Reverse logistics in companies in the western region of Santa Catarina

Logística reversa em empresas da região oeste de Santa Catarina

Logística inversa em empresas de la región occidental de Santa Catarina

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Resumo: O estudo objetivou analisar as práticas de logística reversa adotadas pelas empresas da região Oeste de Santa Catarina. A logística reversa relaciona-se com as práticas de sustentabilidade, e assim, torna-se relevante a abordagem da Teoria da Legitimidade sobre o dever das organizações em divulgar informações contábeis-financeiras, sociais e ambientais para que sejam consideradas legítimas pela sociedade. Para tal, realizou-se uma pesquisa descritiva, por meio de um levantamento, com abordagem quantitativa. A coleta de dados deu-se por meio de um questionário aplicado aos gestores, responsáveis ou proprietários das empresas investigadas. Os resultados revelam que a maioria das empresas investigadas fazem uso de estratégias ambientais, atendem as normas e legislações brasileiras de sustentabilidade e implementam práticas de prevenção à poluição. Os resultados ainda, revelam que a maioria das empresas estudadas avaliam a possibilidade de redução de custos e utilizam do sistema de logística reversa para eliminar os produtos no seu ciclo de vida final visto à preocupação ambiental e às motivações sociais.

Abstract: The study aimed to verify the reverse logistics practices adopted by companies in the western region of Santa Catarina. Reverse logistics is related to sustainability practices. Thus, the Legitimacy Theory approach is relevant, which states about the duty of organizations to disclose accounting, financial, social and environmental information so that they are considered legitimate by society. The study was carried out through a descriptive research, through a survey, being a quantitative research. Data collection took place through a questionnaire applied to managers, responsible persons or owners of the investigated companies. The results reveal that most of the investigated companies use environmental strategies, comply with Brazilian sustainability standards and legislation and implement pollution prevention practices. Still, the findings reveal that most of the companies studied evaluate the possibility of cost reduction and use the reverse logistics system to eliminate products in their final life cycle and implement reverse logistics in their companies due to environmental concerns and due to social motivations.

Resumen: El estudio tuvo como objetivo verificar las prácticas de logística inversa adoptadas por empresas de la región occidental de Santa Catarina. La logística inversa está relacionada con las prácticas de sostenibilidad. Así, resulta relevante el enfoque de la Teoría de la Legitimidad, que establece el deber de las organizaciones de divulgar información contable, financiera, social y ambiental para que sean consideradas legítimas por la sociedad. El estudio se realizó mediante una investigación descriptiva, mediante una encuesta, siendo una investigación cuantitativa. La recogida de datos se realizó mediante un cuestionario aplicado a directivos, responsables o propietarios de las empresas investigadas. Los resultados revelan que la mayoría de las empresas investigadas utilizan estrategias ambientales, cumplen con los estándares y la legislación brasileña de sostenibilidad e implementan prácticas de prevención de la contaminación. Aún así, los hallazgos revelan que la mayoría de las empresas estudiadas evalúan la posibilidad de reducción de costos y utilizan el sistema de logística inversa para eliminar productos en su ciclo de vida final e implementar la logística inversa en sus empresas por preocupaciones ambientales y por motivaciones sociales.

Introduction

Globalization has required changes in the way companies are managed, which demand greater effort and differential in customer service and satisfaction, so the differential is in the quality of the products and services offered. In this sense, reverse logistics comes in, which can be conceptualized as: "the process of planning, implementing and controlling, adequately and efficiently the flow and storage of goods, services and related information from the point of origin to the point of consumption and vice versa, in order to satisfy customer requirements" (Costa et al., 2010, p. 10). Rogers and Tibben-Lembke (1999, p. 2) define it as "the process of planning and controlling the path and low cost of related information with the intention of value recovery or proper disposal for waste collection and treatment".

In this way, a planned and efficient logistics can contribute to meet the requests of customers in order to satisfy them, and also contribute to the impact that their products may cause on the environment. It is noticed that the concepts of logistics and reverse logistics are similar, however, the latter is concerned with the return of the product after consumption so that it can be reused in a new production process or the appropriate destination is carried out, contributing to environmental preservation.

Reverse logistics, on the other hand, focuses on the reuse of materials for the production process, seeking reuse, reducing production costs, promoting the appropriate disposal of materials and preserving the environment (Srivastava, 2007). Thus, the return of products happens through operations of collection, disassembly and reprocessing of materials or parts, in order to ensure a strategy of competitive prices and environmental awareness (Drohomeretski et al., 2014).

