DEPLOYMENT OF ICT AND E-BUSINESS APPLICATIONS IN THE TRANSPORT & LOGISTICS INDUSTRY

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Abstract: "e-Commerce" can mean different things in the transport & logistics sector (TLS). In passenger transport, it can mean "e-ticketing", enabling customers to order and receive their ticket online. In freight transport and logistics, e-commerce includes initiating, tracking, and acknowledging shipments online. The special role of this subsector in this context is that its business is exactly to provide these services to other industries. Thus, logistics companies are not only users of e-business themselves, but, in a way, provider of e-services. In all cases, e-commerce is in this sector closely linked with the objective to optimise business processes: paperless trade eliminates the operational costs related to manual paper processing and increases the transparency of the supply chain and information exchange between trading partners. Another e-commerce application is e-ticketing in passenger transport. This is a ticket-less concept, which ideally provides companies with the opportunity to reduce administrative costs and, at the same time, offer a higher level of service to travelers.

Key words: transport industry, logistics industry, e-business, information technology, communication technology

1. INTRODUCTION

ICT are major potential influences on the mobility of people and goods. ICT are also potentially important enablers of changes in social and organisational practices, thus affecting the demand for transport in spatial and temporal terms. Technological trends will meet the demand for comfort, safety and speed through advances in ICT and telematics (traffic and transport management systems, travel information and reservation systems, vehicle guidance systems, and mobility cards) [1].

Overall business growth is likely to cause an increase in road traffic and hence, an increase in CO₂ emissions. Presently, transport is responsible for about 28% of total CO₂ emissions. Road transport alone represents about 84% of all transport related CO₂ emissions [2]. With 98% dependency on oil, the transport industry not only has a big impact on air quality and greenhouse gas emissions, but high oil prices also have a significant influence on the transport sector and the economy as a whole. Applications of ICT-based energy efficient activities searching to de-couple energy consumption from growth, will improve the efficiency of transport, reducing the energy use or even the need for transport. The main areas of the EU initiatives, activities and projects in the sphere of ITS for a more clean and energy efficient that have been taken into consideration in the 5th, 6th and 7th Framework Programme. These areas are:

- **Vehicle-based**, for example driver support and eco-driving;
- **Infrastructure-based**, for example synchronisation of traffic signals;
- **People**, for example online environmental information and intermodal support optimisation.
A new e-Safety Forum Working Group on "ICT for Clean and Efficient Mobility" has been established to investigate the ICT-related technologies impact on transport safety, clean and energy efficient mobility of people and goods. There are many practical examples that would help the Working Group to collect data as is the case of the FRIDA solution developed and implemented by Nordic Port in Sweden. The deployment of the FRIDA system allows the Sweden authority today not only to measure the pollution generated by the public transport all over Sweden but also to set up concrete and achievable goals for the environment for the different regional authorities.

Road safety remains a major concern. Each year in the EU around 40,000 people are killed and more than 1.2 million injured in road accidents [3]. Information and communication technologies can contribute significantly to improving road safety, enabling the development of sophisticated safety systems that improve road users’ chances of avoiding and surviving accidents. ICT also provide new systems for enhanced traffic management e.g. receiving the latest information shortly before departure on the best way to reach a destination or being warned about congestion ahead, before the user get caught up in it.

There is no doubt that the ICT is playing also an important enabling role in logistics. The ICT that may be used by firms in order to improve their competitiveness may be classified into three categories:

i) identification technologies,
ii) data communications technologies;
iii) data acquisition technologies [4].

In what concerns the identification technologies, firms may appeal to bar-coding or to RFID. The bar-coding and RFID are identification technologies that facilitate logistics information collection and exchange.

As regards data communications technologies, firms may appeal to the electronic data interchange (EDI), the Internet, the Value Added Network amongst others. Nowadays, as regards the data acquisition technologies, the firms usually deal with a large amount of goods and data which means that data collection and exchange are critical for logistics information management and control. Good quality in data acquisition can help firms deliver customers’ goods more accurately and efficiently.

Firms need to be able to manage information effectively, and to integrate several logistics activities by including inbound and outbound transportation, distribution, warehousing, and fleet management, in order to streamline the physical product flows of their customer companies. Through the intensive use of ICT (acquisition, communication, and identification technologies) in logistics, the information flows, efficiently used by firms, will reinforce the existent competitive advantages, or alternatively, will create new competitive advantages. The ICT are important to logistics, since they make available the right information, at the right time and at the right place.

This popular logistical paradigm, which most often refers to physical goods, is shown to have equal relevance in the management of information. Introna [5] in 1991, demonstrates that while the logistical system converts materials into products, through the creation of value for customers, the information and communication systems convert data into information, in order to facilitate managerial decision making. The author argues that information is a resource to be used for decision and which can subsequently enhance logistical effectiveness, efficiency, and flexibility. These factors improve a company's competitiveness.

