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**In Top Gear towards Sustainable Mobility: Consumer Car Preferences
and Information Search Channels**

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Abstract

There's a high awareness in society about negative environmental impacts of auto mobility. However, this does not directly translate into the purchase of environmentally friendly cars. In this paper, we measure the relations between (stated and revealed) car preferences and the use of information sources in the car purchasing process, based on a survey of 1392 households in the Netherlands.

The analysis showed that attitudinal and behavioural constructs are found for 'environmental', 'performance' and 'convenience' preferences. The size of gap between attitude and behaviour was found to vary with the preferences: the environmental attitude-behaviour gap was found being the largest.

Performance attitude and behaviour turned out to be positively related to knowledge about cars and to the use of mass media and web information sources. Environmental attitude is negatively related to knowledge about cars and to the use of mass media and web information sources. However, people with a positive environmental attitude that also show environmental behaviour have more knowledge about cars than people that do not translate their environmental attitude into the corresponding behaviour. This leads to the idea that not only environmental knowledge is a prerequisite for environmental behaviour, but also knowledge about cars. Opportunities are described for policymakers on how to address car buyers with different preferences in relation to car purchase, and which information channels are best suited to that end.

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1. INTRODUCTION

Eight out of ten citizens in the European Union share the opinion that the type of car, and the way people use their car have an important impact on the environment in the respondent's area (EC 2007). Although 75% of the Europeans say that they are ready to buy environmentally friendly products, even if these are more expensive, only 17% of the Europeans are likely to take actions that are directly related to their lifestyles and consumption habits, such as using their cars less and purchasing green products (EC 2008).

The above figures support the idea that there's a high awareness in society about negative environmental impacts of automobility. However, this does not translate directly to changes in car use and car purchasing behaviour. Much research has been conducted in which the relation between attitudes and environmentally friendly behaviour is investigated (e.g. Grob 1995; Nilsson and Kuller 2000; Kollmuss and Agyeman 2002; Walton et al. 2004; Gardner and Abraham 2008). These studies all conclude that although attitudes and the corresponding behaviour are related, the explanatory value of attitudes on behaviour is limited. Also, research has shown that the assumption that if people know more about the environmental implications of their behaviour, they will act more pro-environmentally, is untenable (Blake 1999; Owens 2000; Anable et al. 2006; Bartiaux 2008). On the other hand, scientists acknowledge that information provision is a prerequisite for changing environmental behaviour (Kaiser et al. 1999; Nijhuis and Spaargaren 2006).

Environmental innovation in mobility requires the development of cleaner fuels and propulsion techniques, on the one hand. On the other hand, the greening of consumption, which includes changes in mobility behaviour and also the uptake of environmentally benign innovations is of paramount importance. In relation to changing (mobility) behaviour, different audiences behave differently, and require targeted and/or tailored interventions (Darnton et al. 2005). A question from the policy domain is thus how to effectively address different target groups. One of the possibilities for policy makers (and marketers) to effectively convey information to specific groups of car drivers is at the point in time when it can matter most: the moment when people buy a (new or used) car.

Prior to the actual purchasing of a new car, consumers typically engage in an information search process (Blackwell et al. 2001). Past research has shown that important determinants of information search are the consumers relevant prior knowledge and experience with the product under investigation (Moore and Lehmann 1980; Punj and Staelin 1983; Srinivasan and Ratchford 1991; Moorthy et al. 1997; Van Rijnsoever and Castaldi 2008)². This relevant prior knowledge and experience is defined as the knowledge base. In literature, many papers have addressed the information search process when buying a car. Punj and Stealin (1983) and Srinivasan and Ratchford (1991) focus on the determinants of search in general. Klein and Ford (2003) and Ratchford et al. (2007) look at the time spent on different search channels, thereby mainly focussing on the impact of the Internet. Finally, Van Rijnsoever et al. (Forthcoming) compare the use of different search channels in relationship to knowledge base.

In this paper we will identify clusters of consumers based on their attitudes and behaviour related to car purchasing. Knowing the characteristics and the size of each group of consumers can help policy makers to evaluate the potential effects of their policy measures. Next we will

² In the literature, a distinction is often made between familiarity and expertise as two types of knowledge (see Alba, J. W. and J. W. Hutchinson (1987). "Dimensions of Consumer Expertise." Journal of Consumer Research 13(4): 411-454.). This paper focuses on the familiarity dimension.

combine the consumer's attitudes and behaviours towards car purchasing with a model for pre-purchase information search.

We will show that the size of the gap between attitude and behaviour depends on the type of attitude, and how the use of information sources may help to bridge this gap. Further, this research gives policy makers (and marketers) insight into which communication channels to use to target groups of consumers with specific preferences.

Section 2 presents a concise review of the literature on attitude theory in relation to pro-environmental behaviour and on pre-purchase information search. In the sections 3 and 4, the data collection and modelling efforts are described. Our empirical results are based on a representative survey of 1392 households owning a car in the Netherlands. Finally, in section 5 the theoretical and policy implications of our findings are discussed.

2. THEORY

In this section our theoretical framework will be presented. We start by reviewing the literature about attitudes and behaviour. Then we describe the results from previous work by Van Rijnsoever et al. (Forthcoming) on which we will build our current model. Finally we present a conceptual model that integrates the attitudes with consumer information search. This model will be tested empirically.

