Diagnostic Study of the Implementation and Demand for New Technologies in Road and Rail

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STUDY CONTENT:

- Study of the Demand for New Technologies in Road and Rail.
  - Supply Study for New Technologies in Road and Rail.
  - Electronic Catalogue in the Ministry of Development website

Website of the Ministry of Development → Land Transport → What’s new / Highlights

http://www.fomento.gob.es/MFOM.DGTT.CatalogoElectronico.web/

- Innovation, Revitalization and Promotion Plan for new technologies
STUDY CONTENT

- **Study of the Demand** for new technologies. **Methodology.**

  Interviews and surveys conducted in the 1st quarter of 2011.

  “user” is considered the interviewee or polled, belonging to companies or organizations of transport sector listed below.

- **Road:**
  - Qualitative study:
    - In-depth interviews of professional associations (2) and major companies in the sector (22).
  - Quantitative survey:
    - Telephone questionnaires (CATI collection system).
    - Sample: 600 companies in the goods transport sector, and 531 in the traveller transport sector.

- **Railway:**
  - Qualitative approach:
    - In-depth interviews of railway operators and administrators (24 interviews).
NEW TECHNOLOGIES IN THE ROAD SECTOR
### RESULTS. DEMAND STUDY. Road Sector.

#### Qualitative study. Conclusions.

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**IMPORTANCE**
- Reduce costs.
- Manage and operate with the fleets and the goods.
- Maintain the communication channel with clients and other companies members.
- Improve the quality of the service offered.
- Provide added value.

**DRIVING FORCES**
- Reduce costs.
- Improve the quality of the service.
- Fulfil clients requirements.
- Increase competitiveness, differentiate from the rest.
- Fulfil authorities requirements.
- Comply with business interests.

**BARRIERS**
- Features of the sector: atomization.
- Cost and earnings.
- Functions and utilities.
- Lack of technological supply.
- Lack of knowledge of the available equipment's.
- Lack of times to development.
- Lack of standardization.
- Problems with mobile phone services.
- Resistance to change.
- Training of employees.
### RESULTS. DEMAND STUDY. Road Sector.

#### Qualitative study. Systems analysed:

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<th>GOODS</th>
<th>ADVANCED TECHNOLOGIES</th>
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<tr>
<td>Mobile Phone</td>
<td>Vehicle management system</td>
<td>SAE (Operation Assistance System)</td>
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<tr>
<td>Laptop</td>
<td>ERP (Enterprise Resource Planning)</td>
<td>ERP (Enterprise Resource Planning) or software for the transport company managing</td>
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<tr>
<td>Internet Connection</td>
<td>Location, positioning systems and route optimising</td>
<td>Operation Planning System</td>
</tr>
<tr>
<td>Email</td>
<td>CRM (Customer Relationship Management)</td>
<td>System of cost control and profitability</td>
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<tr>
<td>Smartphone</td>
<td>Demand forecast system</td>
<td>Ticketing system (on paper)</td>
</tr>
<tr>
<td>PDA</td>
<td>TMS (Transporte Management System)</td>
<td>Ticketing system: magnetic band</td>
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<tr>
<td>Electronic tolling</td>
<td>e-Commerce</td>
<td>Ticketing system: contactless chip</td>
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<tr>
<td>Digital Tachograph</td>
<td>RFID</td>
<td>Ticketing system: contact chip</td>
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<tr>
<td>GPS (navigator)</td>
<td>EDI (Enterprise Data Interchange)</td>
<td>e-Commerce of tickets</td>
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<tr>
<td>Website</td>
<td>Consultation of the sending status through the websites</td>
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<tr>
<td>Call</td>
<td>Security system for goods</td>
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<tr>
<td>Computer network</td>
<td>Security system for vehicles</td>
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</tr>
<tr>
<td>Computer servers</td>
<td>Electric vehicles</td>
<td>Hybrid vehicles</td>
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<td>Hybrid vehicles</td>
<td>Natural gas powered vehicles</td>
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<td>Vehicles powered by natural gas</td>
<td>Hydrogen powered vehicles</td>
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<td></td>
<td>Vehicles powered by hydrogen</td>
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<td>Control refuel system</td>
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<td>eCall</td>
<td>eCall</td>
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<tr>
<td></td>
<td>Booking system of safe and secure parking truck places</td>
<td>Passengers information system</td>
</tr>
</tbody>
</table>
Qualitative study. Conclusions (passengers):