Andrade et al. (2018) explain that for many years organizations were concerned only with the distribution of products, focused on generating revenues, reducing costs and becoming more competitive in the market. In the 21st century, companies are realizing that the care in collecting the distributed product, already used by consumers,

in order to reuse them in their production processes or even give the correct destination to the packaging, which in turn represents an opportunity for growth and cost reduction.

In this regard, in order to address the main environmental, social and economic problems arising from inadequate waste management, Law No. 12,305 of August 2, 2010, was created, establishing the National Solid Waste Policy (NSWP) (Brazil, 2010). The law establishes a global trend based on successful experiences of sustainability practices already adopted in developed countries.

Industries generate negative impacts on the environment, from the initial production process to the final destination of goods, and some consequences may occur, such as the accelerated growth of cities and the increase in consumption by the population (Luna & Viana, 2019). The authors also reinforce that, in Brazil, there is a lack of an effective law for the Reverse Logistics system and, therefore, the NSWP is a possibility to contribute to the elaboration of action plans that further stimulate the collection of solid waste that involves the entire production chain, that is, from the supplier of the raw material to the final consumer.

Thus, depending on the complexity of the company's activities, there may be difficulties in relation to reverse logistics practices. Nascimento et al. (2016) comment that reverse logistics cause marketing implications, as they are practices that are related to products, customers and suppliers, with the destination of products and also serve as strategies to add economic, socio-environmental value and brand promotion. The authors also comment that, in Brazil, reverse logistics occurs in short steps due to the absence of legislation that ensures and requires organizations to implement it.

In this sense, the approach of the Legitimacy Theory becomes relevant, which states that it is linked to the duty of organizations to disclose accounting and financial information and also social and environmental information so that they are considered legitimate and accepted by society (Araújo et al., 2017). Legitimacy is associated with accounting since the latter is responsible for the disclosure of accounting information and, over time, companies are being pressured to disclose information related to actions promoted in favour

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of society and the environment (Brown & Deegan, 1998).

Legitimacy can be understood as a kind of social contract between the organization and society, and if the terms of this contract are breached, the company may lose its legitimacy, such as a drop in demand for products and unavailability of labour (Eugenio, 2010; Brown & Deegan, 1998). Thus, the commitment of organizations to disclose economic, social and sustainable information, in addition to being transparent, makes them legitimate (Machado & Ott, 2015).

Given the above, the guiding problem of the study is: What are the reverse logistics practices adopted by companies located in the western region of Santa Catarina? Thus, the study aims to analyze the reverse logistics practices adopted by companies located in the western region of Santa Catarina.

The research is justified by the interest in verifying the commitment of companies located in the municipalities of the western region of Santa Catarina to the environment and the impacts that such attitudes cause in the management of materials and costs of organizations. It is also justified due to the important role of reverse logistics in the life cycle of products since it reduces the generation of solid waste and assists in its proper management (Santos et al., 2013).

The study contributes as a way to demonstrate the importance of performing reverse logistics, since through it they generate less impact on the environment and in reducing costs. It contributes to companies as a means of publicizing their actions before society, demonstrating that they are committed to the environment and the society in which they operate.

Theoretical elements of the research

Reverse logistic

According to Guarnieri (2011), discussions about the environment began due to the unbridled extraction of natural resources and the increase in the scale of production, factors that stimulated the exploitation of the environment and increased the amount of waste generated. According to the author, technological innovations and changes in consumption have intensified the situation, threatening future generations.

These factors have contributed to the emergence of more sustainable practices in the business environment, making room for a new waste management and return tool, the reverse logistics tool. With trade restrictions and environmental requirements, it becomes an increasingly indispensable practice in organizations (Guarnieri, 2011).

Research on reverse logistics has evolved over the years. For Agrawal et al. (2015), reverse logistics has become an important field of research and application for organizations, considering that concerns about environmental issues, sustainable competition, social responsibility and legislation are growing in the business environment. For Cheng and Lee (2010), the factor responsible for the acceleration of reverse logistics processes in organizations was globalization.

Andrade et al. (2018) comment that reverse logistics awakens an opportunity for growth and cost reduction, gaining more space and the attention of innovative companies through the reuse of raw materials and inputs, that is, it is a reverse path process of the availability and supply of products within the consumer market. The authors explain that reverse logistics not only makes products available on the market directly, but is linked to other logistical factors that can improve the production process of organizations, such as delivery time, distribution channels, reuse of raw materials and the return to the life cycle of products.

For Rogers and Tibben-Lembke (2001), reverse logistics management is becoming important. The authors classify reverse logistics in two ways: product and packaging. The first classification is divided between the activities of returning the product to its origin, reselling the product, selling the product via outlet, reconditioning, remanufacturing, recycling, donation and disposal. The second classification is divided into reuse, recycling and disposal

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activities.

