

# THE CHALLENGE AND ADOPTION OF GREEN INITIATIVES FOR TRANSPORT AND LOGISTICS SERVICE PROVIDERS

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## **Introduction**

Due to the increasing demand for advanced logistics and supply chain management (SCM) services over the past decade fuelled by e.g. globalization, customer orientation and different market conditions, the role of logistics service providers (LSPs) has started to change both when it comes to content and complexity. Furthermore, LSPs and its services have been identified to have potential to become more value-adding operation in supply chains (Bø and Hammervoll, 2010). This applies when LSPs begin to transform their operations and strategy to become more effective from a green perspective. However, research shows that managers in general lack an understanding of what kind of initiatives that can be part of the sustainability performance and furthermore there is a lack in a common overall view about the whole spectrum of drivers and barriers that are relevant to their companies and industries (Berns et al., 2009).

LSPs have started to green their operations in order to help their customers to be better prepared for predictable and future green demand from both market and government legislations. However, the level of initiatives in order to develop and introduce new products and services to provide shippers with green transport and logistics options differs among LSPs. For that reason, this study aims to increase the knowledge how LSPs face the challenge to greening their operations according to their own business and its context characteristics. Therefore, an important point of departure is to understand the underlying mechanisms in form of drivers and barriers affecting these companies in their work to green their operations. Drivers to improve green considerations within logistics may include for example increased demands from authorities and customers, while barriers may consist of for example availability of technology and customers lack of interest. Another underlying mechanisms namely firm characteristic can also influence how LSPs have addressed green initiatives, e.g. large firms are probably more exposed from customers and society and possess more resources compared to smaller firms. Hence, in general SMEs (small-medium sized enterprises) are also an exposed group when larger companies require SMEs to adopt a more green approach, which in turn can generate barriers such as lack of economic resources, lack of knowledge and experience and problems related to company structures (Biondi et al., 2000).

Therefore, the purpose of this paper is to: *develop a base for further investigations of green initiatives carried out by LSPs and analyse if the green initiatives implemented are dependent on firm characteristics of the LSPs, as well as drivers and barriers experienced.*

This paper proceeds with the frame of references, which provides an outline of green initiatives taken in the transport and logistics industry and how these initiatives are influenced by drivers and barriers connected to a LSPs firm characteristics. The following section illustrates the research approach applied. Thereafter findings and analysis from the survey are presented, followed by the conclusions where a summary of findings is discussed and the paper ends with further research suggestions.

## **Frame of reference**

### **Green initiatives in the logistics service industry**

Research in green supply chain management (GSCM) has significantly expanded over the last decades in connection with the growing importance of the environmental component in the management of supply chain. There is not an accepted definition of GSCM initiatives in the current literature and as indicated by Sarkis (2006), the boundary of GSCM is strictly dependant on the type and scope of initiatives adopted by companies participating in supply chain processes. For example,

Zhu and Sarkis (2004) argued that in the literature, GSCM initiatives range from green purchasing to integrated green supply chains flowing from supplier to manufacturer to customer, and include reverse logistics. Furthermore, Eltayeb and Zailani (2009) suggested a general classification of green supply chain initiatives organised into the following three categories: eco-design or design for the environment, green purchasing and reverse logistics. The uncertainty in defining green initiatives is affected by two main issues. Firstly, most of the literature on GSCM has focused on studying a single function or activity rather than looking at the entire supply chain (Rao, Holt, 2005). For example, transportation is the focus of several research studies as result of its significant contribution to greenhouse gas emissions, while little research has been carried out on green initiatives beyond transport (see for example Marchant, 2010). The second issue relates to the need to implement and integrated set of green measures comprising transport and non-transport focused initiatives in order to cover the spectrum of supply chain activities as suggested by Srivastava (2007).