- **Implementation:**
  - Direct relationship between the size of the companies and the level of technology implementation thereof.
  - There is a “gap” between the companies with less than 6 vehicles and the rest.
  - Companies engaged in international transport show higher implementation, while discretionary service have lower implementation.
  - Clear difference between the level of implementation of basic and advanced technologies.
  - There is wide penetration ratio of basic technologies. Seven out of twelve technologies analysed are used in more than a half the companies surveyed. More than 80% of companies have basic equipment like mobile phone, laptop, email address and Internet access.
RESULTS. DEMAND STUDY. Road Sector.

- Qualitative study. Conclusions (passengers):
  - **Implementation:**
    - There is lower penetration in the sector of advanced equipment, with few devices implanted in more than 50% of companies surveyed. The most widely used NTs involve security, information and energy efficiency aimed at reducing costs.
RESULTS. DEMAND STUDY. Road Sector.

- Qualitative study. Conclusions (passengers):
  - **Implementation**:
    - Evolution in relation to 2004:
      - Increasing use of mobile phone, GPS and digital tachograph.
      - Internet access has grown in the sector to cover almost 95% of companies, for example the creation of websites has doubled since 2004 to reach 63% penetration.
      - There has been no change in advanced technologies no changes are located. However, some technologies show higher implementation in companies with more than 21 vehicles, as the case of SAE or e-commerce (ticketing).
Qualitative study. Conclusions (passengers):

**Level of Satisfaction:**

- Satisfaction with the different equipment or technological systems in use is high.
- However, signs of dissatisfaction with digital tachograph appear. GPS and websites also provoke adverse opinions.
- On Smartphone, with less than 30% implementation among companies, is the device with the highest proportion of fully satisfied users.
- Some of the widely accepted advanced technologies have higher levels of dissatisfaction: SAE (13 %), e-commerce (ticketing) (19 %) and issuing and validation of tickets with contactless chips. (18%).
Qualitative study. Conclusions (passengers):

- **Knowledge and interest:**
  - The knowledge of the different equipment (although they are not available yet) is high, but there is low interest low among those that have not got these yet.
  - Knowledge of basic equipment is higher than advanced equipment. Interest focuses on websites, laptops and electronic tolling.
  - Interest in advanced NTs is focused on non-conventionally-fueled vehicles.
  - There is wide generic knowledge of the different technological systems. Interest depends on how well informed passengers are about the technologies usefulness and practicality.
RESULTS. DEMAND STUDY. Road Sector.

- Quantitative study. Results (passengers):
  - **Main factors driving implementation of NTs:**
    - Meet customer demand.
    - Environmental improvement (linked to fuel economy).
    - Improve quality of service.
  - **Barriers to implementation of NTs:**
    - Lack of organizational resources (staff, time), economic aspects (doubts about profitability and maintenance expenses) and training.
    - Lack of information about availability and mismatch between supply and the specific needs of companies.
  - **Measures to encourage the implementation of NTs in the sector:**
    - Subsidies, tax incentives and funding facilities.
    - Subsidied training and improvement of mobile network coverage.
Quantitative study. Conclusions (goods):

- **Implementation:**
  
  - Direct relation between the size of the company and its degree of technological implementation.
  
  - There is a gap between the companies with less than 6 vehicles and the rest.
  
  - Implementation in the sector is strongly conditioned by two fundamental aspects:
    - High atomization.
    - Generation of different needs for equipment among small companies depends on the type of customers they serve.
  
  - Clear differences between the level of implementation of basic technologies and advanced technologies.
  