Reverse logistics can be divided into two areas of activity: after-sales reverse logistics and post-consumer reverse logistics. The first deals with the planning, control and destination of unused goods, which can return to the distribution chain for reasons such as damage in transportation, and expiration date, among others. Post-consumer reverse logistics is seen as "the area of reverse logistics that deals with goods at the end of their useful life, used goods with the possibility of reuse (packaging) and industrial waste" (Guarnieri, 2011, p. 55).

It is important to distinguish between after-sales and post-consumer reverse logistics due to the different destinations of the waste derived from each of them. After-sales goods return to companies and can have their parts reused. On the other hand, post-consumer goods can be sent to destinations such as landfills or incineration, or they can return to the production cycle extending their useful life (Guarnieri, 2011).

Regarding the complexity of product return, Leite (2006) describes that the return follows some steps, which can be summarized as product entry into the reverse chain (collection), quantitative and geographical consolidations of the collected products, destination selection of returned products, industrial processing of material reuse and distribution of new products to the market.

Leite (2006) makes a relationship between reverse logistics and the environment when he states that ecological sensitiveness is one of the new incentive factors for reverse logistics. Ecological sensitiveness has been accompanied by actions of organizations and governments, aiming to mitigate the most visible effects of the various impacts caused to the environment, protecting society and its own interests.

With this, it is perceived that reverse logistics is fundamental for organizations, not only as an economically viable practice but also conveys to its consumers the idea of an ecologically responsible company. Regarding the social scope, there is the possibility of job creation, since by encouraging recycling new workplaces are originated for collection, preparation and reprocessing activities.

Sustainability

In the 21st century, research on sustainability has evolved as population and economic growth accelerate and the shortage of natural resources is perceived. At a global level, sustainability is understood as actions taken to meet the needs of present generations, but without compromising the needs and quality of life of future generations (Hart & Milstein, 2004). In turn, a company is considered sustainable when its actions generate economic, social and environmental benefits, thus promoting sustainable development (Claro & Claro, 2014; Barboza et al., 2015).

Zanella et al. (2019) explain that sustainability can be defined as the possibility to manage the organization and the interests of society. It is understood as a set of actions that cover the social, environmental, economic and financial dimensions. According to the same authors, there is still a misalignment between the objectives of companies with the concept of sustainability, given that concerns and interests focused on the economic and financial aspects of firms still prevail. On the other hand, environmental issues are less addressed, especially in smaller companies (Leoneti et al., 2016). In addition, social issues stand out from environmental issues due to the requirements of companies to comply with strict labour laws (Wernke & Junges, 2020).

Sehnem et al. (2015) explain that in recent years stakeholders (customers, suppliers, employees, governmental and non-governmental bodies) have demanded environmentally friendly postures from companies. However, small and medium-sized enterprises, in particular, face difficulties in investing in environmentally friendly actions due to limited financial and human resources, which can undermine their competitiveness with larger companies. The authors add that it is not enough to implement sustainable actions, it is also necessary to implement indicators that allow the company to monitor sustainable development, considering that

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the return on investments in sustainability occurs in the medium and long term.

Barbosa et al. (2019) state that some companies, such as industries, generate a large amount of waste, effluent and emit substances into the atmosphere that impact the environment. Packaging, soot, metals, scrap metal, glass, light bulbs, among others, are examples of waste generated by industrial companies that must be managed to avoid incorrect disposal. However, managers are aware that environmentally sound actions must be part of the organization's decision-making processes to avoid resource scarcity and environmental liabilities.

According to the authors, through a study applied in industrial companies, some socio-environmental initiatives are perceived, such as the selective collection of garbage, the awareness of workers regarding the separation of recyclable material and the replacement of disposable materials (cups) with plastic materials.

In turn, the literature demonstrates other sustainable initiatives practised by companies, such as investments in occupational safety and medicine, life insurance, scholarships for workers' undergraduate and graduate degrees, donations, training, lectures (Branco et al., 2019), reduction in the use of chemicals for pest control, quality and reduction of water consumption, green awareness programs, renewable energy (Fighera et al., 2017), reverse logistics, environmental certification, implementation of the 5S program and treatment of liquid and solid waste (Wittmann et al., 2017).

