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Edward Sweeney
Dublin Institute of Technology, edward.sweeney@dit.ie

Pietro Evangelista

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A CASE STUDY ANALYSIS ON INFORMATION AND COMMUNICATION TECHNOLOGY USAGE IN SMALL LOGISTICS SERVICE COMPANIES

Pietro Evangelista, Institute for Service Industry Research, Italy, p.evangelista@irat.cnr.it, +39 081 2470920
Edward Sweeney, National Institute for Transport and Logistics, Ireland, esweeney@dit.ie, +353 1 6445723

ABSTRACT

The impact of ICT (information and communications technology) on the logistics service industry is reshaping its organisation and structure. Within this process, the nature of changes resulting from ICT dissemination in small 3PLs (third party logistics providers) is still unclear, although a large number of logistics service markets, especially in the EU context, are populated by a high number of small 3PLs. In addition, there is still a gap in the literature where the role of technological capability in small 3PLs is seriously underestimated. This gives rise to the need to develop investigation in this area. The paper presents the preliminary results of a case study analysis on ICT usage in a sample of 7 small Italian 3PLs. The results highlight some of the barriers to effective ICT implementation, as well as some of the critical success factors.

1. INTRODUCTION

The role of 3PLs in supply chain management (SCM) has changed significantly as a consequence of ICT developments in recent years. Logistics companies play a more important role than in the past as they coordinate and accelerate physical and information flows along multiple levels of the supply chain (Cooper *et al.*, 1998). This has forced 3PLs to look for accurate and real-time information on the status of the entire shipment process to increase their planning capacity and to improve customer service levels. For these companies ICT is a critical tool for both differentiation of logistics services in a customised supply chain context (Sauvage, 2003) and to assure the rapid customisation of products and maintain competitive lead-time of service users (Van Hoek, 2002). Nevertheless, while large logistics firms have heavily invested in ICT and have actively developed information systems, small 3PLs have more difficulties in setting up ICT applications and this has further complicated their competitive position (McClelland, McKinnon, 2004). The risk is that small 3PLs could either be marginalised in the marketplace as "tier suppliers" of large logistics companies, or even forced out of the market completely. This situation appears particularly critical in those markets characterised by a large number of small 3PLs and where multinational logistics companies hold a substantial market share as in the case of the Italian 3PL industry. This paper follows a previous work containing the result of an empirical survey carried out on a sample of small Italian 3PLs (Evangelista, Sweeney, 2006). The main aim of the paper is to provide qualitative data and information that complement the results of the field investigation. The methodological approach adopted is based on a multiple case study analysis carried out in a set of companies selected within the sample of the previous field survey. Following this introduction, the subsequent section describes the research design. Section 3 gives an overview of the data collection strategy. The main findings emerging from the case study survey are presented in section 4. The concluding section discusses managerial and research implications.

2. RESEARCH DESIGN AND DATA COLLECTION STRATEGY

This paper is part of a larger research project aimed at assessing the impact of ICT on small logistics service providers. The first research step comprised an empirical survey which examined a sample of 153 small Italian 3PLs on the base of a definition and taxonomy. The specific objectives on which the survey was based are as follows: 1. to set-up a technological profile of the surveyed companies; 2. to analyse the role of ICT tools in supporting the customisation of services; and, 3. to analyse ICT perception. The second research step has been based on a case study analysis conducted on a sample of small Italian 3PL companies that participated in the previous empirical survey. The in-depth analysis of main results of the field survey is the main aim of this research step. The use of case study method is motivated by the fact that ICT usage in small 3PLs is an emergent issue with limited discussion on the subject in the logistics and SCM literature, hence case analysis provides an appropriate means to study such issue. The need for more case study analysis in logistics has been emphasised by several scholars (Chow, Heaver and Henriksson, 1994; Ellram, 1996; Meredith, 1998; Gammelgaard, 2003). Another reason for using the case study approach is that the research project is explanatory and theory building in nature and case study analysis is particularly appropriate in this context (Ellram, 1996; Meredith, 1998). It is expected that the results of the case study analysis combined with the findings from the previous field survey will provide a clearer and more integrated picture of the impact of new technologies on small 3PL companies. The data collection strategy is based on a multiple case study approach. By comparing two or more case study it is possible to provide concepts that are relevant to an emerging theory. In most situations 6 to 10 cases (Yin, 1994) should provide evidence to support or reject propositions

