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GREEN SUPPLY CHAIN INITIATIVES IN THE TRANSPORT AND LOGISTICS SERVICE INDUSTRY: AN EXPLORATORY CASE STUDY ANALYSIS

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Introduction

In recent years the natural environment became a major issue as global warming and resource scarcity became more prevalent and oil prices continued to rise. In addition, the recent economic global crisis has accelerated the need for sustainable growth where better usage of natural resources creates the potential to develop a greener economy. The impact of business operations on the natural environment is one of the main areas in which societies and governments have become more sensitive. That is why companies need to react to the challenges of green issues by implementing sustainable (or green) logistics and supply chain management (SCM).

At a macro level transport and logistics related activities are the most important contributors of greenhouse gas emissions. That is why transport and logistic companies (3PLs) are increasingly being asked to respond to the challenges of green logistics by implementing more environmentally sustainable strategies. From the research point of view, on the one hand, it appears that the focus of environmental impact research has been almost exclusively on manufacturing industries rather than service. On the other, environmental initiatives have been mainly explored with reference to different stages of the supply chain with a specific focus on single functional areas. Environmental research specific to 3PLs has been neglected despite the fact that these companies have assumed a more critical role in supply chain orchestration and management. The main aim of this paper is to explore the range of initiatives that 3PLs are implementing to reduce the environmental impact of transport and logistics activities. The analysis also focused on identifying drivers and barriers affecting green initiatives undertaken by these companies.

The overall research approach is based on a case study analysis investigating a sample of 3PLs operating in Spain and Ireland. Given the lack of theory in this field, the case study approach is ideal in this context as a theory building strategy. The interviews were conducted through a data collection guide compiled on the basis of the literature review on green supply chain initiatives. The results of the case study analysis identify how 3PLs are responding to the environmental pressures on their businesses. In addition, the study allows a comparison between initiatives implemented in two different countries: Ireland and Spain. Considering the scarcity of study on 3PLs' green initiatives, this paper provides avenues for future research in the field. Its focus on inductive theory building supports this development. In particular, further research may focus on understanding how green initiatives may affect the 3PL business and performance.

The paper is organised into five sections. Following this introduction, the second section provides an outline of the evolution of the logistics service industry together with a summary of literature on sustainability in 3PL research. The third section sets out the objectives and methodology used in this research. The main findings emerging from the case study analysis carried out in a small set of 3PL companies are described in the fourth section. Finally, conclusions and implications for future research in the field are drawn in the concluding section.

Literature review

The evolving 3PL industry scenario

The logistics service industry is undergoing a major transition as a result of a number of changes affecting logistics and SCM such as economic, social, technological and environmental sustainability. In the context of evolving SCM, to meet the new customer requirements 3PL companies have

gradually transformed scope and characteristics of their service offering in order to improve customer service levels (Daugherty et al., 1992).

For many 3PL companies this evolution consisted of a transition from a single-activity company toward a business model based on providing a wider range of integrated services (Ashenbaum et al., 2005). New services must have additional features for improving value creation for the customer (Berglund, 2000). Logistics service providers are under constant pressure to enhance their customer relationships and continually expand the range of services offered. Core service offerings are being commoditised (e.g. transportation), while value-added services and technological capabilities are considered points of differentiation (Evangelista, 2004).

This has given 3PLs a new potential role in customising the supply chain as a growing number of activities beyond transportation and warehousing can be carried out by logistics service providers (Cooper et al., 1998; Hertz and Alfredsson, 2003). For example, the practice of postponement of product finishing to downstream stages of supply chains means that 3PLs have the opportunity to offer services such as final assembly and customisation of products (van Hoek, 2000). Offering these services gives 3PLs the opportunity to penetrate segments of supply chains with higher added-value services compared to traditional transportation and warehousing services. The supplementary customised services provided may give a differentiation edge, while raising added value in services which can improve margins, as well as deepen the relationships with customers (Porter, 1980). As a result, 3PLs play a more important role than in the past insofar as they are entrusted with the task of integrating and accelerating physical and information flows at multiple levels of the supply chain (Ojala et al., 2006; Cooper et al., 1998).

The evolving role of 3PLs in the supply chain affected relationships with customer. Ojala (2003) noted that while primary driving forces in the 3PL sector previously were to reduce cost and release capital for alternative purposes, the driving forces today have more strategic influences in terms of market coverage, improving the level of service or increasing flexibility in view of the changing requirements of customers.

