the adoption process, the Affect Infusion Model (Forgas, 1995) states that judgments about complex stimuli (substantive processing context) such as cars, requiring more elaborate processing when they are made without the benefit of objective evidence, should show greater affective effects. Also Kwortnik and Ross (2007) state that emotions are particularly important early in the decision process. Therefore it could be assumed that the relative importance of emotions in the usage intention process diminishes over time.

The context of this study is the Belgian car market in which the diffusion process of electric cars is in its infancy. End 2009 (the first wave of the study) there were hardly any electric cars on the road, and early 2012 (the second wave of the study), there were only 68 electric cars registered. As such, the study investigates shifts in the motivational determinants to adopt an electric car during the pre-adoption stage in which very few people had a direct experience with the new product and its visibility was very low (although electric cars received a lot of attention in the media). Therefore it is hard to predict to what extent the shifts that have been found in other adoption-diffusion research will be noticeable in this particular context. Nevertheless, studying the shifting usage intention process over time is theoretically relevant to obtain more insight into these shifts in the course of the pre-adoption stage of the introduction of an innovation.

**Research model Structure, research questions and hypotheses**

The extended DTPB that we explore in this study is presented in Figure 1. All DTPB studies predict a positive effect of a favourable attitude (ATT) on usage intention (INT) (Venkatesh et al., 2003). Perceived compatibility (Comp), relative advantage (RelAdv) and lack of complexity (Compl) are cognitive belief antecedents of this general attitude and affect this attitude positively (Avlonitis & Panagopoulos, 2005). The effect of the subjective norm on behavioural intention is called the compliance effect (Venkatesh & Davis, 2000). Rogers (1995) claims that in the pre-adoption period, which the electric car is still in, besides peers (SNP), mass media and external communication (SNM) play an important role in diffusing information and awareness about the product and have an influence on intention. For instance, Oliver and Rosen (2010) in their study in the US showed the impact of social factors (neighbours) on purchasing hybrid electric vehicles. Perceived behavioral control can be an important driver of behavior (e.g. Chen & Tung, 2010). In the case of electric vehicles, potential users may for instance be concerned about whether their budget will be sufficient to buy an electric car, whether they will be able to charge the battery in a convenient way, or whether the maintenance of an electric car will be well organized. They may express 'range anxiety', i.e. the fear that the car cannot be used for long distances, or the concern that a car with a combustion engine will soon not be allowed to enter the city. Most studies find a positive effect of behavioural control on behavioural intentions. According to the DTPB, perceived ability (PBC/PA) and facilitators and constraints (PBC/ESC) determine perceived behavioural control (Taylor & Todd, 1995). Hence, we expect:

H1a: A positive attitude towards the electric car has a positive effect on the intention to use it.
H1b: A positive subjective norm (peers and media) has a positive effect on the intention to use the electric car.
H1c: The perception of being able to use the electric car (personal ability) has a positive effect on the intention to use it.
H1d: Perceived external constraints have a negative effect on the intention to use the electric car and perceived external facilitators have a positive effect on the intention to use the electric car.
H1e: Perceived compatibility, relative advantage and lack of complexity have a positive effect on the attitude towards the electric car.

How should emotions be integrated in the TPB? In this respect there are two distinct conceptual questions: are emotions different from attitudes, and how should emotions be modelled in the classical TPB framework? First of all, emotions are a distinct construct from general attitudes or affective attitude (Bagozzi, 2007; Wang, 2011). An attitude is an evaluative judgment of a stimulus that can contain both cognitive and affective elements (Kim et al., 2007; Schepers & Wetzels, 2007). Affect (feelings) are valenced affective reactions to emotion-eliciting objects/states being processed by the individual, a valenced affective reaction to perceptions of situations (Kim et al., 2007; Dolan 2002; Richins, 1997). Bagozzi et al. (1999) state that research based on the reaction to a single stimulus frequently finds that emotions often cluster in only a limited number of dimensions. Also Bagozzi (2007) concludes that when emotions are modelled in the Technology Acceptance Model, they measure affect towards use (e.g. joy-sadness) and/or affect as liking for a particular behaviour. Since in the present study we measure emotions towards a new product that is in its very early stage of introduction, in line with this, it is assumed that consumers can only express their affective reactions in general valenced feeling terms and we measure the emotional response to using the electric car accordingly. However, we also measure emotions towards car driving. Since all consumers in our sample drive a car, they can be expected to have more specific emotional reactions to the car driving experience. Therefore, for the emotions towards car driving in general, we measure a number of specific emotions.

How should emotions be modelled in the TPB? Some authors argue that emotions are antecedents of TPB components (e.g., Doll et al., 1991; Perugini & Bagozzi, 2001). However, most authors argue that emotions are an extra factor in the TPB and thus a direct driver of intentions (Bagozzi, 2007). Morris et al. (2002) claim that emotions can have a direct influence on behaviour that is not captured or summed up by attitude judgment. Affect is not necessarily dependent on cognitive variables (Machleit & Wilson, 1983). Wang (2011) and Perugini and Bagozzi (2001) model emotion as a determinant of intentions at the same level and as a parallel predictor as the other TPB constructs. Therefore, we model emotional reactions to the electric car and car driving in general as an independent determinant of usage intentions alongside the traditional cognitive variables of the TPB model. Therefore, we expect emotions towards the electric car (EEC) to have a positive effect on usage intention:

H1f: Positive emotions towards the electric car have a positive effect on the intention to use it

Cognitive responses and beliefs may impact the usage intention of the electric car in their own right. However, they may also generate negative or positive emotions that, in turn, inhibit or stimulate usage intention. In other words, emotions can significantly mediate the effect of cognitive considerations on usage intention. The affect-as-information theory (Forgas, 1995) posits that, rather than forming a judgment on the basis of features of a target directly, individuals may ask themselves: 'How do I feel about them?' and in doing so, may be guided by their feelings to judge the cognitive aspects of a stimulus, especially processing complex stimuli, which require elaborate processing and are made without the benefit of objective evidence, should show substantial affective effects. Hence, we expect:

H2: Emotions towards the electric car mediate the effect of perceived complexity, compatibility, relative advantage, the subjective norm (peers and media) and perceived behavioural control (personal ability, facilitators and constraints) on the intention to use it.