In this sense, it should be noted that the Legitimacy Theory postulates that organizations must operate within the norms and limits imposed by society. However, the norms and limits are not fixed and may change over time, although companies will always be responsible for the way they explore their activities. In this sense, it can be said that there is a social contract between organizations and the people affected by the operation of their activities and it is expected that all the terms of this contract are fulfilled. Otherwise, revocation may occur by reducing or eliminating the demand for the products offered,

eliminating the supply of labour, financial capital and/or constituents may pressure the government to increase taxes, fines and create more stringent laws that prohibit actions that are out of line with society's expectations (Brown & Deegan, 1998).

Correa et al. (2015) explain that due to accelerated economic growth, over time, society began to worry about the scarcity of natural resources and the aggression caused by companies toward the environment. Companies pressured to adopt measures to reduce the environmental impacts caused by the exploitation of their activities, began to present their legitimacy to society through the disclosure in their reports of their sustainable actions.

On the other hand, Machado and Ott (2015) explain that gaining legitimacy is more difficult than maintaining it, considering that the organization's efforts to be accepted in the market when starting its activities will be greater due to the necessary capacity to convince society of the need to produce and consume the product, the positive and negative social and environmental impacts and the practices to mitigate the negative impacts caused on society and the environment due to the exploitation of activities.

Patten (1992) points out that until recently legitimacy was considered only in aspects related to economic performance, that is, it was enough for the company to be economically and financially successful to be rewarded with legitimacy. However, between the 1960s and 1970s, society's perception of business changed. Lawyers and researchers focused on corporate social performance gained prominence, while the credibility of organizations with society decreased. Therefore, society started to demand better social and environmental practices from companies. According to the authors, while economic performance could be measured through profit growth, social performance was not being demanded by the market and, therefore, the initiative to address social concerns caused by organizations came from public policies.

Legitimacy Theory posits that organizations must operate within the norms and boundaries

imposed by society. Such norms and boundaries are not fixed and may change over time, but companies will always be accountable for the way they operate their activities. In this sense, it can be said that there is a social contract between organizations and the people affected by the operation of their activities and it is expected that all the terms of this contract will be fulfilled. Otherwise, abrogation may occur through reduced or eliminated demand for the products offered, elimination of labour supply, financial capital, and/or constituents may pressure the government to increase taxes, fines, and create laws that prohibit actions that are out of line with societal expectations (Brown & Deegan, 1998)..

Related studies

Andrade et al. (2018) conducted a case study in the electronic TEC group, with the objective of analyzing the importance of reverse logistics as a means of reducing costs. One of the main results found was that the values achieved with the reverse logistics process, in percentage terms, promoted a reduction in handling and transportation costs of 51.45% over the direct logistics process.

Fernandes et al. (2018), through a systematic literature review of 11 selected scientific articles, sought to investigate, through analysis, the ways of measuring the performance of reverse logistics. The results of this study showed that the most used indicators were financial and/or economic performance, together with indicators related to customers, followed by indicators related to the improvement of internal processes, environmental, innovation and growth, social and, finally, supplier. It is emphasized that there is no singular justification for the best measures to evaluate the performance of an activity, so each company must establish the measures appropriate to its characteristics so that they can meet the company's goals.

Lourenço and Lira (2012) carried out a bibliographical research. The objective of the study was to make a comparative analysis between three processes of reverse logistics of vitreous waste.

The results showed that the reverse logistics processes described provide economic and environmental advantages for companies. On the other hand, the implementation of reverse processes requires high investments, as well as the mapping and standardization of production processes.

Santana (2008) sought to identify how companies adopt or employ the concept of reverse logistics. Through literature review and historical reverse logistics in a non-probabilistic sample for convenience, 110 questionnaires were sent to companies throughout the state of Rio Grande do Sul. The research reveals how much companies know the concept and how much it is inserted in the organizational context. The companies in this segment surveyed are seeking to use the tool and, at the same time, provide solutions to items that may be obstacles in the operationalization of reverse logistics in the daily routine of common logistics.

Santos et al. (2013) conducted a bibliographical research with the information available on the web, such as the website of environmental regulatory agencies and associations linked to the tire segment. The objective of the research was to analyze the contribution of reverse logistics in the stages of proper management of post-consumer tires. Among the main results found, the dynamics of reverse cycle management stand out, that is, the life of a product does not end with delivery to the customer, since products become obsolete, damaged or cease to function, and must return to the point of origin to be properly disposed of, repaired or reused.

Santos et al. (2012) conducted a case study in the Solidarity Movement Colmeia, a social organization located in the municipality of Rio Grande (RS). Their objective was to analyze the main environmental, social and economic benefits resulting from the recycling practices of used frying oil in the soap-making process. The results identified that the workshop contributes to the generation of several environmental and socioeconomic benefits, since the used frying oil,

which would be discarded in the collection of organic waste, is transformed into raw material for the production of soap.

