TØI report 1097/2010
Authors: Torkel Bjørnskau, Terje Assum, Louise Eriksson, Robert Hrelja, Jonna Nyberg
Oslo 2010, 96 pages Norwegian language

Summary:

Privacy protection and ITS-based road safety measures

A study of section control, intelligent speed adaptation (ISA) and event data recorders (EDR)

New ITS-based road safety measures that control and enforce traffic rules can greatly improve road safety. A downside is their potential threat to personal privacy. Section control – the registration of average speeds over road sections – and event data recorders (EDR) have direct implications for privacy, as do intelligent speed adaptation (ISA) systems which store data. Norwegian and Swedish authorities differ in the way they have dealt with the privacy implications of section control. In Norway the system has been implemented on trial sections whereas in Sweden section control will not be implemented. However, both countries have installed ISA in the company cars of the national road administrations. EDR has attracted relatively little attention in either country.

Car owners are by and large positive towards both section control and ISA, and acceptability increases if speed is viewed as a risk factor. Car owners are more sceptical about EDRs ("black boxes"), which are becoming more and more common in modern cars. The amount of data stored in EDR units is also increasing. Car owners should be kept better informed about this and be given access rights to any data registered.

Background, research problem and method

This study is one of several within the research program "Privacy protection and road traffic", launched by the Norwegian Public Roads Authorities. In it we consider three ITS-based road safety measures: (i) section control, i.e. speed enforcement by automatic average speed measurements; (ii) intelligent speed adaptation (ISA); and (iii) event data recorders (EDRs).

The main research questions are:

1. What institutional and procedural factors promote or inhibit the implementation of safety measures with implications for personal privacy?

2. What are the factors influencing road user acceptability of road safety measures with implications for personal privacy?

Institutional and procedural factors describe (i) the institutions and interests that attempt to influence authorities in deciding whether or not to adopt and implement ITS-based road safety measures; and (ii) the legal, political and professional processes associated with such decisions. Acceptability is about whether or not road users or the public will accept or welcome such measures.

In order to investigate institutional and procedural factors, we consulted official documents on ITS and personal privacy. We also reviewed Norwegian, Swedish and international research on section control, ISA and EDR, focusing particularly on privacy issues.

To assess the extent of the privacy implications of each of the three measures, a separate legal evaluation was conducted, with an emphasis on how legal privacy issues should be interpreted when dealing with ITS. The degree to which privacy considerations must give way to other priorities was also considered.

In Norway and Sweden we interviewed transport authority representatives, politicians and interest groups involved in the decision processes surrounding the adoption of these measures.

Road user opinion about each of the three safety measures was studied by surveying samples of car drivers in Norway, Sweden and Denmark. The survey contained some general questions about speeding and enforcement, and some more specific questions about the three safety measures under study. Questions about each of the different measures were designed to be as similar as possible to allow comparison of responses across measures. Themes included the advantages and drawbacks of each the measures, privacy, and confidence in data protection. Respondents were also asked about the extent to which they were for or against the implementation of each measure. Standard background variables, such as sex, age, income, education and car use were also collected. In addition, the Norwegian and Danish samples were asked about political preferences.

The Norwegian and Swedish samples were drawn from the national vehicle register, but we oversampled regions where the measures were known to have been trialed. In Norway, section control has been trialed on certain road sections; in Sweden a large ISA trial was carried out in some specific geographical areas from 1999 to 2002. In Denmark the sample was drawn from customers of a specific insurance company, “ALKA”, which offers customers reduced insurance premiums in return for installing a specific type of EDR (“ALKA-boks”). Car owners were also stratified according to gender; 50 per cent of the gross samples were female car owners. In total the gross samples consisted of 1500 car owners in each of the three countries.

The samples in all three countries were also divided according to whether they received a version of a question on camera surveillance as an anti-terror measure or a road safety measure.

Institutional and procedural issues

Section control

Section control is a system for speed enforcement that registers the average speed of vehicles along a defined stretch of road. This is achieved by registering car and driver information at two points on a road section. Average speed is calculated using the time spent between the two points. If the average speed is below the speed limit, then all collected information on car and driver is deleted. If the average speed is above the speed limit, pictures of driver, vehicle, plate number are forwarded to the police along with the speed data. Section control has been

trialed on three road sections in Norway. According to the Public Roads Authorities average speeds have decreased on all three sections. The speed reductions were greatest on that section where the speed was highest in the before-period. Section control has also been discussed in Sweden, but not implemented due to privacy and legal issues.