Travel mode choices are not always made in a rational way. They can often be characterized as unconscious and habitual, especially when people have used the same travel mode to reach the same goal repeatedly in the past ( Aarts et al., 1997). The potential influence of habits on these decisions is very high (Klöckner & Matthies, 2004). A lot of our 'unsustainable' behavior is due to this 'unconsciousness', which is installed by repetition of a behavior that after a while becomes a habit (Ehrenfeld, 2008; Manzini, 2009; Ouellette & Woods, 1998; De Vries et al., 2011). In general, it can be expected that positive emotions related to the habitual product experience will reinforce the habit and inhibit people to adopt a new travel mode, such as the electric car. Positive car driving emotions should thus have a positive effect on habits while negative emotions related to car driving should have a negative effect on habits. Habits, in turn, should affect electric car usage intention negatively. As argued before, car driving emotions can be triggered at three levels of a product stimulus in line with the processing levels of Norman (2004): the product itself (visceral), the behavior related to product use (behavioral), and the consequences of the product (reflective). Reflective emotions towards car driving may make people more critical towards the (environmental) consequences of car driving, and may therefore have a positive effect on the intention to use the electric car that could alleviate these consequences. However, depending upon the perception of electric cars, strong positive visceral and behavioural emotions towards current car driving may lead people to dislike the electric car as a less satisfying alternative to their current vehicle. Positive visceral (ECC/Visc) and behavioural (ECC/Beh)

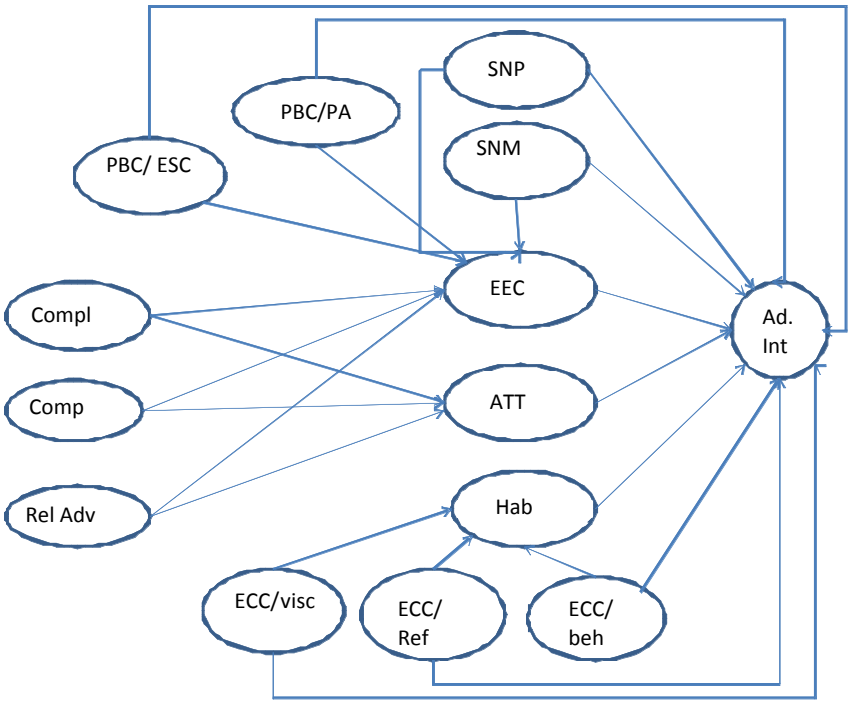
emotions towards car driving may reinforce car driving habits, while negative reflective emotions (ECC/Ref) with respect to the consequences of car driving may have a negative effect on car driving habits (HaB) In turn, it may be expected that the habit of current car use is inhibiting the intention to use another car system (Norman, 2004). Hence, we expect:

H3a: Car driving habits have a negative effect on the intention to use the electric car.
H3b: Reflective emotions have a positive and visceral and behavioural emotions have a negative effect on electric car usage intention. These effects are mediated by car driving habits.

As we argued before, we could expect the influence of subjective norms on the usage intention to decline over time and the influence of attitudes on behavioural intention become stronger (internalization). During the adoption-diffusion process, consumers internalize decision making, and motivations shift from external to internal (Venkatesh & Davis, 2000). Facilitating conditions and constraints (perceived behavioural control) are expected to have a more substantial influence on the usage intention in later stages of the adoption process (Venkatesh et al. , 2003). It could also be assumed that the more a new car type becomes mainstream as it is adopted by increasingly more consumers, the less habits will have a constraining role on the usage intention. Based on the Affect Infusion Model (Forgas, 1995), it is expected that emotions are particularly important early in the decision process. Therefore it could be assumed that the relative importance of emotions in the usage intention process diminishes over time. However, as argued, the Belgian electric car market is in its early pre-adoption stage of the adoption process, both in 2009 (wave 1) and in 2012 (wave 2). Therefore the motivational shifts found in earlier longitudinal adoption studies may not hold in this particular context. Therefore, with respect to the shifts in determinants of usage intention, we formulate the following research question:

RQ1: What are the changes in the importance of determinants of the usage intention of electric cars between 2009 and 2012?

Figure 1. Extended Decomposed Theory of Planned Behaviour model structure




## Method

### *Procedure and samples*

Two online studies were set up. The first wave of the study was conducted in December 2009, just before the Belgian car fair of January 2010. In the context of this event, television, radio and journals gave some attention to the electric car. The second wave of the study took place in February/March 2012, just after the Belgian car fair of January 2012 on which a lot of media attention was given to the electric car. For the first wave a snowball sampling method was used. Sixty students were mailed and asked to complete the questionnaire and to forward the link also to their friends, parents and neighbours. The latter were invited to mail the survey again to their friends and colleagues. The survey was also placed on an internet forum about car driving. For gathering the data for the second wave, a market research agency sent out the same questionnaire to a quota sample of their consumer panel. This second sample was representative of the Belgian population with respect to age, gender and level of education. Table 1 shows the size and the socio-demographic composition of the samples. The two samples differ with respect to age and education of the respondents.

