

Innovation in Road Transport

Opportunities for Improving Efficiency

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REPORT AND CONCLUSIONS

Prepared by General Rapporteur
José M. VIEGAS
Instituto Superior Técnico, Lisboa

Report and Conclusions of the Joint ITF/IMTT Seminar on Innovation in Road Transport: Opportunities for Improving Efficiency

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Introduction

The *ITF/IMTT Seminar on Innovation in Road Transport: Opportunities for Improving Efficiency* was held in conjunction with the meeting of the ITF Group on Road Transport (1 October 09) and brought together some 150 participants, including ITF Member countries' officials, researchers and industry representatives, concerned with road transport.

One of the main purposes of this seminar was to provide input to FORUM 2010 *on Transport and Innovation*. On its own, it allowed its participants an update on technological progress in several fronts as well as some progress towards a shared vision of the main vectors of innovation of road transport and their impacts on public policy.

The purpose of this report is to summarise the background papers and the discussions in the seminar, and draw Conclusions and Recommendations from those inputs. While the recommendations are especially focussed on Governmental actions related to innovation in road transport, a particular emphasis in the conclusions is given to the identification of issues for debate at FORUM 2010, involving Ministers and industry leaders.

While a small number of papers addressed topics equally applicable to passenger and freight transport by road, the clear emphasis of the seminar was on freight transport.

The program was organised in three technical sessions and a closing session in the form of debate. A total of 22 papers was presented. Session 1, with 9 papers, was dedicated to ICT (Information and Communication Technologies) and their role in promoting **efficiency and legal compliance** in road (freight) transport. Session 2, with 7 papers, addressed the application of ICT in **road charging**. Session 3, with 6 papers, took on innovation related to **vehicle and fuel technologies**.

Session 1: How can innovation and ITS help increase the efficiency of the trucking industry?

This session opened with a paper by Prof. Alan McKinnon, from Herriot-Watt University, on "Innovation in Road Transport – achievements and challenges" in which the author draws a

general picture of the multiple fronts of technical innovation in road freight transport, directed at the three P's (Profit, Planet, People), noting that, in spite of those many innovations there is slow progress in some areas. Innovation has been present on vehicles and freight handling systems, on the management of fleets and of road networks, and even further on the management of the logistical system.

He then discussed the barriers to progress, pointing out the existence of external and internal barriers, and discussed how at least some of them could be mitigated. In some cases, this calls for Government intervention, either because there are unaccounted for external benefits or because there are other market failures namely those related to low margins in the business (leading to a low propensity to invest for efficiency gains) and to low levels of skill in the management and operations of many companies (related to the very low barriers to entry and high pressure on prices).

Next was a paper by Jens Hügel of the International Road Union (IRU) –, highlighting that innovation is and has been a driving force and a priority in the road transport sector. Through innovation very significant gains were achieved by the road freight industry in several indicators of productivity and cleanliness. It was argued that for the sector to play its role adequately, three I's were needed namely: *Innovation*, *Incentives* (to encourage quick adoption of innovations by operators), *Infrastructure* (to avoid bottlenecks and missing links, ensuring fluidity). However, it was stressed that innovation should be industry driven and that governments too often interfere with market developments as it was the case with the false promotion of first generation biofuels and the rejection of the Modular Concept. The argument was presented that the rhythm of innovation towards cleaner vehicles has been too fast, leading to problems of insufficient time to amortize the investments or (which is equivalent) too quick degradation of the second-hand value of vehicles. Finally it was stressed that the use of ITS applications should be voluntary, safeguarding the right of companies to confidentiality in their operations and ensuring the right of the economic agents to freely choose the transport mode that they consider optimal for their needs.

The third paper was by Willy Maes, of the DG TREN – European Commission, dedicated to show how the EC promotes coordinated ITS (Intelligent Transport Systems) deployment in the member countries. Starting by a brief recap of the huge potential benefits and of the efforts done in the R&TD front, the author stated that ITS is a key enabler of many transport policies and that there are many mature applications available but at the same time a “slow and fragmented uptake”, mainly due to the domination of local and national services. From this, the EC concluded that an Action Plan on ITS deployment was needed, and adopted one on December 2008, in which 6 priorities were defined. This is to be followed soon by a Directive with a Framework for the Implementation of the Action Plan. This Directive already had a very positive first reading in the Parliament and is under discussion in the Council. Finally, the author presented the EasyWay project, which aims at the integration of several regional initiatives, providing a harmonised deployment of ITS services on the Trans European Road Network and its interfaces with other modes.

