

**SUPPLIER MANAGEMENT BASED ON PERFORMANCE INDICATORS: A
STUDY IN THE PULP AND PAPER SECTOR**

**GESTÃO DE FORNECEDORES BASEADA EM INDICADORES DE
DESEMPENHO UM ESTUDO NO SETOR DE PAPEL E CELULOSE**

**GESTIÓN DE PROVEEDORES BASADA EN INDICADORES DE DESEMPEÑO:
UN ESTUDIO EN EL SECTOR DE PAPEL Y CELULOSA**

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ABSTRACT

Supplier management is one of the strategic pillars for the competitiveness of supply chains, especially in highly productive sectors such as pulp and paper. In an environment characterized by deverticalization, an increasing number of partners, and pressures for efficiency and sustainability, performance indicators become essential tools to evaluate and align expectations between customers and suppliers. This article aims to analyze the use of performance indicators in supplier management in the pulp and paper sector in Santa Catarina, highlighting their contribution to reliability and continuous improvement of the supply chain. Methodologically, the research is exploratory, with both quantitative and qualitative approaches, developed through a literature review and the application of a structured questionnaire to 36 companies, obtaining 30 valid responses. The results show that the most valued indicators are delivery time, quality, and cost, although aspects such as flexibility, production capacity, after-sales service, and socio-environmental responsibility also emerge as relevant criteria. It was found that the systematic application of indicators contributes to greater reliability, enhances communication among partners, and enables joint action plans for continuous improvement. Additionally, established suppliers in the market tend to achieve better performance, reinforcing the importance of accumulated experience and long-term partnerships. As a contribution, the study broadens the understanding of the application of performance indicators in a strategic sector, emphasizing the need to incorporate emerging dimensions such as innovation and sustainability in the evaluation and development of suppliers.

Keywords: Performance Indicators. Supplier Management. Supply Chain. Pulp and Paper.

RESUMO

A gestão de fornecedores é um dos pilares estratégicos para a competitividade das cadeias de suprimentos, sobretudo em setores de alta intensidade produtiva como o de papel e celulose. Em um ambiente marcado por desverticalização, aumento do número de parceiros e pressões por eficiência e sustentabilidade, os indicadores de desempenho tornam-se ferramentas essenciais para avaliar e alinhar expectativas entre clientes e fornecedores. Este artigo tem como objetivo analisar a utilização de indicadores de desempenho na gestão

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de fornecedores do setor de papel e celulose em Santa Catarina, destacando sua contribuição para a confiabilidade e a melhoria contínua da cadeia. Metodologicamente, a pesquisa caracteriza-se como exploratória, de natureza quantitativa e qualitativa, desenvolvida por meio de revisão bibliográfica e aplicação de questionário estruturado junto a 36 empresas, obtendo 30 respostas válidas. Os resultados evidenciam que os indicadores mais valorizados são prazo de entrega, qualidade e custo, embora aspectos como flexibilidade, capacidade produtiva, assistência pós-venda e responsabilidade socioambiental também apareçam como critérios relevantes. Constatou-se que a aplicação sistemática de indicadores contribui para maior confiabilidade, aprimora a comunicação entre parceiros e viabiliza planos de ação conjuntos para melhoria contínua. Além disso, verificou-se que fornecedores consolidados no mercado tendem a obter melhor desempenho, reforçando a importância da experiência acumulada e das parcerias de longo prazo. Como contribuição, o estudo amplia a compreensão sobre a aplicação de indicadores de desempenho em um setor estratégico, ressaltando a necessidade de incorporar dimensões emergentes, como inovação e sustentabilidade, no processo de avaliação e desenvolvimento de fornecedores.

Palavras-chave: Indicadores de Desempenho. Gestão de Fornecedores. Cadeia de Suprimentos. Papel e Celulose.

RESUMEN

La gestión de proveedores es uno de los pilares estratégicos para la competitividad de las cadenas de suministro, especialmente en sectores de alta intensidad productiva como el de papel y celulosa. En un entorno marcado por la desverticalización, el aumento del número de socios y las presiones por eficiencia y sostenibilidad, los indicadores de desempeño se convierten en herramientas esenciales para evaluar y alinear expectativas entre clientes y proveedores. Este artículo tiene como objetivo analizar la utilización de indicadores de desempeño en la gestión de proveedores del sector de papel y celulosa en Santa Catarina, destacando su contribución a la confiabilidad y la mejora continua de la cadena. Metodológicamente, la investigación se caracteriza como exploratoria, de naturaleza cuantitativa y cualitativa, desarrollada mediante revisión bibliográfica y aplicación de un cuestionario estructurado a 36 empresas, obteniendo 30 respuestas válidas. Los resultados evidencian que los indicadores más valorados son plazo de entrega, calidad y costo, aunque aspectos como flexibilidad, capacidad productiva, asistencia postventa y responsabilidad socioambiental también aparecen como criterios relevantes. Se constató que la aplicación sistemática de indicadores contribuye a una mayor confiabilidad, mejora la comunicación entre socios y posibilita planes de acción conjuntos para la mejora continua. Además, se verificó que los proveedores consolidados en el mercado tienden a obtener un mejor desempeño, reforzando la importancia de la experiencia acumulada y de las asociaciones a largo plazo. Como contribución, el estudio amplía la comprensión sobre la aplicación de indicadores de desempeño en un sector estratégico, destacando la necesidad de incorporar dimensiones emergentes, como innovación y sostenibilidad, en el proceso de evaluación y desarrollo de proveedores.