The growing need for businesses to diversify and delegate as their supply chains become broader and more complex has validated the role of 3PLs in every aspect of logistics including the environmental aspect related to their service offering. This has fuelled the transition from the traditional “arms length” approach to the supply of integrated logistics services packages on a “one-stop shopping” basis and has further facilitated the migration of companies from asset-based to information and knowledge-based, value-added logistics service enterprises (Panayides, 2005). Accordingly, the 3PL market is moving towards a tiered system where three different evolving stages can be identified over the last three decades.

Logistics service companies now have the opportunity to evolve from playing their traditional tactical roles (first wave) to become adaptive supply chain providers (third wave). In this evolving process, environmental sustainability is an area of increasing importance for 3PLs as their core activities have often a strong environmental impact (e.g. transport activities).

Sustainability in 3PL research

Environmental sustainability is an area of increasing concern for policy makers, academics and businesses globally. In order to mitigate detrimental environmental effects, logistics and transport activities (e.g. hazardous goods) have become more regulated. Transport provides a good example as this activity causes a high rate of negative environmental impact such as pollution (McKinnon, 2006). Companies are continually forced to reduce, reuse and reapply packaging materials, by-products of production and obsolete items. Hence, environmental issues have an impact on several logistics decisions along the supply chain such as location, sourcing of raw material, modal selection and transportation planning (Wu and Dunn, 1995). Efforts towards the achievement of green logistics require the extension of traditional economic supply chain objectives to include ecological objectives. This increases complexity in the management of the logistics business, creating additional costs and limiting options.

For these reasons, green supply chain initiatives are a great challenge for logistics service providers that are seeking more sustainable service strategies. From the sustainability point of view, logistics companies have to increasingly face two different pressures. The first source of pressure relates to

transportation costs due to rising fuel prices (van Hoek and Johnson, 2010). This is leading 3PL companies to implement cost-cutting sustainable initiatives such as the adoption of transport network optimization software. The second source of pressure comes from customers (Foster, Sampson and Dunn, 2000). Manufacturers and retailers are investing increasing an amount of resources in accomplishing their environmental objectives. As a result, logistics service providers are requested to improve their sustainable capability in order to support the environmental strategies of their customers. As the importance of green supply chain initiatives is likely to grow in the near future, it is reasonable to expect that the criteria for selecting 3PLs will be increasingly based on the evaluation of their sustainable practices and performance.

The evolution of the logistics service industry outlined above highlight that 3PLs are playing a more critical role. This puts these companies in a critical position to support the efforts towards environmental sustainability of supply chain operations. Nevertheless, most of the literature (Srivastava, 2007) and empirical studies (see, for example: Eltayeb and Zailani, 2009; Hong, Kwon and Roh, 2009) on sustainability in SCM have been directed towards manufacturing companies. Surprisingly, environmental practices in services have only recently attracted the attention of researchers (Kassinis and Soteriou, 2003), and in logistics services particularly. In fact, two recently published literature reviews on 3PL hardly mention sustainability related issues (Maloni and Carter, 2006; Selviaridis and Spring, 2007).

Four papers dealing with environmental sustainability in the logistics service industry have been retrieved in the specialised literature. Three of them are focused on the role of environmental issues in the procurement/selection of 3PL services (Meade and Sarkis, 2002; Schmitz, Hofenk and Semeijn, 2010; Wolf and Seuring, 2010). These works take into consideration sustainability when buyers source transport and logistics services (the buyer perspective). Conversely, the paper written by Isaksson and Björklund (2010) adopts the perspective of the logistics service company when consider environmental aspects in developing their service strategy.

The paper of Meade and Sarkis (2002) deals with the involvement of 3PLs within reverse logistics programmes. The authors proposed a decision model for selecting appropriate 3PL partners in such programmes. The model is based on a multi-attribute utility decision support tool (the analytical network process) that is presented with an illustrative example. The model includes a set of qualitative, quantitative, strategic and operational factors (e.g. location of product in its lifecycle, strategic performance criteria, reverse logistics functions required and the role of reverse logistics in the organisation) that may affect the 3PL involvement in reverse logistics decisions.

The work of Schmitz, Hofenk and Semeijn (2010) explores the role of sustainability issues in selecting freight transport services providers. The authors carried out a questionnaire survey involving 62 members of Dutch Shipper Council in The Netherlands. The respondent was asked to score the importance of, and performance in, both standard selection criteria and sustainability criteria. Based on an Importance-Performance Analysis, the results show that all sustainability criteria are perceived as unimportant performance factors.