The second part of the first session started with a paper by Pedro Pedreira of the GSA-European GNSS Supervisory Authority, dedicated to satellite navigation services for the road industry. The author pointed out that, with the introduction of such services there will be an upgrade from road based to network based management, as well as a fairer distribution of the costs of provision of that network across its users. Noting their actual deployment in Germany and the expectation for similar action soon in Slovakia, an emphasis was made on the Netherlands, where the first case of universal coverage with variable pricing is expected in a relatively near future. Finally, he pointed out that with the start of operations of EGNOS just the day before, a very significant improvement of accuracy for navigation services was now available, complementing the GPS signals, and thus anticipating some of the expected benefits of the Galileo system.

The next paper was by Reinhard Pfliegl, of Austria Tech, and was dedicated to the role of cooperative systems for efficient intermodal transport management. The author showed that the vast majority of the ITS developments are unimodal, and that to obtain efficiency gains in intermodal transport, cooperative IT systems must be developed, both for planning and for real time management. This will however require more than technological development, namely a change in organization.

The two following papers were about Enforcement. First spoke Jorgen Christensen, of the Joint Research Center, Working Group on Heavy Vehicles, about how ITS could lead to new approaches to enforcement of laws and regulations in the road sector. According to the author, the trend in this enforcement is a combination of electronic detection of non-compliance, followed by concentration of enforcement resources on high-risk drivers and operators, coupled with the imposition of legal requirements on off-road parties with control of truck operations, holding them jointly responsible for the unlawful conduct of drivers and road operators (the concept of “chain of responsibility”). He also stated that extensive use of ITS should also be made for self-monitoring, in line with what is practised in many other sectors in accreditation processes, mentioning several successful applications of these concepts in Australia.

The second paper related to enforcement was presented by Eric Louette, of the French Ministry of Ecology, Energy, Sustainable Development and the Sea, and consisted of a report about an already operational project for the real-time tracking of trucks transporting dangerous goods; it would be extended on the Atlantic Arc, between Portugal and the UK, passing through Spain and France, thanks to the EC fundings (7th FP or Easyway program). This project involved not only the Ministries and motorway companies, but also traffic management and information centres and emergency services in the various countries concerned. The project basically allows visualisation of the vehicles on the road map, with detailed information about their cargoes, but it also allows collecting information on traffic flows and road incidents, and passing them to the drivers of those trucks. A high value feature of the system is that in the case of an accident with one of these trucks, the information relayed to the emergency services includes not only the location of the accident, but also the nature and quantity of the hazardous materials carried, which strongly facilitates the effectiveness of the rescue efforts.

There were two more papers in Session 1, both dedicated to real applications of ITS for fleet management in Portugal: in the first case, presented by Pedro Pires of Multifrota, a pure transport service was concerned, whereas in the second, presented by Carlos Melo of Visabeira, the application was made for deployment of mobile teams engaged in operations of electrical and telecoms maintenance services. In both cases, very significant gains of efficiency and of customer satisfaction were reported.

Given the long duration of this session, only a short period was given for debate. From this, the main result was the recognition of the need for new cooperation models, involving several stakeholders, public and private, and possibly making use of new types of platforms for innovation management.

Just before closing the session, the Chairman gave the word to Hans Rode, of the Swedish Road Administration, who presented some of the main conclusions of the 16th ITS World Congress, held in Stockholm the previous week. He pointed out that, besides the many new components and systems presented in that Congress, a consensus emerged that a lot of technology is available but that may not be enough to drive the required changes, as we also require people, infrastructure, rules, cooperation platforms and incentives. He also announced that the Swedish Government had just decided that an Action Plan should be prepared until March 2010 by the Swedish Road Authority in cooperation with other agencies and the business community, with the aim to identify the requirements for a deeper penetration of ITS in all modes.