However, most studies conclude that socio-demographic factors have no or an inconclusive effect on consumer behaviour in general and on environmentally-friendly behaviour in particular (Wang, 2011). Jansson (2011) concludes that attitudinal factors explain consumer behaviour to a much higher degree than socio-demographics. Leonidou et al. (2010) state that the use of traditional socio-demographic factors, even though important is inappropriate for identifying green consumers because of contradictory and inconclusive findings. Also Kilbourne and Beckmann (1998) state that the literature on 'who is the green consumer' is frequently inconclusive and sometimes contradictory. A recent study also demonstrated that of various demographics tested, only gender had a small significant effect on the usage intention of electric cars: women are more inclined to use the electric car than men (Moons & De Pelsmacker, 2012). Although the socio-demographic differences between the samples is a matter of concern, its impact on the validity of comparing the two sample results is expected to be limited.

Table1: sample description of the two waves

| Sample | wave 1 | wave2 |
|---|---|---|
| N | 1200 | 1023 |
| **Age** | | |
| 18-25 | 53,90% | 16,60% |
| 25-45 | 21% | 42,30% |
| >45 | 24,60% | 41,10% |
| | | |
| Gender | | |
| Male | 57,30% | 50,40% |
| Female | 42,70% | 49,60% |
| | | |
| Education | | |
| high school or less | 32,70% | 58,70% |
| higher education | 67,30% | 41,30% |

### *Measures*

The measures are (modifications of) existing scales used in earlier comparable research settings (e.g., Cauberghe & De Pelsmacker, 2011; Verplanken & Orbell, 2003) and partly based on exploratory qualitative research. All constructs used five-point Likert scales (anchored from 'strongly disagree' to 'strongly agree') (see Appendix for constructs and scale items). First, for each of the dimensions, a separate exploratory factor analysis was conducted. This resulted in the identification of single factors for all constructs in the model. Attitude was measured with 6 dichotomous scales (see appendix). The sum of the positive items was taken into account. The items measuring the perceived behavioural control construct (external source constraints and facilitators) did not produce a useful factor structure. It was therefore decided to include the most relevant single-item PBC measures in the model, based on the results of the earlier qualitative research. These items were: My budget is sufficient to buy an electric car (ESC1), Cars with a combustion engine will soon not be allowed to enter the city (ESC2), You can drive a long distance with an electric car (ESC3), I will not be able to charge an electric car at home (ESC4), I will not be allowed to charge my electric car with energy I have produced myself (ESC5), The battery of an electric car cannot be charged underway (ESC6).

The items and constructs were then used as input for a two confirmatory factor analyses, i.e. one per wave (SPSS AMOS 19). Only the items with a Critical Ratio (C.R.) >|1.96| and a Standarized Regression Weight (SRW) of above .50 were kept in the model. All SRWs were well above these cut-off points, except for one item of visceral emotions scale in wave 2, SRW=0.41. Because of its relevance in wave 1, this item was kept in the model.

## Findings

### *Model fit and reliability and validity of constructs*

The Structural Equation Model in Figure 1 was estimated for both waves seperately, using SPSS AMOS 19. Table 2 shows the model fit indices. Although Chi_/df is slightly above the recommended maximum of 3, the other indexes indicate a good model fit for both waves. CFI and TLI are above the recommended .90 cutoff, and RMSEA is below the recommended .05 cutoff (Hair et al,, 2005). The models fit the data reasonably well.

Table 2: Model fit indices for the two waves

| | wave1 | wave2 |
|---|---|---|
| | | |
| Chi_/df | 3,62 | 3,47 |
| CFI | 0,93 | 0,92 |
| TLI | 0,92 | 0,91 |
| RMSEA | 0,047 | 0,049 |

The measurement of both models possesses convergent validity, reliability and discriminant validity. All but one loadings of the items were higher than the recommended cut-off value of .50, illustrating convergent validity. In addition, the average variance extracted (AVE) of all latent constructs was larger than the recommended cut-off value of .50, ranging, except visceral emotions in wave 1 (.49) and wave 2 (.35) and relative advantage in wave 1 (.46). All Cronbach alphas exceed the threshold of .70 (between .72 and .94), implying a satisfactory level of reliability. Also the composite reliabilities, with values between 0.73 and 0.97, give a fulfilling indication of the reliability and unidimensionality of the scales (Bagozzi & Yi, 1988) (Table 3). All correlations between latent constructs are lower than 0.60, except for the correlation between SNM and compatibility (.658) and Compatibility-complexity (.759) in the second wave. All correlations between the latent constructs are significantly different from one. This indicates discriminant validity.

***Path models***

Table 4 shows the Standardized regression Weights (SRW) between the constructs as indicated in Figure 1 and their levels of significance, for both wave 1 and wave 2. As expected in H1a, a positive attitude towards the electric car has a positive effect on usage intention. This result is significant in both waves. The effect of subjective norms (H1b) (peers and media) both have a significant positive effect on usage intention in wave 1 and 2, although the effect in wave 2 is only marginally significant. This confirms H1b. The perception of one's personal ability to drive an electric car has no significant effect on the

usage intention, neither in wave 1 nor in wave 2. H1c is not supported. The only external facilitator that both in wave 1 and wave 2 results in a slightly positive effect on usage intention, is having the budget needed to buy an electric car. H1d is only very partially supported. External constraints and facilitators only play a marginal direct role in developing usage intention. Consistent with H1e, perceived compatibility and relative advantage and the perceived lack of complexity have a significant positive effect on the attitude towards the electric car. In both wave 1 and wave 2, emotions towards the electric car are an important and highly significant predictor of usage intention. H1f is supported.

