Power and Trust in Reverse Logistics Systems for Scraptires and its Impact on Performance

Francisco Gaudêncio M. Freires

Federal University of San Francisco Valley (UNIVASF)
francisco.gaudencio@univasf.edu.br

Alcibíades Paulo S. Guedes

University of Porto (UP)
apguedes@egp.up.pt

ABSTRACT: A reverse logistics system (RLS) involves all players, their activities and relationships in the process of recovering value from end-of-life products. This article describes and analyzes the influence of power and the trust among players over performance (effectiveness and efficiency) of RLSs. Two cases were developed describing RLSs for scraptires. The main conclusions show a forward relation between trust and effectiveness and efficiency of RLSs. However, regarding power, no forward evidence over performance was found.

KEYWORDS: Reverse Logistics Systems, Qualitative Research, Power & Trust, Scraptires, Performance Management

INTRODUCTION

Reverse logistics studies the material flow that goes from the end consumer to the original logistics process to a new point of consumption or refurbishment. Examples of reverse logistics processes are the collection of empty bottles, the return of merchandise and the recovery and/or recycling of materials.

The main activities of reverse logistics are the collection of products to be recovered and distributed after reprocessing. Although this problem is similar to classic distribution problems, some differences exist: normally, many points exist where goods/products need to be collected; the collection of product's packaging is generally a problem; you need the cooperation of the shipper; and the goods tend to have low monetary value.

The differences between reverse and forward logistics are summarized not only in the direction of the materials flow (from customers to suppliers, in reverse logistics), but also in many other things. Otherwise, it could just be said that these are "normal" flows that start at the end consumer (playing supplier role) and end in another logistics flow.

Nowadays, reverse logistics is associated with some operational matters. Some studies have been dedicated to the optimization and management of RLSs, such as the study conducted by Guide et al. (2000) focused on the characteristics of remanufacturing systems. More recently, De Brito (2004) explored questions of planning and control of production systems.

To characterize reverse logistics, Rogers and Tibben-Lembke (1999, p. 02) adopted the concept of logistics:

"The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of origin to the point of consumption for the purpose of conforming to customer requirements."

Then:

"The process of planning, implementing, and controlling the efficient, cost effective flow of raw materials, in-process inventory, finished goods and related information from the point of consumption to the point of origin for the purpose of recapturing value or proper disposal."

Since RLS is a relatively new area of investigation and is rather practical, other terms can be found in literature, such as: logistics of return, inverse logistics, and backward logistics distribution. All these expressions are almost the same. A reverse logistics system (RLS) is a system that involves all players, their activities and relationship involved in the process of recovering the value of end of life products. The performance - effectiveness and efficiency - of reverse logistics systems (RLSs) are normally evaluated in terms of costs due to the fact that little research has been done in this field.

The increasing interest in RLSs is partly due to the pressure of new legislation. Recent developments demonstrate that legislation and its consequences have grown, particularly regarding end of life vehicles (Directive 00/53/EU), electronics (Directive 02/96/EU) and product's packaging (Directive 94/62/EU). These three specific directives have forced the producers to be responsible for the collection and final destination of their products (Europa, 2008). These challenges are related to the differences between the players of these systems; and to the volume of exchanged products; and to the relationship between market forces and legislation.

More specifically, these challenges are based on practical things, such as the cooperation and ability of the players in managing RLSs. This paper will discuss questions related to power and trust involved in the management of reverse logistics systems. As an example, the observed situation of shared management (trust) versus centralized management (power) in RLSs for scraptires was discussed. In this sense, one question was raised from the observations in the study:

*What is the influence of **power** and **trust** between the players over performance (effectiveness and efficiency) of the RLSs?*

The choice of this subject is due to the fact that, no practical study on problems of leadership, trust and power in these systems regarding RLSs was found in the literature investigated. Some possible expla-

nations can be related to the fact that these systems might be considered a "new approach" to logistics researchers. Another fact is that, if it is hard to find logistics systems managed as a whole entity for the case of direct flows of goods, then it is even harder to find situations where reverse flows are managed as an entire entity due to low volume of products in RLSs.