2.1. ATTITUDES AND BEHAVIOUR

According to Ajzen (2005) an attitude is defined as “a disposition to respond favourably or unfavourably to an object, person, institution or event.[...] The main characteristic of attitude is its evaluative nature.” Attitude theory (Ajzen 1991; Eagly and Chaiken 1993) typically relates attitude to behaviour through an intermediary intention construct. Before purchasing a new car, a consumer forms an attitude towards the possibility of owning a car. This attitude can be translated into an intention to buy a (specific) car, and finally the consumer can act on his intention and take steps in order to purchase a car. In order to preserve theoretical parsimony in this study we only measure aggregated attitudinal and behavioural constructs, although we recognize the importance of intention as an explanatory construct. A consumer will have attitudes towards all characteristics (attributes) of a new car. We are mainly concerned with the consumers' attitudes towards environmentally friendly aspects of a car. It is well-known that not all attitudes are translated into behaviour (Acock and DeFleur 1972; Ajzen and Fishbein 2000); this discrepancy is called the attitude-behaviour gap. Research has shown that such a gap is certainly present with regard to environmental concerns (Blake 1999; Owens 2000; Anable et al. 2006; Bartiaux 2008). Anable et al. (2006) made an extensive review of studies that describe the relation between public attitudes and transport behaviour. They concluded that many barriers obstruct the translation of awareness into action (travel behaviour). These barriers apply at the personal and at the collective level, and consist of both subjective and objective factors. At the individual level, important subjective factors are values, norms, perceived behavioural control, instrumental and affective attitudes, identity and status. The objective individual factors named by Anable et al. (2006) are knowledge/awareness of consequences, habits and resource constraints. Collective factors include social dilemmas, group culture and shared norms. Ajzen and Fishbein (2000) claim that the more specific the attitude is towards behaviour, the smaller the gap becomes. For example: a favourable attitude to waste recycling has a higher correlation with recycling behaviour than a favourable attitude towards the environment in general. Kaiser et al. (1999) state that the lack of a unified attitude concept has negatively affected the predictive power of environmental attitude concepts. We include both attitudinal constructs and behavioural constructs in our model, in order to measure the attitude-behaviour gap. In this study the attitudes and behaviours are the consumers' stated and revealed preferences in the car

purchasing process. We will empirically explore the attitudes that consumers have towards car attributes in the purchase process and what behaviour these consumers displayed when buying their current car. Further we will explore whether consumers can be clustered into distinguishable groups on the basis of attitudes and behaviour.

2.2. CONSUMER INFORMATION SEARCH

In the literature, two types of pre-purchase information search are distinguished: internal and external search (Blackwell et al. 2001). An internal search is nothing more than an internal memory scan by the consumer for decision-relevant information. External search is the consulting of external information sources for decision-relevant information in the purchase process. A consumer can use various external search channels to gather information. Van Rijnsoever et al. (Forthcoming) related the size of the (car-related) knowledge base to information search in the car-purchasing process. They identified four external information search channels: 1) Personal Channels; 2) Mass Media Channels; 3) The World Wide Web (WWW) and 4) Experts. Personal channels refer to the relations of an actor with people from his or her social environment (e.g. friends, family and colleagues). Mass media channels are the information sources that do not require direct local-interaction with the actor; examples are radio, TV or newspapers. The World Wide Web relates to all information that consumers retrieve from Webpages. Experts are people who advice consumers about cars as part of their profession. The most notable example is the car dealer.

The study by Van Rijnsoever et al. had the following results: 1) It was confirmed that channels of information search are complementary in the case of car purchasing, rather than competing. This means that consumers are likely to consult multiple channels during the purchasing process; 2) Internal search is the most important search strategy for most individuals; internal search is strongly related to knowledge base; 3) Two external search strategies that are also often used are the use of personal channels and the use of experts; these two search channels are quite unrelated to knowledge base; 4) On average, mass media search channels and the WWW are used less than other information channels, but these channels are strongly related to knowledge base.

Van Rijnsoever et al. (Forthcoming) explained these findings by following a cost-based perspective (Ratchford 1982; Moorthy et al. 1997). They compared the search costs (in terms of effort) of the information from a certain channel versus the content of that channel. Personal channels and experts offer basic information against relatively low costs, while mass media and webpages offer more specialized information. The costs of mass media information are higher because the consumer is dependent on when the channel makes the information available. The costs of Web based information are higher, because there is an overflow of information.

The attitudinal and behaviour constructs that are found will be related to knowledge base and the use of information search channels. This leads to the conceptual model displayed in figure 1. We expect that different types of attitudes and behaviour can be related to knowledge base and to use of search channels.

Insert figure 1 about here

Finally, we address a class of variables that is not in the model. A common method for targeting groups in mass communication is to use socio-demographic characteristics (Roberts 1996). However, to keep our models parsimonious (and therefore comprehensible), we have decided not to include socio-demographic variables. Again, we do recognize that these variables might have additional explanatory value.

3. RESEARCH DESIGN

3.1. DATA COLLECTION AND MEASUREMENT

A total of 1500 questionnaires were personally delivered by students of a research methodology course to Dutch households throughout the Netherlands. If there was a car in the household, then the person who was most involved in the most recent car purchasing process was requested to fill in the questionnaire. After a few days the students returned to collect the filled-in questionnaires. A total of 1392 households owning a car were surveyed in this manner. Quota by sex and age for the respondents were used to ensure a representative sample. After checking with data from the Dutch Central Statistics Office (CBS 2007), the response turned out to be a good representation for Dutch households owning a car. Only the education level of the respondents turned out to be too high compared to the total Dutch population³.

The questionnaire included questions about attitudes towards attributes of new cars, characteristics of the car presently owned, the knowledge base of consumers about cars and the use of search channels in the car purchasing process. We decided not to measure intentions in this survey, due to a high risk of false correlations due to common method biases (Podsakoff et al. 2003).

