DEFINING THE PUBLIC SUPPORT: WHAT CAN DETERMINE ACCEPTABILITY OF ROAD SAFETY MEASURES BY A GENERAL PUBLIC?

Sven Vlassenroot
Institute for Sustainable Mobility (IDM) Ghent University, Belgium
Transportation Research Institute (IMOB), Hasselt University Belgium
Johan De Mol
Institute for Sustainable Mobility (IDM) Ghent University, Belgium
Tom Brijs, Geert Wets
Transportation Research Institute (IMOB), Hasselt University Belgium

ABSTRACT

Increasing road safety is one of the main goals in traffic policy. Measures to increase.(sustainable) road safety can be divided into infrastructural measures, which make road infrastructure and traffic situations more understandable and transparent for road users; vehicle technologies, like intelligent transport systems that increase the safety of drivers and passengers; information, education and enforcement of road users. Engineering, education and enforcement, also known as the 3E's, are considered as an integrated approach of road safety policy. These measures consider mostly adaptation of or guidance in road user behaviour. However, traffic behavioural change implies acceptance of traffic policies and/or regulations.

Nowadays, new technologies, such as intelligent transport systems (ITS), could create alternative solutions for a better road safety. But how sure can we be whether (new) traffic rules will be accepted by the people, especially if technologies, like ITS, would be implemented? Or will there be support by the general public? Measuring public support of road safety defines the degree of acceptance or intentions people have to adapt or not to adapt to the desired behaviour.

In today's applied traffic behaviour studies – like studies on advanced driving assistance systems (ADAS) - the focus on acceptance is mostly limited, or not measured at all. Most of the existing studies only give some indications of the drivers' perception on their behaviour. If there are issues that can indicate acceptance, it is mostly measured in relation with potential benefits for the driver (e.g. will you use device X, if your insurance will be cheaper?).

The focus of this paper is defining what is actually meant with 'public support', what the benefits are of knowing the public support for road safety policy, and how it can be measured. Through literature search, the content of public support will be outlined and the underlying personal and social factors will be described and linked with social behavioural and acceptance theories. This may result in a first theoretical framework to develop a future model for

measuring public support of road safety measures, especially related to the use of ITS within reducing inappropriate speed.

1. INTRODUCTION

In the last few decades, the importance and popularity of Intelligent Transport Systems (ITS) to improve transport and road safety has been growing rapidly. ITS refers to a large variety of information and telecommunication technologies aimed at improving the performance of transport systems in general and limiting the negative consequences, such as congestion, reduction in safety, pollution,…

One of the most promising intelligent transport systems, specifically aimed at reducing inappropriate speed, is Intelligent Speed Adaptation (ISA). ISA is an intelligent in-vehicle transport system, which warns the driver about speeding, discourages the driver from speeding or prevents the driver from exceeding the speed limit (Regan et al., 2002). Most ISA-devices can be categorized into three types (ETSC, 2005) depending on how intervening (or permissive) they are. An informative or advisory system will only give the driver feedback with a visual or audio signal. A supportive or warning ISA system will intervene when the speed limit is exceeded. For example, the pressure on the accelerator pedal will increase when the driver attempts to drive faster than the speed limit. A mandatory or intervening system will totally prevent the driver from exceeding the limit: the driver cannot overrule the system.

Several trials with different types of ISA have already been done across Europe. In the Netherlands, a mandatory system was tested. The United Kingdom, instead, focused on an advisory system (Carsten and Fowkes, 2000). In Sweden, a range of different types of systems was tested in different cities (Vägverket, 2002). In France, a trial was held near Versailles with the involvement of the car-industry and even in Belgium (Vlassenroot et al., 2006) a trial has been held in the city of Ghent where 34 cars and 3 buses were equipped with an advisory ISA-system.

Within these trials, most of the focus was put on the behavioural changes and acceptance when driving with an ISA-device. The outcome was mostly very promising and the degree of acceptance after experiencing ISA was rather high (Vàrhelyi and Mäkinen, 2001).