Session 2: Information Technologies and Infrastructure Charging

This session was dedicated to applications of Information technologies to infrastructure charging, and included three papers reporting from systems in operation in the EU, and one in the US, two papers about the situation in countries where such deployments are in more and less advanced state, and one paper about a technological development to facilitate interoperability.

The first paper was presented by Stephan Schibler of the Swiss Federal Customs Administration, who presented the objectives, basic principles and modes of operation, as well as some data related to this charging system, in place since January 2001, and its impacts on the road freight market in Switzerland.

The second paper was that of Werner Fritz, of Asfinag, Austria, who presented the mission of its company, and some of the essential data about the charging in Austria, followed by the level of progress concerning interoperability with Switzerland (in place) and with Germany and Scandinavia (under evaluation) and by the introduction of “ecologisation” of the charge, i.e. its variation with the emission class of the vehicle, on January 2010.

The next speaker was Ms. Siegrid Penndorf, of the Ministry of Transport of Germany, who started by presented the objectives and the legal framework, some of the essential coverage

and revenue data, as well as its impact on the HG traffic volumes. Indication was also given of the split in the application of revenues across different modes (with 50% for road), and of the enforcement procedures.

The next paper was presented by Jorge Lopes of Brisa, Portugal and dealt with the development the essential features of an on-board unit that is functional for road charging both in a DSRC (infrastructure based) environment and in a GNSS (satellite based) environment, thus acting as a facilitator of interoperability. The authors recognize that the on-board hardware is not everything and substantial work needs to be done on service contracts, data exchange and enforcement before real interoperability is in place.

Then came the paper by Johan Gille, of ECORYS in the Netherlands, who started by reporting on the relatively long discussion and aborted implementations of road pricing in that country, and then introduced the plan currently approved for implementation. This consists of a constant per kilometre charge, to which a variable congestion charge may be added as a demand management instrument. The whole system is to be budget neutral, with reductions in vehicle purchase fees and annual registration fees to match the new revenues from kilometre charge and congestion charge. And the revenues will be earmarked for investments in the road infrastructure.

The application of this scheme is to be part of a three-tier process of “Construction, Optimization, Pricing”, in which the government combines the construction of infrastructure as the budget permits, with the deployment of measures to optimize traffic management, and of pricing to manage the demand. He then presented a study on the impacts of this scheme, which will depend on the magnitude of the fixed per kilometre charge. The implementation has already started with a gradual transfer of the purchase tax to the annual circulation fees, and the charging phase is expected to start in 2012 for trucks, reaching full deployment for private cars by 2017.

The following paper was presented by Tuomo Suvanto, from the Finnish Ministry of Transport and Communications. He started by showing the very different situation of Finland regarding most other European countries: no road tolls at all, and higher logistics costs for their companies given the large distances to be covered inside the country as well as access to their main markets. However, Finland also has to deal with transit traffic and would like those vehicles to contribute to cover the national road costs, while not increasing logistics costs for the domestic industry, which has proved to be difficult to achieve. After analysis of several options, it was found that the Eurovignette would be the most efficient, and its introduction is planned for 2011. He concluded by presenting some of the arguments underlying the current discussion for introduction of a congestion charging scheme in Helsinki.

The final paper of this session was presented by João Fontes, of Via Verde, Portugal, and dealt with the implementation of a complex tolling system in a part of the Denver Beltway, in which several detection, identification and payment solutions are applied in parallel, with great flexibility and efficiency. A cost reduction of more than 60% was reported when compared with the previous tolling system.

Again, only a very brief period was available for questions and debate. These were related to the possibility of the OBU shown in the fourth paper (by Jorge Lopes) automatically differentiating charges according to the emission class of the vehicle, to the costs and difficulties of having multiple technologies in parallel development, making interoperability much more difficult, and about the expected enforcement costs for the Eurovignette in Finland.

This session has clearly shown that there are several mature technologies available for charging, with transaction costs that are relatively low in high traffic roads but which increase significantly when whole networks have to be covered. OBU's with multiple technologies begin to exist, but the great barriers to interoperability are the proprietary status of the software in application in some countries.