Palabras clave: Indicadores de Desempeño. Gestión de Proveedores. Cadena de Suministro. Papel y Celulosa.

1 INTRODUCTION

Historically, the market goes through several phases, different sectors can go through different moments, a fundamental point is to serve your customer within the established deadline with the quality of contracted products, so the monitoring of suppliers along the supply chain is essential to make it reliable (CASTRO; SANTIAGO; JÚNIOR, 2012).

Reliability in suppliers allows many companies to reduce some internal processes, in order to eliminate losses in the production system, loss due to equipment wear, losses in logistics, consequently having a product benefited by specialized labor, among others. Thus making external suppliers responsible for the supply chain, making them increasingly concerned with the "Just in time" philosophy and directly responsible for the quality of the final product.

The monitoring of product delivery conditions is eminent due to the growth of supply, making performance indicators a very important tool for controlling these suppliers, thus evidencing the degree of reliability of these suppliers (BRANCO; MARTIN; SILVA, 2016; GOD; RODRIGUES; LACERDA, 2011).

One of the ways to monitor suppliers throughout the supply chain is through the use of supplier performance indicators, thus allowing the analysis of the reliability and performance of its suppliers, as well as the results achieved by the company (BOWERSOX et al., 2014).

Thus, this research aims to identify what are the types of relationships adopted between the corrugated paper packaging supplier and its customers, as well as to diagnose the intensity of these relationships. This work seeks to explore the understanding of the types of evaluations and indicators that a company uses to evaluate suppliers. This analysis allows the company to correlate the acquired indicators with its internal management indicators, enabling a broader understanding of possible situations and ensuring more efficient improvement plans for a given situation.

2 WORKS RELATED TO THE RESEARCH THEME

RINCKUS and BASTOS (2014) in their article entitled "Use of performance indicators as a tool to support the management of suppliers of a company in the metal-mechanic sector of the middle valley of Itajaí-SC", aims in their article at the increase of suppliers in the new phase of the industry, which seeks to take production processes out of their hands. The article highlights the need to use performance indicators to improve some indicators, such as quality,

price and delivery time, and as an improvement in feedback, partnerships and goals are perceived, the dialogue between customer and supplier and their processes and products is improved.

Branco et al. (2016) in their article "Indicator studies for 36 supply chain performance measurements: a case study of the physical control of a Brazilian Army vehicle", aims to analyze the supply chain control activities of the Brazilian Army using vehicles as a case study, aims to propose supply chain performance indicators. As a conclusion, it was verified the importance of planning the use of resources. The modernization of the system is a suggestion to organize activities, as well as to sustain long-term planning.

Sena and Campos (2015) evaluated the performance of suppliers in the civil construction supply chain. To do so, it used a questionnaire based on performance indicators. The form made it possible for the customer to choose the supplier, since indicators pointed out the best evaluated suppliers and general data of each of them. With the research, the authors concluded that not even the customers in the civil construction supply chain had a well-defined system of suppliers, leading them to often change suppliers at each work, making partnerships difficult.

For Galo et al. (2013) in their article entitled "Performance measurement and supplier selection: a case study in a logistics operator", the objective was to suggest which indicators are more appropriate for service providers in external transport and to analyze the alignment of these indicators against the preferences of the logistics decision-maker in the process of choosing the service provider. With the collection and tabulation of data, the company's concern with the appropriate selection of service providers is verified, the maintenance of the supplier's performance throughout the contract is a widely used concern.

Almeida (2013) also applied managerial performance indicators in a company in the civil construction area. The survey proposed that the company adopt new performance indicators in the evaluation of supply chain management. During the analysis, it was found that the company had many indicators to evaluate project management, while few were intended to specifically measure supply chain management. In view of this, the authors proposed new performance indicators to manage the supply chain, as well as presented proposals for methods to measure these new indicators.

3 METHODOLOGICAL PROCEDURES

The research was applied to companies in the pulp and paper sector in the state of Santa Catarina. This research is characterized as exploratory of quantitative and qualitative nature and developed through field research. As for the sources of research, it was substantiated through bibliographic review and field research. The survey was carried out with customers from different segments.

For the execution of this research, it was necessary to prepare a questionnaire with 25 objective questions via Google Forms and the Microsoft Word and Microsoft Excel® software for analysis of the collected data and preparation of Figures to make the results available.

The research instrument was based on the work of RINCKUS and BASTOS (2014), being the only form for data collection, which was used in this research. The questionnaire presents the pre-established answer options and uses a Likert scale.

Before the final application, a pilot test was carried out in three companies in the segment, to verify the adhesion and possible improvements in the instrument. After making the suggested adjustments, the questionnaire was sent to the representatives of the companies. For the respondents, they were asked to choose a single alternative for each question, in order to allow the identification of the practices adopted in the relationships and thus the characterization of the type of relationship that the company maintains with its suppliers.

