Reverse Logistics as Source of Competitive Advantages and its Relationship with Total Quality Management

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Abstract. This paperwork analyze how Reverse Logistics (RL) provides great benefits like reduction of costs, new opportunities of business and facilitates adaptation to new regulations in the matter of environment, this benefits improves performance of the company and favour their growth. We analyze how companies which have Total Quality Management (TQM) and implanting a Reverse Logistics System (RLS) improve their recovery activities and reusability of materials and products, reduce its costs and improve its enterprise performance.

Keywords: Logistic, Reverse Logistics, Total Quality Management

1. Introduction

Increasing competitiveness between companies, in markets where every time real differences between products are smaller, has forced to companies to develop all kind of services policies to the client, such as: "if you are not satisfied, we give back your money", "guaranteed satisfaction", "use it, and if in 60 days you does not obtain performance, we received it without making questions", among others. From the client perspective, these ones are rights and privileges which allow enjoying a greater service quality, and every time it is more common. Although, what kind of implications has it for the industrialist?

Study of all product flow in opposite way, from the consumer to the manufacturer, and to the supplier to the manufacturer, is indeed what it has denominated Reverse Logistics (RL) in last time (Rogers and Tibben-Lembke, 2002).

Total Quality Management (TQM), is a set of directed actions to plan, to organize, and to control quality function in a company (Llorens and Fuentes, 2000), and this one is fundamental for success of many companies, to obtain sustainable competitive advantages in their markets. TQM facilitates the RL integration in the organization (Brah, 2005). Thus, the excellence for client means give products it needs, in time and in amounts that it needs, in the direct flow as for the inverse one.

The objective of this paperwork is to analyze existence of positive synergic effect in those companies with a TQM system, which implant a reverse logistics system (RLS), providing improvement of their performance and reductions of costs of whole organization.

Thus, in first of all, we realize a brief revision of literature about RL, secondly, we analyze as RL is necessary to materials and obsolete products recovering, providing additional advantages and benefits for organization, thus, for example, this one transform increase of costs derived from the adaptation of the new regulation into new opportunities to obtain benefits, besides to obtain reductions of costs derived from the introduction of recycled material like raw material of new products. Thirdly, we analyze synergic effect of TQM in RL activities, and analyze RL impact in performance of the company. To get it, we propose a series of hypothesis, which we will contrast empirically. And finally we present the obtained performance and we establish conclusions of this research.

2. Theoretical background

One of first studies is by Stock (1992), which is analyzed, among other questions, logistic processes related to product return from the consumer to the producer, recycling, reusability of materials and components, elimination of remainders and operations of restoration, repair and remake. In this paperwork, RL concept is already uses. Stock (1998) recovers RL subject by kind of White Book on this issue. This author analyzes importance of logistic in product return, reduction on remainders generation, recycling, repair and remake, developing for it management models which combine techniques of logistic engineering and models of enterprise decision with objective to create profitable on flow of return of obsolete products.

Between definitions we find in RL literature, we emphasized: RL like the harvesting, transporting, storage and processing of given back products (Krikke, 1998). A process that uses activities of logistic in used products that are able to be reused again in the market (Fleischmann et al., 1999). Process of planning, implanting and controlling the efficiency, the real cost of the flow of materials and finished goods and all information related from the consumption point to the source point for the value recapture (Rogers and Tibben-Lembke, 1998). Process where a manufacturer systematically accepts products or parts of these from consumption point to possible recycling, remake or reusability (Dowlatshahi, 2000). And task of recovering rejected products, which including its packing and transports to harvesting central station where recycling or remake it (Guide et al. 2000).