Session 3: Innovations in vehicle and fuel technologies

With session 3, the focus changed to the inside of the vehicle, namely to the powertrains and the associated energy carriers. The Chairman, Tiago Farias, from IST, Portugal, made a brief introduction to the theme in which he called the attention to several key questions that must receive a positive reply before any new powertrain technology is ready to enter the market: does it make sense in terms of reducing emissions and securing supply, is it price competitive, is the refuelling infrastructure available, is the legislation ready, who pays, and who wins?

The session had five papers, two from truck manufacturers, one from a technology consultant, and two directly related to the introduction of electric vehicles. The first paper was presented by Rui Timóteo, of Scania, who showed evidence of very important reductions in fuel consumption of HGVs over the last 40 years, and presented his company's view on how a 50% reduction of Carbon Dioxide emissions from 2000 to 2020 could be achieved. This includes the introduction of longer, modular vehicles which can carry 50% more cargo, improved driver energy performance, the introduction of hybrid powertrains and of biofuels. He finally presented some examples of currently available biofuels and of the potential benefits from their increased utilisation.

The other speaker from a truck company was Staffan Lundgren, of Volvo. He presented the company's position on this front, very oriented towards the use of alternative fuels, stating that the technology is ready, while the problem is the availability of those fuels. The BioDME project will include a field test, to be carried out starting in 2010, involving 14 trucks in commercial operation, with estimated annual distances of 100'000 km/truck across all Sweden. In parallel, they are carrying out other field tests involving longer (modular) vehicles, with which significant reductions of costs and of emissions per ton.km transported are expected.

The paper by Neville Jackson, of Ricardo PLC dealt with Low Carbon Technologies for Heavy Duty Vehicles. After showing the main figures of carbon emissions by mode and sector, and noting that the intended solution path for private cars was electrification, he stated that there is yet no clear path for commercial vehicles. The points of loss of energy efficiency in a typical commercial vehicle were then displayed; he then showed how the savings with hybrid heavy

vehicles strongly depend on the type of application they are in. Finally a graphic was shown with a comparison of the carbon emission reductions possible with different technological features vs. the economic cost of their implementation. From this very rich information, it was concluded that several measures are available to reduce carbon emissions, with an attractive benefit/cost ratio, but with different levels of maturity and risk, the main ones being the adoption of electric or alternative fuel based powertrains, vehicle platooning, and improved driver behaviour.

The final part of this session was dedicated to the electric vehicle, the first paper of which was presented by Robert Stüssi, of the European Association for Battery, Hybrid and Fuel Cell Electric Vehicles. He spoke about three paradigms: the Hybrid Bus program in London, where TfL has imposed that the new bus operation contracts be executed with hybrid buses (thus allowing that critical mass was reached on the production side); the EU-projects for research and demonstration, where new solutions are being tested, and public awareness raised; the race among cities to be in the front row for introduction of electric cars, but with no coordination or harmonized technical standards. He then went on to show examples of application of the full electric mini bus, namely in a roving demonstration in 6 Portuguese cities for proximity services, and to mention the role of the Portuguese Association of the Electric Vehicle in dissemination, benchmarking and technical support. He concluded by stressing that mobility should be concerned with the movement of people, not of the vehicles, under the motto “people rapid transit”.

The last paper in this session was presented by Francisca Duarte Pacheco, of the Portuguese Ministry of the Economy and Innovation. She spoke about the Electric Mobility programme in Portugal, and started by presenting the Government strategy for electricity production and distribution, with a strong emphasis on renewable and smart grids, and argued that the electric mobility program is very effective complement to the electricity strategy of the country. Then she presented the fundamentals of this program: vehicle pricing advantages with respect to the Internal Combustion Engine vehicle; Universal Access of suppliers to a market that will provide several options to the client; mostly based on private investment, and ensuring a fast nationwide infrastructure deployment. The next phase of the presentation was dedicated to the expected impacts of the program, and to its multiple components – Communications; Business Model; Pilot Infrastructure; Institutional Relations, as well as the roles of the several players, from the electricity producers and distributors, the charging services, the manager as integrator of those players, and the municipalities. Finally, she spoke about the Portuguese technology consortia and the innovations they have been deploying to make this program a short term reality.