Table 3: Reliability and convergent validity of the constructs

| | Cronbach Alpha | | Composite Reliability | | Average Variance Extracted | |
|---|---|---|---|---|---|---|
| | Wave1 | Wave2 | Wave1 | Wave2 | Wave1 | Wave2 |
| Usage intention | 0.88 | 0.89 | 0.87 | 0.83 | 0.70 | 0.62 |
| Emotions towards electric car | 0.84 | 0.83 | 0.82 | 0.84 | 0.62 | 0.65 |
| Subjective norm peers | 0.86 | 0.89 | 0.86 | 0.88 | 0.75 | 0.8 |
| Subjective norm media | 0.73 | 0.87 | 0.74 | 0.78 | 0.59 | 0.64 |
| Perceived behavioural control: personal ability | 0.75 | 0.87 | 0.91 | 0.88 | 0.77 | 0.71 |
| Habits | 0.91 | 092 | 0.91 | 0.92 | 0.65 | 0.66 |
| Visceral emotions towards current car driving | 0.88 | 0.72 | 0.83 | 0.73 | 0.49 | 0.35 |
| Behavioral emotions towards current car driving | 0.74 | 0.77 | 0.74 | 0.77 | 0.59 | 0.63 |
| Reflective emotions towards current car driving | 0.86 | 0.63 | 0.76 | 0.94 | 0.63 | 0.53 |
| Compatibility | 0.75 | 0.94 | 0.95 | 0.88 | 0.86 | 0.71 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Complexity | 0.92 | 0.88 | 0.85 | 0.97 | 0.65 | 0.92 |
| Relative advantage | 0.86 | 0.83 | 0.72 | 0.84 | 0.46 | 0.64 |

Perceived relative advantage, compatibility and lack of complexity, and the media social norm all have a positive influence on the emotions towards the electric car. However, the results of both waves don't show any significant influence of relevant others (peers) on the emotions towards the electric car. Only in wave 2, the perception of one's personal ability to drive an electric car has a significant positive influence on the emotions towards it. Only in wave 1, having the budget to buy an electric car, being able to drive a long distance with it, and the fact that the car cannot be charged underway, have significant effects on the emotion towards it, be relatively small. The fact that one is concerned about the fact that it is not possible for everyone to charge the car at home, only has a significant influence on the emotions towards the electric car in wave 2. The fact that the battery can be charged on the road is a bigger concern in the first wave ($p<0.001$). All in all, the effects of external constraints and facilitators are small, scattered and inconsistent. As proposed in H2, the effect of perceived relative advantage, compatibility and lack of complexity and of media subjective norm on usage intention are all partially mediated by the emotions towards the electric car. Only in wave 2, the effect of personal ability on usage intention is fully mediated by emotions, in support of H2. These mediation effects are all confirmed by Sobel tests ($p<.001$). Contrary to the expectations in H2, the influence of peers only has a direct, non-mediated effect on usage intention. The effect of some of the external facilitators and constraints are significantly mediated by emotions, but their effect is very small and inconsistent across waves. H2 is only partly confirmed.

Contrary to the expectations in H3a, car driving habits have no inhibiting effect on the usage intention of an electric car. However, the emotions towards car driving have the expected effect on habits: visceral and behavioural emotions have a positive effect, and reflective emotions a negative one. These combined results lead to the conclusion that H3b has to be rejected: habits do not mediate the effect of emotions towards car driving on usage intention. On the contrary, emotions towards car driving only have a direct effect on intention. In wave 1, visceral, and reflective emotions have a positive effect and behavioural emotions have a negative effect on intention. In wave 2 only reflective emotions have a significantly positive effect on usage intention of the electric car.

Both in wave 1 and 2, emotions towards the electric car are by far the most important determinant of usage intention, followed by the attitude towards the electric car and its antecedents. The subjective norm is relatively less important. Emotions towards car driving also play a meaningful role, especially reflective emotions. External constraints ad facilitators are largely irrelevant.

Table 4: Standard regression weights and their levels of significance of the constructs in the model, wave 1 and 2.

| Construct | | Construct | Wave1 | Wave1 | Wave2 | Wave 2 |
|---|---|---|---|---|---|---|
| | | | _ | p | _ | p |
| EEC | ← | RelAdv | 0.093 | .001 | 0.088 | 0.003 |
| | ← | Comp | 0.608 | <.001 | 0.496 | <.001 |
| | ← | Compl | 0.178 | <.001 | 0.222 | <.001 |
| | ← | SNP | 0.030 | 0.245 | -0.033 | 0.237 |
| | ← | SNM | 0.063 | 0.041 | 0.142 | <.001 |
| | ← | ESC1 | -0.053 | 0.007 | -0.031 | 0.119 |
| | ← | ESC2 | 0.050 | 0.019 | 0.042 | 0.046 |
| | ← | ESC3 | 0.002 | 0.923 | 0.008 | 0.706 |
| | ← | ESC4 | -0.030 | 0.128 | -0.042 | 0.032 |
| | ← | ESC5 | -0.030 | 0.141 | -0.026 | 0.216 |
| | ← | ESC6 | -0.065 | 0.001 | -0.022 | 0.268 |
| | ← | PBC/PA | 0.039 | 0.112 | 0.112 | <.001 |
| Usage Intention | ← | ATT | 0.210 | <.001 | 0.187 | <.001 |
| | ← | EEC | 0.432 | <.001 | 0.452 | <.001 |
| | ← | HaB | -0.011 | 0.674 | 0.007 | 0.802 |
| | ← | SNP | 0.103 | <.001 | 0.064 | 0.063 |
| | ← | SNM | 0.135 | <.001 | 0.148 | 0.002 |
| | ← | ESC1 | 0.051 | 0.026 | 0.068 | 0.005 |
| | ← | ESC2 | 0.038 | 0.119 | 0.031 | 0.228 |
| | ← | ESC3 | -0.036 | 0.130 | 0.049 | 0.062 |
| | ← | ESC4 | 0.020 | 0.369 | -0.011 | 0.650 |
| | ← | ESC5 | 0.015 | 0.524 | -0.040 | 0.122 |
| | ← | ESC6 | -0.025 | 0.277 | -0,041 | 0.089 |
| | ← | PBC/PA | 0.038 | 0.159 | -0.002 | 0.938 |
| | ← | ECC/visc | 0.074 | 0.020 | 0.041 | 0.183 |
| | ← | ECC/beh | -0.062 | 0.049 | 0.017 | 0.590 |
| | ← | ECC/refl | 0.095 | 0.002 | 0.109 | 0.002 |

| | | | | | | |
|---|---|---|---|---|---|---|
| Attitude | ← | compl | 0.123 | <.001 | 0.360 | <.001 |
| | ← | comp | 0.475 | <.001 | 0.229 | <.001 |
| | ← | RelAdv | 0.236 | <.001 | 0.294 | <.001 |
| Habits | ← | ECC/visc | 0.302 | <.001 | 0.230 | <.001 |
| | ← | ECC/beh | 0.131 | <.001 | 0.123 | 0.003 |
| | ← | ECC/refl | -0.345 | <.001 | -0.265 | <.001 |