Attitudes were measured with regard to 19 attributes of (new) cars. These 19 attributes were based on research for the UK Department for Transport (DfT 2004) in which people were asked (unprompted) what factors are important in deciding what make and model of car to buy. From this listing, factors that are not car attributes were left out, like e.g.: 'dealership' and 'personal experience'. Respondents could respond on a 5-point scale that varied from very important to very unimportant. An exploratory principal component analysis revealed that a three factor solution best fitted the data. This solution was modelled in a confirmatory factor analysis (table 1), using the LISREL programme (Jöreskog and Sörbom 2006). The three factors were:

1. an environmental attitude, a favourable disposition towards environmentally friendly aspects of a car.
2. a performance attitude, a favourable disposition towards elements of a car that enhance driving performance and the image of a car.
3. a convenience attitude, a favourable disposition towards elements of a car that enhance the comfort and practicalness of a car.

A well-known issue with regard to the measurement of the attitudes is the fact that attitudes are not constant; they change with the situational context in which the attitudes arise (Payne et al. 1999) and they evolve over time (Aversani et al. 1999). The situations in which the surveys were filled in do not match the actual car buying situation in e.g. a showroom. Heiskanen (2005) and Nijhuis and Spaargaren (2006) argue that the situational context may be as important for the behavioural outcome as the consumer attitudes. This is one of the reasons why behavioural constructs were also measured. The advantage of measuring behaviour is that its measurement is more reliable, since this is factual information. The main disadvantage of measuring behaviour in a survey is that it relates to behaviour in the past. There is no real telling whether the attitudes that we measured were formed because of the past behaviour, or whether these attitudes were formed prior to the behaviour. If the attitudes have evolved since the past behaviour, this might explain a part of the attitude-behaviour gap that we find. As indicators for displayed behaviour, the respondents were asked to give a number of characteristics of the car they most recently

³ This is the same dataset as Van Rijnsoever et al. (Forthcoming).

bought⁴. A principal component analysis gave a three factor solution that corresponded with the attitudinal solution. This solution was modelled into a confirmatory model. The indicators and the solutions are provided in tables 1 and 2.

Insert table 1 about here

Insert table 2 about here

Knowledge base can be assessed from two points of view. It can either be defined as the actual knowledge the consumer has about a product category, this is called objective knowledge. It can also be assessed as the knowledge the consumers thinks he or she has about a product, this is called subjective knowledge (Park et al. 1994; Mattila and Wirtz 2002). We measured the subjective knowledge, because the choice for an information search channel is based on the knowledge base the consumer perceives to have. The knowledge base was measured with the IPCA Automobile involvement scale by Bloch (1981). This is a validated scale that consists of 17 items that measure involvement with automobiles. Originally the scale has 6 factors: 1) Enjoyment of driving and usage, 2) Readiness to talk to others about cars, 3) Interest in car racing activities, 4) Self-expression through one's car 5) Attachment to one's car and 6) Interest in Cars (Bloch 1981). The six items from factors 2 and 6 were used as a proxy for the knowledge base the actor has. This means that we have assumed that highly involved consumers also (think that they) have more knowledge about cars.

To measure the use of search channels, statements were posed about the use of various information channels in the process of purchasing a car. Respondents could respond on a 5-point Likert scale that varied from fully disagree to fully agree. The exact operationalization is provided in table 3.

Insert table 3 about here

3.2. ANALYSIS

First, using SPSS 15.0, a two step cluster analysis was conducted to identify groups of consumers based on the three attitudinal constructs. The same procedure was done to identify consumers based on their displayed behaviour. The log-likelihood was used as distance measure for the clusters. With the help of Schwarz's Bayesian Information Criterion (BIC), the best cluster solution was determined. Next, the attitude cluster solution and the behavioural cluster solution were compared with the help of a cross tabulation. This will show to what extend both types of clusters correspond, and can thus serve as a measure for the attitude-behaviour gap on the population level.

⁴ It should be noted that we only looked at the technical characteristics of the car. We did not enquire about the respondents driving behaviour, which is also important for the environmental effects of car driving.

Next, the attitudinal and behavioural constructs were analysed in relation to knowledge base and search channels. Pre-testing revealed that analysing the constructs separately yielded superior results compared to using the cluster solution. In the cluster solution too much valuable information is lost that can help to explain channel use. Therefore the constructs were analysed separately. Using the LISREL (Jöreskog and Sörbom 2006) programme three models were built (cf. Figure 1). In the first model the attitudinal and behavioural constructs were related to measure the attitude-behaviour gap. In the second model the attitudinal constructs were used to predict knowledge base and search channel use in the model by Van Rijnsoever et al. (Forthcoming)(indicated with a grey background in Figure 1). In the third model the behavioural constructs were related to the model by Van Rijnsoever et al. (Forthcoming). In the models we allowed for covariance among the information channel variables, the attitudinal constructs and the behavioural constructs. Also error-covariances among the indicators were allowed if the modification indicated that this would improve the model fit. As model performance indicators the Goodness of Fit Index (GFI), the Root Mean Square Error of Approximation (RMSEA) and the Normed Fit Index (NFI) were used and the model chi-square with the degrees of freedom.

4. RESULTS

In this section the empirical results are presented and interpreted. First we present the results of the two-step cluster analysis. Then we present the results of the structural equation models.

4.1. CLUSTER ANALYSIS

The two-step cluster analysis revealed that for the attitudinal constructs a four cluster solution would be the most optimal. Table 4 displays the percentages of cases of each cluster and the cluster means and standard deviations. Since the constructs were standardized variables it is only possible to make claims relative to the average, which is by definition zero. In interpreting our results we will call any number that does not differentiate significantly from zero ($p > 0.05$) average; all values that have a mean of 0.5 above or below the average will be called moderately deviating; all values that have a mean of 0.5 to 1.0 above or below the average will be called high or low deviations; all values that have a mean of >1.0 above or below the average will be called very high or very low deviations.

