ICT Adoption by Logistics Service Providers: Developing a Learning Agenda

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ICT ADOPTION BY 3PL-PROVIDERS IN ITALY AND IRELAND: TOWARDS A LEARNING AGENDA

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Abstract

Recent years have seen innovations in the logistics and freight transport industry in relation to Information and communication technologies (ICT) diffusion. The implementation of such technologies by third party logistics providers (3PLs) allows the real-time exchange of information between supply chain partners, thereby improving planning capability and customer service. However, the logistics and freight transport industry is lagging somewhat behind other sectors in ICT diffusion.

In relation to the latter point, it is important to note that the dissemination of ICT in logistics and supply chain management (SCM) is shifting the 3PL industry to an increasingly knowledge-intensive approach. In this process, the role of learning becomes more central and an assessment of the impact of future ICT learning needs for the logistics providers is a strategic imperative.

The aim of this paper is to assess the impact of ICT on logistics and freight transport industry in Italy and Ireland, and to identify learning needs for more effective ICT adoption in 3PLs.

Keywords: ICT adoption, 3PLs, competencies, learning

1. Introduction

The last 10 years have seen a technological revolution that has offered solutions that make logistics and SCM even more streamlined and efficient than it has ever been. One key component of SCM is Information and Communication Technology (ICT) since "no product flows until information flows". The need to serve customers in a flexible and speedy manner has forced manufacturers and distributors to effectively exploit ICT, by creating 'global nervous systems' that link a continuous flow of supply and demand information between suppliers and customers. This has raised the level of information intensity in logistics and SCM services.

In this context, ICT developments have increasingly influenced the transport and logistics services market, shifting it from a physical to an electronic one and giving rise to new organisational forms for these services. As a result, growth in the volume of electronic communication along the supply chain is expected to double by 2005. For example, electronic exchanges of transport documentation, invoices, order instructions and payments are forecast to grow by 59% (Trilog, 1999). This has led to an increasing interest in assessing the effects of ICT on logistics and SCM.

Unlike in some other industrialised countries, the Italian and Irish logistics and transport industry lags behind somewhat in adopting ICT. This situation can be attributed to a series of factors such as: a) the traditional resistance to change on the part of 3PLs; b) the small size of most 3PLs that places considerable constraints upon investment in ICT; c) technology choice difficulties as a result of the proliferation of ICT solutions; d) the insufficient degree of professional skills for using such technologies on the part of staff in such firms.

Following this introduction, the next part of the paper (section 2) provides a conceptual framework of the impact of ICT 3PL-providers. In the third section the state of ICT dissemination in the Italian and Irish third party logistics industry is outlined. In the fourth and concluding sections, the impact of ICT on the training needs of 3PL-providers is discussed and the implications of the foregoing for the development of an appropriate learning agenda is outlined.

