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## **The Networked Vehicle – Transport Telematics for Road and Rail**

A headline from a daily newspaper in Bern on the 26<sup>th</sup> of August 2002 said: 'Journey into the city centre to cost 5 pounds'. The city in question is London, venue for this year's EPTA conference, where starting next year, automobile journeys into the city centre will be charged a fee from 7 in the morning until 6:30 in the evening. A journey into the city centre will cost 5 pounds, and the price of an annual ticket will be around 2000 euros. A computer will store the vehicle details of every driver who has paid the fee. Some 230 cameras around the city centre will scan traffic for number plates which are not registered. The operators of unregistered vehicles will have to pay a minimum fine of 130 euros.

London is not alone in employing road charges, one of the many applications of transport telematics. Road users in Oslo, Marseille, Barcelona and Singapore must also pay. And road pricing is expected to yield positive results. In the case of London, we learn from the aforementioned newspaper article that the road charge will reduce traffic by 10 to 15 percent next year, thus making a substantial contribution to overcoming smog. The opportunities, but also the risks, of road charges and other applications of transport telematics are the subject of this presentation, as follows:

I will first try to define the concept of transport telematics. The next step will be to describe the current situation with regard to the implementation of transport telematics in Switzerland, and in doing so to contrast, in particular, the respective views of supporters and opponents.

Thirdly, I will go on to present – by way of methodology (with a small 'm') – a matrix for assessing transport telematics. This will lay the foundations for the fourth step – sketching out the opportunities and risks of transport telematics. Finally, I will wrap up with a glance at the future political agenda and further studies to be conducted by TA-Swiss.

My arguments are based in essence on a working paper by Technology Assessment-Swiss entitled 'The Networked Vehicle – Transport Telematics for Road and Rail'. It has been compiled by a working group under the leadership of Franz Mühlethaler. Plans are for an abstract to be published early next year.

### **1 What is transport telematics?**

Transport telematics does *not* represent a new technology. Rather it has to do with a new field in the application of information technology (IT): the application of IT to transport. The possibility of applying information technology to transport is significant because without information such as timetables, traffic signals, road maps and the like, along with the ability to process this information, our transport system would be inconceivable. Our vehicles and the associated infrastructure are veritable information hubs, to which the terms 'smart vehicle' or 'smart roads' are increasingly applied.

The areas of application are diverse: besides road charges, they include intermodal route planners, parking control systems, fleet management, dynamic traffic control systems, passenger information and many others.

## 2 Transport telematics in Switzerland

Switzerland is not one of the European leaders as far as the use of transport telematics is concerned. It would be a vain effort were one to search for examples of Swiss cities that might have implemented Road Pricing. But in certain, individual application areas, Switzerland did manage to take on a pioneering role such as, for instance, in car sharing and intermodal transport, not to mention the capacity-linked levy on heavy goods vehicles (HVF). Experimentally-minded enterprises include the Swiss National Railways, although numerous initiatives never emerge from the experimental stage (the latest example is Easy Rider).

Today, however, owing in no small degree to the support it has received from Swiss transport policy officials, Switzerland intends to catch up with other European countries. In 2000, the Federal Department responsible for transport issues published a strategy paper entitled “Road Transport Telematics: Guidelines for Switzerland in the year 2010”. In contrast to its strategy with respect to the railway system, the government foresees no expansion of the road network until the year 2015. It is more a case of maintaining the existing road system and putting it to optimal use. In order to master the ever-increasing road traffic, while at the same time guaranteeing safety, the government is counting on transport telematics: ‘What is needed, therefore, are ‘intelligent solutions’ that promote the sustainable development of vehicle traffic’.

The priority set by Swiss transport policy-makers in terms of transport telematics has brought numerous opponents into the picture, recruited primarily from pro-automobile groups, representatives of special interests, and political parties. They call into doubt the potential of transport telematics as an instrument for relieving pressure and optimising efficiency, and they demand an immediate start to the planning of new roads and infrastructure projects. In their view, the implementation of the regulations to increase safety goes too far in the direction of “surveillance and state control”.

The controversial nature of transport telematics, which can be brought out by contrasting the opportunities and the risks, is but one of the reasons for which TA-Swiss has made transport telematics the focus of one of its studies. And this now leads me to speak about the “Matrix” established in order to assess transport telematics.

## 3 A matrix for appraising transport telematics

### 3.1 Three application fields (clusters)

In the study under discussion here, each of the aforementioned applications will not, in contrast to other publications on the subject, be assessed separately as to its social effects. There are too many of them. Dividing applications according to the technology used will also be avoided. We do not wish to get into technical details. Rather the multiplicity of transport telematic applications will be grouped into ‘clusters’, whereby a cluster denotes applications of transport telematics with a similar purpose. In this way, three clusters can be distinguished: the optimisation of transport, safety, and the utilisation of transport paths.

