AN EMPIRICAL INVESTIGATION ON THE IMPLEMENTATION OF GREEN PRACTICES IN THE LOGISTICS SERVICE INDUSTRY

Pietro Evangelista[a], Jukka Hallikas[b], Anni-Kaisa Kähkönen[b] and Katrina Lintukangas[b]

[a]IRAT-CNR and Department of Industrial Engineering, University of Naples Federico II, Naples, Italy

[b]Lappeenranta University of Technology, School of Business, Lappeenranta, Finland

E-mail: p.evangelista@unina.it, jukka.hallikas@lut.fi

ABSTRACT

Purpose: Due to the increasing demand for advanced logistics services, third-party logistics service providers (3PLs) are increasingly requested to provide more 'green' services. This development provides 3PLs business opportunities but also challenges on how to translate green initiatives into practise. The purpose of this paper is to investigate the implementation of green initiatives and influencing factors.

Research approach: The research methodology used in this paper is based on two-phases approach. Firstly, a systematic literature review on sustainability in 3PLs has been carried. Subsequently, a case study investigation on a 34 Italian 3PLs allows to address research objectives.

Findings and Originality: The research results indicate a different degree of involvement of 3PLs in green initiatives in relation to the different breadth of service offered. The adoption of "point" initiatives focused on one or few logistics functionalities is prevalent. Main drivers and inhibitors affecting the adoption of green initiatives were identified.

Research impact: This paper provides a deeper knowledge on how 3PLs respond to changing market conditions driven by sustainability pressures. It provides a broad base for further research on 3PLs strategy development to facing future green requirements both from customers and government.

Practical impact: The paper describes the level of implementation of 3PLs' green initiatives. Furthermore, the study provides a deeper understanding on how green logistics services can be approached and what drives and inhibits that process.

Keywords: logistics service providers, green initiatives, drives and inhibitors, Italian logistics market, case study analysis

Paper type: Research paper

Introduction

In the 21st century, greening of the supply chain has become an increasing concern for many businesses as well as a challenge for logistics management (Zhu et al., 2008). However, most studies on environmental issues have focused on manufacturing sectors and little attention has been paid to the service sectors, as in the case of the logistics service industry (Lin and Ho, 2011). Third-party logistics service providers (3PLs) are under pressure to improve their customer relationships and continually expand the range of value-added services offered including environmental sustainable related services. In the transport and logistics sector, environmental concerns have become more stringent due to the demand for mobility of goods that has grown considerably in recent decades and will continue to grow in the coming years. In response, an increasing number of 3PLs have started to transform their operations and strategies to be more effective from a green perspective. This transformation may provide benefits but, simultaneously, it should presents challenges and concerns. From this point of view, 3PLs are called to drastically reduce their externalities through effective actions. This is particularly relevant for Italy that is one of the European countries with the highest density of internal traffic with more than 60% of freight shipments moved by road transport. The main aim of this paper is to explore environmental practices in a sample of 34 Italian 3PLs. This research assumes the 3PL perspective and it specifically examines the type of green initiatives implemented and factors (barriers and drivers) affecting the adoption of such initiatives. The section following this introduction presents a systematic literature review on sustainability in the logistics service industry. The results of the literature review allow to identify three research objectives. The third section

provides the methodology used to conduct a case study analysis. The summary of main findings obtained from the case study investigation has been presented in the fourth section. Finally, conclusion and implications deriving from the study have been drawn in the fifth section.

Literature review and research objectives

In order to provide an understanding of existing body of knowledge in the field of environmental sustainability in the logistics service industry, this section provides a systematic literature review. It was conducted using two selected databases (Scopus and Web of Knowledge) and the keywords "green" and "sustainab*" were used in combination with "logistics service providers", "third-party logistics", "3PL" and "LSP". A total of 146 papers were initially identified. Narrowing the search to only include items in the social sciences of the two databases, the number of papers decreases to 94. The output obtained from the two databases were analysed and compared. This allowed the elimination of 34 duplicate papers leaving a total of 60 works. Subsequently, two inclusion/exclusion criteria were established. The first criterion relates to the inclusion of peer-reviewed journals articles published in scientific journals only. The second involved the inclusion of papers with a management focus only. Taking the two criteria into account, 23 articles were selected. A further seven articles were added using cited references, leaving 30 articles in the final sample. The content analysis of the 30 articles resulted in the identification of four different topic areas used to classify the papers (see tab. 1).