This identification is also important in the logistics service industry. In the last few decades, LSPs have gradually transformed the scope of their service offering shifting from providing single-activity toward a business model based on offering a wider range of services (Ashenbaum et al., 2005). As result of this evolving process, LSPs are in the position to adopt both green transport and non-transport related initiatives or a mix of both altogether. Secondly, LSPs may adopt an approach based on designing an integrated package of initiatives to improve the environmental sustainability of service they provide.

Although the body of literature on GSCM is growing, little research has been conducted on environmental issues in the logistics service industry, but it seems expanding over the last few years (Wolf and Seuring, 2010). A sample of 22 papers dealing with environmental sustainability in logistics service industry has been retrieved. Because of the development of environmental sustainability research in the logistics service industry is still in its infancy, most of these works are empirical-exploratory in nature and they miss of well established theoretical body (the literature background is predominantly based on GSCM literature or technological innovation thinking). In the sample identified there is not an explicit definition of green initiatives in the specific context of LSP, only two papers offer a categorisation of green initiatives. Lieb and Lieb (2010, pp.526-527) on the basis of the survey they conducted on a sample of 28 CEO of large LSPs operating in the North American, European, and Asia-Pacific, clustered green initiatives into four categories: administrative, analytical, transportation-related, and a broadly defined "other" category. Similarly, Martinsen and Hüge-Brodin (2010, p.455) on the basis of a review of general green logistics literature as well as a survey and company homepages scan grouped green initiatives into transport related measures (e.g. fuels, vehicle technology, mode choice, behavioural aspects, transport management), and beyond-transport initiatives (e.g. logistics system design, choice of partners, environmental management system, emissions and energy data). This approach has been used in the present study to investigate current and future adoption of LSPs' green initiatives.

### **Drivers and barriers to greening logistics**

Some of the papers analysed focused on factors influencing green initiatives. In relation to *drivers*, the work of Ho et al. (2009) analyses organisational determinants influencing the implementation of green innovations in the LSP industry. The authors studied the influence of technological, organisational and environmental drivers (derived from the literature on technological innovations) on the willingness to implement green innovations in a sample of 153 LSPs operating in Taiwan. The results indicate that support for innovation of top management, quality of human capital, organisational knowledge accumulation have positive influence on the adoption of green innovative initiatives.

On the basis of the review of literature on company's environmental work, the paper of Isaksson and Hüge-Brodin (2010) proposed a wider perspective in analysing drivers affecting pricing of green initiatives adopted in a set of four Swedish LSP case studies. The authors distinguish between internal and external driving forces. Internal driving forces includes not only organisational issues but also factors related to cost efficiency, employees interest, company's strategy and revenue and cash flow. External factors relate to government legislation, customer concerns, competitors and suppliers. The results indicate that higher revenues as result of better environmental performance, innovation opportunity and top management involvement are the most influential internal driving forces, while pressure from customer is perceived has the most critical external driving force.

A similar approach has been used by Evangelista et al. (2010) that surveyed four LSP case companies in Ireland and Spain. The analysis investigates the impact of external and internal factor

affecting large and small LSP. Also in this research, the influence of top management is perceived as the most influential internal factor among large LSP as well as entrepreneur for small companies. Among external factors, customer influence is the most important driver for large companies, while regulation has been indicated as the most important influential factor for small case companies. A further research conducted by Evangelista et al. (2011) on eight LSP case studies in Sweden, Italy and Ireland show that managerial support, employee involvement and customer pressures are the most prominent drivers of green initiatives.