Section control has privacy implications because the identity of drivers passing through the section is stored for a certain period, whether or not they have been speeding. In the Norwegian system, a picture of the driver and the plate number is taken both when the car enters and leaves the road section, so that the driver may be identified and sanctioned if speeding. Thus, information about when and where an identified person has driven is registered. The system takes pictures of the driver, in addition to registering the vehicle, in order to ensure that it is the person driving the car at the time who is sanctioned in the event that the car is speeding. Pictures are important for legal protection, but have privacy implications. Thus there is a conflict between a need to consider legal protection and a need to consider right of privacy.

If the car owner rather than the driver were legally responsible for maintaining the speed limit there would be less need to personally identify the driver, and accordingly there would be less infringement on privacy. Indeed, in most European countries where section control is being used it is the car owner who is legally responsible, and thus there has been little need to debate privacy issues raised by section control. Despite this, there is little sign that either Norway or Sweden will change legal responsibility for speeding violations in the near future.

The Norwegian Data Inspectorate has proposed the adoption of practices with less implications for privacy, such as recording an image of the driver after it has been established that the car was speeding. However, both the Public Roads Administration and the police argue that that such a practice contravenes basic principles of legal protection. In other words it would not be possible to establish as fact that the driver in the picture was behind the wheel at the time the car was speeding.

If section control was given a separate legal basis within road traffic law, the problems concerning privacy issues would be reduced. With a separate statuary basis, this law would take precedence over the general personal data act. Both the Data Inspectorate and the Public Roads Administration have argued in favor of such a separate statuary basis for road section control systems in Norway.

Intelligent speed adaptation (ISA)

Intelligent speed adaptation (ISA) can be designed in different ways, each with varying implications for privacy.

Informative ISA only informs drivers of the speed limit and warns them when they are speeding. Based on GPS and digital maps of speed limits, or intelligent road signs communicating with the vehicles, informative ISA can hardly be seen to have any privacy implications. Systems that influence the choice of speed might be viewed as restricting personal freedom, but it is difficult to argue that the freedom to break the law is an important aspect of personal privacy.

It is also possible to design ISA systems that log data about positions, movements and speed, and here the implications for privacy are more obvious. In the ISA trials conducted in Norway (”The vision zero project” in Lillehammer) and Sweden, such systems were not used. However, the ISA systems that are being installed in company cars of the Swedish and Norwegian road authorities include data logs with information about when and where vehicles have been speeding. This information is aggregated over several drivers and time periods to ensure that single drivers are not identified.

The Swedish Transport Authority has been a key player both in making ISA systems available to drivers and in adopting such systems. They also instigated the large research trials on ISA in Sweden from 1999 to 2002. ISA is now on the market, but only the informative version. ISA systems that control the drivers, e.g. making it impossible to drive beyond the speed limit, have low driver acceptability. According to the Swedish Transport Authority informative ISA is now installed in approximately 2000 vehicles in Sweden, mainly in the company cars of the Transport Authority and some municipalities. In Norway, ISA is less widespread, but informative ISA is being installed in the vehicles of the Norwegian Public Roads Administration.

Data recorders (EDR/JDR)

Whereas section control and informative ISA are relatively clearly defined, “data recorders” contain a number of different systems and technologies. In principle one can broadly distinguish between two main types: “event data recorders” (EDR) and “journey data recorders” (JDR). The EDR is often called a “black box” and is a device in the vehicle that records different types of data before, during and after a crash. JDRs are systems that register journey data about speed and other variables more or less continuously. Such systems are typically used for fleet management of commercial vehicles. It is mainly be EDR systems that are focused on in our study.

Although EDRs and JDRs are quite different there are numerous systems that fall between (as well as outside) these two principal types. There exist many different data recorders in modern vehicles. Most components and processes in vehicles are electronically controlled, making the storage of data about their functioning relatively straight forward. Modern cars are equipped with diagnostic tools making it possible to utilize stored data about the functioning of different components in order to ease maintenance and repair. Much of this information is stored in the car key, but data can also be stored in other ways. There are companies specializing in extraction of information about instrument operations, speed, pedal use etc., which may be relevant in accident investigations, and such information may be demanded by the Police or the Norwegian Accident Investigation Board.

Car manufacturers also extract technical information from car crashes in order to identify technical failures and weaknesses in order to improve safety. According to the manufacturers data are collected and stored anonymously so that the car owner will not be identified. Exactly what data they extract, and how this is done is somewhat unclear and not something car owners are given much information about.

Some insurance companies offer separate EDR or JDR units to costumers in return for lower insurance premiums. In such systems information about when and where the vehicle has been driven, at what speeds etc., are typically stored alongside event data connected to crashes. The Danish insurance company "ALKA" offers 40 per cent premium reduction if car owners install an EDR (so-called "ALKA-box").