In order to answer RQ1, the results of the two waves are compared. All in all, the relative importance of the determinants of the usage intention of the electric car are not very different between the two waves. In each of the two periods, emotions towards the electric car remain the most important driver of usage intention, and partly mediate the effect of relative advantage, compatibility and lack of complexity. One remarkable result is that in the first period all three types of emotions towards car driving have a significant effect on usage intention, while in the second period only reflective emotions have a significant effect. The two type of subjective norm have a comparable effect in both periods. External constraints, habits and personal ability are largely irrelevant in both periods. Perceived lack of complexity has a substantially larger effect on attitudes in the second period than in the first one, while perceived compatibility and relative advantage has a larger effect in the first period than in the second one.

**Discussion**

The results of the present study confirm the relevance of extending the DTPB with emotions towards the electric car and emotions towards car driving in general. Adding affective components to the TPB appears to be highly relevant. In both periods emotions towards the electric car are by far the most important factor that drives the electric car usage intention. Also the attitude towards the electric car is very important, but less important than emotions towards the electric car. Both subjective norm factors are significant as drivers of intention, but substantially less significant than emotions and attitudes. Behavioural control constraints are generally of less or no importance. Only the perception that the budget is going to be sufficient to afford an electric car has a significant but small impact on usage intention. This PCB result is surprising because factors such as ‘range anxiety’ (the perception that, without charging possibility, electric cars have a limited range) or battery charging issues dominate the debate on the success of electric cars. Personal ability and car driving habits do not have a significant effect on electric car usage intentions. Most effects of cognitive

considerations on usage intention are mediated by the emotions towards the electric car. These results illustrate that rational, cognitive factors affect the usage intention of a relatively high involvement technologically innovative and environmentally-friendly product mainly through the affective reaction they evoke. This confirms theories such as the Affect Infusion Model (Forgas, 1995) that even under substantive processing emotions are important, and that cognitive considerations influence behavioural intention through their effect on felt emotions. The results confirm the relevance and importance of emotions for product development and the eventual acceptance of this new product, which is in line with the conclusions from earlier research, such as Hsiao and Chen (2005), Jordan (1999) and Norman (2004). The results also illustrate that rational, cognitive factors affect the usage intention of a relatively high involvement technologically innovative and environmentally-friendly product mainly through the affective reaction they evoke. This confirms the pivotal role of feelings in this decision situation, as posited by, amongst others, Forgas (1995), Pham (1998), Chaudhuri et al. (2010) and Perlusz (2001).

Norman's (2004) model is also confirmed: car driving emotions are experienced in three main dimensions: visceral, behavioral and reflective. All three emotional levels associated with car driving have a significant influence on driving habits. Behavioral and especially visceral emotions have a positive effect on driving habits. Reflective emotions (based on cognitive considerations about the negative consequences of car driving) have a negative effect on habits. This is in line with our expectations of the reinforcement of habit through positive emotions with the product. However, these car driving habits have no effect on electric car usage intention. Perhaps the travel mode choice between a car with a combustion engine and an electric car are not perceived as a choice between two very different behavioral patterns. Nevertheless, car driving emotions have a significant, though relatively small direct effect on electric car usage intention. In period 1, visceral and reflective emotions have a positive effect on intention, and behavioural emotions a negative one. The positive effect of visceral emotions towards car driving on electric car usage intention is unexpected. Perhaps people who feel positive emotions because of the look and feel of cars are attracted to the cool and technologically advanced character of electric cars. Our results highlight the importance of emotions related to car driving for the adoption process of a new type of car. Hard facts and figures may have an impact on electric car usage through the emotions they evoke towards the electric car.

The relative importance of the factors driving usage intention are in many ways not very different between the two periods. Although, on the basis of previous research and the

insights from the Affect Infusion Model, it could be expected that emotions towards the electric car become less important as adoption rates increase, this was not found in our study. However, there is one indication of the diminishing role of emotions in the process. While in the first period all emotions towards car driving in general play a significant role, in the second period only reflective emotions have a significant effect. Also the diminishing role of the subjective norm and the increasing role of personal attitudes are not confirmed. However, compared to the first period, the influence of peers seems to diminish and the impact of the media seems to increase in the second period. This may be due to the fact that, as a result of the early adoption stage, electric cars are hardly 'the talk of the town' and consumers may not have a clear idea on how peers would react to them driving an electric car. On the other hand, media coverage of electric car issues has increased over time. It is therefore not surprising that perceptions created by the media have become more important. One last remarkable observation deserves some attention. In the first period, mainly perceptions about compatibility and relative advantage shaped attitudes, and far less perceptions of complexity. In the second period, the relative importance of relative advantage and compatibility have decreased, but the effect of complexity perception on attitudes has substantially increased. This may be the result of increasing knowledge about electric cars and the way in which they are discussed in the media. Indeed, people may have become more used to the idea of an electric car, but increasingly worry about the complexity that comes with driving one, due to the often negative way in which these cars and the problems they cause driving them are discussed in the media. In that respect 'complexity' might capture part of the 'constraints' effects that were not explicitly found in this study. The complexity factor might represent a mechanism that the practical problems electric cars pose lead to more negative attitudes. Overall, this complexity perception indirectly has a strong effect on usage intention, especially in period 2. In that respect, our results contradict previous studies: complexity and constraint effects have not diminished over time, but have rather become more important drivers of usage intention.