Nowadays, the focus has shifted more and more towards developing implementation strategies for ISA. A central notion is that policymakers do not have a clear picture of the ITS conditions, goals and concepts contributing to road safety or mobility. A certain risk-avoiding attitude towards ISA among policymakers can be noted (Marchau et al. 2002). One of the key-concerning issues is how the public will react if ISA were to be implemented. From the point of view of policymakers, support for policy or measures is an important precondition for success. It is assumed that greater public support would also result in greater support in political and governmental circles and can lead to a better behavioural adaptation by the public (Goldenbeld, 2002).

The central notion within this paper is how to come to an empirical methodology to define public support. Through a first analysis of the terminology of public support, the key-element, which is acceptance or acceptability, is outlined. In a second phase, the content within acceptance measurement is described, where the link is made with socio-psychological, behavioural and motivational theories. Finally, a first integration of the different aspects found in the described methodologies is given which could be the base for constructing an operational model to measure public support of ISA.

2. WHAT IS 'PUBLIC SUPPORT?'

2.1 Definition

Public support could be defined as a positive, negative or neutral opinion, attitude and / or behaviour of individuals involved about the content of a taken policy (Ruelle en Bartels, 1998).

Public support for road safety (measures) can be described (Goldenbeld, 2002) as a positive valuation of road safety and of measures that evidently increase road safety. This positive valuation leads, under favourable conditions, to an increased willingness to accept a measure and even to actively support it.

The growing interest in defining public support must be seen in the increased notion that policymaking acts must be considered as a two-way direction wherein interaction, transaction and communication with the public are the key-elements (Nelissen and Bartels, 1998). This leads, in terms of road safety policy, to the precondition that the effectiveness of a measure will increase if there is support. Therefore, measuring public support would be a valuable tool.

A strong definition of what the term 'support' contains is absent. In most cases 'public support' has been related to acceptability, commitment, legitimacy and participation (Goldenbeld, 2002). A main difference that has been made is between political, policy and social 'support.'

The relation between both terms- support and acceptance - is strong, but some nuances have to be made.

2.2 The Difference between Acceptance and Public Support

To a certain extent, the terms acceptance or support are strongly related. Goldenbeld (2002), however, describes a nuance between support and acceptance. Acceptance can be noticed but this does not necessarily lead to the support of a measure. For example: it is possible for an individual to accept paying taxes, but he would not necessarily support it. In this way acceptance must be seen as a precondition to come to support but would not be the same.

Acceptance can be further defined as a phenomenon that reflects to what extent potential users are willing to use a certain system. Whether a system will be accepted or not will depend on the way user needs are integrated in the development of a system (Ausserer K. and R. Risser., 2005). In some research regarding the use of new devices, acceptance is mostly considered as the outcome of the behavioural changes, i.e. by comparing the old driving style with the new driving behaviour when using the device, in combination with the opinions of the users, which would declare the 'willingness to use it' (Jameson, 2005; Garvill, 2002). In other research, the outcome of behavioural change is mentioned as (behavioural) adaptation (Brookhuis et al.,1999). In the PROSPER-project (2004), a European funded research project in which different countries participated regarding ISA-research, the term acceptance was related to research on opinions, perceptions and attitudes of the test drivers. Van der Laan et al. (1997), however, noted a certain difference between user acceptance and social acceptance. User acceptance is more related to the ergonomic issues of a device, whereas social acceptance will focus more on the (long-term) effects by analysing indirect attitudes. Within their method, a certain standardization for measuring acceptance is made, although it is still focused more on the ergonomic aspects.

Generally, within these research-projects 'acceptance' would only be a part of the 'public support' concept and more strictly related to the integration of specific needs of the user within the device or measure.

Schade and Schlag (2003) use the term 'acceptability': "*The term acceptability describes the prospective judgment of measures to be introduced in the future. Thus the target group will not have experienced any of these measures, making ''acceptability'' an attitude construct. Acceptance defines respondents' attitudes including their behavioural reactions after the introduction of a measure. Likewise, the term public acceptability is conceptually rather fuzzy as it is unclear what exactly is meant by the public. Some authors focus on motorists, others on voters, consumers, citizens or inhabitants*".