This chapter provides insights into current trends of ICT use and e-business activity in the transport and logistics industry. The chapter does not claim to provide a comprehensive analysis, as that would exceed the limits of this report. In fact, it
would be difficult to realise, as ICT and e-business are relevant for nearly all core business areas of the TLS industry. Therefore, the issues analysed should rather be understood as representative examples of current practice and the related opportunities and challenges. However, where needed, the SeBW survey results are linked to the drivers and impacts of ICT adoption and to the case studies presented. The focus and issues discussed have been selected in coordination and agreement with DG Enterprise and Industry and with industry federations as particularly relevant and topical.

2. ACCESS TO AND USAGE OF ICT NETWORKS

Current ICT technologies provide new possibilities for networks, the distribution of information and the design of business logic. The accessibility and the numerous opportunities to creatively use the Internet has brought many implications to the organisations core business processes to generate enormous benefits in terms of performance as well as provide greater value-added products and services. The use of ICT by European enterprises has grown steadily from 2005 to 2008 for several technologies. Even internet access, reaching saturation, still increased by 2 percentage points, from 89% to 91% [6].

Over the last few years firms operating in the transport and logistics sector have made significant progress in their adoption of new technologies, particularly those linked to the Internet and e-business. ICT and e-business activities deployment has thus become increasingly important for the industry. Low-cost access to the Web and the dissemination of e-business technologies provide firms with a tool to satisfy customer demand by using traditional services in conjunction with growing information-based services. Firms can automate existing processes and dramatically reduce cycle times throughout the supply chain. They can enhance communication, collaboration, and cooperation between knowledge teams (including virtual teams) using intranet technologies as well as between the organisation and members of its external constituent organisations using extranet technologies. Firms may link their electronic systems to those of their suppliers, distributors, and dealers in powerful inter-organisational network to support effective supply chain management objectives, including integrated production life cycle planning.

In logistics, the new methods of distribution, such as just-in-time (JIT) manufacturing - where warehousing seems to be unnecessary because products are shipped directly to customers, led warehousing companies to strive to become more than simply storage facilities. They are transforming themselves into "third-party logistics providers" or "3PLs" that provide a wide array of services and functions. In addition to packing and staging pallets, contemporary warehousing facilities offer light manufacturing, call centres, labelling, and other non-storage options.

In the past, warehouse management was very paper-intensive in its coordination of a multitude of activities. This has changed with the introduction of warehouse management system software. Warehouse management systems (WMS) assist managers in tracking products throughout the entire storage and distribution process. These systems span from simple computer automation systems to high-end, feature-rich management programs that improve order picking, facilitate better dock logistics, and monitor inventory management. Case studies about Geodis (Belgium) and AIT (France) represent the range of actual possibilities available to logistics companies - large or small-sized - to develop WMS. The main issues or trends in warehousing include radio frequency identification (RFID), transportation management systems, pick-to-light
technology, and voice-activated receiving and packaging.

Tabel 1 below shows that the transport and logistics patterns of enterprises adopting several ICT technologies (as a percentage of the total number of enterprises with 10 or more persons employed) is quite similar to the overall percentage of enterprises in EU 25 (including all sectors).

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<th>Internal Computer Network</th>
<th>Intranet</th>
<th>Online purchases business model</th>
<th>Online sale business model</th>
<th>External integration of business processes</th>
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<td>Transport &amp; Logistics</td>
<td>59</td>
<td>29</td>
<td>21</td>
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<td>13</td>
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<td>EU 25 – all sectors</td>
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Today, the main transport and logistics service firms are in a position to provide a variety of information via the Internet and to secure transactions online with customers. Modern information systems and technology offer opportunities for fast and safe sharing. Key findings regarding use of and access to ICT in the TLS are summarised below.

3. INTERNET ACCESS

Internet access is seen more and more as a vital utility, such as water or electric services. The prominence of the internet among all computer networks is evident, because of its size in terms of the number of persons and enterprises it connects and its worldwide scope. Internet access is therefore fundamental for enterprises to start benefiting from the Information Society. For most EU Member States internet adoption is approaching saturation point. Overall, for the EU, by 2008, 91% of enterprises with 10 or more persons employed had internet access [6]. In line with this tendency, in the present study, nearly all companies (99%) which use computers in the TLS sector said that they are connected to Internet. Only among passenger transport firms, a minority of 1% responded that they have no Internet connection. By share of employment, firms representing 99% of the sector workforce are connected to Internet.

