THE RISK OF RUPTURE IN READY-MADE JUICE INDUSTRY

O RISCO DE RUPTURA NA INDÚSTRIA DE SUCO PRONTO

EL RIESGO DE RUPTURA EN LA INDUSTRIA DE JUGO LISTO

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Abstract

The risk of ruptures in the supply chain is present for many companies in different sectors. Despite the development of an entire communication network and logistics infrastructure to ensure market supply, there are still situations where supply in the various productive links is impaired. The objective of this article is to identify the factors that represent risks of rupture in the supply chain of a company in the segment of ready juices. The investigation was conduct through two stages; the first one consisted of a research of qualitative nature followed by a quantitative study approach. In the qualitative stage, six respondents, occupying positions considered strategic in the company, were encouraged to express their opinions about the perception about the risks of rupture that the company is subject as well as the opinion on the strategies of resilience used. In the quantitative study, a questionnaire was designed to analyze perceived risk levels and the resilience strategies employed. In this stage, 54 individuals were interviewed among suppliers, customers and the company employees. The risks of rupture perceived for the company were related, mainly to the supply of raw material due, among other factors, the seasonality of the fruits. In many circumstances, the dependence of exclusive supplier was evidenced and it also identified the existence of few companies qualified by the company to supply most of its inputs. Among the identified resilience strategies, investments in process improvement and the use of strategic stocks showed high utilization in the supply chain studied.

Keywords: Logistics Supply Chain, Ready-made juices, Risks of Rupture

Resumo

O risco de rupturas na cadeia de suprimentos está presente para muitas empresas em diferentes setores. Apesar do desenvolvimento de toda uma rede de comunicação e infraestrutura logística para garantir o suprimento de mercado, ainda existem situações em que o fornecimento nos vários elos produtivos é prejudicado. O objetivo deste artigo é identificar os fatores que representam riscos de ruptura na cadeia de suprimentos de uma empresa no segmento de sucos prontos. A investigação foi conduzida em duas etapas; o primeiro consistiu em uma pesquisa de natureza qualitativa seguida de uma abordagem quantitativa de estudo. Na etapa qualitativa, seis entrevistados, ocupando posições consideradas estratégicas na empresa, foram incentivados a expressar suas opiniões sobre a percepção sobre os riscos de ruptura a que a empresa está sujeita, bem como a opinião sobre as estratégias de resiliência utilizadas. No estudo quantitativo, foi elaborado um questionário para analisar os níveis de risco percebidos e as estratégias de resiliência empregadas. Nesta etapa, 54 indivíduos foram entrevistados entre fornecedores, clientes e funcionários da empresa. Os riscos de ruptura percebidos para a empresa estavam relacionados, principalmente, ao fornecimento de matéria-prima devido, entre outros fatores, à sazonalidade dos frutos. Em muitas circunstâncias, a dependência de fornecedor exclusivo foi evidenciada e também identificou a existência de poucas empresas qualificadas pela empresa para fornecer a maior parte de seus insumos. Entre as estratégias de resiliência identificadas, os investimentos em melhoria de processos e o uso de estoques estratégicos mostraram alta utilização na cadeia de suprimentos estudada.

Palavras-chave: Cadeia de suprimentos de logística, sucos prontos, riscos de ruptura

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Resumen

El riesgo de rupturas en la cadena de suministro está presente para muchas empresas en diferentes sectores. A pesar del desarrollo de toda una red de comunicación e infraestructura logística para garantizar el suministro del mercado, todavía hay situaciones en las que el suministro en los diversos enlaces productivos se ve afectado. El objetivo de este artículo es identificar los factores que representan riesgos de ruptura en la cadena de suministro de una empresa en el segmento de jugos preparados. La investigación se realizó a través de dos etapas; el primero consistió en una investigación de naturaleza cualitativa seguida de un enfoque de estudio cuantitativo. En la etapa cualitativa, seis encuestados, ocupando puestos considerados estratégicos en la empresa, fueron alentados a expresar sus opiniones sobre la percepción sobre los riesgos de ruptura a la que está sujeta la empresa, así como la opinión sobre las estrategias de resiliencia utilizadas. En el estudio cuantitativo, se diseñó un cuestionario para analizar los niveles de riesgo percibidos y las estrategias de resiliencia empleadas. En esta etapa, se entrevistó a 54 personas entre proveedores, clientes y empleados de la empresa. Los riesgos de ruptura percibidos para la empresa se relacionaron, principalmente, con el suministro de materia prima debido, entre otros factores, a la estacionalidad de las frutas. En muchas circunstancias, se evidenció la dependencia del proveedor exclusivo y también se identificó la existencia de pocas empresas calificadas por la empresa para suministrar la mayoría de sus insumos. Entre las estrategias de resiliencia identificadas, las inversiones en la mejora de procesos y el uso de acciones estratégicas mostraron una alta utilización en la cadena de suministro estudiada.

Palabras clave: cadena de suministro de logística, jugos preparados, riesgos de ruptura

1 Introduction

Companies constantly coexist with events that can lead to a lack of supplies. Despite the development of an entire communication network and logistics infrastructure to ensure market supply, there are still situations where supply in the various productive links is impaired. As a result of the tsunami on the Japanese coast in 2011, entire factories were shut down, cities ran out of power and a major nuclear accident triggered a crisis similar to that experienced in Japan during the Second World War (Valor On Line, 2011). This performance has caused Toyota to lose the position of world leader in the car market, falling to third place (Leite, 2012).

In Brazil, in 2006 the clash between two aircraft highlighted the problems of the Brazilian air sector and led to the installation of an International Criminal Court (ICC). In 2012 a strike of truck drivers paralyzed several highways and put at risk the food supply in large centers like Rio de Janeiro. Strikes at ports and airports constantly hamper foreign trade

and jeopardize the operations of companies such as those in the pharmaceuticals sector that depend on imported materials.

