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TECHNOLOGY INFLUENCES ON SMALL LOGISTICS PROVIDERS: A CASE STUDY ANALYSIS

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Abstract

ICT has triggered many changes in the logistics service industry. New technology is reshaping the organisation and structure of this industry as ICT impacts significantly on the operations of 3PLs. Within this process, while large 3PLs are gaining substantial benefits from technology usage, the nature of changes resulting from ICT usage in small 3PLs remains unclear. This is critical particularly for those markets populated by a high number of small 3PLs such as the Italian logistics industry. From the research point of view, there is still a gap in the literature where the role of technological capability in small 3PLs are seriously underestimated. This gives rise to the need to develop investigation in this area. This 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.

***Key words*:** ICT impact, small 3PLs, Italian logistics service market, case study analysis

1. Introduction

Information and communication technology (ICT) developments have strongly affected supply chain management (SCM) in recent years. ICT has had a great impact on all supply chain participants including logistics service providers. 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. ICT is also of critical importance in developing logistics services in a customised supply chain context. In this regard, Sauvage (2003) noted that in a highly competitive business characterised by time compression, technological effort becomes a critical variable and a significant tool for differentiation of logistics services. Van Hoek (2002) assigned a specific role to ICT for 3PLs aiming to perform customising operations for service users. The author pointed out that the use of specific technological capabilities may assure the rapid customisation of products and maintain competitive lead-times. Nevertheless, the use of ICT in the 3PL sector is unevenly distributed between large and small-medium sized logistics service providers Large logistics firms have heavily invested in ICT and have actively developed information systems. Small logistics service providers, on the other hand, 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. The main aim of the paper is to provide a qualitative data and information that complement the results of a 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

This paper is part of a larger research project aimed at assessing the impact of ICT on small logistics service providers. The basic research hypothesis of the project is that "the effective adoption of ICT has the potential to improve the competitive capability of small 3PLs. This improvement is dependant upon an understanding of major process, drivers and enablers". The integration enabling role of ICT is a key focus of the study. To test the above hypothesis two different research steps have been designed and conducted on the Italian logistics service market. Firstly, an empirical survey has been developed preceded by two focus groups (Evangelista, Sweeney, 2006). The field investigation examined a sample of 153 small Italian 3PLs on the base of a definition and taxonomy. The specific objectives on which the survey has been 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 is 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 achieved through 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 excellent 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 appears particularly appropriate in such context (Ellram, 1996; Meredith, 1998). Furthermore, the use of case approach in this project allows to adopt a multiple methodological approach. This approach is particularly valuable, as it allows both to overcome the weakness of a single research approach (quantitative vs. qualitative) and to enrich data collection and analysis. The advantage is to combine methodological approaches which integrate strengths and mitigate shortcomings of quantitative and qualitative methods, the so called triangulation. Triangulation can therefore improve internal and external validity as the combination of separate research methods in one study helps to counter the trade-offs inherent in others (Scandura & Williams, 2000). From this point of departure, it is expected that the results of case study analysis combined with the findings emerged from the previous field survey will provide a more clear and integrated picture of the impact of new technologies on small 3PL companies.

3. Data collection strategy

A multiple case study approach was chosen for the purposes of this survey. The main benefit of multiple case study research approach is again that it improves theory building. By comparing two or more case study it is possible to provide concepts that are relevant to an emerging theory. In most situation 6 to 10 cases (Yin, 1994) should provide evidences to support or reject propositions (Eisenhardt, 1989, recommend 4 to 10). The data collection strategy has built upon the information generated by the empirical survey and it 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 has been carried out 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 *et al.*, 2005): *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 has 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 information technology in the company in terms of number and sophistication of tools adopted. In the case of Full Haulage companies the 100% of turnover is generated by pure haulage, 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 different breakdown of turnover associated to transport/warehousing and other services provided (value added services 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. Such hypothesis has been tested and the result shows a positive correlation between the two variables. Within each group of provider type, two subsets of companies have been further 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 survey and to check both the breed of service provided and the level of technology in place. Seven companies accepted to participated in the survey divided for each provider type as follows: 2 Full Haulage Providers, 3 Basic Logistics Providers and 2 Advanced Logistics Providers. Table 1 shows a summary of the studied 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