  - Advanced systems have a low level of implementation in the sector. Small companies don’t feel a need for complex tools.
  
  - Among advanced systems, those that stand out are vehicle security systems (67%) and goods security systems (51%), followed by refuelling control systems (18%), fleet management systems (15%) eco-driving systems (12%) and the web query systems (11%). The rest don’t exceed 10% of penetration.
RESULTS. DEMAND STUDY. Road Sector.

- Quantitative study. Conclusions (goods):
  - **Implementation:**
    - Evolution from 2004:
      - The degree of implementation of some basic technologies have grown in recent years, specially in smaller companies (PC, Internet access, email, electronic toll system).
      - Bigger companies' evolution in the degree of penetration of advanced technologies from 2004 has been remarkable in some equipment like ERP, fleet management systems and vehicle and goods security systems.
      - Small companies have also increased the level of provision of advanced technologies in recent years but this increase hasn’t been as remarkable as in large companies.
RESULTS. DEMAND STUDY. Road Sector.

Quantitative study. Conclusions (goods):

- **Level of satisfaction:**
  
  - Satisfaction with basic and advanced tools depends on the particular technology but there is, generally, a greater degree of satisfaction with basic technologies than with advanced ones.

  - The smartphone, electronic toll and GPS stand out for their greater acceptance, regardless of the degree of implementation. On the other hand, there are negative valuation of Internet connections, PDAs, websites and digital tachographs.
Quantitative study. Conclusions (goods):

- **Knowledge and interest:**
  - There is little interest in advanced NTs among those companies that don’t have them (because of the atomization of the sector and doubts about the usefulness of the technologies).
  - Some technological systems are not adapted to the singularities of different companies.
  - The greatest interest is in e commerce systems, hybrid vehicles and e call automatic systems.
RESULTS. DEMAND STUDY. Road Sector.

- Quantitative study. Conclusions (goods):
  - Factors that drive the implementation of NTs:
    - Fulfil clients’ requirements.
    - Improve the environment (linked to energy savings).
    - Improve quality of services offered.
  - Barrier to implementation:
    - Maintenance is expensive.
    - High cost of acquisition and doubts about profitability.
    - Lack of time to develop technological projects.
  - Measures to encourage the implementation of NTs:
    - Subsidies, tax incentives and funding facilities.
    - Subsidies training and improvement of mobile phone coverage.
NEW TECHNOLOGIES IN THE RAIL SECTOR
RESULTS. DEMAND STUDY. Railway Sector.

- Assessment of needs and trends in new technologies.
  - Railway dynamic technologies:
    - Need to address the lack of reliability of computer simulation models.
    - Specific solutions based on in-depth knowledge of the issue from a railway perspective are required.
  - RAMS y CENELEC Regulation:
    - Different software should be developed for the same function (complete redundancy).
    - Methodologies are required to predict the life-cycle costs of products and resources “Open Source” for the delivery of security software system. The development of critical software and software validation is still insufficient.
  - Technologies for sustainability:
    - There is a robust technological base available in the market that meets the requirements of measures set out in Law 2/2011, 4th March on Sustainable Economy.
    - Intelligent distribution and supply networks should be developed.
    - Reversion of surplus energy for use in railway vehicles and other railway functions.
    - Alternative energies developed to a small degree. Magnetic levitation is considered unfeasible and the development of hybrid locomotives is advocated.
RESULTS. DEMAND STUDY. Railway Sector.

- **Assessment of needs and trends in new technologies.**
  - Develop energy storage systems for electrical substations and vehicles (flywheels and static accumulators)
  - Idem for efficient driving
  - Eco-design, development of new sustainable and recyclable materials.

- **Safety and security technologies:**
  - Satisfaction with the technologies available and their level of implementation. However there are some difficulties with its application due to the complexities of the rail system.
  - Areas to improve: Detection of obstacles, artificial vision, level-crossing safety, passive safety in rail interiors, braking systems, modelling and simulators and the integration of the human factor in the entire safety system. Resolution of issues regarding trams and interference with pedestrian and road traffic.
  - Prioritised development of support systems for degraded mode operation and in circumstances where human factors intervene to a greater degree: real time decision support systems and forecast systems.
  - Maximise automatisation: systems for testing and fault detection in security software and detection of security alerts. Increase frequency without reducing safety.
  - Achieve real time interface with external systems for the management of the state railway network.
RESULTS. DEMAND STUDY. Railway Sector.