In general, the dilemma of who must manage a logistics system is based on authority and control of the system. This can be of different natures (technological, financial, domain of the market, etc). The problem of power, which although is a mechanism of control, will be contrasted with what generally is conceived as mechanism of competitive control between players, trust. The RLS that are the scope of this study involves scraptires, which is a problem and will be presented in the next section.

LITERATURE REVIEW

Effectiveness and Efficiency

The performance management was basically financial for many years. Today, however, models such as *Balanced Scorecard* are to monitor the implementation of strategy, promoting its re-valuation (from a strategic perspective), keeping the financial scores but also including non-financial ones together to create an evaluation system.

Holmberg (2000) states that the companies who have successfully implemented the supply chain management have two points in common. Initially they think of the supply chain as a whole, instead of keeping the vision focused internally. The second point is pursuing results, seen in the increase of income, use of assets and reduction of costs, or, strategic subjects.

Speaking of performance management, you cannot forget two concepts: effectiveness and efficiency. Both are components of performance, which are approached in different ways in according to the object or discipline to be investigated.

According to Harrington (1993) and Neely et al. (1995), the concept of effectiveness mentions the extension that the processes (or sub processes) achieve the needs and expectations of the customers. It can be said that effectiveness relates to producing the "right thing". The organizations must know the needs of the customers in order to produce the right

product. To measure the effectiveness of an organization, the results reached by the processes must be measured. When measuring the result of a process, the company aims to find out how the results relate to the established measures and what the customers will think of these results. So, a better evaluation of the effectiveness is the satisfaction of the customers with the result (Kaplan and Norton, 1996; Vitale et al., 1994).

Efficiency is an indicator of how resources are used by the organization (resources are minimized and the wastefulness is eliminated) to reach effectiveness (Harrington, 1993; Neely et al., 1995). In simple words, efficiency is "doing the things the right way". In order to measure its efficiency, an organization must measure its processes. When measuring a process, an organization needs to find out how resources are being used in the processes and if something can be done to improve those processes. When a company assesses a process with a certain routine, it is possible to implement extra shares when (and if) they are necessary. Typical measurements suggested for efficiency are costs, time and quality.

Power and Trust

Reverse logistics systems (RLSs) can be managed on a basis of a relationship of mutual agreement, centered on a reliable relationship. Contrarily, it can be based on a relation of power of one stronger player. A joint management based on the confidence between the players is only sustainable up to the point where all players are satisfied. In the other situation, in the management of power of a single player, the maintenance of the relationships is dependent on the motivation of this player in giving continuity. This section will touch on the concepts of power and trust, and their implications in the models of management according to these concepts.

Ballou et al. (2000) states that cooperation is in general an informal process, in a system can be originated by two mechanisms: power and trust. In accordance with what was previously mentioned, these two factors normally are seen as opposing. A player in a dominant position can use power, while trust is an expression that involves the determination of partnerships centered on mutual integrity and trust.

Ford et al. (2003) approaches trust in the context of a mutual agreement between buyers and sellers. According to this author, trust in the context of marketing channels is generally perceived as an attitude or feeling that a player has in relation with its partner. The level of reliability was changeable in the cases studied, going from very low (case of the Society Valorpneu) to very high (Program "Paraná Driving Clean"). Some factors that influenced the reliability level were present during the whole relationships; the relative power in the relationships; cooperation; and external factors to the system like the variability of scraptire supply.

Other researchers have studied the problem of power and its use in being more effective and efficient in distribution channels and supply chains. Cooper and Ellram (1993) describe the contour of supply chain management, mentioning specific ways where a logistics system is managed by using power. The authors suggest a model based on joint management as a future possibility, however, they do not make any mention of a reliable concept among the members of the system.

Some research has been done describing trust and contrasting it with use of power. Kumar (1996) agrees with Ballou et al. (2000) when he establishes an opposing relationship between power and trust. The author states that management by trust creates interdependence, with a bilateral agreement. To the contrary, a management based on power causes a unilateral communication and causes a relationship of apprehension on the part of the weaker players.