Topic area	No. of papers
1: Factors affecting the adoption of 3PLs' green initiatives	8
2: Innovation and ICT tools supporting 3PLs' green initiatives	4
3: Green initiatives and 3PLs' performance	12
4: Buyer's perspective and collaboration	6
Total	**30**

Table 1: Categorisation of the literature by topic areas

Considering that the specific focus of this research is on the logistics service provides perspective, the paper belonging to the fourth topic area (Buyer's perspective and collaboration) have not been considered in this review of the literature. As result 24 articles have been considered only.

Factors affecting the adoption of 3PLs' green initiatives

The first topic area contains eight articles related to the analysis of factors (drivers and barriers) influencing the adoption of green initiatives in logistics service companies. In an early work Wong and Fryxell (2004) examined how stakeholder influenced the effectiveness of environmental management practices in fleet management in Hong Kong. The study found that environmental management practices among fleet managers appeared to be modestly influenced by stakeholders. The two mirroring papers of Lin and Ho (2008) and Ho et al. (2009) analysed the factors influencing logistics companies' attitudes toward environmental management practices in a sample of Taiwanese logistics companies. The research results indicate that the diffusion of knowledge about green practices can help the transfer of technological knowledge within the organisation and, consequently, can raise the willingness to adopt green actions. The work of Maas et al. (2012) explored the relationship between environmental management capabilities and differentiation advantage in a sample of 202 German 3PLs using environmental communication as a moderator in this relationship. The evidences show that environmental communication capabilities positively moderate the relationship between pollution prevention and competitive advantage based on differentiation. The survey conducted by Lieb and Lieb (2010a) on a sample of 20 CEOs of large logistics companies operating in the North American market emphasises the importance of a mix of both internal and external factors. The findings indicate that the most important factors triggering their involvement have been "the corporate desire to do the right thing" and "customer pressures". Similarly, the survey carried out by Lin and Ho (2011) on a sample of 322 Chinese 3PLs revealed that different types of factors, both internal and external, influence green practice adoption. Their analysis indicates that regulatory pressure, governmental support, organisational support, quality of human resources have significantly positive influences in driving green practice. Other studies highlight a number of other influencing factors. The paper of Jumadi and Zailani (2010) argued that 3PL customer relationships may have a positive influence on the adoption of green action in the logistics service sector in Malaysia. Beskovnik and Jakomin (2010), in discussing the challenging role of green logistics in Southeast Europe, identified long-term contracts as an important driver of the implementation of green measures by logistics companies.

Innovation and ICT tools supporting 3PLs' green initiatives

Few studies have been published on the role of innovation and ICT in supporting the adoption of sustainability initiatives by logistics service companies (four articles). The survey conducted by Zailani et al. (2011) on a sample of 70 Malaysian 3PLs addresses the importance of green innovation in logistics outsourcing. The results show that the vast majority of the surveyed companies consider information technology as an important tool in mitigating the environmental impact of transport and logistics activities. Similar conclusion was reached by Ho and Lin (2012) who analysed the factors that affected willingness to implement green innovations in a sample of 162 logistics companies in Taiwan. The paper of Ferguson (2011) investigated corporate social responsibility and sustainability activities within the Asia-Pacific branch of DHL. The result evidenced the positive impact of the three main company programmes on the eco-efficiency management of fleet and warehousing energy use. In addition, advantages have been achieved in terms of increasing the awareness of employees and improving the alignment and commitment of both staff and managers. Finally, the paper of Lai et al. (2011) examined the environmental awareness and measures adopted in the shipping industry. The authors propose a new conceptual framework for evaluating green shipping initiatives based on a six-dimensional measures for green shipping actions.

