

## Study of reverse logistics practices in the industry of Portugal

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### Abstract

Intrinsically linked with the returns process, Reverse Logistics (RL) appears as a relevant study area. Although there are studies on RL practices, none of these studies are related to the Portuguese case. Therefore, a survey was conducted in Portugal to fill this gap. This study was applied to a group of Portuguese companies of four sectors: 1) Food Industry; 2) Automotive Industry; 3) Electronics; 4) Transformation Industry. These four sectors are highly diversified, regarding to how they manage RL. The results demonstrate that Portuguese companies consider important the management of RL. The most common practice used is the proper disposal of returned products. Mainly, companies adopt RL due to the benefits associated with improvement of customer satisfaction and reduction in logistics costs. The biggest barrier to the implementation of RL is a lack of strategic planning by the companies on handling returned goods. The main reason affecting the performance of RL activities is the lack of quality of the returned product. The study also allowed to estimate the volume of returned products and the costs of RL.

**Keywords:** reverse logistics, supply chain management, survey.

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### 1. Introduction

Currently, the retail world faces growing uncertainty on the demand of consumers. Adding to that the national economic situation is an aggravating factor of the situation in the Portuguese market. In addition, the seasonality of sales and the implementation of various campaigns and promotions throughout the year, are also responsible for increased difficulty in making accurate forecasts of consumer demand. On other hand, the operations of Reverse Logistics (RL) contribute decisively to the value and competitiveness of enterprises, where margins and profitability are increasingly lower, so the challenge to overcome is to transform costs in value added to the supply chain management. Therefore, it is increasingly important to consider RL relevant and to end labelling it as "the forgotten child of the supply chain" (Morrel, 2001).

The lack or poor implementation of the RL generate disastrous effects for businesses and cause high costs in transportation and storage, increase processing times and accumulation of products without a destination, conflicts with customers/suppliers, legal and environmental issues. This lack of planning and implementation on RL systems, is a reality in Portugal, making the costs of RL relatively high (Logística Moderna, 2013). One of the biggest difficulties for companies is how collect, effectively and economically, all products from the place where they are no longer desired and transfer them to a place where they can be processed, reused or recovered. It is in this context that emerges this study, because there are studies on RL practices, but in Portugal this gap is clear, with a lack of empirical studies.

The main objective of this study is to evaluate the perception on RL practices in the Portuguese context. To achieve this goal, were addressed the following research questions (RQ): 1) What are the RL practices most common in the Portuguese industry?; 2) What are the main reasons that lead companies to adopt RL practices?; 3) What are the main benefits associated with adopting RL practices by companies?; 4) What are the main barriers/difficulties experienced by companies for implementing RL practices?; 5) Is important for businesses implementing RL operations?.

## **2. Literature Review**

In the past, the RL has been seen only as a cost for the companies, however the perspective on RL is suffering strong changes. Whether by its economic value gained in reusing used products, or even by using used components in the manufacture of new products (Savaskan and Van Wassenhove, 2006). The benefits of RL begin to be not only understood, but also practiced in a global scale. With this concerns about product returns and proper implementation of RL systems, the academic community has been studying this area and as a result, in recent years, has been published increasingly more scientific articles on this subject (Rubio et al., 2008).

In the early nineties, emerges the first definition of RL, Stock (1992) emphasis on the recovery aspects of RL, defining as: "... the term often used to refer the role of logistics in recycling, waste disposal, and management of hazardous materials; a broader perspective that includes all logistics activities as recycling, substitution, reuse of materials and disposal of products". Furthermore, Rogers and Tibben-Lembke (1998) summarize RL as the process of moving goods from the final destination to another point in the supply chain, in order to capture unavailable value. Fleischmann et al. (2004) complement this definition by listing several possible ways to recapture value after the products reach the final destination in the traditional supply chain. These authors emphasize that many of the goods move beyond the traditional supply chain, consequently causing additional business transactions. More recently, Pokharel and Muha (2009) state that the focus of RL belongs to the waste management, recycling of materials, recovery of components or product recovery. According to the authors, the RL involves a paradigm shift in the product life-cycle management. Traditionally the life cycle of a product was between the period of its manufacture and its disposal ("cradle-to-grave"); currently the RL allows to change the product life cycle, between the period from manufacture until its recovery ("cradle-to-cradle").