The paper of Wolf and Seuring (2010) is focused on ascertaining if environmental issues may be considered a supplier selection criteria of companies when sourcing 3PL services. In order to achieve this objective, the authors conducted a case study analysis involving nine companies, where six buyers and three 3PL are involved in dyadic relationships. The results of the analysis highlight a number of interesting elements. While 3PLs show an increasing interest in environmental issues, buying decisions are still made on traditional performance objectives, such as price, quality and timely delivery. Environmental concerns have not been incorporated in the service buying decision making process and when it happens it is considered a sort of minimum requirement. The study demonstrated that transport buyers and 3PL are only sporadically taking first steps towards cooperative partnerships on environmental issues. The realisation of such approaches presents difficulties and challenges.

Finally, Isaksson and Björklund (2010) proposed a framework that considers sustainability in the development of services offered by 3PLs. The authors reviewed and compared the literature on sustainable service and product development with the literature dealing with development of offerings for logistics companies. A framework containing issues of sustainable service offerings of relevance from a logistics company perspective is proposed. The framework is based on several aspects (such as customers and market, collaboration, business strategy, ICT, control tools and competence and

knowledge) that may be used to develop environmentally sustainable service offerings and also improve the competitive position of 3PL companies.

Research objectives and methodology

The purpose of this paper is to investigate the role of green supply chain initiatives in the service strategy of 3PLs. The analysis proposed in this work is explorative in nature as sustainability in the logistics service industry is an emergent issue with limited discussion on the subject in the logistics and SCM literature. The case study method provides an appropriate means to study such an issue. The specific objectives of the paper are as follows:

1. to analyse awareness of the importance of sustainability in 3PLs;
2. to analyse the adoption of green supply chain initiatives by 3PLs;
3. to identify the external factors affecting green supply chain initiatives in 3PLs; and,
4. to identify the internal factors affecting the adoption of green supply chain initiatives in 3PLs

In order to achieve the above objectives, four logistics companies have been investigated in two different countries: Ireland and Spain. In both countries, the two companies (one relatively large and one relatively small) have been selected on the basis of previous contacts and collaboration and this has facilitated the access to company information. Information has been obtained during face-to-face interviews with company managers conducted at the company site. During the meetings a data collection guide compiled on the basis of the literature review has been used with quite open stated questions. A number of additional information about the companies has been collected from a variety of information sources including company reports and company web-pages. Such information has been used to integrate the information collected during the interviews that form part of the case study history.

Case study findings

The analysis presented below has been performed in accordance to the four objectives outlined above. In addition, the four case companies have been grouped into two groups: large and small firms. Comparing the results obtained in each group it is possible to identify the influence that firm size may have on sustainable initiatives undertaken by the companies investigated (Lee, 2008). The following four sections describe the results regarding the awareness of sustainability importance, the adoption of green supply chain initiatives, the internal and the external factors affecting green supply chain initiatives by the case companies.

Awareness of sustainability

The level of awareness of sustainability issues is an important prerequisite to understanding if companies may develop green initiatives to minimise the environmental impact of transport and logistics activities. In order to analyse this issue the following four elements have been considered: knowledge of environmental issues, prioritisation of environmental issues, reason for adopting green supply chain initiatives and who is responsible for green initiatives within the company (see table 1).

Considering large 3PL companies in the sample, two different perspectives emerge. One of the two companies (3PL1 in Ireland) show a very high level of sustainability awareness as it demonstrated a very high knowledge of environmental issues together with a strategic prioritisation of sustainability. In addition, the influence of customer on company sustainability policies is critical although cost reduction, increasing firm profitability and corporate image improvement are also important reasons for adopting green initiatives. Finally, the company has a cross-functional approach to developing and implementing green initiatives. The second large company (the Spanish 3PL2) provides a slightly different scenario characterised by a lower level of knowledge of environmental issues and a non-strategic importance attributed to sustainability. The main reasons for adopting green initiatives are related to cost reduction, improvement of customer relationships and company image. The entrepreneur and managers are responsible for the implementation of sustainable initiatives.

Both small 3PLs have low knowledge of environmental issues and assign non-strategic priority to sustainability for the development of their businesses. Green initiatives are mainly seen as a way to improve customer relationships and company image. The Spanish company 3PL4 pursues a more structured approach to sustainability as a green team is responsible for managing green initiatives in comparison with the Irish 3PL3 that has no people devoted specifically to sustainability.