In addition, Dowlatshahi (2000) groups studies and works on RL in five categories:
1. General concepts
2. Quantitative Models
3. Distribution, Storage and Transport
4. Enterprise Profiles
5. Industrial Application

3. Reverse Logistics (RL)

Although there are differences between RL and Logistic (Krikke, 1998, Thierry et al., 1995; Van der Laan y Salomon, 1997), RL empower profits of Logistic in the company (Tibben-Lembke, 2002; Rubio 2005), profits like (Cohen et al., 2004):
1. To increase competitiveness and to improve performance of the companies to undertake the challenge of the global world.
2. To optimize management and logistics management for international national trading.
3. Optimal coordination of all factors that influence in the purchase decision: quality, trustworthiness, price, packing, distribution, protection, service.
4. Extension of the management vision to turn Logistics in a model, a frame, a mechanism of planning for internal and external activities of the company.

From enterprise logistic perspective, RL is integrated by processes of management of (Stock, 1998):
1. Product returns that was rejected by agents in trading channel or by final consumer, as well as excessive of inventories because of service life end.
2. Return for reusability of packages, packing, and units of handling.
3. Reusability of materials.
4. Remake of rejected product.

Setting up these mechanisms to recovery and use products rejected by the consumers comes originated, mainly, by two types of reasons:

Legal reasons: The new European regulation is drawing a new scene for many companies, in which the producers become people in charge of all the product service life, from it enters to factory until it becomes remainder (Hawken, 1993; Klassen, 1993; Shrivastava, 1995; Schmidheiny, 1992). A new paradigm of management in European markets is considered, where the industrialist not only must take care enterprise costs which are associated to manufacture and distribution of product in consumption market (Rogers and Tibben-Lembke, 1998), but also must control costs related to correct management of that product turned remainder by the final consumer.

Between these increasing regulations, it emphasizes (Foundation Surroundings, 1998):
- Regulation about Packages and Remainders of packages (E+RE), already transferred to each one of the States members of the UE, with concrete objectives to reach in the 2001. At the moment, these objectives are revised with new values from the 2006;
- Regulation about Obsolete Vehicles (VFU), where the spare parts and components of the automobile are included; this director is in phase from transposition to each European country;
- Regulation about Remainders of Equips Electrical-Electronic-Brown Line (REEE), with special attention to batteries and batteries what are in this equipment;
- Regulation about remainders of equips of household-electric- White Line (REE);
- The specific regulation for Remainders of Construction and Demolition (RCD);
- Regulations related to the management of plastics of conservatory in Spain, among others.

This legal imperative has been observed traditionally like a negative element for competitive capacity of the companies, due to assumption of the costs that supposes the industrial adaptation of processes and operations to this regulation. Nevertheless, an environmental regulation, correctly designed, it will generate innovations able to compensate the cost derived from the fulfillment of this legislation (Mohr, 2002). These "compensations by innovation" not only would diminish the net cost to compliment regulation, but these could generate sustainable competitive advantages by reductions in total costs of manufacture, the Time-to-market or increasing the value of the product for the consumer (Porter and Van Der Linde, 1995).

Economic reasons:
As we commented at the beginning of this paperwork, the increasing competitiveness between diverse companies, in market where every time real differences between products are smaller, has forced companies to develop all kind of service policies for the client. Among them the policy of returned product (Daugherty, 2004). Flows of returned products usually have elevated costs, mainly because of great capillarity, of the additional manipulation it suppose, of the quality controls that supposes and of the quality controls of products distant. But the company, by means of Reverse Logistics system (RLS), has tools to contribute to its reduction. To get it, it is possible for company to adapt its logistics net and transport net to returns, or to integrate them like a component more of supply chain. Also it is possible to be carried out a

management and optimization of stocks, which will derive in decrease or, even, elimination, of returns to factory (Rogers and Tibben-Lembke, 2002).