Companies have been using more liberal return policies, in order to reduce the risk of the end customers and thus increase sales volume (Smith, 2005). In the United States, the estimates are even more significant with the annual costs for the manufacturers and retailers are about \$ 100 billion which corresponds to a reduction of the yield at about 3.8% (Blanchard, 2007), while Greve and Davis (2012) states that the electronics industry is the amount exceeding 14 billion dollars, as well as the rates of returns of the end customers ranging from 5% to 9% of sales for most retailers.

Implementing an effective RL system helps create multiple benefits for businesses, including increased customer satisfaction level, reducing the level of investment in resources and reduce storage and distribution costs (Andel, 1997). Thus, the integration of RL in supply chains is increasingly used as a strategy, to increase profits or to promote sustainability and customer satisfaction (Du and Evans, 2008). That said, Brito and Dekker (2003) identify the main reasons that lead companies to adopt RL operations:

- Economics - is a decisive force in the RL. Companies have direct benefits through lesser use of raw materials, reduction in disposal cost, etc. An organization also have indirect benefits due to competition, environmental image, improve customer-supplier relations, etc.
- Legislation - refers to any jurisdiction that indicates that a company should recover all the products produced by them or own responsibility of products after their end-of-life. With the growing concern for the environment, laws have been emerging in European, like the Directive of the European Commission in 2003, that forced companies to develop their RL processes with the introduction of quotas for the recovery, recycling and packaging.
- Corporate citizenship - this concerns a set of values and principles that motivate a company or organization to become involved responsibly in RL activities. This motivation arises from the need to have a responsible and sensitive image to environmental issues.

The activities of RL networks may differ, such as, for example, the type of returned products to be recovered and deployed logistics network. We identify five essentially sequential recurring groups of activities of various supply chains with RL (Prahinski and Kocabasoglu 2006; Barker and Zabinsky 2008; Silva et al. 2013). They are: 1) acquisition of products; 2) collection of products; 3) inspection and disposal; 4) recovery and distribution and resale.

Ravi and Shankar (2005), studied the main barriers of the implementation of the RL operations in the automotive industry. The authors concluded that there are five main barriers, lack of knowledge of RL, lack of commitment by managers, problems with product quality, lack of strategic planning and financial constraints. However, the lack of knowledge in RL practices is the most significant barrier. Therefore, managers should focus on the development of awareness on the use of RL.

Aberdeen Group (2006) conducted a study on RL based on a survey of 175 companies from various continents. The aim of this study was for perceive and analyze the best management practices on RL. In total of the companies surveyed, 61% said that effective management of RL is very important. The authors, also found that companies spend about 9% of sales in costs related with RL.

A study by Chan and Chan (2008), a successful RL systems may result in greater customer loyalty and reduced operating costs due to the reuse or replacement of products. Their study obtained a total of 73 companies of the mobile industry in Hong Kong and 34 interviews. This research showed that companies in this sector consider important RL, but compared to other issues, their importance is smaller and revealed that this is the biggest barrier on the implementation of RL.

In the same context, as our study, Ravi and Shankar (2015) developed a study based on a survey of 105 companies present in India, where they investigated practices in RL in four sectors of Indian industry: automotive, paper, food and electronics. With the results, the authors concluded that, the adoption of practices in RL is very important and RL should be thought at a strategic level. Also found that the volume of returned products is an important factor to implement RL. But perhaps the most important factor of adoption RL is the economic benefit associated.

### **3. Research Method**

The questionnaire was designed to obtain answers to all research questions previously presented. The questions were based on information obtained from the work of the authors mentioned in the literature review (Andel 1997; Daugherty et al. 2005; Fleischmann et al. 2004; McCarthy-Byrne e Mentzer 2011;

Ravi and Shankar 2015; Ravi and Shankar 2005; Rogers and Tibben-Lembke 1998; Tibben-Lembke and Rogers 2002; Tibben-Lembke 2002), and addresses issues like the importance of RL, its benefits, barriers and implementation difficulties. The five point Likert scale was considered appropriate for the evaluation of this type of issues.

The initial questionnaire was used as a pilot test for the survey. This pilot was tested by a group of teachers, researchers, colleagues (unrelated to the topic) and senior consultants specialists in SCM. Later questionnaires were tested by five companies. After the pre-test some of the questions were modified to convey their intended meaning and a few other questions were also deleted.