The application field ‘**Transport Optimisation**’ aims to optimise transport for individual users or individual transport goods. In this sense, it is a *user-based* means of appraisal. From the point of view of the transport user, it is possible to optimise the route, the transport chain, and the vehicle load factor. An example to illustrate this cluster would be dynamic route planning, which in contrast to static route optimisation also takes into account the current traffic conditions.

The application field ‘**Safety**’ aims at early recognition of dangerous situations, timely and accurate analysis, and an appropriate response. Harmful and dangerous situations are to be avoided and any damage, should it occur, should be eliminated as soon as possible. In this connection, it is also possible to distinguish between prevention – by influencing driving behaviour and through surveillance using security technology – and dealing with critical safety (safety-risk) situations. This cluster can be illustrated by the monitoring the driver’s eyes while driving in order to warn of fatigue, or by the breath-analysis of drivers in order to detect alcohol consumption.

The application field ‘**Utilisation of Transport Paths**’ involves increasing the use of transport paths by better co-ordinating the movements of vehicles in the network. This is a *management-orientated* means of appraisal. Co-ordination can be carried out according to vehicle characteristics or by place and time. The aim is optimisation, so that utilisation does not exceed the ideal level, nor fall substantially short of it. This cluster combines measures such as increased efficiency through traffic control, managing authorization to drive, controlled traffic volume, vehicle prioritisation, and the road pricing which was mentioned at the outset.

### 3.2 Three areas of Impact: sustainability

In appraising the three application fields with regard to their effects on society, we will concentrate at this point on three areas of impact: economy, environment and social effects. And in fact these are the dimensions of sustainability on which Swiss transport policy is based: the economic, the environmental and the social. This means that mobility:

- Must be economically sustainable and efficiently managed (-> the economic)
- Our life-sustaining natural resources must not be destroyed and transport safety must be increased (->the environmental)
- All segments of the population and all parts of the country are entitled to an effective transport system (->the social).

In juxtaposing the three clusters or application areas with the three areas of effect or impact, our matrix for appraising Transport Telematics emerges (see below). The clusters are located in the first column, while the sustainability dimensions are in the top-most line.

**Matrix: Opportunities and risks of transport telematics**

		Areas of effect		
		Economy	Environment	Social effects
Clusters (application fields)	<b>Transport optimisation:</b>	<ul style="list-style-type: none"> <li>• Reduced travel time and duration</li> <li>• Equally distributed pressure on the network</li> <li>• Increased vehicle load factors</li> <li>• Number of vehicles minimised</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Shift of traffic to the secondary road network</i></li> <li>• <i>Preventing the formation of transport corridors</i></li> </ul>	
	<b>Transport safety:</b>	<ul style="list-style-type: none"> <li>• Reduction in the socio-economic costs of accidents</li> <li>• <i>Increase in the socio-economic of accidents</i></li> </ul>		
	<b>Utilisation of transport paths:</b>	<ul style="list-style-type: none"> <li>• Increase in vehicle output</li> <li>• Increased attractiveness of high capacity vehicles</li> <li>• Reduction in unnecessary journeys</li> <li>• Cost reality</li> </ul>	<ul style="list-style-type: none"> <li>• Concentration of main transport trunks</li> <li>• Reduced pressure on areas with high traffic density</li> <li>• Reduction in the attractiveness of mobility</li> </ul>	<ul style="list-style-type: none"> <li>• <i>Reduced accessibility for unvalidated vehicles</i></li> <li>• <i>Mobility restricted to the well-to-do</i></li> </ul>

### 4 The opportunities and risks of transport telematics

I would like, by way of example, to talk about those opportunities and risks that on the one hand are characteristic of the respective clusters (= horizontal interpretation) or on the other hand, characterise an area of impact (= vertical interpretation).

With respect to these **application fields, or clusters**, transport telematics can be appraised as follows:

- The application field ‘*transport optimisation*’ is distinguished by the contrast between economic opportunities (such as reduced journey times, speedier transport of goods, a more balanced exploitation of the road transport network capacity, increased load factors and minimisation of the number of vehicles in use) and environmental risks (such as the shift of traffic to secondary roads and the prevention of traffic channelling). Most promising is the optimisation of the transport chain, especially with regard to particular forms of transport; there is significant potential for optimisation with regard to passenger transport by road and freight transport by rail.
- The application field ‘*transport safety*’ is marked by a controversial debate with regard to economic effects: this debate revolves around the question of the effects of transport telematics on the vehicle operator. Can socio-

economic costs be reduced by lowering the number of accidents? Does the vehicle operator take more risks when driving confidently on a safer system, so that the safety gains are lost again? Will the reduction in the socio-economic costs of accidents be cancelled out by more reckless driving? In social terms, data protection represents a significant risk in this regard.