Insert table 4 about here

Attitudinal cluster 1 contains 15.3 % of the sample and consists of respondents with a moderately low environmental attitude, and very low performance and convenience attitudes. Cluster 2 (18.8% of the sample) has very low environmental attitudes and a moderately high performance attitude. The convenience attitude is average. Respondents in cluster 3 have a moderately high environmental attitude and a moderately low convenience attitude (although this is negligible). This is by far the largest cluster, containing 46% of the respondents. Finally respondents in cluster 4 (19.9 % of the sample) have high environmental and performance attitudes and a very high convenience attitude. Of this cluster solution it can be said that clusters 1 and 4 are rather uninformative. The respondents in these clusters either think that all three aspects are not important, or that they are important. There is no strong discrimination between the three constructs. It is thus difficult to tell whether this difference is the result of response biases or that there are real differences between the groups.

The same type of analysis was performed for the behavioural constructs. This again gave a four cluster solution. The percentages, means and standard deviations are displayed in table 4.

Behavioural cluster A, (24.4% of the sample) contains respondents with a moderately low environmental behaviour, but with very high performance behaviour and high convenience behaviour. Cluster B also shows moderately low environmental behaviour and low performance behaviour; convenience behaviour is moderately high, but the difference from zero is negligible. This is by far the largest cluster, containing over 46% of the respondents. Respondents in cluster C score very high on environmental behaviour and they score high on performance and convenience behaviour, with 13.9 % this is the smallest cluster. Finally cluster D (15.6 % of the sample) scores moderately low on environmental behaviour, low on performance behaviour and very low on convenience behaviour. Again one could ask the question whether clusters C and D are different from each other, since they do not discriminate between the constructs themselves. However, since these are behavioural measures, the answers are less sensitive to response biases, so in this case there are real differences between the clusters.

Finally, a cross tabulation that indicates the difference in attitudes and behaviours among the clusters is presented in table 5. The cross tabulation shows how the respondents from the attitude clustering are distributed over the behavioural clusters. The rows represent the attitude clusters, the columns the behavioural clusters. The cells give the percentages of the sample that have specific combinations of cluster membership.

Insert table 5 about here

It can be seen that a total of 65.9 % of the respondents has a positive attitude about the environment (the members of attitude cluster 3 and 4), from this group, only 17.2 % has translated these attitudes into pro-environmental behaviour (the members of attitude cluster 3 and 4 who are also in behavioural cluster C, this is 11.5 % of the population). This means that 2.4 % of the population who do not feel that the environmental aspects are important, still have relatively environmentally friendly cars (cluster combinations 1C and 2C). Of the 38.3 % of the respondents who has a positive attitude about performance (the members of attitude clusters 2 and 4), 51.2 % shows the corresponding behaviour (the members of attitude clusters 2 and 4 who are also in behavioural cluster A and C, this is 19.6% of the population). This leaves 18.7 % of the population whose car has more performance attributes than average, even though the respondent does not deem this important. Finally of the 19.9 % that has a positive attitude towards convenience (the members of attitude cluster 4), 91.3 % also has a car that scores above average when looking at convenience⁵ (cluster combinations 4A, 4B and 4C: 18.6% of the population). We can thus conclude that on a population level the average attitude-behaviour gap is the largest for the environmental constructs, and the smallest for convenience constructs. This is a finding that might be due to social desirable answering by the respondents or there might be other factors of influence here.

4.2. *STRUCTURAL EQUATION MODELLING*

The second part of the results section presents the models in which the different constructs are related to knowledge base and information search channels (cf. Figure 1). First, we discuss the model that estimates the attitude-behaviour gap in terms of explained variance. Then we will discuss the models that relate either the attitudinal constructs or the behavioural constructs to knowledge base and search channel use. Table 6 presents the results of the first model. The columns represent the independent variables and the rows the dependent variables. Each cell gives the completely standardized direct effect estimator; this allows us to compare the effect sizes.

⁵ To verify these results we also ran a two-step cluster analysis with the attitude-behaviour pairs of the constructs. These analyses gave similar result for each construct.

Insert table 6 about here

Model 1 measures the relationship between the three attitudinal concepts and the three displayed behavioural concepts on an individual level. The model GFI is 0.95, NFI is 0.94, the RMSEA is 0.026 and the model chi-square is 1467.19 with 763 degrees of freedom. This indicates a good model fit.

When looking at the explained variance (between 14% and 26%), it can be seen that there is quite a large attitude-behaviour gap, although the result is somewhat different than the results from the cluster solution. As predicted by attitude-theory, all three corresponding attitude-behaviour relationships are significantly positively related. A surprising result is that environmental behaviour is better predicted by a performance attitude than by an environmental attitude. A possible explanation is that there might be some form of technology clustering (Rogers 2003; Vishwanath and Chen 2006; Van Rijnsoever and Castaldi 2007), this is the phenomenon that products are adopted in combination with each other. In this case well-performing cars also may have more environmentally friendly attributes. This can be because the manufacturers of well performing cars also add environmentally friendly aspects to the vehicle, or because the consumers with high performance attitudes voluntarily adopt additional environmentally friendly attributes (either out of feelings of guilt, or perhaps environmental aspects are also seen as performance enhancing). Convenience attitude is the weakest related to environmental behaviour. The same explanation as with the previous relationship can be applied here.