The information collection method adopted was the questionnaire via Internet. Most of the entities under study were identified by Logistema, a consultant partner in this study, and for certain entities was necessary to make a search through industry associations in order to obtain associated members. In total 225 companies operating in Portugal were identified for the survey. The survey was conducted during May-September 2016. Questionnaires were send, via e-mail to logistics directors and general e-mail addresses, with information about the study, identifying the objectives and scope of the work, with a link to the questionnaire. Reminders were sent to all the non-respondents. In addition, a lot of phone calls were made in order to increase the number of responses to the questionnaire.

In this research, four sectors of Portugal industries dealing with RL operations were selected for this survey. These were: 1) Food; 2) Automobile; 3) Electronics; 4) Transformation (Metallurgical, Energy, Textile, Paper, Wood). In the food industry, RL has a unique role with regard to food safety. By return of food product policies, companies allow the return of products, preventing infection problems or intoxication. Automobile sector, is one of the most dynamic and important sector in Portugal economy. The RL is very important, due to the type of returns (defective product, etc.), as well as the reuse of the main components and subsequent resale. In the electronic industry, the kind of product commercialized has short life cycle due to software updates, among others, originating a high rate of replacement or removal. The own nature of the products, makes them obsolete because of introduction of new equipments, this is the major challenge (Chan and Chan, 2008). Currently, the transformation sector is losing importance, being necessary to achieve its revitalization on modernizing their production processes. This is where the RL enters, since it allows reduction of costs, less use of raw materials. These four sectors are highly diversified in nature with respect to how they operate their RL programs.

#### **4. Results and Discussion**

For statistical analysis was used Excel Microsoft Office and IBM SPSS software for statistical analysis, which consisted essentially to classify the variables based on average values and frequency distributions. The objective was to test the research questions so that the average values of the dependent variables are equal to all categories considered the independent variable, to the dependent variables were assumed as normally distributed, then the following procedure was adopted:

- Test the reliability and internal consistency of responses, Cronbach's coefficient ( $\alpha$ ), for questions in a Likert scale. Was considered as limits of acceptance to Cronbach's  $\alpha > 0.6$ , these values are acceptable when it comes to an exploratory study (Hair et al., 2010);
- The T-test was used to test the "indifferent" value of the overall means, which is the value in the measuring scale that represents a shift in the perception;

- The Levene F homogeneity test was used to verify that the variances of the dependent variables are similar;
- If the Levene F statistic has a significance value greater than 0.05 then ANOVA is performed;
- If the Levene F statistic had a significance value lower than 0.05, which means the variances of the dependent variables are not similar, then the Welch test is used, because is a more robust test for equality of means;
- Finally, when the average values of the dependent variable differ between the categories considered, the post-hoc Tukey test is applied to determine which categories differ.

#### 4.1. Sample

The respondents were divided into sectors, Food Industry (FI), Consumer Electronics (CE), Automotive Industry (AutI) and Transformation Industry (TI).

Of total 225 questionnaires sent, 43 questionnaires were received (*Table 1*). This gives an overall response rate of 19.2%. This situation is common in surveys via email and can lead to non-response bias (Kypri et al, 2004; Sax et al, 2003). To test for non-response bias we compared the sectors distribution of potential respondents (those whom the survey was sent electronically) with the distribution of sectors that effectively answered the questionnaires. Using the  $\chi^2$  test it was determined that there is no statistical significant difference between the distributions of potential respondents and respondents of the survey, which might indicate a low non-response bias.

**Table 1 - Survey respondent distribution.**

Industrial Sector	Potential Respondents		Respondents	
	Frequency	Percentage	Frequency	Percentage
Food Industry	94	41.8	22	51.2
Consumer Electronics	51	22.7	5	11.6
Automotive Industry	49	21.7	8	18.6
Transformation Industry	31	13.8	8	18.6
<b>Total</b>	<b>225</b>	<b>100</b>	<b>43</b>	<b>100</b>

Out of 43 usable responses, food industry accounts for 51.2% of the answers, transformation industry and automotive industry accounts for 18.6%, Electronic sector 11.6%. In terms of employees, 28 companies had more than 250 employees, 12 in the range of 51-250 and 3 companies had less than 50 employees. In relation to the companies' sales volume in the last year, 35% of companies had a turnover between 50 and 250 million euros, 30% had sales over 500 million euros, 21 % between 250 and 500 million euros, and 14% shows sales lower than 50 million euros. The distribution of firms by the different sectors, show that 73.9% of respondents are positioned producers, 10.9% are positioned as retailers, and 8.7% are wholesalers. Finally, was conducted a reliability analysis and internal consistency of responses. Thus, one item was removed of one indicator to achieve the previously limited consistency levels. The remaining indicators have good levels of consistency, respecting the limits of  $\alpha > 0,6$ .