The questionnaire was sent via e-mail to representatives of 36 companies in the pulp and paper sector in Santa Catarina, with 30 responses in total. Before that, telephone contact was maintained to identify those responsible for the supplier's materials management part and identify the people who would answer the questionnaire. Support to answer questions regarding its completion was given by telephone. The choice of the target companies to be part of this research was made through the companies registered on the FIESC website, where due to the large number of companies in the segment in Santa Catarina, the field research became viable.

4 RESULTS AND DISCUSSIONS

The companies surveyed are located in Santa Catarina and were distributed among outsourced suppliers of raw materials and companies that supply standardized products with internal production.

The data collected show that most of the companies surveyed are located in Blumenau, with a percentage of 30%, which shows that these companies in the pulp and paper sector have supply to large industrial centers. It also has 10%, suppliers located in São Bento Do Sul and Fraiburgo and the others with a company in each city.

The profile of the companies surveyed are companies already consolidated in the market. Approximately 90% of the companies surveyed have more than 30 years in the market, a very important factor for the customer. With this time of operation, the supplier indicates a consolidation in the market and evidences a consolidation going through some phases in the economy, thus making the alliance more reliable.

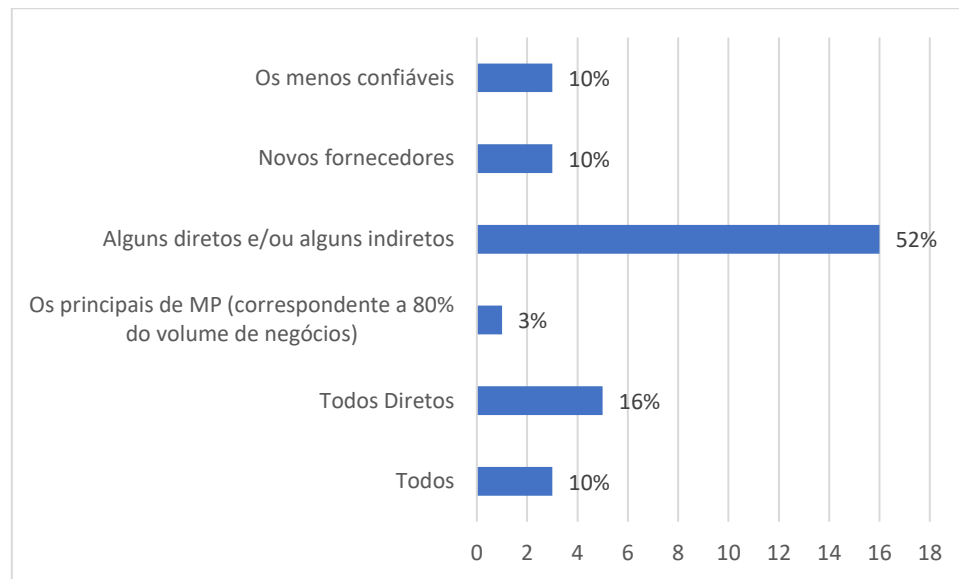
Another important factor to be considered is the size of the companies surveyed, that is, the results show that medium-sized companies have a more expressive percentage, corresponding to 73% of the total companies surveyed, followed by 27% by large companies.

4.1 TYPES OF SUPPLIERS EVALUATED

The answers indicated that 52% of customers evaluated part of the direct suppliers and some indirect suppliers, so the type of supplier is not a determining factor, for most companies, the reason for control. With 16% of customers evaluating all direct, suppliers who are responsible for the inputs used in production, tied with 9% each are, the least reliable, new suppliers and all suppliers are evaluated. The results are presented in Figure 1.

Figure 1

Types of suppliers evaluated by indicators by companies



Source: developed by the author.

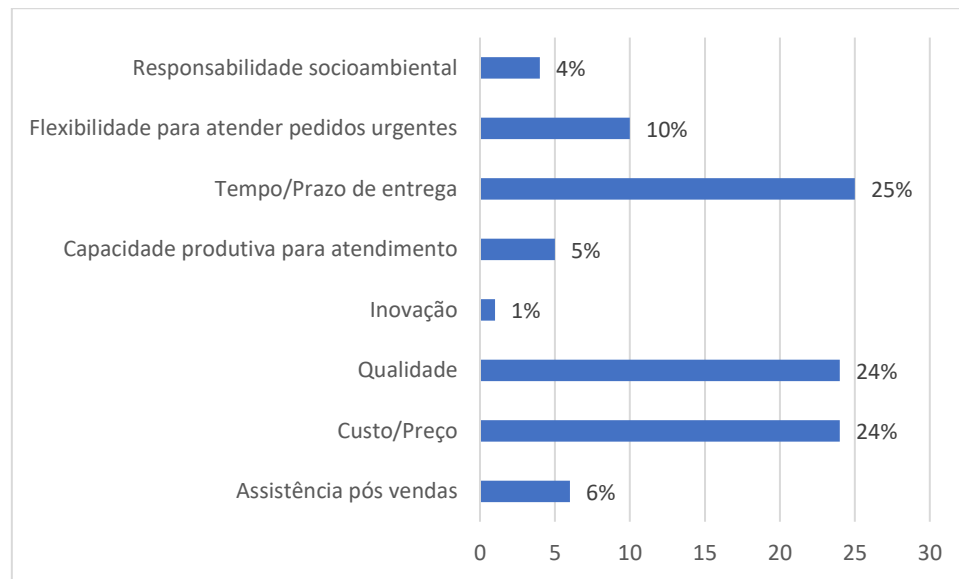
In search of cost reduction, companies are increasingly looking for indirect suppliers, thus aiming to eliminate internal processes. This corroborates more current strategies that show a global trend towards deverticalization and increased supply chain management at the various sectoral levels.