In our approach, we are more interested in defining the social aspects that could lead to public support. These social aspects are partly found within individuals' attitudes; attitudes that describe whether a person wants to accept or reject a certain measure. Therefore acceptance, which is mentioned as a precondition to come to public support, is found within an individual context. The sum of the degree of acceptance by individuals would indicate if there is public support for the measure or not. Because our research target group would not have experienced driving with ISA, the term acceptability should be preferred. Although in literature, this difference between acceptance and acceptability is, strictly mentioned, not always found or they are even sometimes used as synonyms, certainly with regard to the measurement of ITS-devices.

As also noted within the previously described research projects, the device-related characteristics should be taken into consideration within the content of acceptability. This indicates the duality of measuring acceptability as defining

the acceptability of ISA as a measure in road safety, and defining the acceptance of the characteristics of the ISA-device itself.

In brief, defining public support of ISA would be done through measuring acceptability by individuals. Acceptability measurement is determined by of the individual socio-psychological factors and the device-related characteristics of ISA.

3. MEASURING ACCEPTABILITY

3.1 Basic Components within Public Support Research

How can the determination of the socio-psychological factors and the device-related characteristics be integrated in a measuring technique? In the past, some researches were already established, in which a mutual framework can be found.

Schlag and Teubel (1997) define the following essential issues determining acceptability:

1. Problem perception,
2. Important aims to reach,
3. Mobility related social norms,
4. Knowledge about options,
5. Perceived effectiveness and efficiency of the proposed measures,
6. Equity (personal outcome expectation),
7. Attribution of responsibility,
8. Socio-economic factors.

Some of these components are found within the Belgian Study on defining the acceptability of speed related measures (De Mol et al., 2001). Acceptability measurement was based on the attitudes and opinions given by individuals, which represent the general public. Within this concept, several layers with mutual relations were defined:

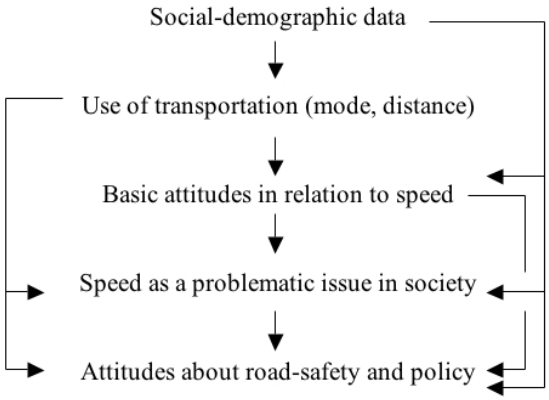

Figure 1. Framework on defining acceptability of speed related measures (De Mol et al., 2001)

The socio-demographic issues and the individual transportation habits are the ‘basic’ factors for the creation of public support. The basic attitudes denote

how people see mobility and transportation, in particular the perception of speed in relation to motorised vehicles. Public support is also determined by 'being a (problematic) issue in society:' if there is no social indication that there is a problem with road safety, speed and speeding, future not be acceptance will not be possiblethere will not be a possibility in future acceptance. Some of the abstract norms and values are made concrete in issues concerning how people think about road safety measures. At this level the 'real' discussion on possible acceptance would take place.

Goldenbeld (2002) has noted that opinion and attitude researches are the most adopted research methodologies to measure public support for road safety measures. One can distinguish between different opinions:

1. Opinions of the general problem of road unsafety (versus other social problems)
    a. Personal consciousness of the problem: is unsafety a problem for the individual?
    b. Social consciousness of the problem: is road unsafety a problem in society?
2. Opinions of the specific problem of road unsafety (ex. Alcohol, speeding,..)
    a. Personal consciousness of the problem
    b. Social consciousness of the problem
3. Opinions about certain solutions to solve the general problem of road unsafety, like effectiveness, justice and proportionality of the solution (measures, enforcement, infrastructure…)
4. Opinions about the concrete solution of specific safety problems, like effectiveness, justice and proportionality of the solution. A relevant distinction is:
    a. Solutions that will affect own behaviour
    b. Solution that will affect the behaviour of others
5. Opinions about the expected own behaviour and behaviour of others when implementing the measure or policy.