#### 4.2. General Questions

The importance that companies give to RL management is revealed by 33% of the responses, that sees RL with the utmost importance, but for 26% of respondents LI is "indifferent", and only 5% of the companies surveyed claim to RL as "Not Important". With the results we can say that RL in Portugal is

important and aligned with previously highlighted studies such as the study by the Aberdeen Group (2006), which stated that the majority of companies surveyed (60%) considered that effective management of RL it is extremely important to the overall performance. Also, there is no significant difference between sectors, that can be observed. The RL offers many benefits, including: improve logistics efficiency and reduction of logistics cost. With 53.5% of the replies (23 responses each option). The less observed benefits are "Improved employee productivity" with only 2.3% of respondents and "Increase on turnover " with 9.3% of the answers. These results meet expectations of the literature review.

The volume of returned products that are recovered was measure in this study. With 26% of companies stated that they recover more than 50% of products, this reveals a growing trend of RL practices and awareness of entities to minimize the costs in raw materials. Only 9% of respondents recovers 6% to 26% of the products. Unfortunately, 30% of the managers cannot estimate a value, which shows difficulties for companies to observe the value recovered from returned products.

The respondents were enquired to estimate the costs of RL according to the volume of sales. The majority of the companies (about 70%), stated that have costs lower than 2%. While 19% of respondents indicate that they have no knowledge on this subject and can't estimate a value, which reveals a lack of visibility of total costs. However, 5% of the companies surveyed say that RL costs more than 10% of total sales volume. The values obtained support the values presented on the literature review. Logistica Moderna (2013) stated that 23% of companies in Portugal had a cost of less than 3%, Greve and Davis (2012) reported that the LI has a weight of 4% in the turnover. These values are aligned and even exceed the values of previous studies, being able to assume that companies have greater knowledge on this topic and have a optimized system on reverse flow management, but on the other hand may show a lack of visibility by managers on the real cost, because the values are very optimistic

Is intended to identify the plans of businesses regarding RL management practices. The vast majority of respondents already have RL software implemented and operational. On the negative side, investment in new infrastructures specialized on RL management and R&D on new techniques, companies have no plans to invest on a short term.

#### **4.3. Adoption Level of Reverse Logistics Practices**

RL encompasses all the activities in managing and controlling the reverse flow of products from the customer to the manufacturer, for product recovery or proper disposal. Regarding to the frequency witch companies execute this practices, the option with the highest score is "Proper disposal of returned products" with 4.05, followed by "Training of employees" with 3.81 points, on other hand the least common practice is "picking the products" with 3,02 points, as can be seen in Table 2. The item "Resale of returned products" was eliminated by the Cronbach's alpha ( $\alpha$ ). The results show that there is no statistical difference at a significance level of 5% between the most common practices and sectors. However, analyzing the table the most used practice on FI, CE and AutI is the "Proper disposal of returned products" while for the TI sector is the "Training of employees". These results can be explained, because not all products can be easily recycled. At this stage the products are destroyed for lack of knowledge of new value recovery methods and lack of training of employees who send the product for destruction without trying to recapture value from it.

**Table 2 - Reverse logistics practices by sector**

	Type of sector*				Global	ANOVA Sig.	Welch Sig.
	FI	CE	AutI	TI			
Proper disposal of returned products	4.00	4.00	4.38	3.88	4.05	0.815	
Training of employees	3.73	3.40	3.88	4.25	3.81	0.313	
Recovery value of returned products	3.45	3.00	3.75	3.00	3.37	0.511	
Picking of the product	3.00	3.20	3.50	2.50	3.02		0.184

\* Values on a Likert scale of 5 points (1 - Never; 5 - Always),  $\alpha=0.62$

#### 4.4. Mortives for Implementing Reverse Logistics

The most important reason for respondents is to "Improve customer satisfaction" with a score of 4.23, the second most important reason is the "Reduce logistics costs" with 4 points. The reason with less importance to companies is the "Lifecycle of products" with 2.86 points. As can be seen in Table 3. The majority of the implementation factors to RL differs from the score 3 ("indifferent" in a scale of importance), except "Reduce stocks" and " Lifecycles of Product". However, the results show no significant difference at the 5% significance level for reasons of implementation and the selected sectors. By observing the values obtained, is clear that the main reason for companies to implement RL operations, is due to the need to improve the satisfaction/relationship of the company with its customers. This factor is unanimous among all sectors under evaluation.