**Limitations and further research**

In the present study, emotions are investigated in a verbal, i.e. self-reported way. We asked people to formulate their emotions towards an anticipated product. Certain types of emotions (e.g. the visceral ones) could be measured in a more valid way, for instance by means of observation techniques measuring facial expressions or autonomous (psycho-

physiological) reactions. Behavioural emotions can best be studied by actually have people use the product. More research into the role of habits is also needed. What are the factors that will lead to breaking through the habits of current car use? Which types of current car use can best be replaced by the use of an electric car? This should lead to answering the question which factors lead people to consider the electric car as an alternative to a more polluting one with a combustion engine. Moreover, it should lead to insights into how such a transition is felt as contributing in a positive way to the well-being of the owners and users. Investigating design strategies that can enhance the various emotional responses to electric cars and studying the response to marketing campaigns that evoke various levels of emotions towards the electric car in combination with rational arguments are also avenues for future research.

In future research, the drivers of the emotions towards the electric car can be investigated in more depth by means of setting up experiments to explore product and design features that evoke positive and negative emotional responses to different types of electric cars and how this affects usage intention. Moreover, as major car manufacturers launch electric cars as extensions of their existing product range, it is interesting to investigate to what extent different types of line extensions benefit or suffer from the 'carry-over effect' of existing brands, their brand image and brand personality. Further research could also explore to what extent the adoption process differs between consumer segments, such as the environmentally more or less concerned, those who already behave more or less environmentally-friendly, innovative or less innovative consumers, and consumers adhering to different value systems.

**Managerial implications**

Stressing the emotional features of the electric car, by design tools and marketing tools, opens opportunities to break through habits, which is key to changing consumer patterns into new more sustainable consumer behavior. Electric car design, marketing and public awareness campaigns should strive for evoking positive visceral and reflective emotions about driving it, and take away the negative effects of behavioural emotions by demonstrating to people that driving electric cars does not limit their positive behavioural car driving sensations. The challenge will be to find design features and marketing and campaigning angles that stress the positive emotional consequences of using the electric car on car driving.

Car driving habits do not have a negative impact on the usage intention of electric cars. This may be due to the possible perception of the electric car as being in line with current car driving (habit). This offers an angle for marketers and public policy, namely stressing the fact that driving an electric car is not basically different from using a traditional one, and that consumers do not have to change their habits when buying an electric model.

The influence of media on the usage intention process is growing and concerns about the complexity of electric cars have a growing impact on usage intention. Electric car manufacturers and public policy agents should clean up their act, design cars that are easy to use and convince the media to report positively about them.

## References


Aarts, H., Verplanken, B., & Van Knippenberg, A.(1997). Habit and information use in travel mode choices. *Acta Psychologica, 96,* 1-14.

Ajzen, I. (1991). The Theory of Planned Behavior. *Organizational Behavior and Human decision processes, 50,* 179-221.

Avlonitis, G.. J., & Panagopoulos, N.G. (2005). Ancedents and consequences of CRM Technology Acceptance in Sales Forces. *Industrial Marketing Management*, 34 (4), 355-68.

Bae H.-S. (2008). Entertainment-education and recruitment of cornea donors: The role of emotion and issue involvement. *Journal of Health Communication*, 13, 20-36.

Bagozzi R.P. (2007). The legacy of the technology acceptance model and a proposal for a paradigm shift. *Journal of the Association for Information Systems,* 8(4), 244–254.

Bagozzi R.P., Baumgartner H., & Pieters R. (1998). Goal-directed emotions. *Cognition and Emotion*, 12, 1-26.

Bagozzi, R.P., Gopinath M., & Nyer P.U. (1999). The role of emotions in marketing. *Journal of the Academy of Marketing Science*, 27(2), 184-206.

Bagozzi R.P., Gurhan-Canli Z., & Priester, J.R. (2002). *The social psychology of consumer behaviour.* Buckingham, UK: Open University Press.

Bagozzi, R.P., &Yi, Y. '1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science,* 16(1), 74-94.

Bayus, B.L., Erickson G.., & Jacobson, R. (2003). The financial rewards of new product introductions in the personal Computer Industry. *Management Science, 49 (2),* 197-210.

Bower, G.H. (1981). Mood and memory. *American Psychologist,* 36, 129-148.

Carsalesprofessional.com/the-car-buyers-emotions/, accessed 1 July 2011.

Cauberghe,V., & De Pelsmacker, P. (2011): Adoption of digital TV by advertising professionals: a longitudinal extension of the theory of planned behaviour. Journal of interactive Advertising, 11(2), www.jiad.org.

Chaudhuri A., Aboulnasr K., & Ligas M. (2010). Emotional responses on initial exposure to a hedonic or utilitarian description of a radical innovation. Journal of Marketing Theory and Practice, 18(4), 339-359.

De Vries P., Aarts H., & Midden C.J.H., (2011). Changing simple energy-related Consumer Behaviors: How the enectment of intentions is thwarted by acting and non acting habits. *Environment & Behavior,* Vol. 43 (5),612-633

Dolan R.J. (2002). Emotion, cognition and behaviour. *Science*, 298, 1191-1194.

Doll J., Mentz M., & Orth B. (1991). The prediction of goal-directed behavior: Attitude, subjective estimations of competence, and emotions. *Zeitschrift für Experimentelle und Angewandte Psychologie*, 38, 539-559.

Duran M., Alzate, M., Lopez, W., & Sabucedo M. (2011). Emotions and pro-environmental behavior. *Revista Latinoamericana de Psicología*, 39(2), 287-296.

Ehrenfeld, J.R. (2008). *Sustainability by design,* New Haven: Yale University Press.

Forgas, J.P. (1995). Mood and Judgment: The Affect Infusion Model (AIM). *Psychological Bulletin*, 117(1), 39-66.

Feitelson, E., & Salomon, I. (2000). The implications of differential network flexibility for spatial structures. *Transportation Research, Part A: Policy and Practice*, *34*, 459-479.

Gärling A., & Thogersen J. (2001). Marketing of electric vehicles. *Business Strategy and the Environment*, 10, 53-65.

Gatersleben, B., & Appleton, K. (2007). Contemplating cycling to work: Attitudes and perceptions in different stages of change. *Transportation Research Part A: Policy and Practice, 41(4),* 302-312.

Hair, J. Anderson, R., Tatham, R., Black, W. (2005). *Multivariate Data Analysis*. London: Prentice Hall International.

Haustein, S., Klöckner, C.A., & Blöbaum, A. (2009). Car use of Young adults: the role of travel socialization. Original Research article. *Transportation Research part F: Traffic Psychology and Bahaviour. 12 (2),* 168-178.