4.2 SUPPLIER PERFORMANCE INDICATORS MEASURED BY COMPANIES

To better understand customer searches, a question was asked to inform which requirements are essential for the evaluation of suppliers. According to Figure 2, the item with the most indications of essential was the delivery time, with 25%. Two other points that stand out are quality and cost, with 24% each. Other points mentioned, such as flexibility to meet urgent orders, production capacity for service, after-sales assistance, socio-environmental responsibility, among others, add up to 26%.

Figure 2

Performance indicators measured by the companies surveyed



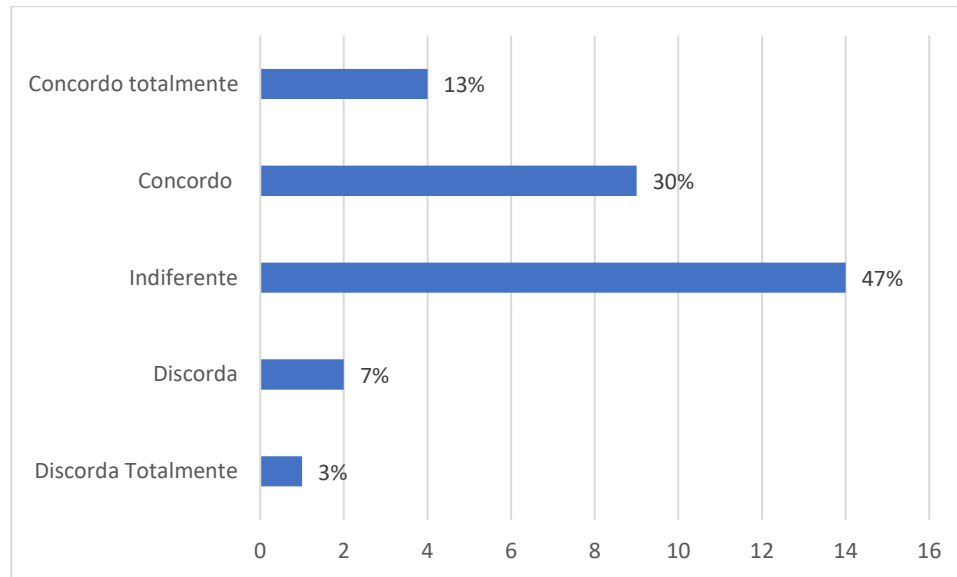
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4.3 VERIFICATION OF COMPLIANCE WITH THE PERFORMANCE REQUIREMENTS OF THE COMPANIES' SUPPLIERS THROUGH THEIR INDICATORS

From this question on, the answers are directed within the Likert scale, with answers from 1 to 5, where 1 indicates total disagreement and 5 total agreement with the question, intermediate numbers divide the agreement scale. Regarding the verification of compliance with the performance requirements of the companies' suppliers through their indicators, Figure 3 presents the respective results, where the objective is to find out if the suppliers meet the company's needs through the established indicators. In view of this, the positive trend passed by the indicators is clear. Although 55% of the responses consider themselves to be indifferent to the performance indicators, 40% identify the application of the indicators as positive, only 5% do not believe in the evaluation. The results are shown in Figure 3.

Figure 3

Compliance with requirements by performance indicators



Source: developed by the author.

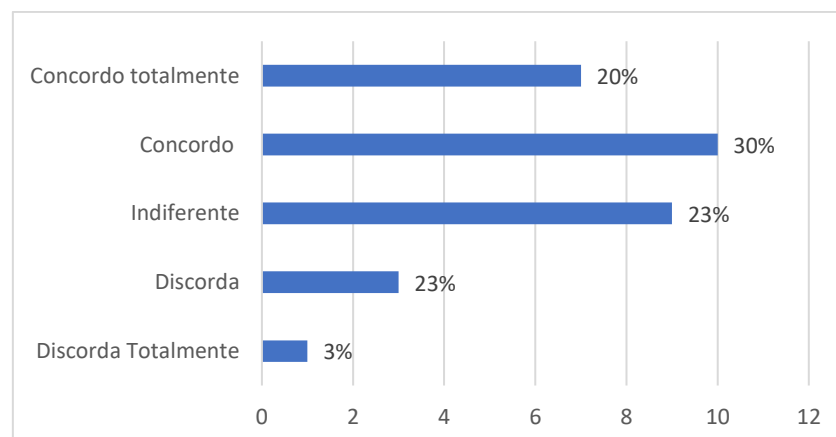
4.4 TARGET APPLICATIONS FOR SUPPLIER ASSESSMENT

According to Deus (2011) the customer is directly responsible for understanding and monitoring the supplier's goals, he believes that for the full development of the supplier it is extremely necessary to have a relationship of complicity between the parties.