- **Assessment of needs and trends in new technologies.**
  - Technologies for the improvement of passenger-operation systems
    - Mature technologies used between infrastructure manager and operator. Lack of generic implementation of these technological developments in the information systems: occasional passengers, intermodality and for reprogramming in the event of an incident.
    - Magnetic cancellation (also for the control of mobility and flows).
    - On-board entertainment and information systems.
    - Software using artificial intelligence for planning, production and maintenance: Dynamic demand management, “e-maintenance”.
    - Universal accessibility: e.g. mobile platform ramps or information for the visually impaired
    - People / passenger counting systems, trend analysis and data management.
  - Technologies for the improvement of passenger marketing systems:
    - The available technology is not highly rated.
    - Development of contact-free cards for use on any transport mode and geographical area.
    - Access to on-line tickets (internet) or through mobile phone.
    - Managing the levels of fraud through information from the sales and cancellation system.
RESULTS. DEMAND STUDY. Railway Sector.

- **Assessment of need and trends in new technologies.**
  - Technologies for the improvement of freight transport:
    - Available technologies are highly valued. The issue lies more in the willingness of those involved in business management and improved application of technologies to ensure the traceability and security of goods.
    - Increase in the net burden: load bearing capacity of the infrastructure, vehicles and light and versatile containers.
    - Promotion and optimization of a model of complex strategic logistics, oriented to specialisation, urban integration, door to door delivery and intermodality.
    - Technologies for the improvement of planning and business management systems:
      - Systems to measure demand and real passenger occupancy.
      - Technologies for “2030” passenger mobility and long term scenarios.
      - Creation and processing of service indicators for passengers and freight in a multi-operator context.
RESULTS. DEMAND STUDY. Railway Sector.

Factors supporting the implementation of new technologies:

- **External factors:**
  - Institutional factors and knowledge of available technology are key.
  - The public administration is important both from a legal perspective and in terms of funding.
  - Knowledge of available technology is gained through three main channels: technology suppliers, forums, fairs and congresses and specialist magazines.

- **Internal factors:**
  - Business culture and strategy.
  - Improvement in the provision of particular services:
  - Internal needs which should be met.
RESULTS. DEMAND STUDY. Railway Sector.

- Barriers to the implementation of new technologies:
  - Resistance to change slows down the development of innovation.
  - Socioeconomic factors, both in terms of the current economic downturn and the economic costs involved, particularly given the general perception that innovation entails excessive economic costs and a lengthy development period.
  - Market demand for adequately tested products slows the implementation of new technologies.
  - Regulation related issues, whereby international rules are more restrictive than European legislation, and impede research, development and innovation.
  - Uncertainty about the implementation of new technologies due to fear of making mistakes.
RESULTS. DEMAND STUDY. Railway Sector.

❖ Development criteria for R&D and innovation

▪ Key strategic issues:
  • Energy
  • Sustainability
  • Safety

▪ Business objectives of R&D and innovation:
  • Leadership and reputation for scientific/technical and business excellence.
  • Increase the supply of products.
  • Need to keep up-to-date with innovations and maintain current technology up-dated.
  • Reappraisal of human capital and profitability of R&D and innovation.
RESULTS. DEMAND STUDY. Railway Sector.

- **Collaboration and funding of R&D and innovation activities**
  - **Partnership** on organisations or companies from the same group, outside companies, universities, technology centres and suppliers, amongst others (occasionally with public administration).
  - **Funding:**
    - Mixed finance is the most widespread source of funding.
    - Company own finances together with public funding (national, regional or european).
    - Funded internally (self-financed by company).
    - Funded externally (by other organisations).
Thank you for your attention

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