	Large 3PLs	Small 3PLs
Knowledge of environmental issues	Very high/low	Not very high
Priority of environmental issues	Strategic priority	Non strategic priority
Main reason for adopting GSCI	<ul style="list-style-type: none"> • Customer (relations, SC effectiveness) • Cost reduction • Corporate image 	<ul style="list-style-type: none"> • Customer • Cost reduction • Corporate image
Responsible for GSCI	Cross-functional - Entrepreneur/Manager	No people - Green Team

Table 1: Awareness of the importance of green supply chain initiatives (GSCIs)

As expected, large 3PL companies show a higher level of awareness of sustainability in comparison with smaller ones. This is particularly true for the strategic prioritisation of environmental issues and the customer centrality in driving green policies. On the other side, it is interesting to note that one small company investigated (3PL4) has an organisation unit (green team) in place entirely devoted to sustainability - a typical solution adopted by larger companies.

Adoption of green supply chain initiatives

The second issue explored relates to the range of green supply chain initiatives undertaken by case companies (see table 2). Current and future (both in the short and long run) initiatives have been considered. In addition, modal shift policies and ICT tools usage for reducing the environmental impact of transport and logistics activities have been included. Finally, factors inhibiting sustainability initiatives have also been considered.

The results reveal that within the large company 3PL1 in Ireland a set of coordinated sustainable initiatives is in place. This includes several measures such as efficient transport, optimised transport operations planning, identification of alternative sources of energy, and innovative transport technologies. This programme may be considered the current and future company agenda in this field and it includes initiatives involving both transport and activities beyond transport (e.g. warehousing). 3PL1 undertakes modal shift policies for international shipments only. Innovative ICT technologies such as network optimisation software are widely used for reducing environmental impact of transport and logistics activities. The company considers high costs and the lack of economic incentives as main inhibitors for implementing sustainable measures and programmes. The Spanish 3PL2 presents a weaker approach in adopting sustainable initiatives as isolated measures have been undertaken such as some electronic expedients to reduce paper and separate garbage collection outsourced to an approved company in order to recycle cardboard. Future initiatives comprise usage of route optimisation software and installation of solar panels. No modal shift policies and innovative technologies are planned to be used in the future. The company sees the lack of organisational/human resources specifically devoted to manage such initiatives and skilled staff as the most important inhibitors.

Differences in approach have also been detected between the small 3PLs. As regard the initiatives currently adopted both companies are focused on reducing the environmental impact of transport initiatives. Nevertheless, the types of initiative undertaken by the two companies are quite different. With reference to transport activities, the Spanish 3PL4 is implementing a programme based on a progressive usage of biodiesel vehicles and electric vehicles for city distribution. On the other side, the Irish 3PL3 is orienting its current measures in this field toward the purchasing of cleaner trucks and better vehicle utilisation through more efficient routing tools. In relation to current initiatives beyond transport 3PL4 seems more active in comparison with the Irish company as a number of measures have been undertaken to reduce the environmental impact of warehousing activities such as the reduction in the use of paper such as recycling of labels, delivery notes, bills, and seals. Both companies show limited planning of future initiatives. Neither company has a modal shift policy currently in place and none is planned for the future. A similar scenario emerges with reference to ICT tools and systems usage for supporting sustainable measures. Finally, in relation with the inhibiting factors 3PL4 indicated that economic factors play a major role (e.g. high costs and lack of economic incentives), while 3PL3 stressed both economic (e.g. high costs and payback period too long) and human resource factors (e.g. lack of skilled people to involve in the management of green initiatives).

	Large 3PLs	Small 3PLs
GSCI currently adopted	<ul style="list-style-type: none"> • Set of coordinated initiatives in transport and beyond transport • Some isolated initiatives 	<ul style="list-style-type: none"> • Main focus on transport initiatives
GSCI planned in the short term	<ul style="list-style-type: none"> • Set of coordinated initiatives in transport and beyond transport • Route optimisation software 	No planned initiatives beyond more green fuel usage
GSCI planned in the long run	<ul style="list-style-type: none"> • Set of coordinated initiatives in transport and beyond transport • Solar panels installation 	No planned initiatives beyond solar panels installation
Modal shift for reducing the environmental impact of road transport	<ul style="list-style-type: none"> • Only for international shipments • No modal shift policies 	No modal shift policies
ICT usage for the environmental impact of transport and logistics activities	<ul style="list-style-type: none"> • Network optimisation software • No specific ICT tools usage 	No specific ICT tools usage
Inhibitors of GSCI	<ul style="list-style-type: none"> • High costs/ Lack of incentives • Lack of HR/skilled staff 	<ul style="list-style-type: none"> • High costs/ lack of incentives • Lack of HR/skilled staff • Payback period too long • Negative impact on customer supply chain

