

INTELLIGENT SPEED ADAPTATION. EVALUATION OF PSYCHOLOGICAL ASPECTS OF A LARGE SCALE PROJECT.

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To increase safety on the roads in line with the intentions declared in the Swedish "Zero-vision" the Swedish National Road Administration have initiated a large scale study of an Intelligent Speed Adaptation system (ISA). The aim of the project is to evaluate different systems designed to remind drivers when they are driving faster than the speed limit, primarily in urban areas. Four Swedish cities, Borlange, Lidkoping, Lund and Umea are taking part in the evaluation and in each place different equipment are tested. The evaluations are made in each city separately but the evaluation measures are synchronised through an evaluation committee. The present paper concerns the evaluation planned in the Borlange sub-project.

ISA-equipment in Borlange

For Borlange the purpose of the project is to:

- to present alternatives to physical speed calming measures like road humps
- to test and compare different concepts, technologies and strategies for speed adjustment
- to evaluate effects of different concepts and measures within the area of speed adjustment
- to measure and evaluate (users of equipment, road users, transport administrators, etc.) behaviour, attitudes and acceptance concerning different concepts
- to provide a useful basis for decision making concerning prolonged development within the area of interest and to make strategies for implementation

The ISA-equipment used in Borlange is a device that warns the driver if the speed limit on the road is exceeded. A small display on the dashboard indicates the legal speed limit on the road. If the speed is too high a warning signal is heard and a small red light starts to blink. The equipment used in the other three communities differ from the one tested in Borlange. In Lund the information about speeding is presented through the gas pedal. In Umea the equipment in the car is similar to the one used in Borlange but the infrastructure is different (information about speed limit will be obtained from transmitters on each signpost instead of digital maps). In Lidkoping a mix of vehicles, some with the Lund system and some with the Borlange system, will be used.

In each vehicle, in Borlange, a device is installed that in addition to the display includes a computer with a digital map, a GPS unit and a GSM unit. Via GPS the equipment get

information about the position and movements of the vehicle. From the digital map, in the computer, information about the current speed limit on the road is obtained. When the vehicle is within the research area information about position, speed, acceleration, speed violations, is recorded every tenth second or in certain places or certain circumstances (for example, when the driver is speeding) every second. The recorded information is regularly sent to a central computer via a GSM, wireless, telephone line. In this way a huge amount of "vehicle behaviour" data will be accumulated and a special data handling program is being developed to systemise this data base. In all, according to the present plans, about 400 vehicles (200 private and 200 professional) are being equipped with the ISA system.

Purpose

The general purpose of the study, as presented above, is rather complex. One aim is to compare the different systems with respect to their effects on driver behaviour, effects on the traffic system in general and on the drivers experiences and acceptance of the systems. The effects that the systems will have on professional drivers is of special interest. For example, the private drivers are all volunteers, with a positive attitude towards the devices tested while the professional drivers are not recruited individually and might be less interested to be warned against speeding. The decisions whether the companies or institutions should take part in the study or not are made centrally in the company. It can be expected that the professional drivers might be differently motivated to use the equipment than their bosses who are more interested in quality aspects of the transports performed.

In the evaluation process of the project psychological aspects concerning driver behaviour, driver attitudes and ergonomic issues are of primary importance. Slightly different designs and methods are used in different cities but the main questionnaires used are common for all places in order to make proper comparisons possible. The main strategy for the measurements planned in Borlange is described below.

Driver behaviour

During the one year test period the drivers that take part of the project will be monitored any time they drive within the Borlange test area. However, the researchers have no control of when and where the driving takes place, that is strictly up to the driver. As the research period is quite long a lot of data will be accumulated for each vehicle and it is therefore necessary to aggregated data for each vehicle and for certain places in Borlange. Proper methods for aggregation of data as well as methods to make data available for different evaluations and demonstrations are being developed. The data will be stored in a special data base.

Twenty-nine road sections have been pre-selected for aggregation of data. For these places special measurements of the general traffic speed is being made before, during and after the test period. The purpose is see whether the test drivers are driving in the same way as drivers in general or not.

In order to compare speed adjustment behaviour with and without the warning device the drivers will begin the test period driving with the equipment installed but with warning signals inactive. The behaviour in the pre-period (about one month long) will be recorded in the same way as in the following test period with an active device.

Thus, there will be different possibilities for comparisons of vehicle speed. With and without warning signals, over different places, with perceived speed of the drivers, with the general speed level, etc. The behaviour of individual drivers will then be compared to subjective variables like their attitudes, norms, acceptance, and so on.

Traffic safety attitudes

To monitor the changes and development of different subjective variables psychological measurements are administered before and during the test-period, mainly to the test drivers but also to other groups of interest. Questionnaires have been developed where general attitudes towards traffic safety are investigated together with questions concerning attitudes, subjective norms, perceived behavioural control, intentions and self reported behaviour based on the theory of planned behaviour (TPB), (Ajzen, 1985). Previous studies have shown that the theory provides a understanding the relationships between attitudes, norms and behaviour towards speeding in traffic. Also, results have been obtained (Aberg, unpublished results) showing that many drivers have problems to keep the intended speed and especially to avoid speeding (low perceived behavioural control of speed adjustment). One hypothesis in the present project therefore that the ISA-equipment will increase the drivers ability to control the speed of their vehicles.

One purpose of the study is to investigate drivers' opinions about safety in traffic. Therefore, the test drivers will be asked to answer questionnaires (as a part of their contracts the test drivers have promised to respond about attitudes and evaluations during the whole test period). As the general opinion about traffic safety issues might change during the time of the test a second purpose is to compare the attitudes of the test drivers with corresponding attitudes of drivers in general in the Borlange area. Therefore, questionnaires have and will be sent to random samples of drivers, not involved in the project, at different occasions.

Ergonomic aspects

During the test period the drivers are asked about the functioning of the warning devices, about the project organisation. Questions will be asked about the way the drivers perceive various aspects of the devices installed in the vehicle like quality of sound and visibility of signals. Also about the reliability (instances of malfunctioning) of the equipment and their trust in the information given. There will also be questions about the perceived usefulness of the equipment.

Acceptance of equipment

An important aspect of the subjective evaluation concerns the drivers acceptance of the equipment. In previous studies in Umea and Lund drivers that tested different kinds of devices differed in their acceptance. There was tendencies that drivers who had tried a certain device to a greater extent than others accepted this equipment. Among other things the drivers willingness to keep and pay for the equipment after the test period will be investigated.

In addition to the measurements described above there will be special questions asked to leaders in the companies and institutes involved. Also the drivers will be interviewed after the test period about their individual experiences and their suggestions for improvements.

As the start of the project have been delayed because of technical problems (in August/September, 2000, the first vehicles will be equipped with the ISA-devices) the original plan for evaluation must be revised and it is therefore difficult to describe this plan in detail. However, the first measurements have been made and others will follow. Hopefully it will be possible to report about results from the present projects in many of the future ICTCT-workshops.