The found similarities can be translated in the following framework, which could be used as basis for the development of our measuring technique:

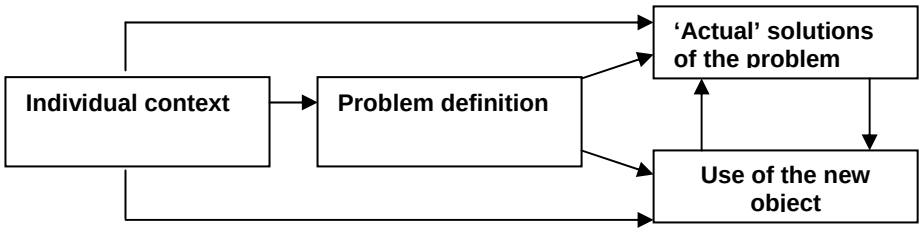

Figure 2. The mutual framework within acceptability measuring methods

The individual context is determined by the personal components (intrinsic), the environmental aspects (extrinsic) and the mode a person uses to travel and the vehicle use. Within the problem definition it is possible to distinguish two aspects: the personal consciousness of the problem and the social

consciousness of the problem. The ‘actual’ solutions of the problem refer to the evaluation and opinions of the individuals about the ‘degree’ of effectiveness of the current solution to counter the problem. The use of the new object refers to the degree of the ‘usefulness’ and the willingness to comply with the new measure or device.

Until now, the description of these components is still rather general. Each component or aspect is defined by personalities and attitudes of individuals. Therefore, this framework must be brought into relation with relevant theories considering motivational aspects, which explain certain behaviour. In this way, the Theory of Planned Behaviour (TPB) is considered to be ideal to investigate the motivational factors involved within the acceptability context. It is also noted that the TPB is of great use within investigation of different aspects of driving behaviour.

3.2 The Theory of Planned Behaviour (TPB)

Based on The Theory of Reasoned Action (TRA) (Fischbein and Ajzen 1975), Ajzen (1991) developed the TPB, which is a social psychological framework for understanding attitudes and behaviour with reference to a small number of concepts linked together in a model. This theory has been used successfully to predict behaviour in a wide variety of applied research settings within different domains.

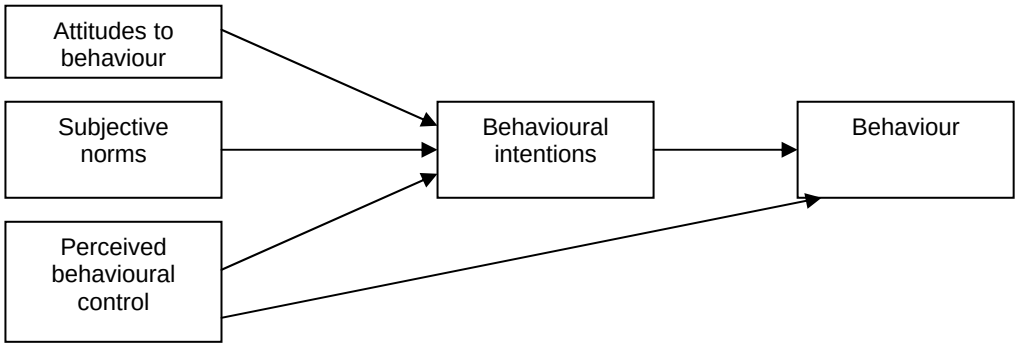

Figure 3. Schematic representation of the Theory of Planned Behaviour

The TPB implies that behavioural intentions, and therefore behaviour, can be predicted by three components. Attitudes towards the behaviour are the individuals’ evaluation of performing a particular behaviour. Subjective norms describe the perception of other people’s beliefs, and perceived behavioural control refers to a person’s perception about one’s own capability to perform an act.

The theory has been used in several studies regarding driving behaviour and traffic safety, like drinking and driving (Aberg, 1993, Parker et al., 1992); driving violations (Parker et al., 1992), speeding and speed behaviour (Elliot et al. 2005, Haglund et al., 2000, Parker et al., 1996).

Warner and Aberg (2006) specifically used the TPB related with the use of ISA. Self-reported speeding of test drivers within an ISA trial was compared

with logged data. 28% of the variance in logged speeding could be explained. In their study, they noted that perceived behavioural control did not add significantly to the prediction of drivers' logged speed.