Hirschman, E.C., & Holbrook, M.B. (1982). Hedonic consumption: Emerging concepts, methods and propositions. *Journal of Marketing, 46*, 92-101.

Holbrook M.B., & Hirschman E.C. (1982). The experiential aspects of consumption: consumer fantasies, feelings and fun. *Journal of Consumer Research*, 9(2), 132-140.

Hsu M.-H., Yen C.-H., Chiu C.-M., & Chang C.-M. (2006). A longitudinal investigation of continued online shopping behavior/ An extension of the theory of planned behavior. *International Journal of Human-Computer Studies*, 64, 889-904.

Hynie M., MacDonald T. K., & Marques S. (2006). Self-conscious emotions and self-regulation in the promotion of condom use. *Personality and Social Psychology Bulletin,* 32, 1072-1084

Isen, A. (1987). Positive affect, cognitive processes and social behaviour. In L. Berkowitz (Ed.): *Advances in experimental social psychology*, San Diego, CA: Academic Press, 20, 203-253.

Jansson J. (2011). Consumer eco-innovation adoption: assessing attitudinal factors and perceived product characteristics. *Business Strategy and the Environment,* 20, 192-210.

Joireman J.A., Van Lange P.A.M., & Van Vugt M.(2004). Who cares about the environmental impact of cars?: those with an eye toward the future. *Environment and Behavior*, 36(2), 187-206.

Karahanna E., Straub D.W.,and Chervany N.L., (1999) Information Technology across time: a cross-sectional comparison of pre-adoption and post-adoption beliefs. Mis Quarterly, 23 (2), 189-213.

Kilbourne W.E., & Beckmann S.C. (1998). Review and critical assessment of research on marketing and the environment. *Journal of Marketing Management,* 14, 513-532.

Kim, H.W., Chan, H.C., & Chan, Y.P. (2007). A balanced thinking-feelings model of information systems continuance. *International Journal of Human Computer Studies, 65,* 511-525.

Klöckner C.A.& Matthies,E. (2004). How habits interfere with norm-directd behaviour. A normatieve decision making model for travel mode choice. *Journal of Environmental Psychology. 24* (3), 319-327.

Kwortnik R.J., & Ross W.T. (2007). The role of positive emotions in experiential decisions. *International Journal of Research in Marketing*, 24, 324-335.

Leonidou L.C., Leonidou C.N., & Kvasova O. (2010). Antecedents and outcomes of consumer environmentally friendly attitudes and behaviour. *Journal of Marketing Management*, 26(13-14), 1319-1344.

Loewenstein G.F. (1996). Out of control: Visceral influences on behaviour. *Organizational Behavior and Human Decision Processes*, 65(March), 272-292.

Machleit K., & Wilson R.D. (1983). Emotional feelings and attitude towards the advertisement: the roles of brand familiarity and repetition. *Journal of Advertising*, 17(3), 27-35.

Manzini, E.(2009). New design Knowledge. *Design Studies, 30*, 4-12

Mazzon J.A. (2011). What are you afraid of? The role of emotions in social marketing. Proceedings of the 2nd World Social Marketing Conference,

McLean, P. (1990). *The triune brain in evolution*. New York: Plenium Publishing Corporation

Morris J.D., Woo C., Geason J.A., & Kim J. (2002). The power of affect: predicting intention. *Journal of Advertising Research,* 42(3), 7-17.

Norman, D. A. (2004). *Emotional Design*. New York: Basic Books.

Ouellette J.A. & Wood W, (1998) Habit and intention in everyday life: The multiple processes by which past behavior predicts future behavior. *Psychological Bulletin, Vol 124*(1), 54-74.

Parker D., Manstead A.S.R., & Stradling S.G. (1995). Extending the theory of planned behaviour: The role of personal norm. *British Journal of Social Psychology*, 34, 127-137.

Pavlou P.A., & Fygenson, M. (2006). Understanding and predicting electronic commerce adoption: an extension of the theory of planned behaviour. *MIS Quarterly,* 30(1), 115-143.

Perlusz S. (2011). Emotions and technology acceptance. Development and validation of a technology affect scale, *jgxy.usx.edu.cn/DAOM/046_StefanoPerlusz.pdf,* accessed 1 July 2011.

Perugini M., & Bagozzi R.P. (2001). The role of desires and anticipated emotions in goal-directed behaviours/ Broadening and deepening the theory of planned behaviour. *Britih Journal of Social Psychology*, 40, 79-98.

Peterson R. E., Hoyer W.D., & Wilson W.R. (1986). *The role of affect in consumer behaviour: emerging theories and applications.* Lexington, MA: D.C. Heath.

Petty R.E., & Cacioppo J.T. (1986). *Communication and Persuasion: Central and Peripheral Routes to Attitude Change*, New York: Springer-Verlag.

Petty, R.E., Schumann, D.W., Richman, S.A., & Strathman, A.J. (1993). Positive mood and persuasion: Different roles for affect under high and low elaboration conditions. *Journal of Personality and Social Psychology*, 64(1), 5-20.

Pham M.T. (1998). Representativeness, relevance, and the use of feelings in decision making. *Journal of Consumer Research*, 25(2), 144-159.

Pham M.T. (2004). The logic of feeling. *Journal of Consumer Psychology*, 14(4), 360-369.

Richard R., van der Pligt J., & de Vries N. (1995). Anticipated affective reactions and prevention of AIDS. *British Journal of Social Psychology,* 34, 9-21.

Richins M.L. (1997). Measuring emotions in the consumption experience. *Journal of Consumer Research*, 24(2), 127-146.

Rogers E.M. (1995). *Diffusion of innovations.* New York: Free Press.

Schepers J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: investigating subjective norm and moderation effects. *Information and Management*, 44, 90-103.

Sheller, M. (2004). Automotive emotions. Feeling the car. *Theory, culture and society,* 21(4/5), 221-242

Sheller M, and Urry J. , ( 2000). The city and the car. International. *Journal of Urban and regional Research*, 24 (4) 737-757.

Shiv B, & Fedorikhin A. (1999). Heart and mind in conflict: The interplay of affect and cognition in consumer decision making. *Journal of Consumer Research*, 26(December), 278-292.