Green initiatives and 3PLs' performance

There are also relatively few studies dedicated to green initiatives adopted by 3PLs (10 articles, four of which are focused on reverse logistics measures and programmes). Surprisingly, very few papers explored the impact of sustainability initiatives on 3PLs performance (two articles). The papers included in this area show that the research efforts in studying 3PLs' sustainability initiatives have followed two main paths. The first is based on the discussion of a single green initiative, while the second discusses the adoption of multiple measures by 3PLs and their possible classifications. Two of the papers belonging to the first approach emphasize the role of multimodal transport to minimise the environmental impact of 3PLs' operations (Rondinelli and Berry, 2000; Lammgard, 2012). Facacha and Horvath (2005) shown that outsourcing of logistics has a higher potential to reduce energy use, global warming potential and fatalities in comparison with the management of logistics in-house. In relation to the second path, the study of Lieb and Lieb (2010) presented the results gained from two annuals surveys carried out on 40 CEOs of large US 3PLs in 2008 and 2009. The authors clustered the initiatives undertaken by the surveyed companies into four categories: i) administrative, ii) analytical, iii) transportation-related; and a broadly defined "other" category. Pieters et al. (2012) investigate how changes in the 3PLs' sustainability strategy influenced the development of new types of physical distribution networks in the Dutch market. To this aim the authors surveyed 145 logistics companies that adopted 608 initiatives directly related to physical distribution that were grouped into the following four categories: i) internal approach (actions organized by the logistics service provider/shipper), ii) external approach (initiatives which need cooperation with others outside organization (e.g. shippers, governments, competitors, stakeholders etc.), iii) innovating (initiatives previously unknown to the logistics service provider/shipper) and iv) optimizing (initiatives for improving efficiency). Isaksson and Huge-Brodin (2013) investigated how logistics service offering is affected by green initiatives in a sample of six case study 3PL companies operating in the Swedish market. The result of the analysis indicated that initiatives to address green issues are in a different state of development among the case companies. The work of Perotti et al. (2012) explores the relationship between green supply chain practices (GSCP) implementation and company performance in the Italian 3PL market through investigating 15 case study companies. The authors indentified eight different categories of GSCP (green supply, distribution strategies and transportation, warehousing and green building, reverse logistics, cooperation with customers, investment recovery, eco-design and packaging and internal management) and three different levels of performance (environmental, economic and operational). The results indicated that the impact on performance is limited although environmental and economic performance are the areas predominantly influenced by green initiatives. A similar study was conducted by Colicchia at al. (2013) that classified the environmental practices into two macro categories: "intra-organizational" and "inter-organizational" practices. The results show that initiatives related to distribution strategies and transportation activities are the most widely implemented, while initiatives involving internal management are not so used. It was found the lack of a standard methodology for environmental performance measurement. Most of the papers dealing with reverse logistics are focused on methods for selecting the appropriate logistics service providers that may be able to manage reverse logistics flows in an effective way and in line with customer demand (Min and Ko, 2008; Efendigil et al., 2008; Kannan et al., 2009). The work of Bai and Sarkis (2013) identified the most information rich flexibility performance measures to use for evaluating 3PRLP performance.