2. The Effects of ICT on Logistics and Supply Chain Management

Information systems applications in the field of logistics and SCM are not new and have a long history, pre-dating the use of computer power. An early example was the maintenance of inventory records on ledger cards which at first were manually updated and later became semi-mechanically updated using magnetically encoded data. As such, the computer has facilitated faster data processing and allowed significantly more data and information to be handled. Figure 1 illustrates the timeline of the main applications in logistics and SCM since their introduction in the 1960s, when systems of Electronic Data Interchange (EDI) were first used to support logistics activity.
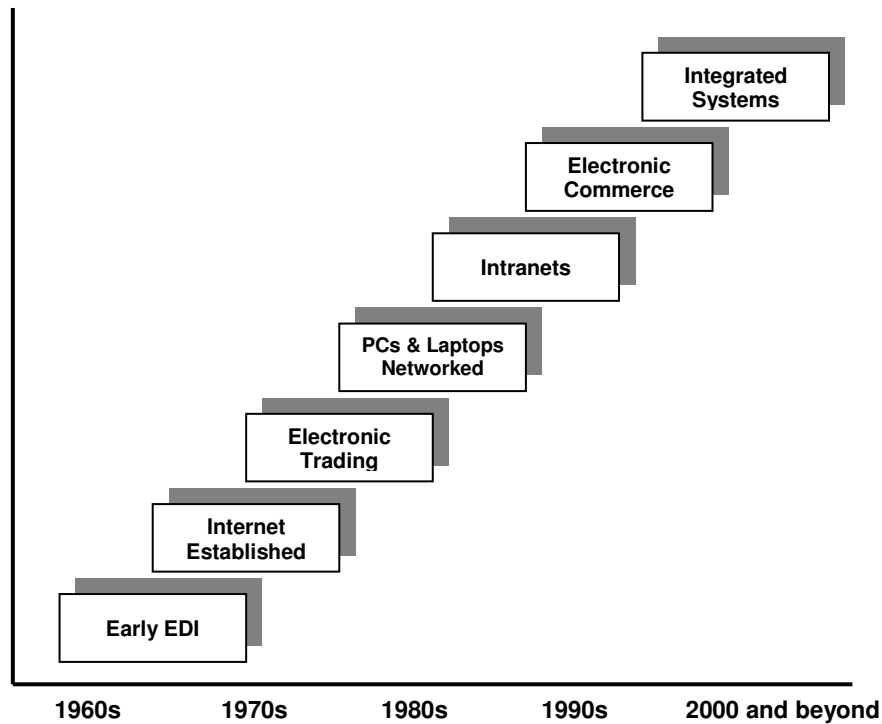

Figure 1: Indicative timeline of ICT applications in logistics and supply chain management

Since then logistics and SCM have changed rapidly, to the extent that the relationship between ICT and the supply chain now appears to be so close that it has even become difficult to establish whether ICT is a driving force or is simply an enabling factor. What is more, in certain respects, a parallel development may be seen between the evolution of logistics and innovations in ICT.

There has been a plethora of works in the recent literature which, from time to time, have underlined the general aspects (Introna, 1993; Hammant, 1995) and specific effects (Peel, 1995; Kia *et al.*, 2000) of these technologies in logistics and SCM. The framework reported in the figure 2 provides the basis for the analysis of the impact of ICT on 3PLs (section 2.1). A detailed discussion of the impact of ICT developments on the overall supply chain is beyond the scope of this paper.

2.1 The Impact of ICT on 3PLs

For manufacturers and retailers, information management has therefore become as critical as the physical movement of goods. As a result, poor ICT resource management by one or more actors in the supply chain can have negative repercussions on the performance of the entire chain in terms of costs, planning ability and customer service (Lee and Billington, 1992). For these companies the choice of 3PLs has an even higher strategic value and the provider's information technology capabilities represent one of the most important selection criteria (Atkinson, 2001). From here stems the pressing demand by manufacturers and retailers for all actors in the chain to place even more attention to the integration of their business processes through ICT and web-based technologies. Under this strong pressure, transport and logistics providers are attaching growing importance to ICT