(Eisenhardt, 1989, recommend 4 to 10). The data collection strategy has been organised in the following three phases: 1) selection of a set of companies from the sample firms of the previous field survey; 2) preliminary phone inquiry conducted with the selected companies; 3) in-depth face-to-face interviews in a subset of 7 companies chosen on the basis of their answers in the phone inquiry. The selection of companies has been based on the following taxonomy proposed in the previous study (Evangelista, Sweeney, 2006): *Full Haulage Providers* (those companies for which transport activities represent 100% of turnover); *Basic Logistics Providers* (those companies for which transport and warehousing together comprise over 50% of turnover); and, *Advanced Logistics Providers* (those companies for which transport and warehousing together comprise less than 50% of turnover). According with the above taxonomy, three sets of companies have been selected from the sample firms using the following two criteria: a) the breakdown of the company turnover by the type of service provided and b) the level of ICT in the company in terms of number and sophistication of tools adopted. In the case of Full Haulage companies the level of technology adopted has been the unique criterion used to discriminate between the companies selected. In the case of Basic Logistics Providers and Advanced Logistics Providers the breakdown of turnover associated with transport/warehousing and other services provided (value-added and SCM services) has been used to select the companies. In this case it has been assumed that a correlation exists between the range of services provided and level of technology adopted. Within each group, two subsets of companies have been selected with a completely different profile (extreme types) in terms of both range of service provided and technology adopted. This approach allows the experience of companies in each subset to be compared and contrasted. Subsequently, a phone inquiry has been conducted to get the acceptance of companies to participate in the study and to examine both the type of service provided and the level of technology in place. Seven companies participated in the study divided as follows: 2 Full Haulage Providers, 3 Basic Logistics Providers and 2 Advanced Logistics Providers. Table 1 shows a summary of the companies studied.

Table 1: Characteristics of the case study companies

Case company	*Turnover*	*Employees*	*Customer industry*	*N. of customer*	*Customer concentration*
Full haulage 1	≤ 2	11	Fertilisers for agriculture, food & beverage	20	85%
Full haulage 2	≤ 10	from 10 to 50	Hazardous goods, food & beverage	200	10%
Basic Logistics 1	≤ 50	from 51 to 249	Electrical device and machinery, electronics, chemical and oil, textile and clothing, automotive, paper	150	40%
Basic Logistics 2	≤ 10	7	Raw material for plastic products	30	80%
Basic Logistics 3	≤ 50	20	Biomedical, publishing textile-clothing-shoes and food packaging	200	90%
Advanced Logistics 1	≤ 50	50	I.T., electronics, telecom, pharmaceutical, automotive, banks and insurance, fashion, promotional and publishing	120	50%
Advanced Logistics 2	≤ 50	200	Coffee, metals, cellulose, rubber and perishable goods	6,000	30%

Turnover: in million Euro; Customer concentration: company's turnover percentage generated by the largest 5 customers.

Within the Basic Logistics Providers, 3 companies were selected because of this category has the largest number of companies in the sample frame. These companies have a different combination of turnover allocated to service provided and technology adopted. Finally, in-depth interviews were conducted at the company site. Interviews were held with the IT manager and/or the operations manager of each company. During the meetings a data collection guide was used with a range specific open questions. The duration of each interview was approximately 90 minutes and every interview was conducted on face-to-face basis, so as to stimulate a broad conversation and breakdown any barriers between the interviewer and interviewee. In addition, a variety of information sources about the companies has been used which include company reports, company web-pages, logistics websites and marketing materials (e.g. brochures, newsletters and other publications). This information has been integrated with the information collected during the interviews to form a comprehensive case study history. For the purpose of this paper, the data analysis presented below refers to the cross-case analysis only,

where the cases have been compared with each other in order to identify commonalities and potential patterns between them.