The company does not know how many products will be given back to it and in what conditions will be. RL allows company to be prepared to take care of these returns more and more frequent, and in addition, it supposes great opportunities like smaller costs, potentials benefits, new opportunities of business, initiatives of environmental quality (ISO 14000) etc. Still more, from the point of view of the demand, company will be able to generate competitive differences by a positioning strategy (Kotler, 1994) looking for an image of responsible company, it makes recyclables products, from materials environmentally recovered, it diminishes generation of remainders and use of nonrenewable raw materials, using clean technologies and integrating its supply chain in its environmental strategy (suppliers, providers, distributors and clients). And by the point of view of the offer, recovery of damaged material and products obsoletes, will suppose substitution of original materials and component by these recovered articles, which could generate a diminution in costs of manufacture and/or in sale price of these products. On this way, companies would not be considering the management of obsolete products, solely, like a necessity motivated by legislative pressures, but it will find in these activities forms to obtain sustainable competitive advantages and, Because of it, the attainment of their enterprise objectives (Porter, 2002)

Next to economic and legal reasons, the company, in its daily activity, finds the necessity of RL by the following causes (Stock, 1998):
1. Merchandise in defective state
2. Return of excess of inventory
3. Returns of clients
4. Obsolete products
5. Seasonal inventories

In order to correct them, processes in RL focus to five key activities: purchases, reduction of virgin inputs; recycled; substitution of materials and management of remainders (Diaz ET to. 2004).

4. Reverse Logistics and Total Quality Management. Hypotheses

Global competition has supposed to give greater importance to TQM. In order to improve their competitiveness, companies have been introduced in global markets. These changes have renewed the approach towards the quality (Brah, 2005). TQM supposes a philosophy formed by, methods, tools and techniques, which are applied to all strategic levels of organization (Samson and Terziovski, 1997).

TQM bet by continuous improvement, focus to the client, implication of all members of the organization. Key of success of a RLS is its ability to improve its internal and external integration in organization. TQM is one of the approaches more used to obtain this integration, and by means of this integration it is able as well to increase the yield (Future Gimenez and, 2005). TQM supposes improvements in relation with suppliers, processes, management of personnel, and generally fortifies relation with the client (Shaukat et al., 2006). In addition, importance of the logistics function and RL has been increased in many companies in high-priority form. These companies apply practices from systems of quality to RLS, and exists empirical evidence of it has a positive impact when it is applied with effectiveness (Sohail et al., 2003). As these practices have been increased in the company, the direct and inverse flow of the logistics has gone away also increased. Although implantation of a logistic system focused to continuous improvement is a long term process, and it requires changes in culture of the organization (Sohail et al., 2003).

Intention of this paperwork is to analyze how RL improves performance of the company, there is a positive synergic effect in those companies which count on a TQM system, to get it, we propose following hypotheses, which have empirically been checked by a survey, which is sent to organizations:

- Hypothesis 1 (H1). Value of given back products by intermediaries, is greater if the company has got a TQM system.
- Hypothesis 2 (H2). Performance of the company in their main products and markets, are greater in companies with TQM systems which implant a RLS than companies what do not implant it.
- Hypothesis 3 (H3). Costs in companies with TQM system with RLS are lower than companies do not have it.

In order to check hypotheses, an empirical study has been made using a survey. In the survey, structured with closed questions it was asked for chiefs to value their company in the dimensions of RL, TQM, and performance, using Likert scales of 7 points. With information provided by these items, a series of variables was elaborated to check the hypotheses of the study. Selection of population of companies was made from the database Dun and Brandstreet 2006 and 50000 greater Spanish companies, this criterion allowed to obtain an adapted size of sample to statistical effects. 400 surveys were sent, by email and postal mail, and by survey on line. Selected companies are dedicated to manufacturing in different industrial sectors, and they have implanted a RLS, and TQM system. The survey was sent to the manager of the company and operations chief. To analysis of collected data, computer science program SPSS 14.01 was used. Finally, we get 135 valid surveys, 28 companies answered on line, and the rest by postal or by mail.