In this sense, based on the review of the literature exposed, the research hypotheses of the study are presented:

H1: Economic motivations (cost reduction and profit increase) influence Reverse Logistics practices in establishments.

H2: Social motivations (social welfare) influence Reverse Logistics practices in establishments.

H3: Environmental motivations (environment, compliance with environmental legislation) influence Reverse Logistics practices in establishments.

Methodological elements of the research

The study is descriptive research conducted through a survey. To this end, the approach to the problem was adopted as quantitative research.

The research population comprises the managers of companies located in the western region of Santa Catarina, thus, the population was delimited to the managers responsible for the logistics sector and the sectors with reverse logistics system of the companies analyzed, such as: mechanics, bar, restaurant, agriculture, supermarket, etc.

For data collection, a 5-point Likert scale questionnaire was used for the statements of the sustainability and reverse logistics blocks. The data collection instrument was adapted from the studies by Varadinov et al. (2017), Slompo et al. (2013) and Souza et al. (2018). To this end, the questionnaire was composed of 37 statements divided into three blocks, the first was used for the characterization of the respondents, the second was composed of questions about sustainability and the third was about aspects of reverse logistics. Chart 1 shows the variables and statements of the research.

The questionnaire was validated with two professionals working in the reverse logistics sector and with a lecturer/researcher in the sustainability area. The research instrument was validated without changes because it had already been applied by previous research.

TChart 1
Research tool

Variables	Affirmative
Economic motivations	Practices actions to reduce the consumption of raw materials. It implements paper-saving actions in its activities. The reason for implementing reverse logistics in the company is to reduce costs. The implementation of reverse logistics is a strategy to make the company more competitive in the market. The implementation of Reverse Logistics in the establishment is related to economic and financial motivations (cost reduction and profit increase). The company evaluates possibilities to reduce the costs of production and services provided.
Social Motivations	It promotes environmental education for employees, their families and the community. The implementation of Reverse Logistics in the establishment is related to social motivations (social welfare).
Environmental Motivations	Makes use of environmental strategies. Complies with Brazilian sustainability standards and legislation. Implements pollution prevention practices. Implemented new environmental management techniques in the last three years. Implements actions in its facilities and activities that aim to preserve the environment. Practices in its facilities actions such as proper final destination for waste that requires specific treatment. Replaces raw materials with others that are less contaminating, dangerous and aggressive to the environment. It is concerned with acquiring products aimed at sustainability. The reason for implementing Reverse Logistics in the company is due to environmental concerns. The implementation of Reverse Logistics in the establishment is related to Legal Motivations (Legislation). The reason for the implementation of Reverse Logistics in the company is due to compliance with Legislation. The company uses the Reverse Logistics system (Collection of consumed products) to dispose of end-of-life products.
Reverse Logistics	The company discusses partnerships with Suppliers, aiming at the return of discarded

	materials (such as expired products, batteries, used tires and used light bulbs, packaging, etc) to the manufacturer.
	The company uses the Reverse Logistics system (Collection of consumed products) to recycle the collected/returned products.
	The company uses the Reverse Logistics system (Collection of consumed products) to reuse the products in new production processes or provision of services.
	The company discusses partnerships with Customers, aiming at the return of discarded materials (such as expired products, batteries, used tires and used light bulbs, packaging, etc) to the manufacturer.
	The company hires service providers such as transporters and recyclers to collect the carcasses/products consumed.
	The company knows the final destination of the products.
	In the last three years, the company has started using some new or significantly improved logistics systems or methods of delivery and collection for its inputs, goods or services.

Source: adapted from Varadinov et al. (2017); Slompo et al. (2013); Souza et al. (2018).

The questionnaire was sent to the managers of the companies that were part of the research population, respecting the following criteria: a) conference of the selected activities; b) be part of the union of each selected sector; c) have e-mail available. After the criteria were met, the questionnaire was sent via e-mail containing the link to the "Google Docs" form. The collection took place from January to May 2020. A total of 40 valid questionnaires were received, so the research sample consisted of 40 responding managers from the companies analyzed.

Descriptive statistics and multiple linear regression were used to analyze the results. After performing the descriptive statistics, in order to obtain evidence of the influence of sustainability mechanisms on reverse logistics practices, multiple linear regression was performed using SPSS software.

The multiple linear regression equation was constituted:

$$LR = \beta_0 + \beta_1 ME + \beta_2 MS + \beta_3 MA + \varepsilon$$

Where:

LR = Reverse Logistics
ME = Economic Motivations
MS = Social Motivations
MA = Environmental Motivations

To validate the multiple linear regression model, the assumptions of normality were observed, using the Kolmogorov-Smirnov test; multicollinearity, using the variance inflation factor (VIF); and Tolerance and absence of serial autocorrelation, using the Durbin-Watson test, thus validating the research model.