3. CASE STUDY FINDINGS

This section reports the preliminary findings of the case study investigation. The grouping and cross-case analysis was performed in accordance to the three research objectives indicated above.

3.1 Technological profile of the case study companies

Most of the case companies (4 out 7) do not have an ICT department in place. Three companies (basic logistics 3 and advanced logistics 1 and 2) have an ICT department coordinated by an ICT manager. Only two companies show a decrease in ICT expenditure during the period 2002-2004. The first (full haulage 1) attributed the reduction to the decrease of communication costs, while the second (basic logistics 3) reduced the budget devoted to technology consultancy. Four companies show an increase of ICT costs, motivated by the need to update hardware and software (full haulage 2 and advanced logistics 1 and 2) or to adjust technical standards in line with the requirements of customer industries (basic logistics 1). In relation to the usage of transportation and logistics e-marketplaces, three companies (full haulage 2 and basic logistics 1 and 2) use digital marketplaces to fully exploit vehicle capacity, to reduce empty trips and to serve a wider geographical area. Finally, the level information exchange with other supply chain participants (namely customers and other 3PLs) is generally low.

3.2 Role of ICT in supporting the customisation of services

The use of ICT to customise service provided is another aspect investigated in this study. The customisation of service has been analysed with reference to the following three issues: software usage, provision of tracking and tracing (T&T) services, and role of the Internet and company website usage. Most of the case companies (5 out 7) use software applications to customise their services. In using software companies aimed to improve the effectiveness of services provided, to reduce cost and to deliver a higher value to the customer. Logistics services supported by software applications are mainly transport, warehousing, order management and value-added services (in the case of advanced logistics companies). Standard software package that can be integrated with specific modules are generally used by the case companies. Reasons for lack of use of software include: 'unnecessary to support service supplied' (full haulage 1) and 'costly and low level of flexibility and friendliness' (basic logistics 2). The provision of T&T capability is more limited in the sample. Only two companies (basic logistics 3 and advanced logistics 1) provide this functionality. Basic logistics 3 provide T&T to increase the value delivered to customer. Interestingly, advanced logistics 1 provide such service as a result of current and future customer needs analysis. Both companies provide T&T services through their company websites. The main reasons given by the remaining five companies that do not supply T&T functionality are focused on the fact that such a service is not required by customers or the company has not got the appropriate technology in place to provide such service. In relation to the impact of the Internet on the company competitiveness, the vast majority of companies (6 out 7) consider the web an important driver in influencing their competitive positions. Different reasons have been given for this. Some companies (full haulage 2, basic logistics 1 and 2) have pointed to the potential of the Internet to facilitate information retrieval and comparison (i.e. research into new customers, research and comparison of service price information), contributing to reduced marketing and communications costs. The remaining three companies (basic logistics 3 and advanced logistics 1 and 2) emphasised the potential of the web to integrate systems and applications of different companies operating in the supply chain. The importance attributed to the Internet is not reflected in the company website usage. Despite this all the case companies have a website in place, with usage generally limited to providing users with general company information. To assess the level of the website company usage the KPMG's Internet Maturity Model has been applied. This model suggests that website usage goes through four different stages – marketing, publishing, transactional and interactive. No companies in the sample reached the highest stage (interactive). Most of the case companies, 4 out 7, (full haulage 1 and 2, basic logistics 2 and advanced logistics 2) use their website at the marketing level. In such companies web pages are used simply to provide general information about the company and advertise services offered. It is interesting to note that this level of usage of the company website is common across all three provider categories. Basic logistics 1 has been positioned at the second level of the model (publishing) as web pages are used to exchange information about shipments with customers. Finally, basic logistics 3 and advanced logistics 1 have been positioned at the third stage of the model (transactional) as the use of website focuses on providing higher service levels (e.g. T&T functionality) and improving the relationship with customers and other supply chain participants through a better exchange of information.