Most modern cars have some sort of EDR system installed, i.e. a device that registers information in connection to accidents. Such systems do not need to have severe privacy implications, but they have the greatest potential to threaten privacy according to our legal review. EDRs may have severe privacy implications because a lot of data concerning driver behaviour is registered and stored (speed, instrument operations, the use of seat belts etc.).

Neither Norwegian nor Swedish road traffic authorities pay very much attention to EDR systems, and there are no explicit plans to utilize them. In the EU, however, the implementation of eCall, a system that automatically calls the nearest emergency centre when an accident occurs, is being considered. Still here, interest in EDRs is very low compared to that in the USA, where EDR data are actively used to investigate and help attribute blame in accidents. In the USA the data recorded by EDRs are governed by clear rules set by the National Highway Traffic Safety Administration (NHTSA). The rules identify what types of data EDR systems can record, how car owners are to be informed about this and the right of car owners and insurers to access data.

Acceptability of the measures among car owners

Value-belief-norm (VBN) theory was used to construct a survey of various influences on public acceptability of section control, ISA and EDR.

VBN theory holds that a person will only behave altruistically if he or she senses an associated moral obligation or personal value. A moral obligation or personal value is more likely to be salient if the issue in question (e.g. road safety) is perceived as important and likely to be influenced by behaviour. Put another way, if we view road safety as important for the collective good, and speed as an important risk factor, then we will be more likely to accept speed restrictions; we would thus be more willing to accept ITS measures that limit speed, such as section control, ISA and EDR.

In designing our survey we assumed that acceptability of ITS measures will also be influenced by general political beliefs, and that wariness about new and unfamiliar technology may make people more sceptical about the measures.

A stratified sampling strategy was used to ensure that a substantial share of the sample had actually had some experience with the measures in focus. A minumum number of people were sampled from areas in Norway where section control has been trialed (Bamble and Dovre), and likewise from areas Sweden where ISA trials were carried out in the early 2000s (Umea). The Danish population were also sampled such that a minimum share of respondents had experience with EDR.

EDR seen as having most profound implications for privacy

The measure seen by respondents in all three countries as posing the greatest threat to privacy is EDR, followed by ISA, with section control being viewed as a lesser threat. It is perhaps not surprising that EDR systems are seen as the greatest threat to privacy, while they save and store data and are seen from a legal standpoint as having the largest implications for the protection of privacy.

It is perhaps more surprising that section control is seen as a less of a threat to privacy than ISA, especially when we only asked about informative or warning ISA systems.

Swedes and Norwegians have to a large degree the same view on how invasive the different ITS measures are. The Swedes are somewhat more sceptical towards section control than Norwegians, while the latter are more sceptical towards EDR. These differences are not statistically significant. The Danish are less sceptical towards all three ITS measures than both Norwegians and Swedes.

Section control is most acceptable

We find generally that section control and ISA have quite large acceptability. Section control has greater acceptability than ISA, even though we restricted the latter to informative ISA. The results are not too surprising given that many studies suggest that the acceptability of such measures is greater than politicians and authorities believe (and fear). Figure 1 shows average scores on an index of acceptability of the three measures in Norway, Sweden and Denmark.