This session also had a brief period for questions and debate. The issues raised then were the possible quick deployment of electric vehicles for urban deliveries, the lack of international standards for the sockets and plugs of electric vehicle charging systems, and the possible reduction of importance of driver training programs as higher levels of automation become possible (and are deployed) in the driving job.

Concluding Session

The General Rapporteur, José Viegas of Instituto Superior Técnico, Portugal, conducted this session in an open discussion with the participants. This was structured around four questions that had emerged, more or less explicitly from the earlier sessions, all related to what he called the “innovation/adaptation chain”, highlighting that technology and prices make adaptation useful and possible, but noting that to make that innovation happen other levers are needed, namely regulation, or favourable business models coupled with available organizational and personal skills.

The four questions and ensuing results of the (relatively short) debate were:

1. *Do we recognize the existence of examples of Commercial or Logistic innovation stimulated by prices?*

The conclusion was clear: there are many such examples, both on the positive side (lower prices or subsidies stimulating adoption of innovative devices or practices) and on the negative side (higher prices or charges forcing adaptation through innovation). However, part of the current barriers to adoption of innovation in the road sector are related to the fact that it is too cheap and has very low margins for the operators, making the innovation related investments very hard to amortize.

2. *What could be the best recommendation for penetration of technological innovation towards smaller companies: Government Regulations or a “push” from Larger Operators / Logistic Companies, adopting a wider interpretation “chain of responsibility” concept?*

In the discussion it was recognized that regulations which force visible cost increases without the equivalent efficiency gains may be too difficult to enforce, and also that the growth of the part of the market associated with large operators and logistic companies who subcontract small hauliers could offer an opportunity in this direction, namely in what concerns the adoption of ICT components that facilitate control of the operations of the latter by the former. This may be occurring by a direct “push” of those larger companies, but can also be stimulated by demanding shippers who require permanent tracking capacity for instance.

However, one should not expect easy adoption of other forms of innovation which do not directly translate into the goals of the main contractor or of the shipper, given the intense competition and permanent pressure for cost reduction in the sector. When those innovations may represent external benefits there is scope for public programs of stimulus for their introduction, possibly accompanied by regulation making them compulsory after a transition period.

3. *Will the availability and adoption of cleaner and more efficient trucks increase public and political acceptance for their presence on the roads, and further reduce market chances for intermodal transport?*

The discussion pointed in the way that indeed cleaner, more silent trucks could get a higher public acceptance, although an increase in their numbers could raise protest from private car drivers seeing their road space increasingly disputed and congested. This will in some cases possibly be solved by additional infrastructure but in the majority by charges, who then will most likely be applied to all vehicles, with HGV's frequently more willing to pay and some private drivers consequently being priced out of those roads (at those times).

At the same time, further gains of efficiency (as indeed expected) will increase the gap of the service/cost ratio between road transport and intermodal transport. But that is nothing strange to the concept of co-modality, and there is no reason to push the adoption of intermodal transport if the price signals are correct and the unimodal road solutions prove to be the most efficient and those preferred by the clients. The stipulation "if the price signals are correct" is very important though, and progress in that direction should be made, for all modes, in parallel with that occurring in technological innovation.

4. *Concerning transit within and beyond EU borders, what paths can we design for more complete interoperability as our transport systems become more sophisticated? And is there real hope that these technological innovations could act as facilitators of transit regimes with other countries?*

Discussion on this point was very limited by time constraints, but the main idea emerging was that indeed the technology is available but there seem to be national interests over and above the promotion of free and efficient movement and trade, even with the EU, which makes political action more important and indeed critical for real adoption of those principles. Roadmaps must be drawn and calendars adopted for adoption of harmonised (or at least compatible) technical standards sufficiently open to allow competition among multiple hardware and software providers. This should permit use of the same OBU for underwriting different service contracts with different (public or private) road charging operators in different regions or countries.