The position adopted in this study does not share the same express opinion by Kumar (1996) and Ballou et al. (2000). During this study a direct opposing relationship between power and trust was not observed. The focus on the type of management depends on the context in which the system is inserted, where the choice between the power and trust leads to different results. Nevertheless, the literature is based on existing conclusions of supply chains and distribution channels for conventional products. In this sense, it is interesting to describe and analyze these concepts for products inserted in the context of RLSs.

The Problem of Scraptires

The process of rubber vulcanization was accidentally developed by Charles Goodyear in 1839. One of the main applications of vulcanized rubber is associated to tires. Elapsing the development of the automobile industry in the 20th century, the consumption of tires reached extraordinary amounts. About 300 mil-

lion tires, equivalent to more than 2 million tons of rubber, are disposed of annually in the United States (Blumenthal, 2002).

When they cannot be reused anymore, these tires pass to the stage of end of life product. Arriving at this phase, the tires are called scraptires or end of life tires. In order to maintain a single term, we will be adopting the term scraptire.

When left in inadequate places, the scraptires serves as a place for procreation of mosquitoes and other vectors of illnesses. They also represent a constant risk of fire when they are left outdoors since they segregate oil that infiltrates and contaminates the soil. Moreover, the disposal of scraptires in landfills is a problem, when compacted and embedded in such spaces they work their way back to the surface after a certain period of time.

The biggest difficulty in scraptires management is a result of the illegal disposal of tires that cannot be recovered. This causes an environmental problem. Most scraptires in the United States (about 65% of the total, which is equivalent to 188 million tires per year) are disposed inadequately (Blumenthal, 2002).

According to data from the National Association of Tire Industry (ANIP), Brazil produced about 45,75 million tires (400 thousand tons) in 2002. ANIP estimates that about 30 million tires are disposed of annually. This Association estimates there are about 900 million old tires spread across the country (ANIP, 2003).

It can be said that the problem of scraptires is related to market, technology, environment and society. In the last decade legislators made laws that deal with the problem of scraptires (Douglah and Everett 1998, Serumgard 1998, Shulman, 2000). This legislation is recent and it is more advanced in the European Union than in the United States or Brazil.
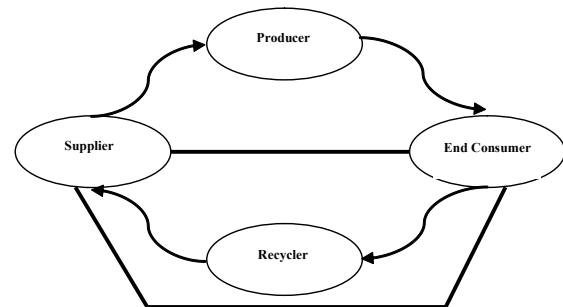
The scraptire generation can be reduced by massive investments in tire design, particularly related to longer durability of tires (better design of carcass and tire structure). Another alternative would be investments in better technology for retreading. These two options could be induced by legislation; however, since the tire and retreading industries are competitive, it is clear that legislation exerts limited power.

The RLS Studied

Globally, this study intends to provide an understanding of RLSs and give practical and theoretical knowledge. Two systems have been developed in order to study different types of units (players and relationships), as well as two distinct groups of questions (power and cooperation based on trust). The studies describe RLSs and, although using different theoretical references, they are all related to the effectiveness and efficiency of the systems. It intends to explain the relationship between these variables in order to reach a better understanding of the systems studied. Breaking into a generic model of circular flow of materials (figure 1), the system studied is located between the end consumer and the traditional supplier of the forward chain.
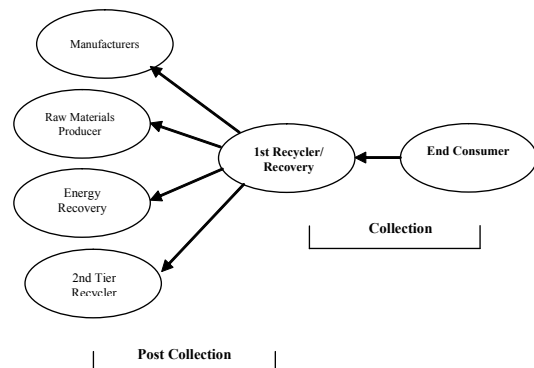
Figure 1 - The Generic and Simplified Model of the Circular

Flow Of Materials and the Position of the Reverse Logistics System (Rls).