There is a negative relationship between environmental attitudes and the performance of the car owned. This is probably due to fact that cars that contain many performance enhancing aspects, are considered to be polluting for the environment. A positive relationship is found between convenience attitude and performance behaviour. A likely explanation is that some of the performance enhancing attributes is also seen as convenience enhancing.

Finally, there is no relationship between environmental attitudes and convenience behaviour. Environmental attitudes thus have no influence on the level of comfort of the adopted car. This can again be due to the manufacturer or the demand of the consumer. Performance attitudes are positively related to convenience aspects. This finding might be due to the segment of more luxurious cars that both have a high level of performance and convenience.

Table 7 presents the direct effects of the model that relates the attitude constructs to knowledge base and the use of search channels (cf. no. 2 in Figure 1). Table 8 presents the total effects of this model. The total effects model takes into account the indirect effects from attitudes through knowledge base to search channel use. This provides insight into whether the relationships found are explained by knowledge base or not. The model GFI is 0.86, the NFI is 0.93, the RMSEA is 0.062 and the Chi-square is 4554.79 with 734 degrees of freedom. This is a reasonable fit.

Insert table 7 about here

Insert table 8 about here

In the model, attitudes explain 48% of the consumers' knowledge base. Performance attitude is very strongly positively related, while environmental and convenience attitudes are negatively related to knowledge base. People who score high on performance attitude thus have a lot of knowledge about cars. People who score high on environmental attitudes generally have a smaller knowledge base about cars. This might be because they see cars as polluting and therefore have less interest in them. People who score high on convenience attitudes also have a lower knowledge base.

The total effects model (table 8) shows that environmental attitudes are negatively related to internal search, while performance attitude is positively related to internal search. In the direct effects model (cf. table 7) it can be seen that both these effects are in fact explained by knowledge base. Because performance is positively related to knowledge base, it is also positively related to internal search. Environmental attitudes are negatively related to knowledge base and therefore also to internal search. Convenience attitude is also positively related to internal search in the total effects model. When correcting for knowledge base, this effect becomes stronger.

In the total effects model, environmental attitude is negatively related to the use of personal channels, while a performance attitude is positively related to personal channels. The explained variance is, however, very low (only 2%). In the direct effects model the effect of environmental attitude is explained by knowledge base, while the effect by performance becomes negative, but remains small.

The largest effect of an attitudinal construct on the use of search channels in table 8 is the relationship between performance attitude and the use of mass media. There is also a small negative effect between mass media and convenience attitudes. In the direct effects model the effects are again explained for a large part by knowledge base, although there remains a relatively strong relationship between performance and mass media use. Also positive relationship with environmental attitudes appears. Using mass media is thus most effective to address consumers with a high performance attitude. This might be because the content of mass media channels specifically targets this group.

Another search channel that is strongly positively related to performance attitude is the World Wide Web. Again this relationship is explained by knowledge base. Interesting in the direct effects model is that under the influence of knowledge base, environmental attitude and convenience attitude become significant. The implications of these findings will be discussed in the next section.

Finally the use of experts is only related to convenience attitude. However, this relationship is very small, and not affected by knowledge base.

Insert table 9 about here

Insert table 10 about here

Table 9 presents the direct effects of the model that relates the behavioural constructs to search channel use, table 10 presents the total effects. The model GFI is 0.95, the NFI is 0.93 the RMSEA is 0.022 and the chi-square is 1451.90 with 865 degrees of freedom. This is a good fit.

There is a positive relationship between performance behaviour and knowledge base and a negative relationship between knowledge base and convenience behaviour. These relationships are the same as in the attitude model. Contrary to the attitude model, there is no negative relationship between environmental behaviour and knowledge base. This is possibly due to the

fact that performance attitude is positively related to environmental behaviour (see table 6). Since performance attitude is also positively related to knowledge base, this could explain the relationship between knowledge base and environmental behaviour. However, an additional analysis that controlled for this aspect revealed that this is not the case (result not shown here). Therefore, we can conclude that consumers that actually display environmentally friendly behaviour have more knowledge about cars, than people who only have environmental friendly attitudes.

In the total effects model (table 10), there is a positive relationship between performance behaviour and internal search that is entirely explained by knowledge base in the direct effects model. The effects from environmental and convenience constructs that were found in the attitudes model are not found in the behaviour model.

Personal channels are positively related to performance behaviour and negatively to environmental and convenience behaviour in the total effects model. The positive relationship of performance is for a large part explained by knowledge base, while the negative relationships remain. People with higher scores on environmental and convenience behaviour make less use of personal channels in the search process. The relationship with environmental behaviour is similar to the one found in the attitude model.

The total effects model (table 10) shows a positive relationship between performance behaviour and the use of mass media, which is explained by knowledge base in the direct effects model (table 9). Furthermore, a positive relationship between convenience behaviour and mass media search appears.

There is a positive relationship between performance behaviour and WWW-search that is again explained by knowledge base. The small effects from the other two constructs that appeared in the attitude model are not found here.

Finally there is positive relationship between performance behaviour and experts, and a negative relationship between convenience behaviour and experts in the total effects model. The explained variance, however, is only 1%. In the direct effects model, both these effects are explained by knowledge base. With regard to the use of experts, both the attitude and behaviour models have in common that they explain the concept very poorly.

5. DISCUSSION AND IMPLICATIONS

In this paper we extended a previous model by (Van Rijnsoever et al. Forthcoming) that measured the relations between knowledge base and the pre-purchase use of information channels. By adding attitudinal or behavioural constructs to the model, we were able to find out how consumer preferences are related to knowledge base and information search channels. Thereby we were able to identify the groups to target.