In our framework, the TPB could be very relevant. As mentioned before, the research notation within our acceptability content is defined by the individual socio-psychological factors (the possible use of TPB) as well as to take device-related characteristics of ISA into consideration. With regard to this last aspect, the TPB is limited. Therefore, other motivational theories concerning the use of new devices must be considered.

3.3 User Acceptance of Information Technology

With the expansion of new technologies and software in information technology (IT), the interest to measure the acceptance by users has grown significantly. Many theories have been used and proposed to define user acceptance. However, these theories are more related to IT and PC-use. The question therefore arises whether these theories can also be applied to the use of ITS in traffic safety.

Content of the individual context, the problem definition and the actual solutions of the problem can be translated in the TPB's three components: attitudes towards behaviour, subjective norms and perceived behavioural control. Some of these issues can be found in previous studies where the TPB is applied to understand speed and speeding behaviour.

Ergonomic issues, difficulty of use, grade of interference, etc. are also noted as relevant issues in the acceptance of ISA (Vlassenroot et al., 2006). Within ISA, there are also different types, as we have mentioned before, where the preferences among individuals could be different. These aspects cannot be forgotten when measuring the acceptability of ISA. Therefore, the TPB could be considered as limited and a better framework may be found in theories regarding IT acceptance.

Venkatesh et al. (2003) noted the problem that there are several theories and models of user acceptance of information technology, which confront researchers with difficulties to choose the proper model. Venkatesh et al. (2003) found different underlying basic concepts in acceptance models by means of a detailed description and analysis of different models like TRB, motivational model, technology acceptance model (TAM), innovation diffusion theory and combined models. Based on these theories, they came up with a unified model, which they called the Unified Theory of Acceptance and Use of Technology (UTAUT).

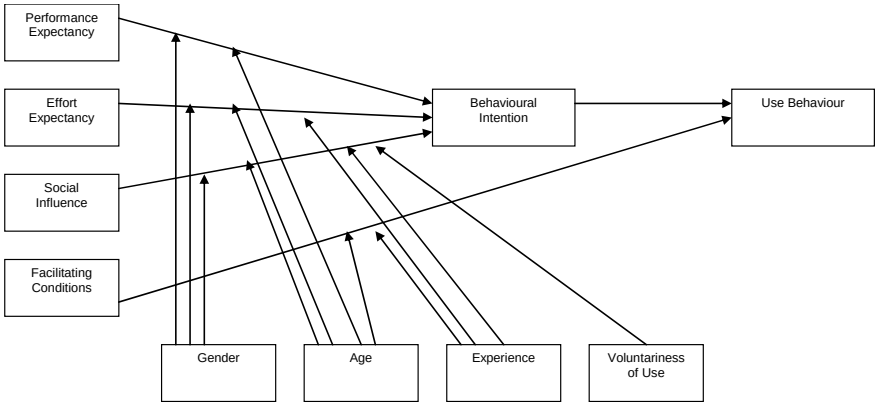

Figure 4.. UTAUT research model

In the UTAUT model, four constructs play a significant role as direct determinants of user acceptance: Performance expectancy is defined as the degree to which an individual believes that using the system would help him or her to attain gains in job performance. Effort expectancy is defined as the degree of convenience with the use of the system. Social influence is the importance of other people's beliefs when an individual uses the system. The facilitating conditions are how an individual believes that an organisational and technical infrastructure exists to support use of the system. The supposed key moderators within this framework are gender, age, voluntariness of use and experience.

Although in several models, 'affect towards use', 'intrinsic motivations' or 'attitude toward behaviour' are the most significant determinants of intention, these are not mentioned in the UTAUT. Venkatesh et al. (2003) presumed that attitudes towards using the technology will not have a significant influence.

4. TOWARDS MEASURING THE PUBLIC SUPPORT OF ISA

In our approach of public support of ISA, the precondition is made that individuals must see the use of ISA as a helpful concept in road safety and also recognise the device-related benefits of a certain ISA-device (informative, supportive or mandatory). This indicates that defining the public support of ISA depends upon the personalities, attitudes and social context of individuals that determine their (safe) traffic behaviour as well as defining the motivational aspects like individual performance and effort expectancy when using the device. Therefore the integration of both models, TPB and UTAUT is not only meaningful but also necessary.