Sitarz, D. (Ed.) (1994). *Agenda 21: The earth summit strategy to save our planet*. Boulder: EarthPress. Worldwatch Environmental Alert Series.

Smith, R.A. (2008). Enabling technologies for demand management: *Transport, Energy policy, 36,* 4444-4448.

Steg, L., Vlek, C., & Slotegraaf, G.. (2001). Instrumental- reasoned and symbolic affective motives for using a motor car. *Transport research, part F, 4,* 151-169.

Taylor, S., & Todd, P. (1995). Understanding Information Technology Usage: A Test of Competing Models. *Information Systems Research*, 6, 144-176.

Thompson R.L.,Higgins C.A., and Howell J.M.,(1994). The influence of prior experience on personal computer utilization: testing a model. *Journal of Marketing Information Systems 11* (1), 167-187.

Thorgesen J. (2006) Norms for environmentally responsible behaviour: an extended taxonomy. *Journal of Environmental Psychology*, 26 (4), 247-261.

Trendy-travel.eu/emotions/start.phtml?link=project, accessed 1 July 2011

Venkatesh V. (2000). Determinants of perceived ease of use: integrating control, intrinsic motivation, and emotion into the technology acceptance model. *Information Systems Research*, 11(4), 342-365.

Venkatesh, V., & Davis, F.D. (2000). A theoretical extension of the technology acceptance model: four longitudinal studies. *Management Science,* 46*(2)* 186-204.

Venkatesh, V., Morris, M.G., Davis, G.B., & Davis, F.D. (2003). User acceptance of information technology, toward a unified view. *MIS Quarterly* 27(3) 425-478.

Verhoef, E., Bliemer, M., Steg, L., & Van Wee, B. (2008). *Pricing in road transport: A multi-disciplinary perspective*. Cheltenham, UK and Northampton, MA, USA: Edward Elgar. Verplanken, B, Aarts, H., van Knippenberg, A., & Moonen, A. (1998). Habit versus planned behaviour: A field experiment. *British Journal of Social Psychology, 37 (1), 111-128.*

Verplanken, B., & Orbell, S. (2003). Reflections on past behavior: A self report index of habit strength. *Journal of Applied Social Psychology, 33,* 1313-1330.

Wang X. (2011). The role of anticipated negative emotions and past behaviour in individuals' physical activity intentions and behaviours. *Psychology of Sport and Exercise*, 12, 300-305.

Wood, S.L., & Moreau C.P. (2006). From fear to loathing? How emotion influences the evaluation and early use of innovations. *Journal of Marketing*, 70(July), 44-57.

Zelezny, L.C., Chua, P., & Aldrich, C. (2000). Elaborating on gender differences in environmentalism. *Journal of Social Issues, 56*(3), 443-457.

## Appendix: Constructs and scale items

| Constructs and items | Type of scale and labels |
|---|---|
| **Intention to use electric car**<br>I have the intention to drive an electric car in the near future<br>I will recommend the use of the electric car to other people<br>I expect that I will be driving an electric car in the near future | 5 category Likert scale<br>Labels: 1=fully disagree; 5=fully agree<br>Cauberghe & De Pelsmacker (2011) |
| **Attitude towards electric car**<br>good – bad<br>like - don't like<br>clever – stupid<br>nice - not nice<br>useful – useless<br>suitable - not suitable. | Sum of positive choices made on six dichotomous items (0-6)<br><br><br><br><br><br>Cauberghe & De Pelsmacker (2011) |
| **Subjective norm peers**<br>People driving an electric car are making a fool of themselves (r)<br>Driving an electric car is cool<br>My friends will find it weird that I'm driving an electric car (r)<br>My family will raise objections against driving an electric car (r)<br>People who are important to me will support me when I should drive an electric car<br>People who are important to me, tell me that I should consider driving an electric car<br>People who are important to me try to convince me to drive an electric car | 5 category Likert scale<br>Labels: 1=fully disagree; 5=fully agree<br><br><br><br><br><br><br>Haustein, Klöckner & Blöbaum (2009) and exploratory qualitative study |
| **Subjective norm media**<br>The media gave me a good feeling about using an electric car<br>Articles in the media influenced me to use an electric car | 5 category Likert scale<br>Labels: 1=fully disagree; 5=fully agree<br>Cauberghe & De Pelsmacker (2011) |
| **Emotion towards electric car**<br>I will like driving an electric car<br>I look forward to drive an electric car<br>Driving an electric car could frustrate me (r) | 5 category Likert scale<br>Labels: 1=fully disagree; 5=fully agree<br>Cauberghe & De Pelsmacker (2011); Kim, Chan and Chan (2007) |
| **Perceived behavioural control**<br>My budget is sufficient to buy an electric car<br>Cars with a combustion engine will soon not be allowed to enter the city<br>You can drive a long distance with an electric car<br>I will not be able to charge an electric car at home<br>I will not be allowed to charge my electric car with energy I have produced myself<br>The battery of an electric car can not be charged underway | 5 category Likert scale<br>Labels: 1=fully disagree; 5=fully agree<br><br><br><br><br><br>Exploratory qualitative study |
| **Visceral emotions towards car driving**<br>Throb of the engine<br>Rapid acceleration<br>Information on the dashboard<br>Beauty of the interior<br>Looks of the car<br>High speed possibility<br>Technological sophistication | 'To what extent do the following aspects contribute to you experiencing positive emotions when driving a car: 1 = not at all – 5 = a lot<br><br><br><br>Norman (2004) and exploratory qualitative study |
| **Behavioural emotions towards car driving**<br>Enjoying the environment while driving<br>Getting relaxed while driving | 'To what extent do the following aspects contribute to you experiencing positive emotions when driving a car: 1 = not at all – 5 = a lot<br>Norman (2004) and exploratory qualitative study |
| **Reflective emotions towards car driving**<br>low cost of the car<br>Environmentally friendly car<br>Economic fuel consumption of the car | 'To what extent do the following aspects contribute to you experiencing positive emotions when driving a car: 1 = not at all – 5 = a lot<br>Norman (2004) and exploratory qualitative study |