5.1. THEORETICAL IMPLICATIONS

In this study we measured the attitudes of people with regard to (environmental and other) attributes of (new) cars. In exploring the indicators that measure the importance of certain aspects of a car we discovered three attitudinal constructs that were used in our further analyses: an environmental attitude, a performance attitude and a convenience attitude. We also found three behavioural constructs that were equivalent to the attitudinal constructs.

For both the attitudinal constructs and the behavioural constructs we conducted a cluster analysis to identify groups of consumers. Our analysis showed that although 65.9 % of the sample had a relatively favourable attitude toward environmental aspects of a car, only 17.2 % of this group was classified into an environmentally friendly behavioural cluster. This indicates

a large attitude-behaviour gap, which is in line with previous findings (e.g. Grob 1995; Nilsson and Kuller 2000; Kollmuss and Agyeman 2002; Walton et al. 2004; Gardner and Abraham 2008). Although literature describes that there are many reasons why attitudes are not translated into behaviour, such as a lack of intention formation, habitual behaviour and social norms (Eagly and Chaiken 1993). We like to focus on a specific reason that is implied by our results. Literature acknowledges that information provision is a prerequisite for environmental behaviour (Kaiser et al. 1999; Nijhuis and Spaargaren 2006). These studies focus on environmental knowledge. Our results have shown that environmental behaviour is not related to knowledge about cars, while environmental attitudes are negatively related to knowledge base. We thus found that people who translated their environmental attitude into environmental behaviour do know more about cars. Knowing more about the object at hand (cars in our case) may therefore be another prerequisite for bridging the attitude-behaviour gap.

Our results have shown that the size of the attitude-behaviour gap varies per construct. The attitude-behaviour gap for the performance constructs was 51.2 %, while the attitude-behaviour gap for the convenience constructs was virtually non-existent. It is possible that this difference is due to the clustering procedure, but the still widely held belief that environmental choices involve certain sacrifices, in comfort, performance or financially (Nijhuis and Spaargaren 2006), might also explain part of the large gap between environmental attitude and behaviour. The attitude-behaviour gaps that we measured at the individual level (using the structural equation models) were larger for all three constructs (environment, performance, convenience) than when measured at the population-level (with the clustering approach). These differences may be explained by the different statistical techniques used. In the two-step cluster analysis, much information is lost. The image presented is thus a simplified one. The structural equation model approach, on the other hand, has to account for random noise in the data. We can, however, conclude that there certainly is an attitude-behaviour gap for the environmental constructs.

A noteworthy finding is that a performance attitude better explains environmental behaviour than an environmental attitude. We speculated in the results section that this could be explained by technology clustering where fully-loaded, high-performance cars are also equipped with environmentally friendly attributes. Our current dataset does not provide insight in the reasons for this relationship. Further (qualitative) research will have to provide more insights here.

A final finding, for both the attitudinal and behavioural model is that the performance constructs are the most strongly related to search channel use. This is for a large part explained by the knowledge base the consumer has about cars. The environmental constructs and convenience constructs are much less related to channel use and knowledge base. Although the inclusion of these two constructs have enriched our understanding of the use of search channels and can also be useful from a policy perspective, their explanatory power is limited for understanding information search.

From a methodological point of view we should remark that the possible effects of socially desirable answering may have led to an overestimation of the gap between environmental attitude and environmental behaviour. Also, the situational context of the data collection should be kept in mind when drawing conclusions: influences in e.g. a car showroom may influence attitudes (and behaviour), which is difficult to measure with a questionnaire.

5.2. POLICY IMPLICATIONS

These findings provide opportunities for policy makers because this group of performance loving consumers is easy to target through the channels that are easiest to use in any information campaign: mass media and the World Wide Web. We will base our recommendations on these channels.

Our findings that people that have displayed environmental friendly behaviour have more knowledge about cars, indicates that it is important to inform the public about car technology, next to environmental problems. This can best be done for a segmented audience (Blackwell et al. 2001). There are two types of target groups: (1) the consumers with low environmental attitudes and low environmental behaviour, (2) the consumers with high environmental attitudes, but with low environmental behaviour. Targeting group 1 is needed to create more environmental awareness, which is also a prerequisite for environmental behaviour. Targeting group 2 is required to bridge the attitude-behaviour gap. Based on the results of the cluster analysis, we can cautiously estimate the sizes of each of the target groups. The first group consists of people who are members of cluster 1 or 2, which is around 34.1 % of the population. The second group are the people who are in attitude cluster 3 or 4 and in the behavioural clusters A, B and D, which accounts for about 54.3 % of the population. We will make policy recommendations for segments of each target group.

The attitude model in table 8 revealed that there is no positive relationship between environmental attitude and a particular search channel. However, after correcting for knowledge base, environmental attitude is positively related to the use of mass media and Web channels in the car purchase process. This means that these channels are difficult to use when targeting people with a low environmental attitude. The results have shown that performance constructs are strongly related to search channel use. Policy makers can use the performance construct to target a part of the group with low environmental attitudes, by convincing the audience that environmentally friendly aspects of a car can also fit in the image of a high-performance car. Tailored information about new (technical) developments that improve environmental performance while keeping up car performance (e.g. speed and image) may help to get a more positive attitude toward such new developments. For instance, if Jeremy Clarkson from BBC's program Top Gear would genuinely show more environmental awareness when commenting on performance cars⁶, this might lead to an increased acceptance of environmentally friendly attributes of cars. Past research has also shown that feelings of responsibility (Kaiser and Shimoda 1999) and the consumers' belief that they, as individuals, can help solve environmental problems (Roberts 1996), are strong predictors for ecological behaviour. An additional strategy could therefore be to use the mass media and web channels to awaken feelings of responsibility and to convey the message that individual car drivers can play an important role in reducing environmental problems. Of the target group, only the members of cluster 2 (being 18.8%) score high on performance attitudes, and are therefore more likely to respond to a performance based communication strategy.