Presentation and discussion of results

This section presents the results and analysis of the data obtained. The strategies adopted aimed at sustainability and the motivations that led companies to implement reverse logistics practices were analyzed.

In this first approach, the characteristics of the respondents of the questionnaire are described, taking into account the professional information, as well as the characterization of the company.

Table 1
Age range and education of the respondent

Age	Abs. Freq.	Rel. Freq.	Form.	Abs. Freq.	Rel. Freq.
18 a 25 Years	10	25,00%	Higher Education	18	45%
26 a 35 Years	13	32,50%	High School	6	15%
36 a 45 Years	10	25,00%	Specialization	11	27,50%
Over 46 Years	7	17,50%	Master	5	12,50%
Total	**40**	**100%**			**100%**

Source: survey data.

Based on Table 1, it appears that most respondents are aged between 26 and 35 years, representing 32.50% of the sample. In its smallest part, there are respondents over 46 years old, representing 17.50%. It can be seen that there is a homogenization regarding the ages of the respondent managers and the responsible for logistics in companies in the West of Santa Catarina.

It is observed that 45% of the investigated sample has higher education training, followed by specialization with 27.50% of managers and

another 12.5% have a master's degree in their highest degree. Table 2 shows the gender of the survey respondents.

Table 2
Gender of respondents

Gender	Absolute Frequency	Relative Frequency
Female	20	50%
Male	20	50%
Total	**40**	**100,00%**

Source: survey data.

It is noted that there is a homogeneity of respondents in relation to gender, showing, in turn, the same number of respondents (20) both male and female. This is an interesting finding, given that in most cases management positions tend to be held by men. Regarding the management, responsibility and ownership of companies, the data are shown in Table 3.

Table 3
Manager/responsible person/owner of company

Description	Absolute Frequency	Relative Frequency
No	17	42,50%
Yes	23	57,50%
Total	40	100,00%

Source: survey data.

It is noted that there is a homogeneity of respondents in relation to gender, showing, in turn, the same number of respondents (20) both male and female. This is an interesting finding, given that in most cases management positions tend to be held by men. Regarding the management, responsibility and ownership of companies, the data are shown in Table 3.

Table 4
City where the company is located

Description	Absolute Frequency	Relative Frequency
Arvoredo	1	2,50%
Caçador	3	7,50%
Chapecó	34	85%
Pinhalzinho	1	2,50%
Xaxim	1	2,50%
Total	**40**	**100,00%**

Source: survey data.

Regarding the location of the companies that participated in the study, it is observed that 85% are in the city of Chapecó, 7.50% in the city of Caçador, 2.50% in the cities of Arvoredo, Pinhalzinho and Xaxim, both cities belong to the western region of the State of Santa Catarina.

Table 5 shows the time of activity of the company in the market.

Table 5
Time the company has been active in the market

Description	Absolute Frequency	Relative Frequency
Up to 5 Years	15	37,50%
6 to 10 Years	6	15%
11 to 15 Years	8	20%
16 to 20 Years	3	7,50%
More than 20 Years	8	20%
Total	**40**	**100,00%**

Source: survey data.

Regarding the time of activity of the company in the market, it is observed that 37.50% are exercising their activity up to 5 years, which represents the largest number of companies in the study. The lowest percentage, 7.50%, are companies that operate in the market between 16 and 20 years. Companies with more than 20 years in the market represent 20% of the sample investigated. It can be seen, then, that there is a diversification in relation to the time of operation of companies in the market that use reverse logistics and the need to adapt and legitimize their activities before society.

Table 6 shows the size of the companies in the sample investigated.

Table 6
Company size

Description	Absolute Frequency	Relative Frequency
Large size	9	22,50%
Small size	17	42,50%
Microenterprise	12	30%
MEI	2	5%
Total	**40**	**100,00%**

Source: survey data.

Table 6 shows that 42.50% of the companies

investigated are small, 30% are microenterprises, 22.50% are large companies and 5% are individual microentrepreneurs. It can be seen that from microentrepreneurs to large companies in the region are concerned with the legitimization of their actions before society and the environment.

Table 7 shows the economic activity of the companies that answered the questionnaire.

Table 7
Economic activity of the company

Description	Absolute Frequency	Relative Frequency
Commerce	14	35%
Trade and services	11	27,50%
Industry	6	15%
Industry and trade	3	7,50%
Provision of services	6	15%
Total	**40**	**100,00%**

Source: survey data.