in the management of their businesses, to the extent that integration and co-ordination with other actors in the supply chain are becoming a vital elements in the business strategies of such firms.
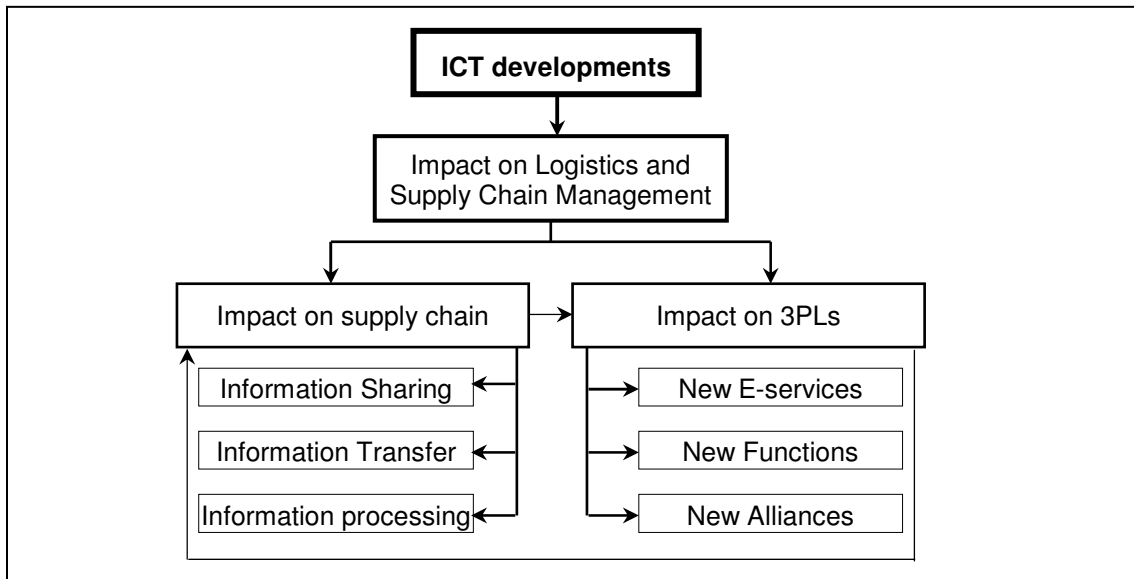

Figure 2: A framework for analysing the impact of ICT on logistics and supply chain management

These developments raise two important questions:
1. What is the impact of ICT on 3PLs?
2. How are ICT and the Internet changing their business model?
The answer to these questions is not straightforward but, nevertheless, some effects appear to be emerging and can be briefly described as follows.

New e-services: One of the first visible effects is the integration of traditional services with "new information services" spurred by the dissemination of the Internet. Although transport and logistics firms have used telecommunication systems and networks for some time, the sector as a whole may not be considered a leader in the field of technological innovation (Tilanus, 1997). However, over the last few years, 3PLs have made significant progress in the adoption of new technologies, particularly those linked to the Internet and e-business. Low-cost access to the Web and the dissemination of e-business technologies have provided these firms with the potential to satisfy customer demand by using traditional services in conjunction with growing information-based services.

Today, the main 3PLs are in a position to provide a variety of information via the Internet and to secure transactions online with customers. However, the range of initiatives online appears to be somewhat diversified. There are firms that initially used their own web sites as electronic service catalogues. Some firms have started to offer tracking and booking services, while others have tried to create a competitive advantage with their web pages by developing signature options unique to their brands.

New functions: The dissemination of ICT has opened up new opportunities for the development of new roles and functions in the supply chain. The purpose of these web-based intermediaries, called transportation e-marketplaces, is to give added value to the transport and logistics business through greater efficiency and information transparency (Regan and Song, 2001). They run web sites which bring together buyers and sellers of transport services, provide the buyer with information and make communication between the two faster and more direct.

In reality, the use of web transport portals by 3PLs is difficult to assess due to the lack of consistent data on the overall volume of services sold. A recent study on the way in which 3PLs use the Internet (Logistics Management & Distribution Report, 2000) reported that 3PLs do not foresee that infomediaries will have a significant effect on their business while only 50% of the shippers interviewed might use transportation e-marketplaces in the near future.

New alliances: Another feature emerging alongside the Internet and e-business development is the creation of a new category of service provider called Fourth Party Logistics Provider (4PL). According

to Bade *et al.* (1999), a 4PL is a supply chain integrator who assembles and manages the resources, capabilities and technology of its organisation with those of complementary service providers to deliver a comprehensive supply chain solution.

The emergence of these providers is linked to the lack of adequate technological and strategic capabilities by traditional 3PLs to meet the demand for re-thinking the supply chain strategies of their customers. In order to improve their skills, some transport and logistics providers have started to secure alliances with complementary service providers (Rockwell, 1999). Alliances have been formed with, for example, management consulting companies, ICT vendors and financial service providers (Eyefortransport, 2001).