**Table 3 - Reasons to implement reverse logistics**

	Type of sector*				Global	T-Student Sig.**	ANOVA Sig.
	FI	CE	AutI	TI			
Improve customer satisfaction	4.23	4.40	4.13	4.25	4.23	0.000	0.947
Reduce logistics costs	4.14	3.80	3.75	4.00	4.00	0.000	0.727
Legal requirements	4.14	4.40	3.75	3.25	3.93	0.000	0.250
Recapturing value of returned products	3.73	4.00	3.50	3.88	3.74	0.000	0.803
Increasing competitiveness	3.73	4.20	3.50	3.50	3.70	0.000	0.598
Reduce stocks	3.32	3.60	3.25	3.38	3.35	0.058	0.962
Lifecycles of Product	3.09	2.40	2.88	2.50	2.86	0.421	0.474

\* Values on a Likert scale of 5 points (score of 1 indicates a low importance and 5 a higher),  $\alpha=0.83$

\*\* T-Student test for overall means (test value = 3 "Indifferent")

#### 4.5. Barriers in Implementing Reverse Logistic

The practice of RL is not free from barriers, so efficient management of these barriers can result in successful RL systems. The biggest barrier identified by respondents is the "lack of strategic planning related to reverse logistics" with 3.58. The option with the lowest score, with 3.02 points, is the "lack of technological systems" which reveals that for companies, technological systems are not the reason for a non-implementation of RL. Table 4, presents the barriers to implementation by sector. The majority of the barriers identified differs from the score 3 ("indifferent" in a scale of importance), except "financial constraints" and "lack of technological systems" with significance values less than 5%, as can be observed by T-test. Also, the results show no significant difference at a significance level of 5% between the barriers and the sectors. Is possible to see, that among the sectors studied, CE ranks with a bigger degree of importance the barriers "lack strategic planning related to reverse logistics" and "lack of training". FI identifies as the biggest barrier the lack of training of its employees. On the other hand, the TI ranks the "financial constraints" and "lack of strategic planning related to reverse logistics" as most significant

barriers. As for the AutI the greatest barriers to RL is the "lack of training", "Lack of interest on the part of decision makers" and "reverse logistics of importance in relation to other matters".

**Table 4 - Barriers to implementation of reverse logistics by sector**

	Type of sector*				Global	T-Student Sig.**	ANOVA Sig.
	FI	CE	AutI	TI			
Lack of strategic planning related to reverse logistics	3.50	3.80	3.50	3.75	3.58	0.002	0.926
Lack of training	3.64	3.80	3.63	2.88	3.51	0.002	0.197
Lack of interest by decision makers	3.41	3.60	3.63	3.63	3.51	0.012	0.956
Relations with partners	3.45	3.60	3.50	3.38	3.47	0.012	0.990
Importance of reverse logistics in relation to other issues	3.41	3.20	3.63	3.50	3.44	0.007	0.909
Financial constraints	3.05	3.60	3.38	3.75	3.30	0.108	0.501
Lack of technological systems	3.05	2.60	3.50	2.75	3.02	0.898	0.514

\* Values on a Likert scale of 5 points (score of 1 indicates a low importance and 5 a higher),  $\alpha=0.85$

\*\* T-Student test for overall means (test value = 3 "Indifferent")

#### 4.6. Reasons that affect the Performance of Reverse Logistics

Measuring the performance of any system is essential to enable improvements in management processes. This is especially important in the management of RL, since it is characterized by high uncertainty in the quality, quantity and timing of the returned products, making the performance measurement a tricky task. The results are shown in Table 5, where we can verify that the "Uneven returned product" and "difficulty in predicting returns" have the bigger score with 3.88 and 3.83 points, respectively. On other hand the "Marketing Difficulty of products used" with 2.81, is identified as a reason that less affects the RL. "Uneven returned product," "Difficulty in predicting returns", "Visibility/Viability of costs" and "Transportation of many sites to one/few places" obtained a different score of 3 ("indifferent"), as can be observed by T-test. The results reveal that there is no statistically significant difference between the reasons and sectors, ANOVA test. The CE sector, ranks higher on the importance scale of factors "uneven returned product" and "Difficulty in predicting returns." But the difference in scores between this sector and the remaining are not significant in order to extrapolate conclusions, but it is important to note this difference.