On the topic of transit regimes, it is recognised that the NCTS regime adopted in the EU has greatly facilitated the movement of trucks across borders and that this one or a similar regime (developed in conjunction with the relevant partners) could play a similar role in trade with neighbouring and farther away countries. But it is also recognised that the main difficulties and associated costs in the present are not related to the prevailing TIR regime in itself but to other constraints and conditions, partly internal to each country, partly of a bilateral nature.

At the end of this discussion period, the Secretary General thanked all speakers and participants, as well as all the support staff from IMTT and from ITF, and closed the workshop.

Conclusions and Recommendations for Governments

In spite of the many presentations and of the consequently brief times available for presentation and discussion, several points have emerged as conclusions from this workshop:

- There is a very wide palette of technical innovations, many under development and many already available in the market to promote more efficient and environmentally friendly road transport. An important stimulus for these has certainly been the significant public investment in R&TD programs. These innovations concern the vehicle, the handling systems, the fleets, the road networks and the logistical systems.
 - There seems to be a serious disconnect between the pace of innovation and that of implementation as the penetration of these technologies in the economic activity is far from what would be desirable from a social point of view. This is mainly due to the presence of multiple types of barriers, some external and some internal to the road haulage companies. It would be of great social value that action would be taken by Governments to remove such barriers fast, allowing the gains from these innovations to reach the markets and societies;
 - Given the role of road transport in international trade, such action by Governments has to be internationally coordinated, involving also the technology providers and users, and it should be launched in several directions in parallel, for greater effectiveness:
 - Promotion of technical standards sufficiently harmonized and open-source to allow full interoperability across the European space and competition of multiple equipment providers;
 - The decision by the European Commission on 6 October setting out the essential technical specifications and requirements needed to launch a European Electronic Toll Service (EETS) that will enable a single on-board unit and a single subscription contract for payment of road tolls across the EU (deployment expected for HGVs in three years and for all vehicles in 5 years) is a major step towards this interoperability and competitive supply;
 - A carefully designed mix of regulatory and fiscal (stimuli or penalties) interventions to induce quicker adaptation of technical innovation by hauliers, and in particular by the smaller companies. This is especially important in relation to reduction of carbon emissions;
 - Sustained public procurement of vehicles or services incorporating those innovations that are mature for introduction in the market but lack the critical mass of demand to lower the risk of that introduction for the suppliers;
- In parallel with the problems of slow deployment of technological innovation, there are others which are causing significant losses of efficiency in road transport and reduction of trade and economic development potential, which would require regulatory and organizational innovation. Here too, coordinated government action is highly needed

- Within the EU, as a response to the high fuel price crisis of early 2008 and more recently as an additional response to the ongoing economic crisis, several countries have enacted restricting changes in their cabotage regimes, as well as different forms of protective measures in favour of their hauliers. This is causing a vicious circle of reciprocation, with increasing distortions in the markets. Harmonization of these cabotage rules (or even better, suppression of the cabotage exceptions to the open access principle), as well as of the rules governing response to the recurrent crisis of fuel price hikes, is highly recommended, as the short-term responses tend to become long-term, with which the intended level playing field of competition is steadily reduced;
- Outside the EU, market access is regulated mostly by non-transparent bilateral agreements, and transit of HGVs often suffers unacceptable delays with trivial excuses and artificial administrative friction at the borders. While this is not a problem depending directly or exclusively on technological innovation, the cost reductions and increased transparency the innovative ICT instruments can offer might well be the catalyst for innovation in the regulatory and organizational dimensions. EU member countries could and should promote action at this level, possibly including significant launching aid for pilot projects in neighbouring countries where these problems are more strongly felt.
 - The speed of progress towards the definition of the e-TIR system has been very slow, largely because of disagreements about whether that new system should be based on the current TIR system (truly international, but still largely paper-based) or on the NCTS system (applied only within the EEA -- European Economic Space, but fully computerized). Although these two systems seem very similar, they have fundamental differences related to the guarantee system, and points in favour of one or the other can be identified. It is essential that a focussed discussion takes place on this topic (at the UNECE), knowing that currently available ICT can provide an essential support to reduce the risks of fraud and the transaction costs of international trade.