3. ICT Dissemination in the Italian and Irish Transport and Logistics Service Industry

From the picture outlined above there is a clear relationship between ICT adoption and the competitiveness of the transport and logistics service industry. Its future strategy can no longer be considered separately from innovation in ICT. This means that the development and efficiency of a country's transport and logistics service industry will depend increasingly on its position in the international technological scenario. In the following sections the dissemination of ICT in the Italian (section 3.1) and Irish (section 3.2) transport and logistics service industry is outlined. These countries form the basis of this research study for a number of reasons, including:
- Logistics is a key determinant of competitiveness in both countries due to location, a factor recognised by policy makers in both countries;
- Imports and exports come from, and go to, many similar markets;
- The transport and logistics sector largely comprises small companies in both countries; and
- A small number of large multinational companies hold a large share of the transport and logistics market in both countries – this tends to marginalise the smaller players.

Before examining the implications of the trends described in the previous section in terms of training and development needs, it is imperative to understand the levels of dissemination of ICT in the transport and logistics sector in both countries.

3.1 The dissemination of ICT in the Italian transport and logistics industry

The delay on the part of Italy in adopting ICT technologies (EITO, 2002) has negatively affected the efficiency of the transport system and, at the same time, has proved to be a constraint on the development of 3PLs. It should be pointed out that there are other constraints contributing to the poor dissemination of ICT in the sector such as the low level of technological and organisational innovation in Italian 3PLs, the poor exposure to ICT in SMEs and the inadequate ICT skills of personnel in such companies.

The characteristics of demand and supply of transport and logistics services in the Italian market has a significant impact on the above constraints (Evangelista and Morvillo, 2000). The effects of such factors on the developments of ICT in this market may be summarised as follows:
- On the demand side, the existence of cultural constraints *vis-à-vis* logistics is mainly due to the marked presence of SMEs in the manufacturing sector. This produces a low level of outsourcing of logistics activities beyond transportation; and
- On the supply side, the large number of small providers has resulted in fragmentation of the sector and control of supply chain processes has been yielded to large foreign companies.

Despite the lack of data and specific surveys, it is worth noting that the above factors have played a major role in determining the low level of ICT adoption in Italian 3PLs. This has held back the development of technological and organisational innovation processes needed to compete in a market characterised by the more complex requirements of customers. Furthermore the industry consolidation process has developed at a far slower pace than in other countries. This has inevitably had repercussions on the willingness of firms to adopt new technologies, which remain at a relatively low level.

These observations are largely confirmed by two recent surveys. The first analysed the level of computerisation and ICT investments by 3PLs in Northern Italy, specifically the Genoa-Savona area (Merlino and Testa, 1998). The survey examined 197 firms and found that they are at the initial stage of adopting ICT and that their investments in new technology are still motivated by a tactical rather

than strategic logic. The survey highlighted that the dissemination of new technologies is proceeding at an intermittent and non-homogeneous pace. This can be attributed in large part to the background history of the firm and its entrepreneurial culture.

The second survey analysed the relationship between the company's entrepreneurial culture and the usage of ICT. It was conducted on a sample of 48 shipping agents and freight forwarders located in Southern Italy, specifically Campania region (Minguzzi and Morvillo, 1999). It found that the willingness to invest in computer hardware and software is generally motivated by personal reasons rather than economic considerations.

The results of both studies underline a contrasting picture where ICT is concerned. While on the one hand the awareness of ICT as a success factor for the firm is evident, on the other there is a low level of ICT adoption with particular reference to the Internet and e-business tools.