Empirical performance

A sample is taken from 135 companies with the purpose of applying an instrument that gather data on TQM, RL and Performance of the Company. The instrument counts on the following structure (see table nº 1):

Table 1. Analysis structure

ASPECT	VARIABLES
TQM	2
RL	32
PERFORMANCE	14

Source: Author's elaboration

With purpose of making a reduction of each one of the aspects, statistical technique for reduction of variables was used factorial analysis[1]. The new variables, denominated factors, are the following ones (see table 2):

Table 2. New variables of the factor analysis

ASPECT	FACTORS	FACTORS DESCRIPTION
TQM	1	COMPANIES WITH TQM SYSTEM IMPLEMENTED
	2	COMPANIES WITHOUT TQM SYSTEM IMPLEMENTED
RL	1	IMPORTANCE OF RETUNS FOR COMPANIES
	2	SOURCE OF RETURNED MATERIAL
	3	NEW SOURCES OF RETURNNED MATERIAL
	4	USES OF RETURNED MATERIAL

[1] Factorial analysis is a multivariate statistical technique that groups the most homogenous variables and separates the most heterogeneous variables, with the purpose of obtaining a reduction of the phenomenon that is studying.

ASPECT	FACTORS	FACTORS DESCRIPTION
	5	PROFITS OF RL FOR COMPANIES
	6	PROACTIVITY TROUGH COPANIES RETURNS
PERFORMANCE	1	GROWN OF COMPANY
	2	PERFORMANCE OF COMPANY
	3	SERVICE TO THE CLIENT

Source: Author's elaboration

For the reduction of each one of aspects is little exigency in the group for the new factors.

H1. Value of given back products by intermediaries, is greater if the company has got a TQM system. The used methodology to find the differences between the companies that implanted a TQM system and those that did not do it, is based on the statistical check of averages, for independent samples (Davis, 2000). A test of resistance of averages (Galve, 2007) for companies that implement TQM system and those do not implement it. Evidence show, 90% confidence is observed, companies with TQM system have greater value in their commercialized products by an intermediary, than companies do not has it. [2]

H2. Performance of the company in their main products and markets, are greater in companies with TQM systems which implant a RLS than companies what do not implant it. With a confidence of 91%, evidence show companies with TQM system and which implant RLS , show better performance of their products, that the companies that do not implant it.[3]

H3. Costs in companies with TQM system with RLS are lower than companies do not have it. With a confidence of 93%, evidence show costs in companies with TQM system, and RLS implemented, is lower than in companies that do not implement it.

Conclusions

Objectives proposed at the beginning of paperwork have been materialized throughout the study. One of objective, to analyze quantitatively relations between the TQM and RL, data has demonstrated a positive relation between both, since the fulfillment of the raised hypotheses is observed to make this relation, although all the dimensions are not equal of important for this performance. On the other hand, also it has been demonstrated that obtains more intense positive synergies effects in organizations with a culture focused towards the quality, and in companies with a TQM system, RL increase benefits for the organization, when facilitating internal and external integration of this one.

Other objectives of the work, was to analyze impact RL in performance of the organization. Data indicate RL improves performance of company with TQM, we remember tendency to increase number of product returns and to increase regulations in matter of returns and remainders, reason why, although at first, it looks like an important cost for organization, is verified with RL performance of the company improve. In addition, performance indicates that RL reduces costs of the company with TQM, being more positive with best information systems.

Analysis has not considered other objectives like operations of the company - information systems, efficiency that also influence in their yield.

[2] Ha: the average value of the companies does not implant RL is greater than the average value of the companies that if they implement it. Assuming different variances t= 1,87 p (t) =0.08

[3] Ha: Costs in companies with TQM that implant RL are minor than cost in companies with TQM without a RLS implemented. Assuming equal variances. t= -2,20 p (t)=0.039

On the other hand, study has used cross-sectional data that make difficult to the establishment of relations cause-effect, reason why a longitudinal study more would be adapted to verify the obtained exploratory performance in this work. In spite of the limitations of the study, the work offers a frame of dimensions of logistic inverse that could be used of starting point for future studies. For example, he would be useful to analyze dimensions of the management of the knowledge and their logistic effect in the inverse one

RL is every time more present in the enterprise world. In competitive surroundings, many companies have noticed that the resolution of the misfortunes related to the inverse flow of the merchandise can imply a significant reduction of costs. RL is sure a philosophy that any company must add to its surroundings, due to all the mentioned factors and before the globalization is occurring is important to have a strategic exposition of RL.

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