Analyzing Figure 5, it is possible to see that only 15% of customers disagree with the importance of setting goals for the evaluation of suppliers, while 40% agree and consider the evaluation of pre-established objectives as reasonable or adequate.

Figure 5

Application of targets for supplier evaluation



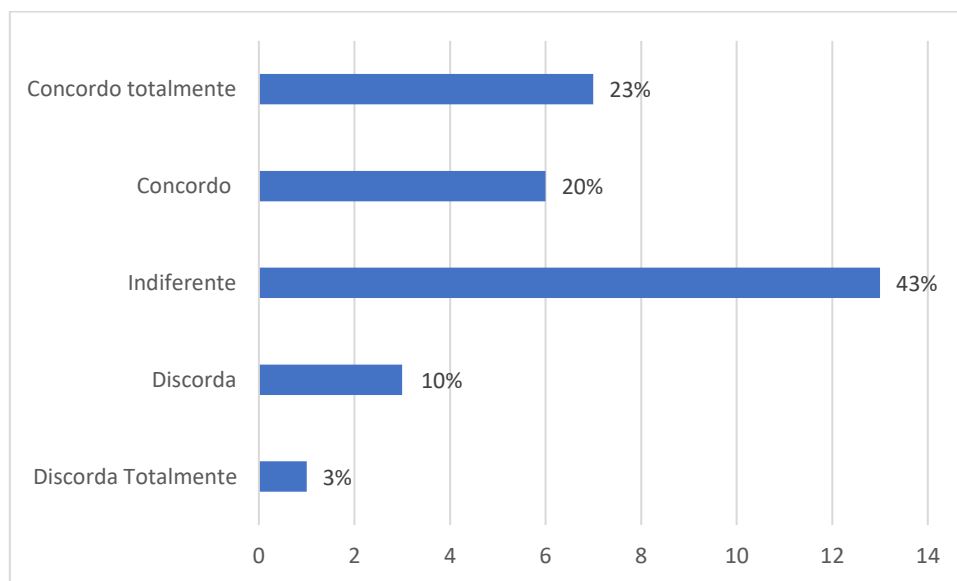
Source: developed by the author.

4.5 APPLICATIONS OF SUPPLIER TRAINING AND DEVELOPMENT PROGRAMS

The survey shows that 43% of those surveyed believe in the importance of developing goals for the evaluation of suppliers, another 43% believe that the supplier needs to be evaluated regardless of the validation of the goals, now only 13% believe that the goals are not important for the evaluation of the goals. The results are shown in Figure 6.

Figure 6

Application of targets for supplier evaluation



Source: developed by the author.

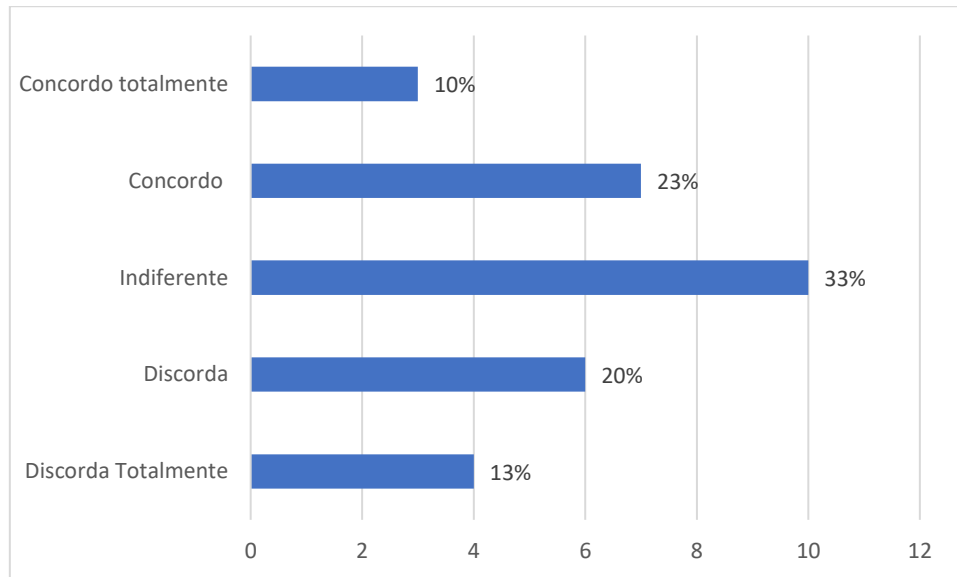
4.6 APPLICATION OF PARTNERSHIP PROGRAMS BETWEEN COMPANIES AND THEIR SUPPLIERS

This question seeks to understand if customers have a partnership program with their suppliers, with the aim of improving results and structuring the relationship between the two parties. The concept of partnership is beginning to be inserted, the relationship between customer and supplier becomes closer, making contact much more direct, sometimes even causing an exchange of information between different areas. Quality and deadline pending issues are received and handled with much greater efficiency.

Figure 7 shows that the partnership is not an important item in the relationship with the supplier, considering the indifferent item as the customer not agreeing with the importance, 66% disagree with the importance of the relationship with the supplier, only 33% agree that partnership applications make the structure develop.