**Table 5 - Reasons that affect the realization of reverse logistics by sector**

	Type of sector*				Global	T-Student Sig.**	ANOVA Sig.
	FI	CE	AutI	TI			
Uneven returned product	3.86	4.60	3.63	3.75	3.88	0.000	0.323
Difficulty in predicting returns	4.00	4.00	3.25	3.88	3.83	0.000	0.389
Visibility/Viability of costs	3.86	3.80	3.38	3.63	3.72	0.000	0.606
Transportation to many places for one/few places	3.36	3.80	3.25	3.88	3.49	0.002	0.574
Poor inventory management	3.32	3.20	3.25	3.38	3.30	0.079	0.955
Product lifecycle issues	3.32	2.80	2.75	2.75	3.05	0.789	0.364
Lack of clarity in relation to the disposal options	3.36	3.20	2.63	2.38	3.02	0.901	0.161
Difficulties on marketing used products	2.82	3.40	2.38	2.88	2.81	0.263	0.416

\* Values on a Likert scale of 5 points (score of 1 indicates a low importance and 5 a higher),  $\alpha=0.82$

\*\* T-Student test for overall means (test value = 3 "Indifferent")

## 5. Conclusions

This research, examine the perceptions of RL followed in Portuguese companies through a questionnaire-based survey. The results show that Portuguese companies considered implementing RL programs in their

organization as a strategic-level decision, as RL programs involve significant allocation of capital and resources.

The main implications of this study are as follows:

- 1) RL is an issue that attracted the attention of academicians and industry in the recent years. With increase in the competition on a global scale coupled with concerns to environment, RL is becoming a necessity. Managers need to consider integration of collection, inspection and consolidation of used products with forward logistics in RL programs.
- 2) The disposal of products is the most common practice among the surveyed companies, which may be due to lack of knowledge of new recovery methods and lack of training of employees who send the product for destruction without trying to recapture the value associated.
- 3) Improve customer satisfaction and reduce logistics costs are the main factors responsible for adoption of RL by Portuguese organizations.
- 4) The biggest barrier identified by respondents is the lack of strategic planning regarding RL. This may be related to the lack of attention of logistics managers or to the lack of importance given to RL.
- 5) The lack of quality of the returned product and the difficulty of predicting returns, emerge as the main reasons that affect the performance of RL management. Most of the products coming from the reverse channel does not have the complete package or returned products may be damaged. Due to the high uncertainty on inverse distribution is essential to exchange information between forward flow and reverse flow to ensure good RL management.

Volume of products entering the inverse stream is a key driver of RL activities. It is seen from the survey that those organizations that had higher volume of returned products (big companies) tended to develop expertise in better operating their RL programs. Literature review indicates that economic, ecological and legislative are the drivers to initiate RL activities. One of the important finding of this research is that Portuguese companies have adopted RL due to the economic benefits associated with them.

State of art technologies for tracking and tracing of products being returned are necessary for successful RL programs. Present research has indicated that Portuguese companies have already invested in terms of EDI, RL software, new logistic resources, etc., which is a good step in the right direction. On the other hand, companies do not have plans to invest in the short term on R&D, new installations, new hardware, etc.

Results of the survey have indicated that Portuguese companies are aware of the benefits of RL which acts as one of primary reasons for implementation of RL programs. For further work is recommended to repeat this study, but with a bigger sample size. Also, it would be interesting to attend the entities and their partners in order to understand the factors of motivation and vision that each party provides for implementation of RL strategies.

Although the work has limitations, it is believed that the results presented contribute to a better knowledge of this field, because until now few investigators have addressed this topic in Portugal. When analyzing this research work we believe that it presents a good contribution by adding value to the field of logistics management.

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