Table 2: Adoption of green supply chain initiatives (GSCIs)

Overall, 3PL1 may be regarded as a leader in the field as the company is implementing a complex set of measures to reduce the environmental impact of transport and logistics activities integrated with modal shift policies and supported by innovative technologies. The other three companies show a more limited range of initiatives in place and none/poor planned measures. In addition, these companies underestimate the green potential of both modal shift actions and ICT systems. The analysis of barriers reflects this scenario as the most important barriers identified by the surveyed companies are in the economic and human resource areas.

External factors affecting green supply chain initiatives

The analysis of external factor affecting green initiatives in logistics service companies include the influence of a number of factors including competitors, customers, regulations and experts (see tab. 3).

In the case of 3PL1 the most influential factors are customers and regulations. The company serves large customers for which sustainability is an important issue. They exert pressure on 3PL1 to accelerate the implementation of green initiatives. 3PL1's approach to green supply chain initiatives reflects such pressures. In addition, after the establishment of a carbon tax in Ireland the company focused green measures on reducing fuel costs through better routing, the identification of alternative sources of energy and, the use of cleaner technology. In Spain, 3PL2 considers regulation as the only external factor affecting sustainability initiatives (e.g. garbage collection and paper recycling).

	Large 3PLs	Small 3PLs
Impact of competitor's GSCI	No impact	No impact
Impact of customer's GSCI	<ul style="list-style-type: none"> • High impact • No impact 	<ul style="list-style-type: none"> • Low impact • No impact
Impact of environmental regulations	<ul style="list-style-type: none"> • Carbon tax forced to fuel costs reduction • Garbage collection by an approved recycling company 	<ul style="list-style-type: none"> • Relevant impact forcing to optimizing routes, reducing operative costs and improving corporate image • No impact
Impact of expert	No impact	No impact

Table 3: External factors affecting green supply chain initiatives (GSCIs)

In the case of small logistics companies, initiatives implemented by customers have had a more limited impact. 3PL3 recognised that initiatives of customers have oriented their own actions, but the most important issue is the need to have no cost implications for customer. In Spain, 3PL4 stated that regulation influenced positively the adoption of route optimisation tools, reducing operating costs and pollution, as well as improving corporate image. For both companies, competitors' initiatives and expert support has had no impact on current and future green initiatives.

Comparing large and small companies it emerges that regulation is the most influential external factor that drives sustainability measures. Initiatives undertaken by competitors seem do not have any effect and neither have external experts and consultants.

Internal factors affecting green supply chain initiatives

The last element investigated in the survey relates to the internal factors affecting green supply chain initiatives. Three issues have been considered: influence of entrepreneur, management and employees. This an important issue as the influence of internal factors reflects the commitment of different company cultures in addressing sustainability challenges (see table 4).

The management of 3PL1 is fully committed in developing green initiatives and disseminating awareness about sustainability in all levels of the organisation. 3PL2 shows a medium level management involvement in green initiatives that confirms that the firm is proceeding in a cautious way on sustainability initiative development.

	Large 3PLs	Small 3PLs
Influence of entrepreneur on GSCI	n/a	Relevant influence
Influence of management on GSCI	Relevant influence	Supportive influence
Influence of employees on GSCI	No influence	Supportive influence

Table 4: Internal factors affecting green supply chain initiatives (GSCIs)

The smaller firms evidence a relevant role for the entrepreneur while both management and employees play simply a supportive role. More specifically, 3PL4 show a cross-functional involvement of entrepreneur, management and employees that results in a more effective response to the challenge of sustainability. In the case of 3PL3 the sole involvement of the entrepreneur appears insufficient to ensure an enduring commitment to develop effective green actions.

Conclusion and implication for further research

The research described in this paper is exploratory in nature as a result of the dearth of literature in this specific area. The findings presented in this paper, along with the results of similar studies in other countries, are being used to inductively develop a model that attempts to rationalise the adoption of green supply chain initiatives in 3PLs. The authors then plan to deductively test this model. Such a framework is important as it provides the basis of a better understanding in this increasingly important area of logistics and SCM.

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