Table 1: Characteristics of the case study companies

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 operation manager of each companies. During the meetings a data collection guide was used with quite open stated 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. A variety of information sources about the companies has been used which include company reports, company web-pages, logistics internet website and illustrative materials (e.g. brochures, newsletters and other publications). Such information has been used to integrate the information collected during the interviews that form part of the case study history. Additional information needs that rose up during the analysis phase were filled by recalling the respondents by phone. For the purpose of this paper and due to space limitation, the data analysis presented below refers to the cross-case analysis only, where the cases has been compared with each other in order to identify commonalities and potential patterns between them.

4. Case study findings

This section reports the main findings of the case study investigation. The grouping and cross-case analysis was performed in accordance to the three objectives. The following three subsections describe the results regarding the technological profile of the case companies, the role of ICT in the customisation of services provided and the perception of ICT in the sample.

Technological profile of the case study companies

Most of the case companies (4 out 7) does 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 expenses 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 expenses that has been motivated by the need to update hardware and software (full haulage 2 and advanced logistics 1 and 2) or to adjust technical standard to different ICT requirements of customer industries (basic logistics 1). Only in one case companies (basic logistics 2) there has been a steady trend in technology expenses. About the usage of transportation and logistics e-marketplace, only three companies (full haulage 2 and basic logistics 1 and 2) use digital marketplaces to fully exploit vehicles capacity, to reduce empty trips and to serve a wider geographical area. Other case companies have not used e-marketplace mainly because they are not considered reliable. Information integration with supply chain participants is another issue analysed in the context of the case study survey. The level information with other supply chain participants (namely customer and other 3PLs) is generally low.

Role of ICT in supporting the customisation of services

The use of ICT to customise service provided is another aspect investigate 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) service, and role of the Internet and company website usage. Software is widely used in the sample. Most of the case companies, 5 out 7, use software applications to customise their services. Reasons were rather homogenous between the companies. In using software companies aimed to improve effectiveness of services provided to reduce cost and to deliver a higher value to the customer. Logistics services supported by software application are mainly transport, warehouse, 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. Only two companies do not use software package (full haulage 1 and basic logistics 2). Different reasons have been given for this. Full haulage 1 considers software unnecessary to support service supplied, while in the case of basic logistics 2, software is not used because it is costly and it has a low the level of flexibility and friendliness. 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 service through their company website. The main reasons given by the remaining five companies that do not supply T&T functionality are focused on the fact that such service is not required by customer or the company has not got the appropriate technology in place to provide such service. About 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 position. Different reasons have been given for this. Some companies (full haulage 2, basic logistics 1 and 2) have pointed out the potential of the Internet to facilitate information retrieval and comparison (i.e. research of new customer, research and comparison of service price information), contributing to reduce marketing and communication and cost. The remaining three companies (basic logistics 3 and advanced logistics 1 and 2) emphasised the increased possibility of the web to integrate systems and applications of different companies operating in the supply chain improving the exchange of information with supply chain partner. 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, the level of usage is more focused on providing users with general company information than to use it in a more interactive way. To assess the level of the website company usage the KPMG's Internet Maturity Model has been applied. Such a model suggests that website usage go through four different stages – marketing, publishing, transactional and interactive – in connection with the evolution of the company's e-commerce strategy. 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 in all three provider categories. Basic logistics 1 has been positioned at the second level of the model (publishing) as beyond the providing general company information, web pages are particularly used in exchanging information about shipment with customer. Finally, basic logistics 3 and advanced logistics 1 have been positioned at the third stage of the model (transactional) as the use of website is mainly focused on providing higher service level (i.e. T&T functionality) and to improve the relationship with customer and other supply chain participants through a better exchange of information.