The RLS presented in the previous figure can be dismembered in some places and in their relationships, giving origin to a chain. The connections or relationship with focus on the recycler or first tier collector will be studied, dividing the RLS into two subsystems or stages: collection and post collection system (figure 2).

Figure 2: The Studied RLS and its Two Phases or SubSystems (Collection and Post Collection System)

The post collection system can end with a raw material producer, a manufacturer of an item (in the case where parts are reused), recovery of energy (using parts of a product as fuel) or another recycler. The post collection system is initiated with the selection and dismantling of the products to be recycled. After these processes, the post collection system can be considered a regular supply chain (forward materials flow).

METHODOLOGY AND CASE STUDIES

According to Morgan (1980), academics of the area of organization try to understand its proper substance of inquiry from a reference structure, which is based on assumptions that are taken for granted. The vision of this author is that a certain study takes as a basis some school of thought, which is included in the area of a paradigm.

Among the different visions of the world, this study is located in the interpretative paradigm, and is based on the vision that the events in the social reality do not exist in any fixed direction, but are equivalent to the product of the subjective and interpretative experiences of people. Society is conceived from the perspective of the participant and not that of the observer. Following this orientation, we are able to understand the process by which multiple shared realities are built, kept and modified. Science is conceived as a network of language games, based on concepts and rules subjectively determined, created and followed by scientists (Strauss and Corbin, 1998).

From a subjective vision of the reality, the study follows qualitative methods. This, according to Potter (1996), is not a particular set of techniques, but a proposal approach, for the study of a social phenomenon. According to Merriam (1998), the philosophical assumption whereupon all types of qualitative methods are based is the vision that reality is created by individuals interacting with their social worlds. The author adds that investigations following this orientation are interested in understanding the meaning invented by people. This approach tries to understand how individuals live and experience their world.

In contrast with a quantitative inquiry (which takes a phenomenon and analyzes its components), the qualitative investigation seeks to clarify the way individual parts of a system operate to form "the whole". Within this context, the investigator constitutes the main instrument of collection and analysis of data. In a general way a qualitative study is sufficiently descriptive, being developed for the reason that existing theories are not adequate enough to explain the phenomenon in question. The aim of a qualitative study is not to test theories. Therefore, there are no hypotheses to be deduced in the theory.

The position adopted in this study is that a description is always sensitive to context, selective and incomplete, being, therefore, revocable. A description never tells all that can be said about an effort, a person, an object or an event. In principle, it is possible to argue against a certain description, pointing out other characteristics from the situation in question. Moreover, when executing the descriptive task, the investigator has an intention and prioritizes, what he considers important, in regards to the investigated phenomenon (Strauss and Corbin, 1998).

Merriam (1998) states that the project of a qualitative study is emerging. That is, normally, the investigator does not know beforehand, all of the players that are going to be interviewed, nor all the questions to be asked. On the basis of his intuition the investigator directs his attention to certain segments of data.

In this perspective, this study includes two case studies, one done in Portugal and the other in Brazil. Although dealing with the same aspect (RLSs for scraptires) the realities of the two cases are different, and the data collection was done in different periods.
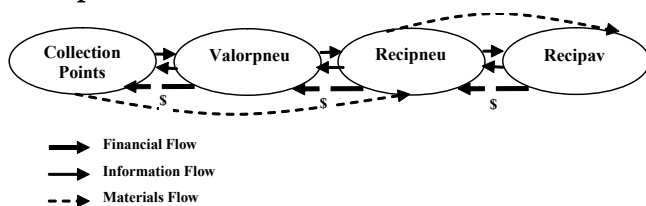
The data used is characterized by a variety of qualitative and quantitative data, extracted from primary as well as secondary sources. Based on interviews, the primary data collection procedure is similar to that of the two case-studies (which are the basis of this paper) in terms of preparation of respondents, documentation and verification of the collected data. Secondary data was captured from observations, companies' information (printed) and internal data collected for other purposes (production volumes, transport volumes and suppliers). The qualitative methodology and quantitative data was combined to discuss the main results of this paper. Table 1 presents a summary of the characteristics of the data sets adopted in this study.