Assessment of literature and research objectives

The review of literature described above allows a critical assessment for each of the four topic area identified. The literature on factors affecting the adoption of 3PLs' green initiatives (topic area 1) highlights that there is not a clear picture of factors influencing green practices in 3PLs. Furthermore, the papers analysed indicate that there is no linkage with theory that may help explaining why certain factors are more influential than other. It looks also important to investigate the impact of particular factor on decision to undertake specific initiatives. The awareness of the importance of environmental sustainability is considered an important pre-requisite for the adoption of green initiatives (see Lin and Ho, 2008 and Ho, Lin and Chiang, 2009) but it has not been widely investigated. Finally, most of the papers in this area are based on questionnaire survey and there are no works using case study or other qualitative techniques. The scarcity of papers in the area of innovation and ICT supporting 3PLs' green initiatives (topic area 2) let believe that green innovation and the role of ICT tools may be a promising field of study that will increase in the near future having the potential to provide significant benefits to logistics companies. There are no specific research works in this area aimed at assessing the potential of specific ICT tools on environmental and operational performance of 3PLs. Most of the papers are based on questionnaire survey with no studies using case study or other qualitative techniques. In relation with green initiatives adopted by 3PLs (topic area 3), the extant literature is quite limited and offers a fragmented picture about of initiatives undertaken by 3PLs. In particular there are papers focused on one single measure (e.g. intermodal transport) while other provides classifications of green initiatives adopted by 3PLs. The classification provided by Lieb and Lieb (2010) is empirically derived on the basis of few interviews carried out with 3PLs' CEOs. On the other side, the classification proposed by Perotti et al. (2013) define as green supply chain practices initiatives that are implemented within the boundaries of the firm (see for example warehousing, green building and internal management). Almost the same measures have been classified by Colicchia et al. (2013) using the "intra-organizational" and "inter-organizational" dimensions that seems more appropriate. Nevertheless, there is a clear lack of a comprehensive taxonomy of green initiatives adopted by 3PLs. In addition, most of the papers analysed are based on questionnaire survey while only recent works used case study or other qualitative methods. Moreover, the analysis of the impact of green initiatives on 3PL's performance is in an early stage and needs to be assessed more in-depth. On the basis of the critical points and gaps emerged from the literature review, the following three research objectives have been identified: A) to analyse the implementation of green initiatives by 3PLs; B) to identify drivers affecting the adoption of green initiatives by 3PLs; and, C) to identify barriers to the adoption of green initiatives by 3PLs.

Case study methodology

In order to achieve the above objectives a research design based on two main steps has been adopted. The first step was based on the literature review that has been summarised in the previous section. In the second step, a multiple case study analysis involving a set of 34 Italian logistics service providers has been carried out. The specific methodology used to conduct the case study analysis has been organised into the following four stages: 1) case study selection and classification; 2) interview protocol; 3) data collection; and, 4) analysis and interpretation. Table 2 displays the main characteristics of the case companies. All the companies involved in the survey have a number of green initiatives in place.

3PL provider type		Full Haulage Providers (11)	Basic Logistics Providers (14)	Advanced Logistics Providers (9)
Size	Micro (4)	3	1	0
	Small (17)	3	9	5
	Medium (8)	3	2	3
	Large(5)	2	2	1
Geographical reach	Local (2)	1	1	0
	Regional (3)	2	1	0
	National (8)	3	2	3
	International (21)	5	9	7
ICT used	Location based technology (EDI, GPS, bar code, RFID)	x	x	x
	Connectivity technology (LAN, WLAN)	x	x	x

	Relational technology (ERP, CRM)		x	X
For the definition of different company size see European Commission (2005). Full Haulage Providers: transport activities represent 100 percent of turnover; Basic Logistics Providers: transport and warehousing together comprise over 50 percent of turnover; and Advanced Logistics Providers: more than 50 percent of the total turnover is generated by value added logistics and SCM services (Evangelista et al. 2013).				

Table 2: Profile of the 34 case study companies

Results

This section provides a short summary of case study findings due to space limitation. It is organised into three parts concerning green initiatives adopted, barriers and drivers affecting the adoption of such actions.

Implementation of green initiatives

The magnitude of the green logistics actions undertaken by 3PLs may be variable in terms of their potential impact on the supply chain. Therefore, in Table 3 it was possible to distinguish between "point" initiatives (those acting on one or few activities mainly within companies, such as the use of vehicles) and initiatives that affect multiple levels of the supply chain (involving multiple supply chain actors and requiring collaborative efforts with them, such as the joint green logistics programs).