3.3 ICT perception: improvements, factors and performance impact

In this section ICT perception has been analysed. Firstly, the source of ICT improvements has been investigated. The analysis is aimed at understanding if, in the relationship between 3PLs and other supply chain partners, major ICT improvements are driven by case companies themselves or by others. Three companies (basic logistics 3 and advanced logistics 1 and 2) played an active role in setting up initiatives to stimulate an increase in the technological levels of customer companies. Of these, basic logistics 3 involved customers particularly in the area of data exchange. To this end, the company shared with customers their analysis of the potential benefits of technology improvements in this area. Advanced logistics 1 co-designed technology solutions with some customers to support specific needs and to this end the company allows the customer to use its information systems. Also advanced logistics 2 that encouraged its small customers to further integrate their ICT systems into the company system. In relation to stimulating 3PL partners it emerged that only one company (advanced logistics 2) has had initiatives to better integrate information systems with some larger logistics providers. In the case of ICT improvements stimulated by other supply chain partners, again basic logistics 3 and advanced logistics 1 and 2 are the companies which have been encouraged by their customers to make improvements in the field of ICT. In the case of basic logistics 3, customers are required to design and implement specific technology solutions in the area of shipment documentation delivery. Advanced logistics 1 was asked to develop specific software applications and consultancy for developing technology projects. Finally, advanced logistics 2 has been requested to increase the technological cooperation in the area of information systems integration by some large customers. Surprisingly, no request for increasing technology cooperation has been received by case companies from other 3PLs partners. The analysis of factors that are inhibiting/stimulating ICT dissemination in the sample generally confirmed the results of the field survey. For basic logistics 1 and 3, financial and cost factors are the main inhibitors of wider technology dissemination. Full haulage 2 and basic logistics 2 stated that ICT products and services are generally not in line with small 3PL company needs. Advanced logistics 1 and 2 suggested that the low level of technological development in small 3PLs mainly results from sector issues such as the high fragmentation of the industry and the uncertainty characterising the competitive scenario. Basic logistics 1 and 3 and advanced logistics 1 identified elements related to the ICT supply side such as improving technological standards, the increasing benefits of ICT and the availability of new ICT products and infrastructures. Advanced logistics 2 indicated that change in legal requirements (such as in the case of traceability for food products) is a powerful factor stimulating ICT adoption. Full haulage 1 stated that the technology embedded in new trucks is having a strong influence on increasing the level of ICT usage in road haulage companies. Finally, the perception of the ICT impact on company performance has been analysed. It is interesting to note that only advanced logistics 2 considers that ICT has a low impact on company performance as ICT is an enabler and for this reason it does not result in a significant improvements in company performance. Five companies (full haulage 2, basic logistics 1, 2, and 3 advanced logistics 1) indicate customer service and operational activities as the main areas in which ICT impacted on performance. Finally, full haulage 1 is the only company that indicated vehicle space optimisation, turnover improvement and enlargement of the customer base as the main areas in which performance has been influenced by ICT.

4. CONCLUSIONS

In conclusion, the competitive landscape for smaller 3PLs is continuously changing to reflect evolving customer requirements and other business pressures. The capability of emerging ICT is increasing at a rapid rate and its effective adoption has the potential to significantly enhance the ability of smaller 3PLs to survive and to prosper. However, it is clear that many barriers exist to the successful adoption of ICT by these providers. Given the importance of such companies in contemporary supply chain configurations it is important that these issues are fully understood. This paper has, in the specific case of the Italian market, contributed to the development of such an understanding. From a research perspective, further work is needed to monitor the ongoing rate of adoption of ICT in small 3PLs and the effectiveness of this technology as an element of the overall strategic approach of firms. Current work on integrating survey and case study results aims to define with clarity and in some detail the key elements of the ongoing research agenda in this area. In addition, the experience in other industries with a similar structure and dynamics is likely to add to the level of understanding of the main issues involved. Furthermore, comparative studies aimed at understanding some of the key similarities and differences between the 3PL sectors in different countries is likely to be beneficial.

REFERENCES will be available on request