3.2 The dissemination of ICT in the Irish transport and logistics industry

A recent study (FAS, 2002) indicates that the main usage of ICT in the Irish transport and logistics sector is in the area of EDI and e-business, which is used by just over 50% of companies. Figure 3 shows the current level of technology utilisation, as well as the intended developments over the next five years.
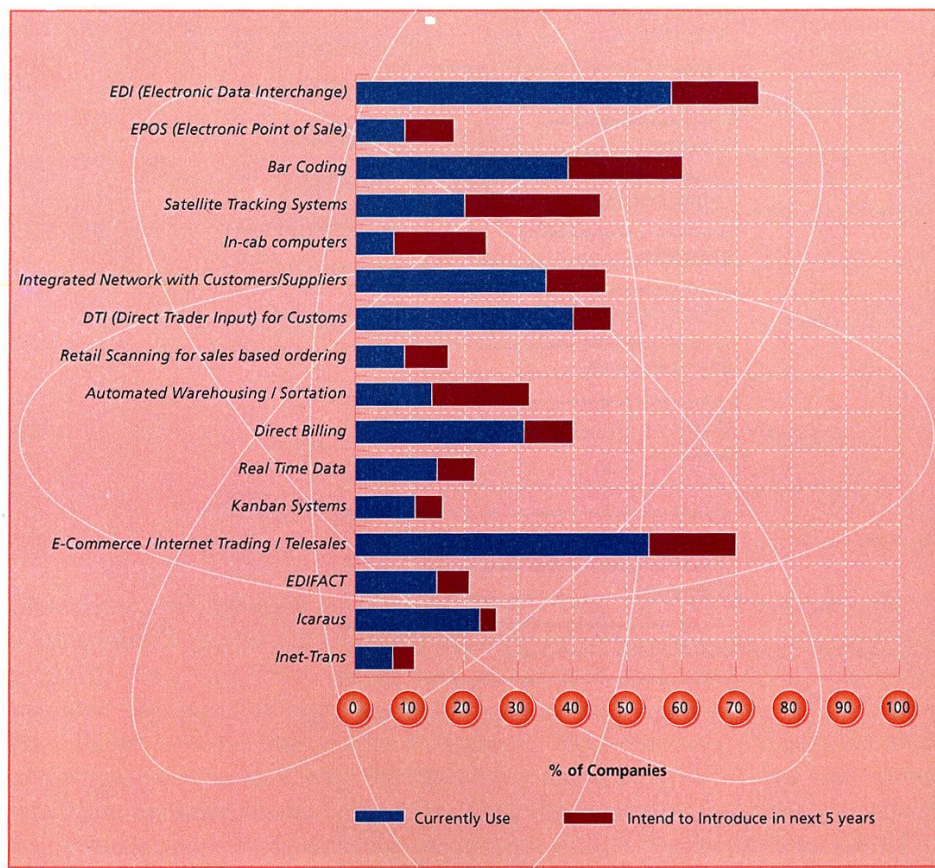

Figure 3: ICT usage in the Irish transport and logistics sector (FAS, 2002)

ICT tools which are regarded as essential for efficient logistics management such as automated warehousing/sortation, direct billing, direct trader input (DTI) for customs and barcoding are used by one third or less of companies. Much of the deployment of this technology is on an incremental, ad hoc basis and the building up of supply chain management systems is not carried out on a systematic strategic business basis.

The same research indicates that there is a strong correlation between the use of ICT and company size. This is an important factor due to the small size of the majority of companies in the sector. In particular, companies with 10 employees or less had the smallest usage of the full range of systems while large companies in turn utilise a broad range of ICT technologies.

Another recent survey (NITL, 2001) confirms some of these points. This survey examined the "logistics capability" of over 300 indigenous Irish companies. Less than 50% of companies regarded themselves as making effective use of appropriate ICT systems in the supply chain integration process. The report notes that the real situation is likely to be somewhat worse than this in reality as respondents were asked to assess their own level of proficiency in this area.

In summary, it can be stated that whilst pockets of excellence undoubtedly exist in terms of the effective exploitation ICT in the Irish transport and logistics sector there is still considerable room for improvement.

4. Training Needs: Towards a Learning Agenda

Based on the analysis of the current situation in Italian and Irish 3PLs there is a clear need to upgrade ICT knowledge and skills in the area. Preliminary work on the development of an appropriate approach to the required learning is based on:
(i)   identification of competency gaps (see sections 3.1 and 3.2) and the associated skills and knowledge gaps; and
(ii)   formulation of relevant learning paradigms based on these gaps and on the characteristics of the sector.
The following sections summarise the main themes emerging from this work.