The second group that needs to be targeted consists of the people with high environmental attitude, but with low corresponding behaviour. In this case the positive relationship between environmental attitude and the Web use or mass media use, can be used in a communication strategy. Using these channels, policy makers should attempt to get people with higher environmental attitudes to be more involved with cars. This may then help them to translate their positive environmental attitude into corresponding behaviour.

There is also a specific segment that scores high on environmental and performance attitudes, but low on environmental behaviour and high on performance behaviour, (these are the people who are in attitude cluster 4 and in behaviour cluster A, around 5.7 % of the population). This group can also be targeted through mass media and the WWW. However, this group is served better if the information is tailored to their relatively high knowledge base and their high interest.

⁶ The mentioning of this show is only exemplary. The authors love the programme as it is.

In terms of policy making, the consumers with a strong preference for convenience seem to be the most difficult category. This group is difficult to target in terms of specific channels and does not seem to have any special interest in (environmentally friendly) cars. We advise policy makers therefore to focus their communication efforts mostly at targeting environmental or performance preferring consumers.

Based on our empirical results we recommend the described communication strategies that can, in combination with other measures, promote environmentally friendly car purchasing behaviour. The results of this study can therefore help to go Top Gear towards sustainable mobility.

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Indicator	Explained Variance	Latent variable	Model performance
How important do you find the following aspects when purchasing a new car? (on a 1 to 5 point scale)			
Greenhouse gas emissions	0.84	Environment Attitude	GFI: 0.92 NFI: 0.95 RMSEA: 0.073 $\chi^2 = 1209.54$ df=143
Emission of polluting chemicals	0.91		
The energy label of the car	0.54		
Environmental friendly materials	0.65		
Appearance	0.63	Performance Attitude	
Brand	0.42		
The "feeling" you get from the car	0.37		
Engine size	0.35		
Image	0.61		
Speed	0.45		
Colour	0.44		
Extra accessories on the inside (such as airco, heated seating, sunroof)	0.34		
Extra accessories on the outside (such as metallic paint, fog lights)	0.45		
Electronic products (such as a CD player, DVD player, navigation system)	0.33		
Type of car (size, arrangement of the car, etc.)	0.47	Convenience Attitude	
Comfort	0.35		
Volume of the car (number of seats, volume of the trunk)	0.50		
Length of the car	0.29		
Reliability	0.32		

Table 1: the measurement models for the attitudinal constructs.

Indicator	Explained Variance	Latent variable	Model performance
CO ₂ reducing tires	0.32	Environment Behaviour	GFI: 0.95 NFI: 0.93 RMSEA: 0.048 $\chi^2 = 847.58$ df=205
Silent tires	0.25		
Econometer / shift indicator	0.15		
Particle filter	0.14		
Leather seats	0.29	Performance Behaviour	
Seat heating	0.34		
Top speed	0.22		
Fuel economy	0.03		
Cruise control	0.39		
Automatic gear	0.17		
Navigation system	0.30		
Four wheel drive	0.15		
Handsfree mobile phone application	0.20		
Length of the car	0.06		
Winter tires	0.15		
Airbags	0.34	Convenience Behaviour	
Year of build	0.18		
Power steering	0.31		
Anti-lock breaking system (ABS)	0.37		
Air conditioning	0.41		
Price	0.27		
New/Second Hand	0.18		

Table 2: the measurement models for the behavioural constructs.

Indicator	Explained Variance	Latent variable	Model performance
I enjoy discussing cars with my friends	0.75	Knowledge base	GFI: 0.99 NFI: 0.99 RMSEA: 0.054 $\chi^2 = 40.68$ df = 8
I get bored when other people talk to me about cars*	0.29		
When I'm with a friend, we often end up talking about cars	0.65		
I regularly discuss cars with friends	0.71		
Cars are nothing more than appliances*	0.32		
I do not pay much attention to car advertisements in magazines or on TV*	0.42		
<i>When Purchasing a car, I make use of the following information sources:</i>			
My own experience from the past	0.18	Internal Search	GFI: 0.93 NFI: 0.94 RMSEA: 0.075 $\chi^2 = 783.11$ df = 89
The results from a test drive**	0.33		
My own knowledge about cars	0.81		
My close relatives	0.33	Personal Channels	
My friends	0.62		
People from my direct environment, for example school or work	0.53		
Advertisements and magazines about cars	0.46	Mass media Channels	
I look at other cars in the street	0.28		
Television programmes about cars	0.49		
Radio and television commercials	0.55		
Internet websites from the various car brands and manufacturers	0.68	World Wide Web (WWW)	
Internet websites for consumers about cars	0.64		
Search engines like Google and Yahoo	0.45		
Garage owners	0.12	Experts	
Experts	0.36		
Car salesmen, dealers or lease companies	0.41		
The results from a test drive**	0.33		

Table 3: The operationalization of the variables, explained variance of the indicators and the performance indicators of the measurement models. *: Items are reversed scored; means are after reversing the scores. **This indicator is factorially complex, it was used both on Internal search and experts.