- It is in the application field '*utilisation of transport paths*' that transport telematics offers the greatest number of opportunities, particularly in economic terms (namely an increase in vehicle output, the increased attractiveness of high-capacity vehicles, a reduced number of unnecessary journeys, relief for areas of high traffic density, higher prices for goods in short supply (real costs)) and in environmental terms (concentration of main transport trunks, relief for areas with high traffic volume, and reduced attractiveness of journeys). Moreover, road pricing in particular stands out in this cluster for the myriad opportunities it holds forth. This is because road pricing tends to reduce the attractiveness of mobility and the traffic density. At the same time, however, there is a marked potential for social conflict. This raises questions such as: Who should be allowed to use particular transport paths? Whose mobility will be reduced? Mobility only for the well-to-do?

With regard to these **sustainability factors**, transport telematics can be assessed as follows:

- All in all, an especially large number of *economic* arguments speak in favour of transport telematics. Transport telematics can contribute to making the transport system more efficient.
- In *environmental* terms, transport telematics represents an opportunity if – in the context of the application field '*utilisation of transport paths*' – it reduces the attractiveness of mobility. Here, however, it presents an environment risk if it contributes to an increase in capacity, in other words to the increased efficiency of the transport system (the application field '*transport optimisation*').
- In *social* terms, transport telematics opens up opportunities with respect to equality of space: it has the potential to solve transport problems in conurbations and cities, that is, in just those areas where the most urgent problems lie.

## 5 Conclusions and Future Prospects

- 1 On the basis of the Technology Assessment-Swiss document cited at the outset, it is evident that transport telematics **cannot** be expected to halt the trend towards increased mobility. However, transport telematics can make a contribution to solving existing transport problems: it represents a large step from the still largely "dumb" or rigid transport regime towards a dynamic optimisation of the whole transport system.
- 2 Official Swiss transport policy is guided by the principle of sustainability, and as has been demonstrated, transport telematics is capable of making a contribution to sustainable mobility. Let us now take a look at Switzerland's current political agenda in terms of the three clusters we have been examining.
  - At the top of the political agenda at present, we find the area of "traffic safety". The foundations for a new road safety policy are being worked out. These draw upon Vision Zero, the safety philosophy originating in Sweden, which envisions a long-term goal of road transport free of fatalities and serious injuries. Before it can be determined which measures are sensible, well-adopted to the circumstances, and necessary, a report recommending a series of traffic safety measures will be submitted to a consultation procedure. Already opposition is forming among special interest organisations.
  - On the other hand, Road Pricing – coming under the area of "utilisation of transport paths" – is an issue not vested with any priority. Indeed, Road Pricing is deemed to be a measure with "immense impact potential" (Federal Department of Environment, Transport, Energy and Communications 2000); yet due to the fact that, first of all, it is prevented by the Constitution, which stipulates the toll-free use of public roads and, secondly, it has still to enjoy any type of consensus among the Swiss population, initially pilot tests are to be run in conurbations and an evaluation is to be conducted on popular acceptance of Road Pricing. Road Pricing should be held open exclusively as a long-term option.
  - All in all, more importance seems to be destined to air transport in the political agenda of the future. Air travel before the autumn of 2001 and the grounding of Swissair, was primarily in the domain of the private sector, where the Federal government has less of a planning role than it does for roads and railways. However, since

the Swissair crisis, the role of the Federal government has changed. For this reason, it is '...foreseeable that parliamentary initiatives will unleash a need for sound basic principles and evaluations' (ASTRA 2002). Priority may be given to aircraft noise, which at the moment is making big political waves at Zurich-Kloten Airport.

- Last but not least, Switzerland has made sure it will play a role in the launching of "Galileo" – the planned European satellite navigation system and alternative to the American Global Positioning System. Implementation is projected to take place from 2005 to 2008. It is to be anticipated that Galileo will pave the way for new transport telematics applications, thus catalysing the transport telematics debate.

3 In light of this political agenda, what calls for action on the part of TA-Swiss are looming on the horizon?

- On the one hand, a need for action emerges in the domain of participatory TA methods, for whether the potential of transport technology can be utilised or not, depends finally on its acceptance by transport users. So far we know very little about public acceptance of transport telematics in Switzerland. There is no research analysing public acceptance of transport telematics in Switzerland, as there is for genetic engineering or nuclear power. Those users directly concerned are barely getting involved in the transport telematics debate in Switzerland. Technology Assessment-Swiss has, in its Publiforum or Publifocus, an instrument to facilitate clarification of the acceptance issue. Of particular interest are the acceptance odds with respect to "Vision Zero" and Road Pricing.
- On the other hand, action is also called for in the area of TA studies. Here high priority should be accorded to the issues of aircraft noise reduction and attenuation, as well as the significance of Galileo as a tool to master traffic problems. It will be a matter for debate as to whether Galileo could be the subject of a project by Technology Assessment-Swiss linked at European level.

And naturally, all of us in Berne can only observe with interest future developments in London. It is comforting to learn that road pricing is not without its enemies in London as well. Thus we learn from the newspaper article quoted at the beginning that Mayor Livingstone of London was castigated by the English press as 'the most hateful man in Britain' for his part in this 'radical step'.