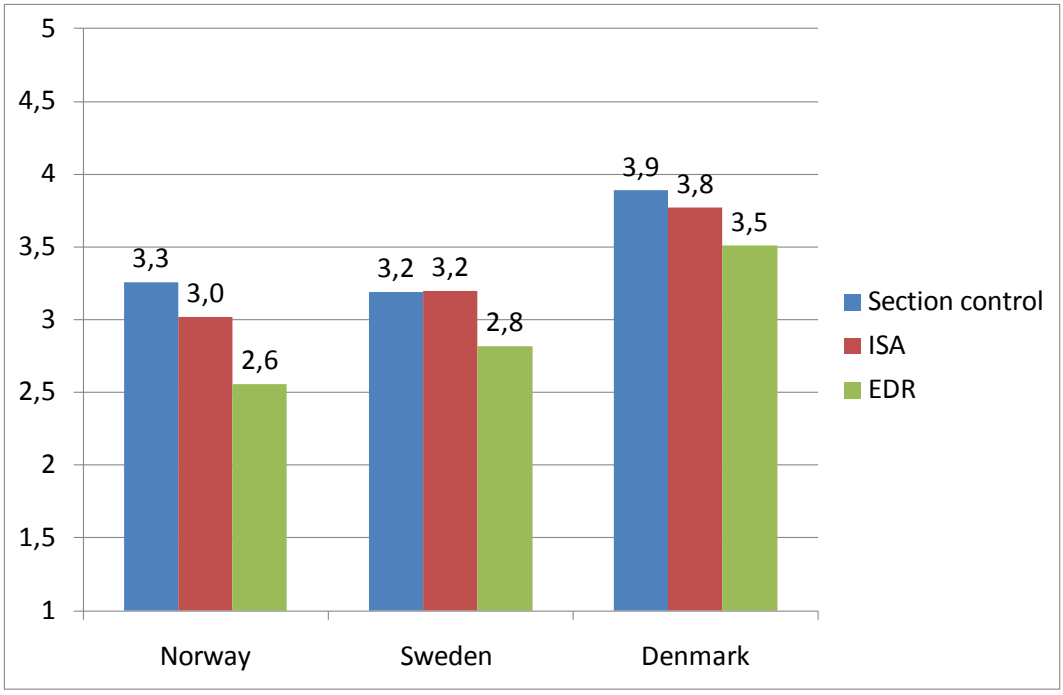

Figure 1. Average scores on an index for acceptability for section control, ISA and EDR, respectively, according to country surveyed. The index varies between 1 and 5, where 5 indicates high acceptability.

In all three countries most people think that section control and ISA should be introduced. The Norwegian and Swedish samples are strikingly similar in their view of section control. Half think that section control should be introduced on roads where many break the speed limit and there are many accidents. Only between one in four and one in five of Norwegian and Swedish respondents do not think that section control should be introduced. Buy-in to all three measures was greater among the Danish respondents, although there are grounds to believe that the Danish sample was not representative of Danish car owners in general. More Swedish than Norwegian respondents thought that ISA and EDR should be introduced.

In Norway (and in Denmark) there is, as expected, a tendency for people who vote for more right-wing parties (e.g. Conservative and Liberal parties) to be more sceptical towards ITS measures than those who vote more to the left (e.g. for the Labour party, Social Democratic party). In Norway though it is the Centre party (SP) voters who are most positive towards the ITS measures. This is in accordance with the ideological differences between the parties – both Labour and Centre Parties are in favour of a higher degree of public governance than either of the right-wing parties. That said, differences on ITS measure acceptability according to voting patterns are not large, and the ideological differences are not always clear. For instance, Socialist party (SV) voters are at least as sceptical about the measures as the Conservative party voters.

Regression analysis shows that acceptability is closely linked to understanding of the problem and personal values. The more one views speed as a road safety problem, and the more one thinks that it is important to keep to the speed limit, the greater the acceptability one has for a speed restricting measure – regardless of its implications for privacy. This is not too surprising, but should be interesting for the authorities. It means, for example, that information about the meaning of speed for road safety could be used to increase the acceptability for measures such as section control and ISA.

What is more the measures are significantly more acceptable if they are experienced as fair and effective. In contrast, acceptability is lower if the measure is experienced as threatening to personal freedom and data protection.

While we find high acceptability for section control throughout the survey responses, responses from Norway suggest that willingness to accept section control could be threatened if many drivers begin to drive well under the speed limit out of fear for being caught. Many of those that said that this was a problem are sceptical towards section control. This suggests that it is important to ensure that road users are better informed about how the system works.

Conclusion

Car owners accept to a large extent modern ITS-based road safety measures such as informative ISA and section control, which guide or help penalise the free choices that they make, but they are not inclined to accept measures that interfere directly with free choice. As long as the car driver can choose to keep the speed limit, there will be a need for systems that monitor road users. At the same time the authorities' speed enforcement measures have led to a market for ISA as driver support systems, and even more advanced systems, such as cruise control, where the car can automatically detect the speed limit and adjust its speed accordingly.

The greatest privacy protection challenges in the future will concern the storage of information on vehicle movements, both for ordinary driving or accidents. Advanced driver support systems are being continuously developed, which include and integrate a range of functions. Car manufacturers and insurance companies will meet increasing demand for access to information about car movements and other related data in connection with accidents, especially in cases where electronic failure or error is suspected. As the number of such cases increases with the use of technology, there are reasons to believe that calls for storage of data will increase in the future. In the USA there have been calls for the standardization of EDR data and establishment of data access rights for the car owner, and it is probably only a matter of time before similar calls are made in Europe.

Despite the privacy implications of these systems there will be governing bodies, road managers, insurance companies and car owners who will want to introduce them. For many car owners, economic and legal interests may outweigh the need for privacy protection; the storage of data on the use of the vehicle will also be in the car owner's interest if it is used to inform road pricing and gather knowledge about accident causation.

There are grounds to believe that these systems will become more comprehensive, more highly integrated and more accepted in the future, as long as they are designed and perceived as *supportive* for the driver, as long as the driver maintains free choice as to whether to use the system or not, and as long as car owners are both informed about and can access data stored in their own cars.