Extant works dealing with *barriers* to green initiatives in LSPs distinguish between internal and external barriers. Isaksson and Hüge-Brodin (2010) identified financial, technical, information, managerial and organisational as internal barriers, while external barriers include policy and market issues. The findings indicate that among internal barriers financial and information are the most relevant barriers to implement green initiatives. Both policy and customer have significant external influence on green initiatives. These evidences have been confirmed by the study of Evangelista et al. (2011) that highlights financial and market/customer as the major barriers to green initiatives implementation. The importance of financial barriers has been also evidenced by of the EU ETTAR (Environmental Technologies Training and Awareness Raising) project that was aimed at identifying the main barriers to the uptake of environmental technologies in the freight transport sector (ETTAR project, 2007). The results of the project indicate that the employment of these technologies might be accompanied with higher costs/prices for transport sellers and buyers. In addition, long investment periods were also cited as a barrier to the replacement of traditional technologies with more environmentally friendly ones. The role of ICT in the greening of transport and logistics industry has been emphasized by a recent study conducted by EU commission (e-Business Watch, 2009) that demonstrated how ICT can improve the environmental sustainability of the transport and logistics sector in Europe. Environmental benefits also seem to be influenced by the different type of ICT tools applied by LSPs (Zailani et al., 2011). It is therefore suggested that barriers to the implementation of green initiatives can be found in the ICT used and existing ICT skills.

#### **Firm characteristics and green initiatives**

The influence of firm characteristics on the adoption of green initiatives undertaken by LSPs has been studied in recent literature. In general, *size* (in terms of both employees and turnover) is one of the most important firm characteristics expected to influence the adoption of green initiatives. The works of Lin and Ho (2008) and Ho et al. (2009) have shown that number of employee, company history, and capital size influence initiatives taken by LSP companies. In addition, differences between small and large LSPs have been found by Evangelista et al. (2010) and Evangelista et al. (2011). For example, large 3PL companies show a higher level of awareness of environmental sustainability in comparison with smaller ones. This is particularly true for the strategic prioritisation of environmental issues and the role of customer in driving green initiatives. With reference to the adoption of green initiatives, the results reveal that large LSP companies tend to adopt a set of coordinated sustainable initiatives in both transport and beyond transport area. A different approach has been detected between small LSPs that show a focus on reducing the environmental impact of transport activities only.

The relationship between firm characteristics (company size) and drivers and barriers of green initiatives in LSPs has been investigated by Evangelista et al. (2011). This work shows that for large LSPs the most influential drivers are customers and managerial support, while regulation is the most important driver for green measures in small LSPs. The work of Evangelista et al. (2011) does not indicate any relevant difference between large and small LSPs regarding the experienced barriers.

The literature do however miss to analyse the relationship between green initiatives and other important firm characteristics such as the type of product shipped and type of service provided. The purchasing literature indicates that companies in different industries experience different hindrances and drivers which lead them to apply different practices (Zhu and Sarkis, 2006), suggesting that the drivers and barriers experienced by LSPs can be dependent on characteristics such as type of product and service provided.

On the basis of the above description on green initiatives in LSPs four main variables have been identified. The description of the elements related to each variable is reported in table 1.

Variables	Elements	Source
Firm characteristics	Company size (turnover, employees) Geographical reach Product characteristics	Lin and Ho (2008) Ho et al. (2009) Evangelista et al. (2010) Isaksson and Hüge-Brodin (2010) Evangelista et al. (2011)
Drivers	Organisational factors Cost efficiency Profitability Customer pressures Competitiveness Market reputation Government regulations	Lin and Ho (2008) Ho et al. (2009) Eyefortransport (2010) Isaksson and Hüge-Brodin (2010) Evangelista et al. (2010) Evangelista et al. (2011)
Barriers	Financial Organisational Technological Customer Government regulations Competitors/Partners ICT	Biondi et al. (2000) ETTAR project (2007) e-Business Watch (2009) Eyefortransport (2010) Isaksson and Hüge-Brodin (2010) Eyefortransport (2010) Evangelista et al. (2011) Zailani et al. (2011)
Green initiatives	Transport focused initiatives	Wolf and Seuring (2010)
	Transport and beyond transport initiatives	Lieb and Lieb (2010) Martinsen and Björklund (2010) Martinsen and Hüge-Brodin (2010)

Table 1: Details on variables and elements identified in the literature review.

## **Research Approach**

### **Survey design**

A questionnaire survey has been launched and it is still ongoing. The survey investigates a sample of LSPs operating on the Swedish and Italian market. The questionnaire is derived from the researchers' earlier research projects based on case studies and literature reviews. Data and information collected through the questionnaire allow identifying green initiatives, influencing factors (drivers and barriers) as well as the basic characteristics regarding the companies studied. Before launching the survey the questions and answering alternatives were discussed with other academics as well as potential respondents in both Sweden and Italy, by the use of a test-survey.