A relevant indicator is the existence of broadband connection. On the path to the adoption of e-business, connectivity is the first step and also a precondition for all potential benefits of the use of computer networks. Only 17% of the sector companies (representing 8% of the sector workforce) still use an Internet access up to 2 Mbit/s, while a half of the sector firms have bandwidth connection ranging from 2 Mbit/s to 100 Mbit/s. One third of the firms have more than 100 Mbit/s bandwidth connections. The quality of the Internet connection is paramount to the development of e-business. This connection enables an exchange of more information per unit of time and supports the exploitation of sophisticated IT systems.

4. USE OF INTERNAL COMPUTER NETWORK

The use of computer networks internally in the enterprise is believed to yield potential gains in efficiency and productivity. The adoption of internal computer networks is a first step towards the computer integration of business processes. Such integration potentially streamlines and boosts the efficiency of the enterprise. A computer network is composed of multiple connected
computers that communicate over a wired or wireless (Local Area Networks - LAN, and Wireless LAN) medium to share data and other resources. In the TLS industry, a half of all firms (75% for the Logistic sub-sector) representing 75% of employees operate a LAN.

However, the deployment of the Wireless LAN technology only reach 22% of the sector companies, although it is already used by about a half of the large-sized firms, and even one third of the small companies. As it can be seen, the use of ICT to connect computers internally to a company network increases with company size. For both of these ICT infrastructure indicators, there is a difference between the EU countries (LAN, 50%; WLAN, 22%) and USA (LAN, 66%; WLAN, 43%).

The size and scalability of any computer network are determined both by the physical medium of communication and by the software controlling the communication (i.e., the protocols). An Intranet is a specific application of the internal computer network which serves as a communication tool within the enterprise, and an Extranet can be viewed as part of a company's Intranet that is extended to users outside the company. As such, both can be regarded as a next step in the use of the internal computer network as e-business. Around one quarter of the TLS sector firm’s use an Intranet and, again, it depends on the company size, ranging from a relative small 23% for micro-sized firms to a high 77% for large firms. Only a few firms in the industry use an Extranet (6%), most been used by large-sized firms (42%).

Remote access means that employees can access data from the company's computer system remotely, e.g. when working from home or travelling. In the TLS industry, 24% of firms (comprising about half of the sector's employment) enable remote access. This infrastructure indicator is quite common among large firms (74%) and medium-sized ones (57%); however, is not yet widely used by small firms (23%). Again, this fact strongly indicates the different stage of ICT architecture maturity levels of companies from different size-bands.

5. VOICE-OVER-IP

Voice over Internet Protocol, also called VoIP, IP Telephony, Internet telephony, Broadband telephony, Broadband Phone and Voice over Broadband is the routing of voice conversations over the Internet or through any other IP-based network. Some VoIP services offer features and services that are not available with a traditional phone, or are available but only for an additional fee. The provision of VoIP is driven by increasing broadband penetration. Some cost savings are due to utilising a single network to carry voice and data, especially where users have existing underutilised network capacity that can carry VoIP at no additional cost. VoIP to VoIP phone calls are sometimes free, while VoIP to public switched telephone networks (PSTN), may have a cost that's borne by the VoIP user.

A major development starting in 2004 has been the introduction of mass-market VoIP services over broadband Internet access services, in which subscribers make and receive calls as they would over the PSTN. VoIP offers all the options that callers are used to using such as call waiting, caller ID, unified messaging, directory services and vertical-specific applications. In addition, VoIP is a standard, open protocol, allowing companies to build their own audio applications or purchase other applications that will come from software developers.

13% of all companies from the sector (accounting for 21% of employment) said that they used Voice-over-IP services. Yet, the results vary between different company size classes. With a diffusion rate of 13%, micro enterprises are behind the level of usage of large companies, where 46% reported using Voice-over-IP services. Curiously, the reported usage of this technology by the medium-sized firms is lower than that from the micro enterprises.
It can be expected, in general, that usage will increase rapidly over the next few years; a common scenario predicts that all fixed network voice telephony might be converted to internet protocol.

6. CONCLUSIONS

Specific software solutions for the TLS sector [7], such as Cargo Handling Technology, Fleet Control System and ITMS (Intermodal Transportation Management Systems) are also mostly used by large transport and logistics companies. For example, only about 20% of the small firms reported that they used Fleet Control Systems, but diffusion increases to about 35% of medium-sized and 43% of large firms. The pattern is similar for Cargo Handling Technology and ITMS.

With regard to the deployment of standards for e-business, the survey found that about a third of the medium-sized and more than 40% of the large firms in the sector use Electronic Data Interchange (EDI). Only 7% of micro companies and 12% of small companies use EDI-based standards. Thus, the size of a company has an enormous influence on the adoption of standards: the smaller the company, the more unlikely it is that it adopts any of these standards. It looks like EDI based standards will continue to play an important role for e-business messaging in TLS industries in the near future [8].

REFERENCES