Table 1 - Data Used in this Study

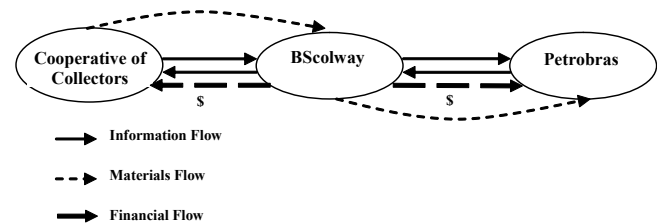| Nature of Data	1st Set Valorpneu case	2nd Set Paraná Clean Driving case	3rd Set Survey
Qualitative	Description of processes and relationships Opinion of experts/ specialists	Description of processes and relationships	Processed contracts
Quantitative	Production, volumes, materials flow	Financial data, Production, volumes, materials flow	Financial Data, processed and exchanged volumes
Primary	Interviews and visits to the companies	Interviews and visits to the companies	Inquiry
Secondary	Companies´ information from Internet, printed documents, brochures and catalogues	Companies´ information from Internet, printed documents, brochures and catalogues, Videos and Software	Previous studies, works and bibliography

Case 1: "Society of Scraptires Management - Valorpneu"

This case study began in January of 2004 and ended in July of the same year. This case study sought to describe the RLS of scraptires adopted in Portugal. This system basically is made up of an entity (Valorpneu) that manages the RLS; a network of collectors of scraptires; a recycling company (Recipneu) and a final customer (Recipav). Figure 3 presents a description of this system and the players involved.

Figure 3 - The Reverse Logistics System of Valorpneu.

Case 2: "Paraná Clean Driving Program"

This case study was designed and conducted in Brazil, in the last semester of 2003. Basically, this system is managed by two companies: a company that retreads tires (BScolway) and its main client (Petro-

bras). Besides these two main players, the case also investigated the rule of secondary players (trade associations, cooperative of collectors, shippers and government entities). Figure 4 presents an overview of the system and the players involved.

Figure 4 - The Reverse Logistics System of Paraná Clean Driving Program

RESULTS ON POWER AND TRUST IN THE STUDIED RLS

Relationships in emerging markets, such as for scraptires, characterized by volatile and low volumes, can be categorized by the frequency and intensity of communication between the players of the system. This has caused an increase of efficiency and effectiveness in terms of capacity of the system.

The level of trust was irregular in the cases studied, going from a low level of confidence (case of the Valorpneu Society) to high ("Paraná Clean Driving Program"). Some factors that influenced the level of trust were: time of relationships; the relative power of each player in the relationships; cooperation; and some external factors such as the variability of scraptire supply.

The concept of a reverse logistics system is taken in this paper as independent players joining efforts to different degrees in order to be more effective and efficient. In a traditional paradigm, each company manages and controls its business, giving enough attention to suppliers and customers relationships. The system approach taken here is to look at several players and their relationships, managing reverse logistics systems for a better performance of the whole system. The system perspective adopted for managing reverse logistics systems is also important because of the low profit margins existing in these systems; consequently the benefits through coordination of logistics activities for efficient and effective logistics must be higher than in forward logistics systems.

According to Recipneu, there is a spirit of coopera-

tion between the company and its main customer, Recipav. Although operating in an emerging market, its perception is that the relationship with Recipav contributes to the efficiency of the whole system. Problems occurring between these two companies are solved informally, based on mutual trust.

In the collection system, Valorpneu states that its cooperation with scraptire suppliers and shippers is based on mutual agreements. The only form of regulation for cooperation in the system comes from environmental legislation, which is not a result of the relationships between the players in the system. A similar situation is described for BScolway, where the relationship between scraptire suppliers and Petrobras is also based on agreements and not on written contracts.