In this section our approach will be made more operational. Different components of different researches of defining speed and speeding behaviour and the technical aspects of ISA are brought into relation with the described models. These components are placed in the general framework (individual context, problem definition, actual solutions and use of the new object) as described in figure 2.

4.1 The Individual Context

The individual context is determined by the personal components (intrinsic), the environmental aspects (extrinsic) and the mode a person uses to travel and the vehicle use.

Gender and age are noted as relevant determinants in the performance of speeding behaviour. Speed is more associated with young drivers (Parker et al, 1992; Stradling et al, 2000; Ingram et al, 2001; Shinar et al, 2001), more specifically with young male drivers. Although male drivers (Stradling et al., 2003) are more likely to speed, some studies show that a difference between the sexes cannot not be found. As for the Ghent ISA-trial (Vlassenroot et al., 2006), female drivers showed a higher degree of satisfaction in using the ISA-device.

Travel behaviour and the choice of vehicle are also brought into relation with speeding behaviour. Silcock et al. (2000) noted that people admitted they drive faster in more powerful and comfortable cars. Moreover, Steg (et al., 2001) did a study to clarify the importance of symbolic-affective motives, as opposed to instrumental-reasoned motives for car use. These motives for car use can have an impact on why they are (not) speeding or why they would (not) like ISA. People who drive more may also speed more. Related to acceptability of ISA, it is therefore hypothesized that travel behaviour and the vehicle choice can be influencing factors.

It is assumed that peers, co-workers or specifically other road users, will influence the attitudes and behaviour of individuals. Silcock et al (2000) noted that drivers admitted to driving differently when they had passengers in their cars. These findings suggest that immediate peer pressure is an important factor in speeding for some groups. Within the Ghent ISA-trial it was noted that drivers would ignore ISA, when other drivers (without using ISA) 'forced' them to speed. (Vlassenroot et al., 2006) Silcock et al. (2000) also recognised the influence of other drivers in speeding. On the other hand, when using ISA, image and other people's opinions could be a relevant determinant to accept or not accept ISA.

4.2 Problem Definition

Within the problem definition it is possible to distinguish two aspects: the social consciousness, compared with other 'crimes' in society and other road unsafety issues and the personal consciousness of the problem. For this study it is important to determine the perception of individuals: whether they see speed or speeding as a problem.

How people see the social consequences of speeding can be established in finding the relation between road unsafety and other 'criminal' issues in society. Particularly the question arises if people see speeding, listed with other social unsafety issues, as a conditional problem. It can be assumed that the higher people rank speeding, the higher the acceptance of road safety measures regarding decreasing speed would be. On the other hand, it may

be that traffic offences are perceived to be different to non-traffic offences. According to Corbett (2001), speeding is not seen as a 'real' crime by most drivers, which indicates that attempts to dissuade drivers from excessive speeding will be a difficult process.

How do people view speeding in the context of other road unsafety issues? To define this issue, the basis can be found in the SARTRE research. In this European questionnaire, the respondents were asked to rank the importance of different crash causal factors, such as speed, alcohol, distance, fatigue, weather, traffic jams, drugs, medicine, mobile phone use, lights, roads, steering mechanism, and tires. It can be assumed that the higher speeding is ranked, the more people will see speeding as a problem in society. Alcohol and speeding were indicated by the respondents as the most probable cause of accidents in Belgium (as in most other countries).

Speeding is generally associated with negative consequences in the form of physical injury and fatal road accidents. Based on the previous topics related to the problem definition, the awareness of speeding as an individual problem should be defined. People's driving styles, or more related (past) speeding motivations, are key factors in the acceptance of road safety measures. In this case, individuals' attitudes about speed and speeding are relevant determinants. Drivers' view of speed limits, the driver's self-image and the perceived risk-taking (speeding) behaviour could be considered as relevant attitudes towards the shown behaviour, according to Silcock et al. (2000).