Attitude		Environmental		Performance		Convenience	
Cluster	Percentage	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
1	15.3%	-0.42***	0.96	-1.28***	0.84	-1.34***	0.99
2	18.8%	-1.33***	0.59	0.29***	0.94	-0.07	0.77
3	46.0%	0.44***	0.62	-0.03	0.69	-0.05*	0.51
4	19.9%	0.57***	0.71	0.78***	0.78	1.23***	0.42
Behaviour		Environmental		Performance		Convenience	
Cluster	Percentage	Mean	Std. Deviation	Mean	Std. Deviation	Mean	Std. Deviation
A	24.4%	-0.24***	0.4	1.08***	0.82	0.76***	0.37
B	46.1%	-0.37***	0.38	-0.52***	0.38	0.06*	0.53
C	13.9%	2.11***	1.03	0.72***	1.09	0.58***	0.66
D	15.6%	-0.41***	0.39	-0.79***	0.4	-1.88***	0.48

Table 4: The cluster solutions for the attitudinal constructs and the behavioural constructs.

		Behavioural Clusters				Total
		A	B	C	D	
Attitude Clusters	1	1.30%	8.93%	0.36%	4.76%	15.3%
	2	6.77%	7.13%	2.02%	2.88%	18.8%
	3	10.66%	22.69%	6.41%	6.20%	46.0%
	4	5.69%	7.35%	5.12%	1.73%	19.9%
Total		24.4%	46.1%	13.9%	15.6%	100.00%

Table 5: The cross tabulation that links the attitudinal clusters to the behavioural clusters.

		Attitude			
		Environment	Performance	Convenience	R ²
Behaviour	Environment	0.21***	0.30***	0.16*	0.23
	Performance	-0.16***	0.44***	0.11**	0.26
	Convenience	0.01	0.20***	0.24***	0.14

Table 6: The Attitude-Behaviour model. *: p<0.05, **:p<0.01, ***: p < 0.001. GFI: 0.95 NFI: 0.94 RMSEA: 0.026 Chisq: 1467.19 df: 763

		Attitude			Knowledge Base	R ²
		Environment	Performance	Convenience		
Information Search Channels	Knowledge Base	-0.21***	0.73***	-0.17***		0.48
	Internal Search	-0.06	-0.05	0.28***	0.61***	0.46
	Personal channels	-0.01	-0.14*	0.02	0.38***	0.10
	Mass media	0.09**	0.12**	0.03	0.63***	0.51
	WWW	0.07*	-0.06	0.12**	0.46***	0.20
	Experts	0.03	0.03	0.10*	0.04	0.02

Table 7: Direct completely standardized effects of the attitude model. *: p<0.05, **:p<0.01, ***: p < 0.001. GFI:0.86 NFI: 0.93 RMSEA: 0.062 Chisq 4554.79 df: 734

		Attitude			
		Environment	Performance	Convenience	R ²
Information Search Channels	Knowledge Base	-0.21***	0.73***	-0.17***	0.48
	Internal Search	-0.19***	0.39***	0.18***	0.27
	Personal channels	-0.09**	0.14***	-0.04	0.02
	Mass media	-0.04	0.58***	-0.08 *	0.30
	WWW	-0.03	0.28***	0.04	0.09
	Experts	0.02	0.06	0.09*	0.02

Table 8: Total completely standardized effects of the attitudes model *: p<0.05, **:p<0.01, ***: p < 0.001

Behaviour		Environment	Performance	Convenience	Knowledge Base	R ²
	Knowledge Base	-0.05	0.62***	-0.33***		0.16
Information Search Channels	Internal Search	0.08	0.15	0.00	0.56***	0.42
	Personal channels	-0.16*	0.26*	-0.23*	0.25***	0.13
	Mass media	-0.06	-0.01	0.16 *	0.69***	0.50
	WWW	-0.04	0.08	-0.01	0.40***	0.18
	Experts	-0.06	0.11	-0.03	0.04	0.01

Table 9: Direct completely standardized effects of the behaviour model. *: p<0.05, **:p<0.01, ***: p < 0.001. GFI: 0.95 NFI: 0.93 RMSEA: 0.022: Chisq: 1451.90 df: 865

Behaviour		Environment	Performance	Convenience	R ²
	Knowledge Base	-0.05	0.62***	-0.36***	0.16
Information Search Channels	Internal Search	0.05	0.49***	-0.20	0.15
	Personal channels	-0.17*	0.41***	-0.32***	0.08
	Mass media	-0.09	0.42***	-0.09	0.10
	WWW	-0.07	0.33***	-0.15	0.05
	Experts	-0.06	0.13***	-0.04***	0.01

Table 10: Total completely standardized effects of the behaviour model. *: p<0.05, **:p<0.01, ***: p < 0.001

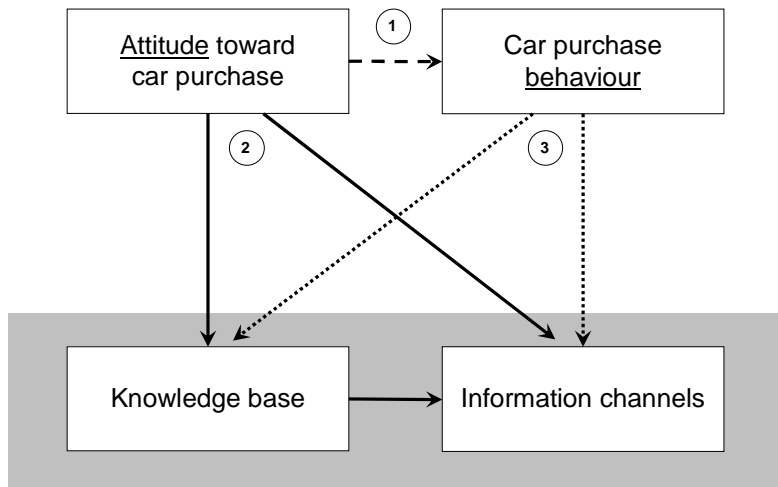


Figure 1. Schematic presentation of the concepts and measured relations in the reduced model.