Area	Initiatives	Full Haulage Providers	Basic Logistics Providers	Advanced Logistics Providers
Vehicle use	Alternative fuels		●	●
	Vehicle specification		●	●
	Eco-driving	●	●	●
	Empty running	●	●	●
	Improving loading phase	●	●	●
Modal shift and intermodality	Low energy transport modes	●	●	●
	Intermodality	●	●	●
Energy efficiency	Renewable energies		●	●
Certification	ISO 14001		●	●
Recycling and packaging	Recycling		●	●
	Packaging		●	●
Training and information	Employee training		●	●
	Information on carbon footprint			●
	Customer/supplier training			●
Supply Chain re-organization	Transport planning		●	●
	Changes in logistics system		●	●
Supply Chain collaboration	Customer collaboration			
	Other 3PLs collaboration			●
Planning and environmental control	EMS			●
	Off-setting			●
	GHG target			●

Table 3: Typology of green initiatives implemented

Following this approach, were identified 9 areas each of which concern a number of actions that may be able to offer benefits from the environmental sustainability point of view. Moving from the top to the bottom of the table, it is possible to shift from areas concerning "point" actions towards initiatives having a wider impact on the supply chain. It is interesting to note that the upper part of the table is much more populated than the bottom part. This means that most of the actions undertaken by the case companies relate to "point" initiatives rather than "supply chain" initiatives (for example "supply chain reorganisation" and "collaborative planning and environmental control" are rarely adopted). This shows that a tactical approach to environmental sustainability is prevalent taking into account mainly internal logic that is reflected in the adoption of actions involving some logistics areas with limited impact on the entire supply chain. The table clearly shows that Full Haulage Providers adopt a smaller number of actions aimed primarily at improving the use of vehicles and shift the movement of cargo from road to other transport modes with lower environmental impact. On the other hand, Basic Logistics Providers adopt a larger number of actions (e.g. vehicles use, energy efficiency, environmental certification, recycling materials and packaging, training and information for staff), but

very few initiatives involve other supply chain levels. Advanced Logistics Providers show the wider portfolio of initiatives adopted with an emphasis on actions involving areas of supply chain collaboration and collaborative environmental planning and control. It is interesting to note that all case companies adopt initiatives to reduce the number of empty trips and improve modal shift towards low energy transport modes.

Barriers to the adoption of green initiatives

The respondents were asked to provide a judgment about the importance of barriers and drivers affecting the adoption of green initiatives. These judgments were then appropriately categorized using the following scale: L = Low, M = Medium, H = High. Table 4 summaries the results concerning the barriers hindering the adoption of green initiatives in the surveyed companies. Such barriers have been divided into two categories: internal barriers (concerning obstacles mainly originated within the firm) and external barriers (concerning inhibiting factors mainly originated outside the firm).

Barriers/3PL Provider types		Full Haulage Providers	Basic Logistics Providers	Advanced Logistics Providers
Internal barriers	Investment costs	H	H	H
	Financial issues and doubtful payback	H	H	M
	Human resources	H	L	L
	Internal knowledge	H	L	L
	ICT skills	L	L	L
External barriers	Customers awareness	H	L	L
	Suppliers awareness	L	M	L
	Financial incentives	H	H	H
	Regulations and standards	H	H	H
	ICT vendors	M	M	L
L= Low importance M= Medium importance H= High importance				

Table 4: Barriers affecting the adoption of green initiatives

In relation with the internal barriers, the table shows that financial issues (such as investment costs, financial resources and doubtful investment payback period) are the barrier considered extremely important by almost all provider types. Surprisingly, the personnel skills (namely ICT skills) are not considered a relevant barrier. Considering external barriers, it emerges that existing legislation is considered an inhibiting factor by all provider types. Regulatory uncertainty and the lack of incentives are factors increasing the difficulties connected with sustainability investments.

The analysis of the importance of barriers by provider types shows interesting differences. The Full Haulage Providers indicate the lack of government incentives and a well defined regulatory framework together with the lack of customer's awareness as the most important external factors inhibiting the adoption of sustainability initiatives. These factors increase the impact of internal barriers concerning financial and human resource dimensions. The specific business conditions in which road haulage companies operates (with customers demanding higher service levels combined with lower service price) do not allow of Full Haulage companies to consider sustainability as a priority. This means that sustainability is considered by these companies as a source of additional costs rather than a strategic driver to differentiate their business. The barriers slowing down the adoption of green initiatives by Basic and Advanced Providers is characterised by a similar profile. Two are the main problematic areas. The first concerns financial issues as the most relevant internal barriers. On the other hand, the lack of a well defined regulatory framework and government incentives are the main external barriers. The customers of these companies show a higher level of sustainability awareness (both type of 3PLs have not indicated customers awareness as a relevant barrier) and the provision of more green service is an expected dimension of the service offering. This results in the need to incorporate in a more explicit way environmental sustainability in the service offering through specific investment in this area. This may explain why governmental financial incentives are considered extremely important by these companies.