Although 'attitudes towards behaviour' was not found to be relevant in the UTAUT model, it has been considered as relevant within ISA-driving and the acceptability of ISA. Within the ISA-trial it was noted that the drivers who exceeded the speed limit most frequently without using ISA were still driving faster (Vlassenroot et al., 2006) when they were using ISA. Also Jamson (2005) fears that people who need ISA the most (frequent speeders) would not use or accept ISA.

4.3 Actual Solutions of the Speeding Problem

The 'actual' solutions of the problem refer to the evaluation and opinions of the individuals about the 'degree' of effectiveness of the current solution to counter the problem.

Some of the abstract norms and values people have about speed and speeding as a problem will be brought into relation with the actual measures taken to stop speeding. Implemented speed limits, infrastructural changes, enforcement, education and information could be considered as the most relevant actual measures taken to combat speeding.

Implemented speed limits should be logical for drivers. Vlassenroot et al.(2006) noted that although drivers were using ISA in 30 km/h areas, they were still driving too fast. In general, the acceptance of ISA by the test drivers was high, so other factors probably influenced the drivers. It was noted that in some areas the 30 km/h-policy was not accepted, because the necessary

infrastructural measures were not taken. Silcock et al. (2000) also noted that the bad or wrong positioning of speed limits can be a reason to speed.

Holland and Conner (1996) studied the effects of police intervention on exceeding the posted speed limit and on intentions to speed in one UK location. They found that an anti-speeding campaign of enhanced enforcement was effective in reducing the numbers breaking the speed limits, with a small effect still evident nine weeks after three weeks of police presence.

Hooke et al. (1996) looked at the effectiveness of speed camera areas and found the installation of fixed-site speed cameras reduced accidents by 28%.

In the view of policymakers, these measures would be regarded as effective. Our interest goes to the evaluation and acknowledgement of drivers whether they found these measures effective and would accept them. Therefore the perform expectancy, effort expectancy and the facilitating conditions must be translated in the model. Also these actual solutions must be brought into relation with ISA.

4.4 Potential Use of the New Object

The use of the new object refers to the degree of ‘usefulness’ and the willingness to comply with the new measure or device.

As noted, ISA (acceptance) is related to drivers’ attitudes and behaviour about speed and speeding. Therefore, the previous concepts must be taken into consideration to define the acceptability of ISA. However, ISA also has particular characteristics and ISA-devices exist in different forms: ISA has got a certain degree of interference with driving or the vehicle. These characteristics have to be translated within the perform expectancy, effort expectancy and the facilitating conditions. For example, a warning ISA could be regarded by individuals as effective, but could still not be immediately accepted due to social influence or because it is not consistent with their feelings about driving.

Also other aspects related with ISA could define the degree of acceptance, such as technical possibilities. In the Ghent ISA-trial, some drivers rejected it more, due to technical failure (such as wrong speed limits in the speed map), rather than by the ‘concept of ISA.’ Questions like costs etc… are noted in most trials as a possible reason for non-acceptance of ISA. Therefore, the gains and losses for individuals when choosing a device has to be included in the framework. These are also mentioned in the UTAUT-model.

6. CONCLUSION

Public support has been identified as a relevant precondition for the success of policy actions. It was noted that the content of public support was rather vague. To make research into measuring the existence of public support possible, techniques in attitude and opinion research are mostly used. Public

support is not a term which is widely found within socio-psychological research, so the best relevant key-element was acceptance-research.

Acceptance research could be used to evaluate already taken measures, whereas acceptability research would be used to predict future acceptance Within acceptability, one should not only consider the social relevance, but also what is in the benefit of individuals' needs. Throughout these remarks and the key issues of public support (individual context, problem definition, actual solutions and use of the new object) the relation was made between two complementary models: the Theory of Planned Behaviour and the Unified Theory of Acceptance and Use of Technology. A rough translation of the support components of these models was outlined.

This research model did not start from scratch but tries to combine relevant research issues within attitudes about speed and speeding behaviour and bring them into relation with the use of new technologies.

Within our attempt, the main goal is to construct an empirically based model which would be of great use in predicting the willingness to apply ITS devices.

The benefits, strengths and weaknesses of this model must be tested. This is part of the challenge of making it operational. In the nearby future a first attempt will be made to use this construct.

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