The questions of the survey addressing *firm characteristics* aspects were mainly of a classifying character. Aspects targeted were the size of the firm (by investigating the number of employees and annual turnover) and geographical market. The position of the studied companies in the supply chain was identified by asking the type of product that make the major part of the deliveries (consumer goods/industry goods). The type of services provided were investigated by distributing the company's turnover into the following categories of logistics and transport services offered namely: transport, warehousing, distribution, value-added services and other supply chain management services.

The questions in the survey addressing *drivers and barriers* were answered on a five-degree Likert scale, ranging from 1 (totally disagree) to 5 (totally agree). The drivers and barriers selected to investigate was based on the findings emerging from the literature review.

The selection of *green initiatives* investigated were based on the frame of reference and the level of implementation were investigated with the same type of five degree Likert scale used when investigating drivers and barriers. The influence of stakeholders has also been analysed.

### **Sample profile**

A mail survey was sent to 1396 respondents, 599 acting on the Swedish market and 797 on the Italian market. The respondents were members in a Swedish network (Sveriges Åkeriföretag and Sveriges Transportindustriförbund) and Italian organisations (Assologica, AILLOG and Confetra). As the survey was launched on early June 42 respondents filled in the questionnaire (39 Swedish and 3 Italian). No specific type of LSP companies was targeted (e.g. size or type of services). In the next section additional information about respondents are presented.

## Analysis methods

Due to the limited number of valid questionnaires receipt, in this preliminary analysis Italian and Swedish answers have been treated as one single group. The plan is to apply a t-test in order to identify significant differences between the two countries (our pre-understanding of the industry is that the Italian LSP market is dominated by small firms compared to the big firms in the Nordic).

This preliminary analysis is aimed at identifying the largest drivers/barriers as well as common initiatives. T-tests were applied in order to identify significant differences between the means. Step-wise regression analyses were made in order to identify significant relationships between the initiatives implemented (dependent variables) and barriers and drivers (independent variables).

Our plan is to continue the analysis and the expected results will allow us to discern if different green initiatives are adopted by different LSPs. This will be achieved by classifying a number of firm attributes (e.g. size, geographical distribution, range of service offerings, the level of ICT adoption) and correlating these attributes to the green initiatives adopted and the type of drivers and barriers affecting these companies. A higher response rate can also make it possible to carry out a factor analysis in order to group the hindrance and drivers experienced, as well as the initiatives implemented. The findings will allow distinguishing if there are any differences or similarities between LSPs active on the Swedish and the Italian market.

## Empirical findings

### Background information of respondents

Since no specific type of LSPs (besides Swedish and Italian) was targeted in the survey, the first survey questions were used to map out the characteristics of the respondents. The respondents are both small and large companies (in terms of both number of employees and annual turnover). The most part of respondents are SMEs, with a number of employees below 100. The annual turnover was evenly spread among the intervals ranging from 2-10M€ to 50-100M€ (see figure 1 below).

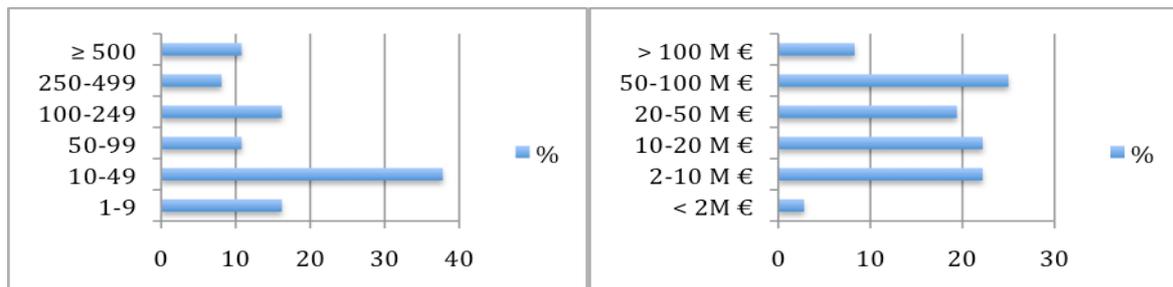


Figure 1: Number of employees (left) and annual turnover (right) in the sample firms