In both case studies, cooperation and trust, instead of a relationship based on power, was considered the most efficient way to get the best performance from the systems. A plausible explanation for this would be the newness of the scraptire market when compared to other products (plastic, paper and metals). Another possible reason can be related to the small sizes of Recipneu and BScolway when compared to Recipav and Petrobras, respectively. The small dimension of the recyclers in comparison to their main customers would not justify a source of conflict. Thus, the newness of the market together with low volumes can explain why the relationships are based more on trust than expected when this study began.

One interesting detail is that BScolway can also be described as a customer, therefore assuming the position of recycler in the collection system. At this point, BScolway is also a promoter of trust among other members/players of the RLS to reach high effectiveness and efficiency. It was noted that trust is not only something between BScolway and its outlets and shipping, but it is also intended through a program of qualification and incentive for its employees and making customers aware of the environmental problem of scraptires.

The former situation expands the reliable concept from the level of companies to the individual level. The building of trust is essential for the efficiency of the system therefore in some ways leading to less bureaucratic relations between Bscolway and its customers, which are the scraptire suppliers. The same logic is applied to its outlets, playing the role of collection points in the collection system.

An important result of from the RLSs is the fact that power and the creation of trust can coexist, and they are not mutually exclusive. This fact is not shared by other researchers (Ballou et., 2000; Kumar, 1996). A reasonable high level of trust between players can reduce the need for the strongest member of a RLS to exercise power. Although not a consolidated reality, the building of relationships based on trust among the members of a RLS is the best way to achieve more efficient and effective solutions (Cox, 1999; Cox et al., 2004).

CONCLUSIONS

It was concluded that there is a relation between the consolidation of relationships between players and volumes exchanged in the system. In the case of scraptires, it is an emerging market with unstable and volatile volumes, trust was the basis for a joint management of the system, being more present than the existence of power. Trust, for example, was always the basis for relationships between BScolway and Petrobras. This also can be observed in the relationship between Recipneu and Recipav. However, these conclusions are still in a period of initial development. In this way, the proposal is that in emerging markets, including small volumes of exchanged products, trust is the choice to reach more efficient and effective solutions.
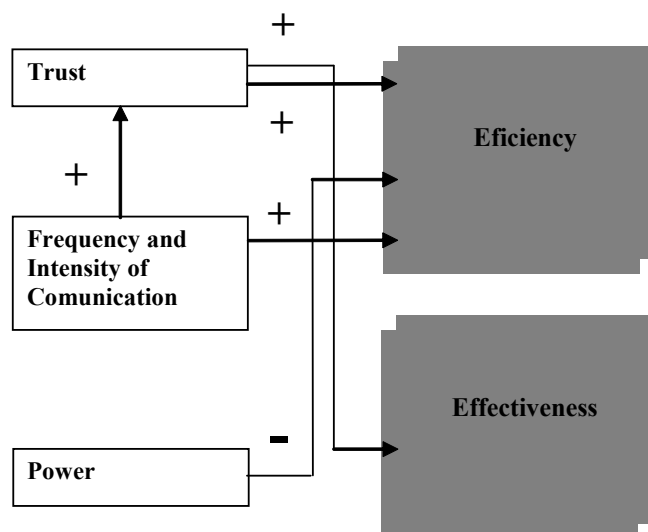
The conclusions on the influences of power and trust over the performance of RLSs are shown in figure 5. Throughout this investigation characteristics were identified that distinguish the emerging market of scraptires. Basically they are short-duration, low volume of products and volatile relationships. This situation contrasts with the already consolidated markets of paper, metal and glass, where the volumes are high and constant and the relationships are long term.

Trust is a way to increase effectiveness and efficiency through the reduction of extra activities and ending of red tape in the system. Besides reducing the red tape in the system, trust also makes possible the exchange of information in a more fluid way. This provides an addition in the performance of the system. Joint management among all members of the system can also lead to system optimization, as all players´ interest and specific knowledge of their part in the process can be taken into consideration. Another benefit from joint management could be the growth of trust among the members and an increased per-

ception of reliability of the systems, as they all have equal insight and opportunities to alert other players, should a problem occur.