Figure 7

Application of partnership programs with suppliers



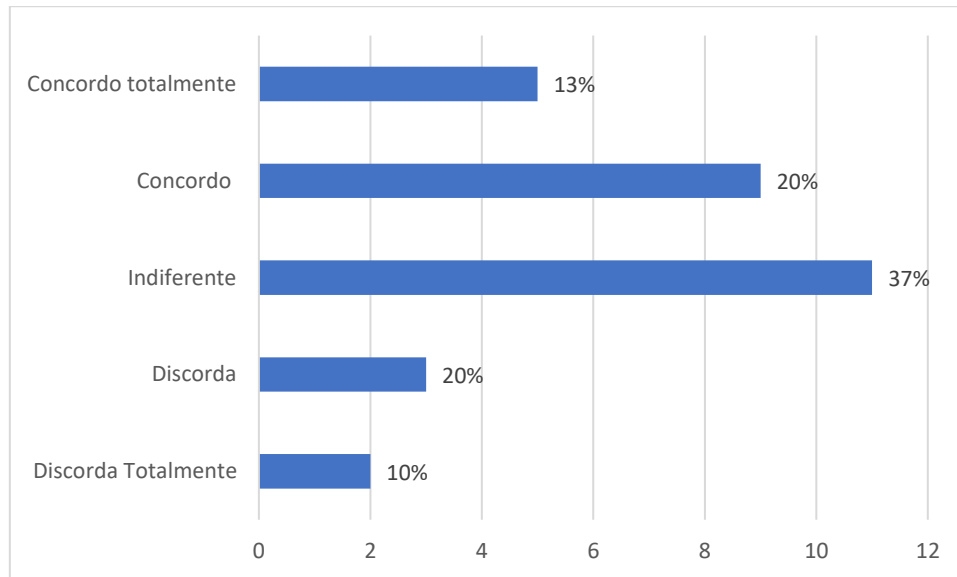
Source: developed by the author.

4.7 SUPPLIER PARTICIPATION IN THE PRODUCT DESIGN PHASE

The participation of suppliers in the development is very constructive for both parties, together they can think better about the product as a whole, a concept. The most assertive way to solve a customer deficiency is to know and understand where the supplier can help, as a single organism. Customers were asked about the importance of the supplier in development, and about 60% of the answers agree, evidencing the importance of exchanging information, and only 10% of companies do not consider it an important practice. The results are shown in Figure 8.

Figure 8

Participation of suppliers in product development



Source: developed by the author.

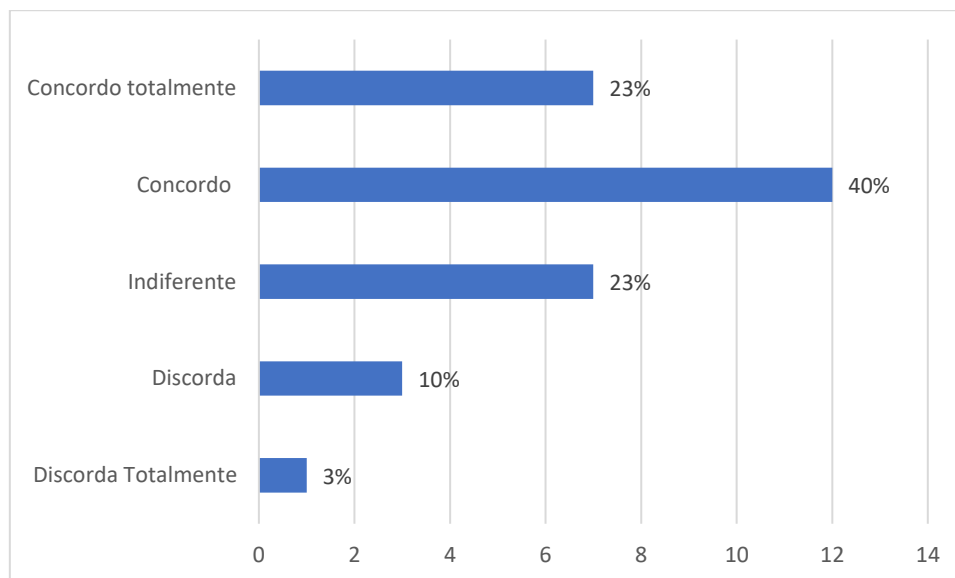
4.8 EVALUATIONS OF THE QUALITY LEVEL OF THE PRODUCTS SUPPLIED BY THE SUPPLIERS

The question seeks to understand whether the application of the goals brings a considerable improvement in the quality of the products supplied. Because the organization that seeks a quality index must parameterize the quality of the product supplied and the internal quality control procedures of the suppliers.

Figure 9 shows that 63% of the companies surveyed agree with the application of goals to verify the quality of suppliers' products, and only 13% are not optimistic about the application of indicators to certify the quality of products.

Figure 9

Application of indicators to assess product quality



Source: developed by the author.