The respondents are furthermore active on a regional to European market. The surveyed companies are active at different geographical scales. The multiple choice question on this topic shows that 41% of the respondents were active on regional market, 38% on local, 35% on national, 32% on an European, and only 16% on global market.

In order to get an understanding of what kind of customer and business areas the respondents were involved within the type of product (industrial or consumer goods) were investigated. The empirical findings indicate that most LSPs handle industrial goods, 41% handle a fairly mix of industrial and consumer goods, 30% handle more than 50% industrial goods, 16% handle only industrial goods, 11% handle more than 50% consumer goods, and not more than 3% handle only consumer goods.

### Green initiatives

Survey evidences indicate that some initiatives are much more common than others (see table 2). The use of ISO 14 000 is the initiative that has the highest mean (4,0) and the comparison of means t-test indicated that this initiative was applied in a significantly ( $p < 0,05$ ) higher extent than most other initiatives. Due to the large resemblance in means, it was however not possible to show statistical significance in means for other items such as climate change, collaboration with suppliers and internal education. On the other hand, emissions off-set programmes was the initiative with the lowest mean (2,0) indicating that this was only to a minor extent applied.

	N	Mean	Std. Deviation
Renewable/green energy	33	2,6	1,54
Collecting information on energy/carbon footprint	34	3,1	1,59
Reduction in the amount of packaging	34	2,8	1,56
Increase the amount of waste recycled	34	3,4	1,30
Environmental certification (e.g. ISO14001)	35	4,0	1,62
Environmental Management System (EMS)	35	3,1	1,68
Emissions off-set programmes	35	2,0	1,52
Setting a corporate GHG emission reduction target	35	3,5	1,62
Cooperation with suppliers/partners in order to reach environmental targets	35	3,4	1,48
Cooperation with customers in order to reach environmental targets	35	3,2	1,39
Environmental education/training/information for employees	34	3,8	1,31
Environmental education for our customers and/or suppliers/partners	35	2,4	1,50

Table 2: Mean values of green initiatives.

#### Drivers to greening logistics/initiatives

The influence from different stakeholders seems to play an important role in driving LSPs to develop and implement green initiatives (see table 3). Top management received the highest mean in this study (4,3) and the t-test showed that this was a significantly higher mean than all other drivers from stakeholders, except from the customers. The high mean regarding the driving force from customers showed a significantly higher influence than most other stakeholders (except top management, owners and employees). The least significant driving forces were identified from insurance companies (mean 2,5) and experts (mean 2,6).

	N	Mean	Std. Deviation
Competitors	35	2,8	1,43
Customers	35	4,1	1,19
Management	35	4,3	1,06
Transport/Logistics Suppliers or partners	35	3,3	1,24
Transport/Logistics Equipment Suppliers	35	2,9	1,28
Employees	35	3,4	1,38
Experts (academics/consultant)	34	2,6	1,56
Trade bodies	34	3,3	1,54
Government and public bodies	34	3,5	1,67
Owner/shareholders	35	3,8	1,37
Insurers	34	2,5	1,62

Table 3: Stakeholders driving the implementation of green initiatives.

Several reasons were also identified supporting and driving the implementation of green initiatives (see table 4). Common for most reasons studied are that they are experienced to have a quite similar and high influence, e.g. only two of the reasons have a mean value below 3.6. The reason to reduce the costs for suppliers had a significantly lower mean than most other reasons studied (not significantly lower than reducing the costs for customers and economical means of control). Furthermore the driving influence from different economical means of control had a significantly lower mean than all other reasons studied except the cost reduction for customers and suppliers. The highest means were identified for increase firm's competitiveness (4.6), improve customer relationship (4.4) improve brand image (4.4), and improve customer service (4.2). This clearly indicates the important role of the customers in implementing green initiatives.