Power bases within the cases investigated varied between the collection and post-collection part of the system. In the collection system, conclusions show that important power bases were: access to information; recycling and logistics know-how; network position and access to logistics resources. In the post-collection system, the power bases identified were: network position in terms of size and relative exchange with customers (cement mills, oil plants, 2nd tier recyclers, automobile suppliers, etc). The power exercised by the strongest player in the system can mean a growth in its individual efficiency and a certain rejection by the other players involved. This fact influences the global efficiency of the system in a negative way. However, although one of the interviewed mentioned a certain fear of control of the system by power, this is not a concrete reality. So, it was not possible to get a more consistent relationship between the use of power and the performance of RLSs.

Figure 5: Influence of Power and Trust Over Efficiency and Effectiveness of the RlS

As was previously mentioned, the RLSs for scraptires are represented by relatively new relationships and by a low and volatile volume of products exchanged. So, the proposals/conclusions presented in figure 5 are described as follows:

P 1: A high degree of interaction and communication between players/members of RLSs leads to a higher efficiency level.

P 2a: Trust is consolidated by the exchange of information and interaction between the members of RLSs.

P 2b: The consolidation of trust makes possible an improvement of the overall performance (effectiveness and efficiency) of RLSs.

P 3: Although not having been fully proven, the use of power by a specific player in the system can lead to a loss of efficiency.

The conclusions show a direct relationship between trust and the performance of RLSs. Regarding power, it was not proven to be a direct influence on the effectiveness of the system. A possible explanation for this fact may be the immaturity of the relationships in these systems. In the two cases investigated, associations between the longevity of the relationships were established in terms of the exchanged volumes of products and the volatility of supply.

REFERENCES

Accetti, K. M., & Pine, L. M. (2000). *Types of Staple fibres and Properties of the Concrete with Staple fibres*. Annals of Brazilian congress of Concrete, April 21-23, Fortaleza, Brazil.

ANIP (2003). Document extracted from Internet. http://www.anip.com.br (accessed 10/06/2003)

Ballou, R., Gilbert, S., & Mukherjee, A. (2000). New Managerial Challenges from Supply Chain Opportunities. *Industrial Marketing Management,* Vol. 29, Nº 1, pp. 7-18.

Ballou, R., Gilbert, S., & Mukherjee. (2000). New Managerial Challenges from Supply Chain Opportunities. *Industrial Management Marketing,* Vol. 29, nº 1, pp. 7-18.

Blumenthal, D. & Closs, D. (2002), *Logistical Management. The Integrated Supply Chain Process,* In (authors), London: McGraw Hill.

BScolway (2003). Document supplied by BScolway.

Cooper, M., & Ellram, L. (1993). Characteristics of Supply Chain Management and the Implications for Purchasing and Logistics Strategy. *The International Journal of Logistics Management,* Vol. 4, nº 2, pp. 13-25.

Cox. (1999). Power, value and supply chain management. *Supply Chain Management: An International Journal,* Vol. 4, N.º 4, pp. 167-175.

Cox., Watson, G., Lonsdale, C., & Sanderson, J. (2004). Managing appropriately in to power regimes: relationship and performance management in 12 supply chain you marry. *Supply Chain Management: An International Journal,* Vol. 9, nº 5, pp. 357-371.

De Brito, M. (2004). Managing Reverse Logistics or Reversing Logistics Management? *Thesis of Ph.D.* Erasmus Research Institute of Management, Erasmus University of Rotterdam, Holland.

Douglah, S., & Everett, J. (1998). Scrap Tire Management (II): And Recommendations marries Study. *Journal of Solid Waste Technology and Management*, Vol. 25, N.º 1, pp. 13-22.

Europa (2008). Document extracted from Internet. http://eur-lex.europa.eu/RECH_legislation.do (Accessed in 05/08/2008)

Ford, D., Gadde, L. E., Håkan, H., & Snehota, I. (2003). *Managing Business Relationships* (2nd edition), London: John Wiley.