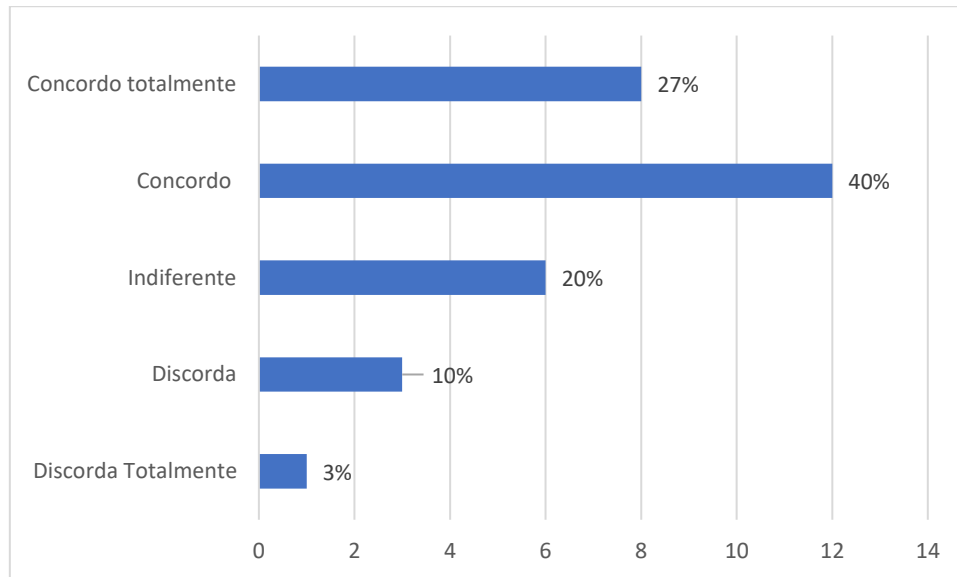
4.9 CHECKS OF THE LEVEL OF COMPLIANCE WITH THE DELIVERY TIME BY SUPPLIERS

As identified in this survey, the delivery time is one of the main points evaluated by companies. The next question seeks to prove its importance for customers, in this sense customers were asked about the importance of performance indicators for possible diagnosis of the supplier's level of service.

The results of Figure 10 show that most customers believe in the importance of the relationship between customer and supplier for meeting the delivery deadline. With 67% of companies agreeing with the importance of measuring delivery time and about 13% do not consider it an important element, another 20% do not have an opinion on the issue.

Figure 10

Application of indicators to measure delivery time



Source: developed by the author.

4.10 COMMUNICATING TO SUPPLIERS ABOUT THEIR PERFORMANCE

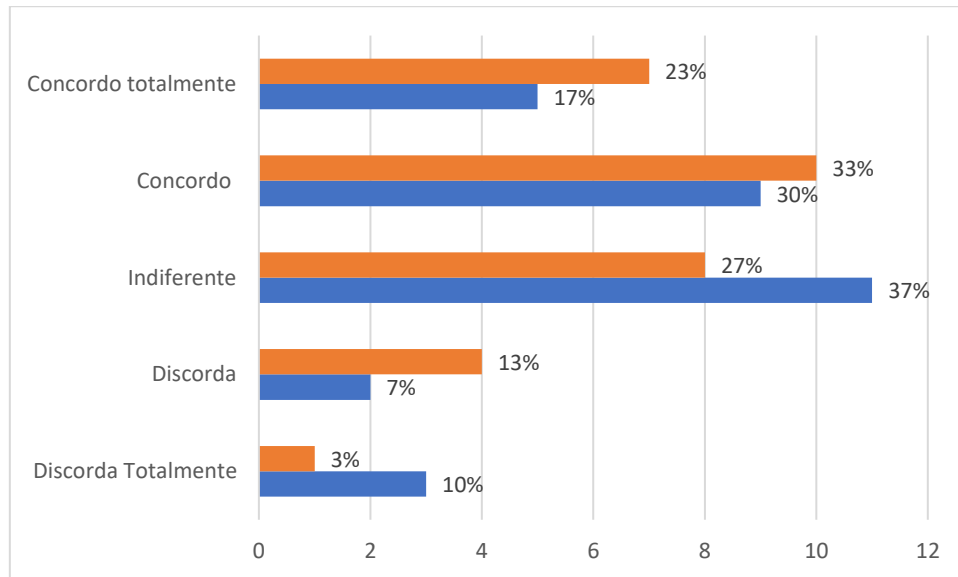
Figure 11 depicts the responses that indicate the importance of customers in establishing feedback on the performance of suppliers and indicating their success. With this exchange of information between customer and supplier, a relationship of complicity is established, when this exists the relationship becomes more personal, thus contributing to the success of the partnership.

The results of Figure 11 show that about 52% agree with this feedback and complicity, and only 11.5% do not consider it a positive or interesting point.

These results corroborate the statements of Bowerson et al (2014), that not only the establishment of goals, but also the monitoring of indicators established jointly by customers and suppliers, result in the success of all together.