	N	Mean	Std. Deviation
Cost reductions for customers	34	3,6	1,16
Cost reductions for suppliers/partners	34	3,2	1,35
Cost reductions within my company	34	3,9	1,20
Improve customer relationship	34	4,4	0,92
Improve customer service	34	4,2	1,09
Increase firm's competitiveness	34	4,6	0,86
Increase firm's revenue	34	4,2	1,07
Increase ROI	34	4,1	1,42
Increase market shares	34	4,1	1,15
National and EU laws and regulations	34	4,0	1,19
Economic means of control (e.g. taxes, subventions)	34	3,3	1,41
Improve brand image	35	4,4	0,98
Reduce company risk	34	3,8	1,34

Table 4: Reasons that drives the implementation of green initiatives.

### Barriers to greening logistics/initiatives

In general, the barriers to implement green initiatives are minor than the drivers. The largest barrier has a mean on 3.9, to be compared with the 9 drivers with a mean above 4.0. The external barriers with the highest means are lack of economic incentives (3.9) (see table 5). Due to the large resemblance in means it was however not possible to show statistical significance in means in comparison with technology, customer support and standards. The smallest means were identified for the external barriers negative impact on customer supply chain (2.8) and lack of ICT vendors (2.9).

	N	Mean	Std. Deviation
Limited access to technology that reduces environmental impact (e.g. vehicles, aerodynamic features)	40	3,4	1,56
Lack of customer interest	40	3,3	1,44
Lack of customer support	38	3,6	1,52
Negative impact on customer supply chain	40	2,8	1,69
Lack of transport/logistics suppliers' or partners' interest	39	3,1	1,49
Lack of transport/logistics suppliers' or partners' support	40	3,1	1,57
Lack of economic incentives	40	3,9	1,35
Lack of clear regulations	39	3,5	1,48
Lack of ICT vendors selling specific product supporting green logistics	40	2,9	1,53
Lack of standards (including ICT standards)	40	3,8	1,70

Table 5: External barriers to the implementation of green initiatives.

The largest internal barriers towards the implementation of green initiatives experienced by the LSPs surveyed are the cost for investments (mean 3.8) and doubtful payback period (mean 3,7). These barriers show a significantly higher mean compared to all barriers with a mean below 3.1 (see table 6). The lowest mean was identified for external ICT skills (2.4).

Despite the low means regarding ICT, the few Italian respondents tend to highlight these aspects to a larger extent, e.g. the external barrier, lack of ICT vendors, was given a 5 by 2 of the 3 Italians, and only 1 of the 39 Swedish respondents.

	N	Mean	Std. Deviation
High investments costs	40	3,8	1,22
Doubtful payback period	40	3,7	1,49
Lack of financial resources	39	2,7	1,35
Lack of organisational/human resources specifically devoted to manage such initiatives	40	3,4	1,30
Lack of knowledge/skills in-house	40	3,0	1,35
Lack of ICT skills internal	40	3,1	1,40
Lack of ICT skills external	40	2,4	1,35
High ICT running cost	40	3,4	1,42

Table 6: Internal barriers to the implementation of green initiatives.

### What influences the green initiatives?

As mentioned in the research approach section, we indicate that the drivers and hindrances influence the implementation of different green initiatives. In this preliminary analysis we have decided to investigate the influence from the strongest contingency factors, i.e. barriers and drivers with a mean over 4.0. A result of this decision is that no barriers were included (all had a relatively low influence, all with a mean below 3.9). The regression analyses indicated that the driving force from customers do seem to have an important and significant influence on the implementation of green initiatives implementation (see table 7).