Goodyear (2004). Document extracted from Internet. http://www.goodyear.com. (Accessed in 13/02/2004)

Guide Jr, V. D. R., Jayaraman, V., Srivastava, R., & Benton, W. C. (2000). Supply-Chain Management will be Recoverable Manufacturing Systems. *Interfaces*, Vol. 30, N.º 3, pp. 125-142.

Harrington, H. (1993). *Aperfeiçoando processos empresariais.* São Paulo: Makron Books.

Holmberg S. (2000), A systems perspective on supply chain measurements. *International Journal of Physical Distribution and Logistics Management*, Vol. 30 nº 10, pp. 47–68.

Kaplan, R. & Norton, D. (1996), Using the balanced scorecard as a strategic management system, *Harvard Business Review,* Vol. 74, Nº 1, pp. 75–85.

Kumar, N. (1996). The Power of Trust in Manufacturer-Retailer Relationships. *Harvard Business Review*, Vol. 74, nº 6, pp. 92-106.

Kumar, N. (1996). The Power of Trust in Manufacturer-Retailer Relationships. *Harvard Business Review*. Vol. 74, Nº 6, pp. 92-106.

Merriam, S. (1998). *Qualitative research and marries study applications in education,* San Francisco: Jossey-Bass.

Morgan, G. (1980). Paradigms, metaphors, and puzzle solving organization theory. *Administrative Science Quarterly*, Vol. 25, nº 4, pp. 605-622.

Neely, A.D., Gregory, M. and Platts, K. (1995), "Performance measurement system design: a literature review and research agenda", *International Journal of Operations & Production Management*, Vol. 15 Nº. 4, pp. 80-116.

Potter, W. J. (1996). *An Analysis of Thinking and Research About Qualitative Methods,* New Jersey: Lawrence Erlbaum Associates.

Recipav (2005). Document supplied by Recipav. http://www.recipav.pt/artigo.php (Accessed in 12 /01/2005)

Recipneu (2005). Document supplied by Recipneu. http://www.recipneu.pt/ (Accessed in 12 /01/2005)

Rogers, D., & Tibben-Lembke, R.S. (1999). *Going Backwards: Reverse Logistics trends and practices.* Reverse Logistics Council, The University of Nevada, Reno, United States. http://unr.edu/homepage/rtl/reverse/book.html (Accessed 12/02/2002)

Serumgard, J. (1998). *Internalization of Scrap Tire Management Costs: The Review of the North American Experience.* UNCTAD/IRSG Workshop, July 21-22, New York, United States.

Shulman, V. (2000). Introduction to Tire Recycling. *Technical Report,* The European Tire Recycling Association - ETRA, Brussels, Belgium.

Strauss., & Corbin, J. (1998). *Basics of qualitative research: techniques and procedures will be developing grounded theory (2ª ed.),* San Francisco: Sage Publications.

Valorpneu (2005). Document supplied from Valorpneu. http://www.valorpneu.pt/ecovalor (accessed 12/01/2005).

Vitale M., Mavrinac S.C. and Hauser M. (1994), New process/financial scorecard: A strategic performance measurement system, *Planning Review,* Vol. 22 nº 4, pp. 12–16.

AUTHOR'S BIOGRAPHY

Francisco Gaudêncio Mendonça Freires - Bachelor in Civil Engineering by Federal University of Ceará (1996), Masters Degree in Production Engineering by Federal University of Santa Catarina (2000) and PhD in Engineering and Industrial Management by the College of Engineering of University of Porto (2007). Currently he is Associate Professor at the Department of Production Engineering at Federal University of San Francisco Valley (UNIVASF). He has experience on the field of Logistics and Operations Management, acting mainly in the following subjects: Supply Chain Management, Reverse Logistics Systems, Performance Management and Logistics Costs.

Alcibíades Paulo Soares Guedes - Bachelor in Mechanical Engineering by University of Porto (1987), Masters Degree in Operations Management (1989) and PhD in Logistics Management by University of Cranfield (1993). Currently he is Associate Professor at the College of Engineering of University of Porto and President of the Management School of Porto. He has experience on the field of Logistics and Operations Management, acting mainly in the following subjects: Supply Chain Management, Performance Management and Operational Research.