Figure 11

Reporting performance to suppliers



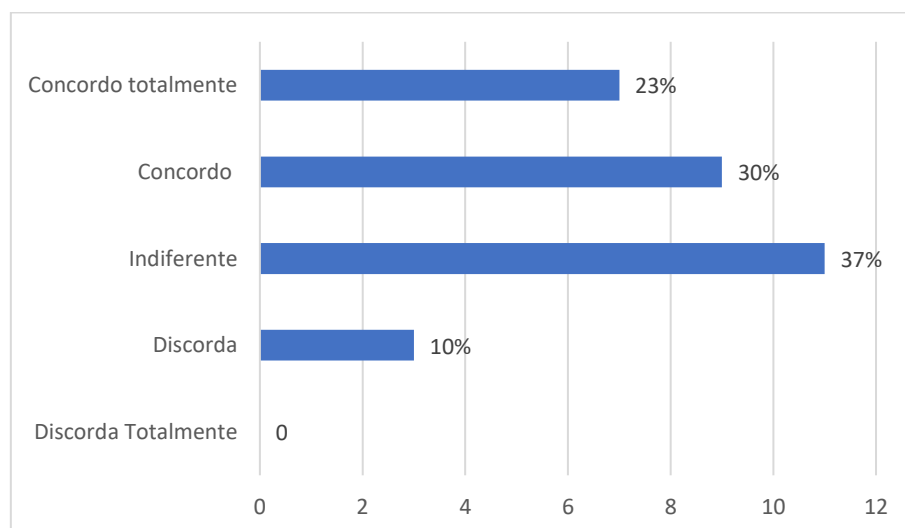
Source: developed by the author.

4.11 EVOLUTION IN THE PERFORMANCE OF SUPPLIERS WITH THE APPLICATION OF THE INDICATORS

With the collection of data on the behavior of suppliers using performance indicators, the evolution of the performance of suppliers throughout the supply of inputs is questioned. The data referring to the performance of suppliers are presented below, in Figure 14.

Figure 14

Evolution of supplier performance



Source: developed by the author.

Figure 14 shows that 53% of the companies believe that there is an improvement in the service of suppliers with the application of performance indicators. Next, only 10% disagree that there has been any improvement in the performance of suppliers.

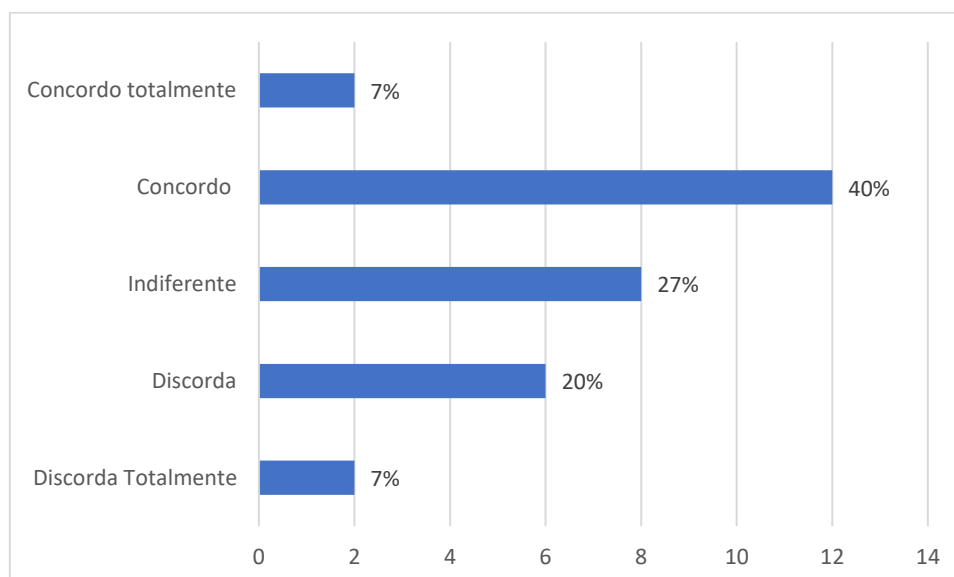
In this sense, it is important to state that the use of performance indicators generates standards for monitoring the supplier's evolution. The measurement of only one indicator is not enough to monitor the supplier reliably, but some indicators generate interpretation and understanding.

4.12 ELABORATION OF AN ACTION PLAN IN SEARCH OF CONTINUOUS IMPROVEMENT

The search for continuous improvement of products and processes is something that companies are seeking in the current market system, mainly through action plans. The data are illustrated in Figure 15, which indicates that most companies about 47% consider that there is an improvement in the level of quality of products and services provided with the actions taken from the performance indicators.

Figure 15

Elaboration of an action plan together with suppliers



Source: developed by the author.

5 CONCLUSIONS

In general, the companies that participated in the survey were very excited, and even requested feedback on the results. The analysis of suppliers through indicators is relatively

new in companies, its evolution feeds a greater performance of suppliers. This proximity between customer and supplier establishes a new relationship and can have a simple exchange of information or the development of projects.

The researched universe traces a line of consolidated companies in the market, medium and large companies that are often charged for expressive results of solid and reliable productions, thus needing partners who become part of the company, becoming a supply web.

The survey demonstrated through its main objective that customers can evaluate suppliers through indicators, sharing the results with suppliers and the importance of understanding the good result achieved by both parties.

Also through the more specific objectives of this research it was possible to show that the results achieved from the application of the indicators improve the level of performance of suppliers, thus allowing the elaboration of potential action plans that help in the development of these suppliers. This also improves the quality levels of the product and its delivery time.

For future work, it can be suggested the application of this same research in other segments of the industry and also in small and medium-sized companies, in order to verify if there is a change in the results and to prepare a comparative study between these segments and sizes.

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