Table 6 shows that 42.50% of the companies investigated are small, 30% are microenterprises, 22.50% are large companies and 5% are individual microentrepreneurs. It can be seen that from microentrepreneurs to large companies in the region are concerned with the legitimization of their actions before society and the environment.

Table 7 shows the economic activity of the companies that answered the questionnaire.

Table 8
Economic activity of the company

Description	Absolute Frequency	Relative Frequency
Agricultural	8	20%
Auto electrics	1	2,50%
Bars and restaurants	4	10%
Safety equipment distributors	1	2,50%
Manufacture of appliances for energy distribution	1	2,50%
Pharmacies	1	2,50%
Mechanics	13	35,72%
Veterinary products and pharmaceuticals	1	2,50%
Refrigeration	1	2,50%
Supermarkets	2	5%
Effluent treatment	7	17,50%
Total	**40**	**100,00%**

Source: survey data.

In relation to the branch of activity of the companies that participated in the research, in the first place there are the mechanics, representing 35.72%, followed by agriculture, representing 20%. Companies in the field of wastewater treatment at 17.50%, bars and restaurants at 10%, supermarkets representing 5% and other branches, such as auto electric, distributors of safety equipment, manufacture of appliances for energy distribution, pharmacies, veterinary products and refrigeration represent 2.50% of the total sample.

Next, we sought to verify which actions the companies practice on their premises related to sustainability, aiming at reducing environmental impacts and preserving the environment. Table 9 presents the descriptive analysis of the variables.

Table 9
Descriptive statistics for the variables

Variables	Average				
Reverse Logistics	1,00	5,00	3,84	4,00	1,02
Economic Motivations	2,17	5,00	4,15	4,33	0,84
Social Motivations	1,00	5,00	4,00	4,33	1,08
Environmental Motivations	2,09	5,00	4,25	4,36	0,73

Source: survey data.

It is observed that on a scale of 1 (totally disagree) to 5 (totally agree), the Reverse Logistics practices by the investigated establishments represent an average of 3.84. From the average of 4.15, it is noted that respondents agree that cost reduction and profit increase influence Reverse Logistics practices in establishments. In the same direction, respondents agree, in view of the average 4 that concerns about social welfare influence Reverse Logistics practices in establishments. Finally, the highest average of 4.25 is noted, that is, respondents agree that concerns about the environment and compliance with environmental legislation influence Reverse Logistics practices in the companies studied. It should be noted that this variable has the lowest standard deviation in relation to the sample mean (0.73).

To verify the influence of the independent variables on the dependent variable (Reverse Logistics), the econometric models were elaborated as shown in Table 10.

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Table 10

Influence of economic, social and environmental motivations on reverse logistics practices

Variables (Independent)	Reverse logistics (Dependent variable)	Cronbach's Alpha
Constant	0,061	
Economic Motivations	0,292	0,781
Social Motivations	0,392	0,682
Environmental Motivations	0,000***	0,821
Adjusted R²	0,70	
F- ANOVA	0,000	
Durbin-Watson	2,33	
Kolmogorov-Smirnov	p < 0,05	
VIF/Tolerance	> 0,10 e < 10	

Source: survey data.

Note: significant at the 10% level *; 5% **; 1% ***

Through Table 10, it is observed that the adjusted R^2 presented high explanatory capacity in relation to the variability between the variables, that is, the economic, social and environmental motivations present 70% of the variability in the implementation of Reverse Logistics practices in the investigated establishments. From the significance evidenced by ANOVA ($p < 0.05$), it is observed that the independent variables interact with each other and explain the dependent variable, leading to the rejection of the null hypothesis, that is, the economic, social and environmental motivations explain the Reverse Logistics practices implemented in the establishments that make up the study sample.

To verify the reliability of the data collection instrument, Cronbach's alpha was applied, a value above 0.7 is acceptable for Cronbach's alpha and values below 0.7 represent an unreliable scale (Field, 2009). In this sense, Table 10 shows that environmental motivations obtained a value of 0.821, economic motivations 0.781 and social motivations 0.682. Therefore, Cronbach's alpha values of the variables representing environmental and economic motivations are reliable, some studies accept Cronbach's alpha between 0.60 and 0.7 in management research.

On the other hand, the Durbin-Watson test presents 2.33, being close to 2, which indicates the absence of autocorrelation of the residuals, because, according to Field (2009), the purpose of the Durbin-Watson test is to test the assumption of independence of the errors and to be of concern the value must be different from 2. The Kolmogorov-Smirnov test compares the normal distribution of the sample and to be significant the value found must be less than 0.05. Therefore, from Table 10, it is noted that the Kolmogorov-Smirnov test shows $p < 0.05$, i.e., non-normal distribution. Field (2009) explains that if the test is significant ($p < 0.05$) the distribution is significantly different from a normal distribution.