Drivers influencing the adoption of green initiatives

Regarding factors stimulating the adoption of sustainability initiatives, information reported in Table 5 show that all firms have indicated the influence of government actions as one of the drivers that have most influence on the decision to adopt initiatives to green logistics. This indicates that companies are

aware that changes in legislation may have a primary role in influencing their green efforts. In addition all provider type indicated that customer may have a positive impact on the decision to adopt green initiatives as this may improving the company's reputation on the market and provides some cost advantages for customers. The role that the management and the entrepreneur may have in stimulating the adoption measures is also considered critical by all provider types.

Drivers/3PL Provider types	Full Haulage Providers	Basic Logistics Providers	Advanced Logistics Providers
Competitors	H	L	L
Customers	H	H	H
Suppliers	L	M	L
Entrepreneur/owner	H	H	H
Management	H	H	H
Employees	L	L	H
Government	H	H	H
Experts and trade bodies	L	L	M
Insurers	L	L	L
L= Low importance; M= Medium importance; H= High importance			

Table 5: Drivers influencing the adoption of green initiatives

In addition to the above factors, the actions undertaken by competitors are also a further stimulation to adopt more sustainable initiative by Full Haulage Providers reflecting the fact that these companies provide a service in a very competitive environment. On the other hand, the Advanced Logistics Providers are much more aware that employees play an important role in disseminating knowledge about sustainability within the company in comparison with Full Haulage and Basic Logistics Providers. Both Basic and Advanced Logistics Providers consider that their support to the customer's sustainability efforts may result in cost advantages and then it is considered a strong sustainability driver. These companies need to maintain and improve relationships with customers and for this reason are paying increasing attention to the customer's sustainability programmes. No stimulating effects are associated with the role of experts and insurers.

Discussion and conclusion

The research results indicate that the surveyed companies adopted initiatives to reduce the environmental impact at different level of involvement due to the different level of awareness and perception of the importance of the environmental aspects. More advanced companies (such as Basic and Advanced Logistics Providers) show a higher level of awareness toward sustainability. These companies undertake actions where the management plays a substantial supporting role committing human and organizational resources. Due to the fierce competition in the road haulage sector, Full Haulage Providers do not attribute an important role to environmental sustainability. The low level of awareness shows that the competitive potential of sustainability is underestimated. This is reflected in the adoption of "point" initiatives that highlights the lack of a strategic vision of environmental sustainability. In fact, this provider type show a poor understanding of the link between actions aimed at reducing the environmental impact of business activities and the achievement of better financial and economic performance. Investing in sustainability initiatives may allow to achieve both better company performance and higher environmental benefits. However, it is not possible to achieve this objective without breaking down the existing barriers. What are the options that 3PL may exploit to overcome obstacles that slow down sustainability investment? For smaller companies, the negative effects of the economic crisis and the lack of (financial and human) resources tend to delay the adoption of sustainability measures. For these companies it seem necessary to set-up support programs that are able to stimulate sustainability initiatives through facilitating the access to both financial resources for making initiatives less expensive (e.g. the EU Marco Polo programme) and appropriate training interventions for human resources. Other interventions may consist in reducing tax charged on the costs companies incurred to develop green initiatives. For larger companies, the success of sustainability initiatives adopted depends primarily on the ability of the management to develop an approach involving customers. The research results show that the customer is often considered as an obstacle for the development of sustainability initiatives. One way to overcome this barrier would be to convince customers to pay extra price for green logistics solutions offered. Another option may be to obtain longer outsourcing contracts in order to ensure a certain return on sustainability investment. The perspective of longer contracts could encourage the development of collaborative initiatives

between customer and 3PL supplier to achieve shared environmental goals. These options can help to overcome barriers and increasing sustainability investments and, at the same time, promote the environmental dimension of the services offered.

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