Dependent variables – Green initiatives	Independent variables – Strong drivers	$\beta$	$R^2$	F	Tolerance
ISO 14 000			0.258	11.112	1.000
	Customer	0.508**			
Climate compensation			0.183	7.149	1.000
	Customer	0.427*			
Goal climate change			0.472	13.855	1.405
	Customer	0.426**			
	Improve brand image	0.357*			
Cooperation with suppliers			0.244	10.356	1.000
	Customer	0.494**			
Cooperation with customers			0.443	25.428	1.000
	Customer	0.665***			
Environmental education - internal			0.596	22.097	0.950
	Customer	0.660***			
	Increase firm's revenue	0.278*			
Environmental education - external			0.202	8.090	1.000
	Customer	0.449**			

\* Significant at the  $p < 0.05$  level, \*\* Significant at the  $p < 0.01$  level; Significant at the  $p < 0.001$  level

Table 7: Regression analyses of strong drivers and green initiatives.

### Discussion and conclusion

This paper describes the way LSPs have started to adopt and manage green initiatives into their operations. The literature review shows that there is no commonly accepted definition of what constitutes green initiative in a logistics context. In contrast, there seems to be a disagreement between scholars regarding what actually constitutes green initiatives. Twelve different green initiatives have been investigated in this study, inspired by initiatives suggested by e.g. Martinsen and Høge-Brodin (2010). The initiatives studied represent a set of green transport and non-transport focused initiatives, in order to cover the spectrum of supply chain activities as suggested by Srivastava (2007). Environmental certifications were the initiative with the highest mean (4.0). One explanation to this can be that Sweden was very early to adopt environmental certifications in the beginning of the 1990-ties. Another could be that the mechanism of ISO 14 000 does drive selling companies to get the certification. Some initiatives studied were surprisingly only applied to a minor extent, such as the use of renewable energy (mean 2.6). This was furthermost surprising since much focus in the Swedish

debate and in the research founding has been directed towards an increased use and applicability of greener energy sources. However, much more research is needed to gain a deeper understanding regarding why these initiatives are applied to different extent.

The study provides a deeper understanding of how green logistics services can be approached and what drives and inhibits that process. Improved customer relationships, improved brand image and improved customer service are significantly stronger reasons that drive green initiatives. This indicates that customers have an important role in driving the greening of LSPs services. As often highlighted in the service and product development literature, customers play an important role in the development and ought to be involved in an early stage of product development. However, little research is available regarding the inclusion, collaboration and information exchange between LSPs and their customers in the development of green initiatives. Thus, this is an area in need for much further research in order to understand and single out successful ways to include the customers in the development of new services. The regression analyses also singled out customers as a driver influencing the implementation of seven of the 12 initiatives studied. This result further calls for the important need to only study the LSPs environmental performance in isolation but instead to broaden the scope and include furthestmost the customers in future analysis.

One of the strongest reasons to implement green initiatives was increased firm's competitiveness (mean 4.6). Despite this the competitors as a stakeholder group driving the implementation of green initiatives received a very low mean (2.8). There is a need to further investigate and understand why this gap is so large. Potential explanations to this could be that LSPs view green initiatives as a competitive advantage in the future but sense no pressure from their competitors today. Cost for investments and doubtful payback period are the strongest barriers identified. One explanation to this may be that most of the respondents are SMEs. These companies may experience the financial part as a stronger barrier than a larger company with more resources. Furthermore, the respondents do not describe ICT as a major barrier. Perhaps the result is dependent on geographical differences (different countries studied). Further analyses and gathering of a larger Italian sample in this study can be an important foundation to further analyse this aspect.

The survey findings also indicate that LSPs experience drivers as having a much larger influence on the implementation of green initiatives as opposed to barriers. 10 of the 24 drivers studied had a mean above 4.0 while the highest driver had a mean of 3.9. The imbalance between drivers and barriers, with a much larger influence of drivers are identified in e.g. green purchasing literature (e.g. Walker et al., 2008; Björklund, 2011). Also a simple search in the logistics literature using the search terms driver as compared to hindrance/obstacle provides much more findings when using the term driver.

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