In relation to the variance inflation factor (VIF), they indicate values less than 10 and greater than 1, so the multicollinearity of the data is not problematic, considering that values below 0.10 and above 10 indicate serious problems of collinearity (Field, 2009).

Thus, we can analyze the hypotheses proposed in the study. H1 indicates that economic motivations (cost reduction and profit increase) influence Reverse Logistics practices in establishments, according to the result found in this study, this hypothesis is rejected (H1), p-value 0.292).

In the second hypothesis H2, the study predicted that social motivations (social welfare) would influence Reverse Logistics practices in establishments. This hypothesis was also dismissed with p-value of 0.392. Thus, it is inferred that social welfare also has no significant influence on the adoption of reverse logistics practices in the companies studied. Thus, it appears that in the companies studied the reduction of costs and respectively increase in profits are not related to the question of whether or not companies adopt reverse logistics in their companies. Based on the results, it can be inferred that companies use reverse logistics out of concern for the environment and as a way to legitimize their actions aimed at the environment.

In the third hypothesis H3, the study inferred that environmental motivations (environment, compliance with environmental legislation) would influence Reverse Logistics practices in

establishments. This hypothesis is accepted, thus H3 is not rejected,with p-value 0.000, indicating that environmental aspects related to the environment and compliance with environmental legislation matter when companies choose to perform reverse logistics.

It can be highlighted that the Reverse Logistics practices implemented in the establishments that make up the study sample are motivated by environmental aspects, that is, the establishments are concerned with complying with environmental legislation, with the correct disposal of waste and other aspects that may negatively impact the environment. Thus, according to Agrawal et al. (2015), reverse logistics has become an important field of research and application for organizations, considering that concerns about environmental issues, sustainable competition, social responsibility and legislation are growing in the business sphere.

It is worth mentioning that the economic motivations due to the need to legitimize environmental practices went unnoticed by companies at that time. As Machado and Ott (2015) comment, gaining legitimacy is more difficult than maintaining it, considering that the organization's efforts to be accepted in the market when starting its activities will be greater due to the necessary capacity to convince society of the need to produce and consume the product, the positive and negative social and environmental impacts and the practices to mitigate the negative impacts caused on society and the environment due to the exploitation of activities. In this way, the companies studied may be at the moment of legitimizing their activities and have not yet had an economic return or have not yet realized this return in their companies due to the need for legitimation.

Final considerations

The study aimed to analyze the reverse logistics practices adopted by companies in the western region of Santa Catarina. This objective was met since there was the possibility of analyzing the reverse logistics practices in companies in the western region of Santa Catarina and the variables analyses that influence the establishments to implement reverse logistics in their activities.

It can be observed that reverse logistics is inserted in companies of the most different branches of activities and various sizes. The motivators that influence the implementation of reverse logistics in the companies investigated are associated with environmental concerns (compliance with environmental standards and legislation, pollution, environmental management and waste management).

It appears that economic and social motivations are not related to the question of whether or not companies adopt reverse logistics in their companies. It is only in the context of environmental motivations that companies are influenced to adopt reverse logistics practices.

The study also shows that there are advantages in investing in the reverse logistics tool since it improves the management of other internal processes of organizations, such as returns, replacement of components and guarantees, among others (Santana, 2008). Thus, it is concluded that the companies investigated make use of environmental strategies, comply with Brazilian sustainability standards and legislation and implement pollution prevention practices. It is also concluded that companies see the possibility of cost reduction and use reverse logistics to eliminate products in their final life cycle and implement reverse logistics due to concern for the environment and social motivations.

As a limitation of the study, it can be pointed out the difficulty in obtaining the return of responses from the questionnaire, which resulted in a relatively low sample. The study is also limited to the questionnaire used and ways of analyzing the data. It is also limited to the companies surveyed being from a specific region. For future studies, it is suggested to verify the economic feasibility of implementing reverse logistics to reduce costs, since this often requires high investments, in order to assess whether it is feasible for organizations to apply this instrument.

Finally, it can be seen that reverse logistics has

been discussed more intensively, both in the academic environment and in the business environment. This discussion is due to the development of social responsibility, in view of the continuous growth of environmental pollution.

Thus, the research contributes to the very reflection on attitudes and daily habits, the environmental, social and economic consequences that the improper disposal of products and waste can bring, since a simple act of saving paper can lead to cost reduction and reduced environmental impacts.

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