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 to understand if, in the relationship between 3PLs and other supply chain partner (namely customer and other 3PLs), major ICT improvements are driven by case companies or by other supply chain participants. Three companies (basic logistics 3 and advanced logistics 1 and 2) played an active role in front of their customer in setting up some initiatives to stimulate the improvement of the technological level 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 the analysis of potential benefits of technology improvements in this area. Advanced logistics 1 often stimulated its customers to cooperate for improving the level of technological capability. In particular, the company co-designed technology solutions with some customer to support specific needs and to this end the company allows the customer to use its information system. Also advanced logistics 2 stimulated its customers to cooperate for improving their level of technological capability. This is true particularly in the case of small customers that have been encouraged to further integrate their ICT systems into the company system. The remaining companies (full haulage 1 and 2, basic logistics 1 and 2) have not launched any initiatives to improve the ICT level of their customer for the following reasons: the price and other traditional attributes of transport and logistics service (such as punctuality, reliability, etc.) still play a major role in the relationship with customer; and the scarce technological sensibility of customer. About initiatives to stimulate 3PLs partner it emerged that only one company (advanced logistics 2) launched initiatives to better integrate information system with some large logistics providers. All the other six companies have no initiatives in place to stimulate a higher level of ICT adoption in logistics providers partner. The low level of cooperation and information exchanged, the absence of needs for specific ICT applications to run the business and the low level of technology in 3PLs are reasons given by the above companies. In the case of ICT improvements stimulated by other supply chain partner, again basic logistics 3 and advanced logistics 1 and 2 are the companies which has been stimulated by their customers for setting up 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 from some large customer. Surprisingly, no request for increasing technology cooperation has been received by case companies from other 3PLs partner. The analysis of factors that are inhibiting/stimulating ICT dissemination in the sample generally confirmed the results of the field survey, and it put in evidence other interesting elements. For basic logistics 1 and 3, financial and cost factors are the main inhibitors for a wider technology dissemination. Full haulage 2 and basic logistics 2 stated that ICT products and services are generally not in line with small 3PLs company needs. Advanced logistics 1 and 2 suggested that low level of technological development in small 3PLs mainly depends from sector issues such as the high fragmentation of industry and the uncertainty characterising the competitive scenario. Full haulage 1 evidenced how ICT tools can negatively influencing truck drivers as such tools can be used to control their performance. About factors stimulating ICT, basic logistics 1 and 3 and advanced logistics 1 identified elements related to the ICT supply side such as improving in technological standards, the increasing benefits coming from ICT and the availability of new ICT product and infrastructures. Benefits linked to technological development are the most stimulating factors for full haulage 2 (price reduction in technology tools) and basic logistic 2 (higher capacity to get information about market trends). Advanced logistics 2 indicates changing in legal rules (such as in the case of traceability for food products) is a powerful factor stimulating ICT adoption. Full haulage 1 stated that technology embedded in new trucks is having a strong influence in 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 produce a significant effects on 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 indicate vehicle space optimisation, turnover improvement and enlargement of customer base the main areas in which performance has been influenced by ICT.

5. Conclusions

As noted earlier, the research described in this paper is part of a larger research project which involves the collection of empirical evidence using a survey questionnaire as well as the case studies.

Current and future work focuses on how the different elements of the research design can be integrated and overall conclusions drawn based on this. Nonetheless, there are a number of general points worth highlighting. While the importance of the Internet is widely recognised by case companies, surprisingly website usage appears to be at an early stage. This specific observation raises questions regarding the effective selection and implementation of ICT solutions in the sector generally. The potential of ICT as an integration enabler appears to be recognised but more robust approaches to its adoption appear to be required. The empirical results gathered from the survey indicated a relatively low level of website adoption. Some of the reasons for this become clearer from the case study analysis. The issue of "to lead or to follow" is a critical strategic one for companies and one which suggests a lack of pro-activity within some of the case study companies. While a general recognition of the role of ICT generally, and of effective website adoption specifically, appears to exist there is evidence of a "wait and see" approach. Given the rapid rate of ICT development in recent years this is a cause of some concern. Furthermore, given that the rate of change in ICT development continues unabated there are issues to be addressed in terms of the future proofing of investment in key enabling technologies. 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. Longitudinal studies monitoring the issues raised in this paper are likely to play an important role in this agenda. 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.

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