4.1 Identification of competency gaps and the associated skills and knowledge gaps

A number of important points need to be made by way of context in relation to ICT competency gap identification in 3PLs. Firstly, competency gaps inevitably will vary significantly from company to company and, as indicated earlier, company size is often a key determinant of the level of ICT knowledge and skills. Secondly, the approach outlined below identifies key competency areas based on strategic, tactical and operational levels of in-company decision making. Whilst this may be appropriate for the larger firms, its specific implementation in SMEs needs to be carefully considered. For example, the same small group of individuals may well have responsibilities at all three levels within SMEs. Finally, the approach outlined in Table 1 (below) is not presented as an exhaustive list of competency areas but rather as indicative of the priority areas based on the research carried out to date.

Decision-making Level	Competency Area	Indicative Description
Strategic	ICT strategy	Alignment of IT investment decisions with overall business and supply chain
	ICT configurations	Knowledge of the possible supply chain ICT configurations
	Integration	The role of ICT in overall supply chain integration (internal and external)
	Management of ICT	Project planning and implementation for ICT
Tactical	Management of ICT	Project planning and implementation for ICT
	Process design	Integtration of ICT with key business processes
	HR management	Management of all people issues at each stage of the process
Operational	System awareness	Knowledge of system rationale, role and functionality
	System-specific skills	Skills to ensure that specific system functionality is fully utilised
	General skills	For example, general file management and other "housekeeping" issues

Table 1: ICT Decision-making levels, competency areas and indicative description

Some competency areas inevitably overlap (for example "Management of ICT") across the levels. It must be emphasised that the above is not a definitive agenda but represents the template which will

form the basis of a more detailed approach. This more detailed approach will be developed as part of the ongoing research with the intention of it forming the basis of a generic checklist. This checklist is primarily designed to facilitate the detailed identification of major ICT competency gaps within 3PLs and the design of effective learning interventions to fill these gaps. This in turn will provide firms with a more robust approach to ICT learning thus ensuring more effective implementation of appropriate solutions.

4.2 Formulation of relevant learning paradigms

The previous section focussed on identifying *what* competencies need to be developed. Linked with this is the related issue of *how* these competencies should be developed. In other words, the form of learning appropriate to the development of specific ICT knowledge and skill sets needs to be specified. Experience in the piloting of the approach to date indicates that this is a critical success factor. A number of key themes have been identified and the ongoing research aims to develop these themes further. A detailed discussion of appropriate learning paradigms is beyond the scope of this paper. However, two key themes, which form the basis of this work are worth highlighting:
- the need to adopt lifelong learning paradigms; and
- the importance of partnership in learning.

Much work has been carried out in relation to the former (Sweeney, 2003). The basis of this work is to relate well established generic lifelong learning paradigms specifically to logistics and supply chain issues, and to ICT learning in 3PLs. The latter recognises that for any learning to be effective high levels of co-operation between the various actors (principally 3PLs, training organisations and ICT solution providers) is essential. This partnership extends from initial identidication of competency gaps through to learning delivery and implementation and embraces learning intervention design, development, assessment and evaluation.

5. Conclusions

ICT has become a key enabler in the supply chain integration process. 3PLs play an important and dynamic role in increasingly global and virtual supply chains. Evidence from both Italy and Ireland suggests that these companies have levels of ICT adoption which are both relatively narrow and relatively shallow. Faced with the rapid pace of technological development, the proliferation of ICT solutions and increasingly stong competitive pressures in terms of both service and cost, the effective implementation of appropriate ICT has never been more complex; neither has it ever been more important. Development of appropriate knowledge and skills is a critical success factor. This is in turn dependent upon the ability of firms to identify and address key competency gaps. The research outlined in this paper provides the basis for development of a learning agenda which embraces the major competency areas and their associated knowledge and skill sets, and which comprehensively addresses the design and implementation of appropriate learning interventions.

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