The market is also undergoing transformations. In the category of ready juices, Coca-Cola's entry in 2005 with the purchase of Sucos Mais, the second company in the Brazilian market, boosted investments (Futema, 2005). The juice market grew more than 12% in the first five months of 2012, maintaining a growth of more than 10% per year in the last three years. (Levin, 2012).

According to a survey conducted by ACNielsen (2012), released in September 2012 by the Brazilian Association of Supermarkets, it is estimated that the rupture rate in Brazil is 8.8%. However, the research has a more alarming result, pointing out the behavior of the consumer against the break. The research carried out in eight thousand Brazilian households and eight baskets of products shows that in the non-alcoholic beverage basket, where the ready juices segment is inserted, only 18% of consumers in the states of Minas Gerais and Espírito Santo and in the interior of the state of Rio de Janeiro look for the preferred brand in another establishment. In a scenario with 8.8% of ruptures and 18% of sales lost to another store, it is inferred that retail loses 1.58% of sales. In this scenario, the losses caused by the ruptures become more expressive for the industry that will suffer the impact of 7.2% in loss of sales.

Thus, a study about the factors that represent risk of rupture in the supply chain of a company in the segment of ready juices becomes relevant. The guiding question of the research can be formulated as: "What are the main risks situations that cause a supply chain rupture in a juice company?"

The objective of this work is to identify the factors that represent risks of rupture in the supply chain of a company, from the segment of ready juices, in the opinion of its key memberships.

2 Theoretical framework

In this section are presented studies on the subject of the work with the purpose of extracting an adequate theoretical foundation. Knowledge of the supply chain is explored.

The study on supply chain risks aims at providing a theoretical basis to identify the current situations that may lead to a shortage of the company, according to the managers of the company itself. The topic of risk management makes it easier to identify the perceived causes and provides the company with information that is useful to obtain risk resilience in its supply chain.

2.1 **Supply Chain**

The supply chain encompasses all the agents involved in meeting the customer's request from the supplier of the primary materials, through the manufacturer to the delivery of the product or service to the final consumer (Chopra & Meindl, 2011; Wei & Xiang, 2013). In essence, while logistics, seeks to integrate the flow of products and information of a business; Supply chain management seeks to articulate and coordinate the processes of other related entities such as suppliers, customers and the organization itself (Silvestre, 2016). The supply chain also encompasses carriers, retailers and all stages involved directly or indirectly in meeting customer needs (Chopra & Meindl, 2011).

In this scenario, supply chain management has increased its importance for companies, as it increasingly presents itself as a strategic tool for quality assurance, cost reduction, increasing flexibility and responsiveness to consumer demands (Ballou, 2006). The coordination of material and information flows to the final customer, known as Supply Chain Management (SCM) or Supply Chain Management, aims to advance relations between industries and partners (Figueiredo, 2003; Ali, Babai, Boyle, Syntetos, 2017). The SCM concept is the integration of the business from the end customer to the original supplier, generating the improvement of the products, services and information that add value to the consumer. (Lambert, Cooper, & Pagh, 1998).

There are several types of supply chain. When identifying a chain and its structure, it is also necessary to identify the companies that participate in it. The goal is to identify which members are critical to the success of the focal company. (Corrêa, 2010).

2.2 Risks in the Supply Chain

Vulnerability in supply chains is gaining importance due to increased complexity and global competition, risk weighting and risk management are at an early stage of development (Jüttner and Peck & Christopher 2003; Jüttner, 2005). If it were possible to predict exactly what the future demand of the products would be, the result would be a correct demand for the necessary materials, but many factors are related to the unpredictability and can modify the demand of the products (Gonçalves, 2010). The market is filled with turbulence and uncertainty. Not only events such as natural disasters, strikes or terrorist attacks, but also changes in business strategies and business profiles require new methods to measure and manage supply chain risks (Christopher, 2011).

The risks of disruption in the supply chain, originating from the most diverse sources, do not constitute exclusive events. The occurrence of one fact may result in the occurrence of another. Rupture in a particular chain link may impact on the next link or compromise the entire chain. Thus, the lack of synchronism between the demand and the inventory flow caused by the lack of coordination in the supply chain can explain a large part of the rupture occurrences (Chopra & Meindl, 2011).

Managers need to be well aware of the risks and uncertainties that threaten not only their activities, but also those that may interfere with other links in the supply chain, especially their suppliers. The approach should consider how the key processes are related in at least three organizations in the supply chain (Jüttner, 2005). A key factor is the coordination of activities between the interdependent organizations that form the supply chain. The goal is to create value for the end consumer at the lowest cost possible for the chain as a whole (Christopher, 2011).

2.3 Risk Management in the Supply Chain

With increasing supply chain vulnerability caused by market turbulence and uncertainty, supply chain risks are more evident. As a consequence, companies need to

develop appropriate methods for managing these risks (Christopher, 2011; Stank & Dittmann, 2014).

According to Mason-Jones & Towill (1988), risks can be grouped into five categories:

• Supply risks - difficulty in obtaining raw material or other resources for the process.

• Environmental risks - related to environmental management, or natural disasters such as floods, earthquakes.

• Control risks - intentional or unintentional events, but not under the direct control of the organization, such as strikes, economic policy, terrorism, sabotage.

• Demand risks - changes in the market and consumer behavior that may affect the demand for manufactured products.

• Process risks - deficiencies in internal company controls such as high costs, poor quality or inadequate technology.

In addition to the categories presented, Bastos Junior (2007) also adds the Logistics Risks that represent the difficulties with transportation, storage and movement of resources. Figure 1 presents a schematic model of supply chain risk analysis.
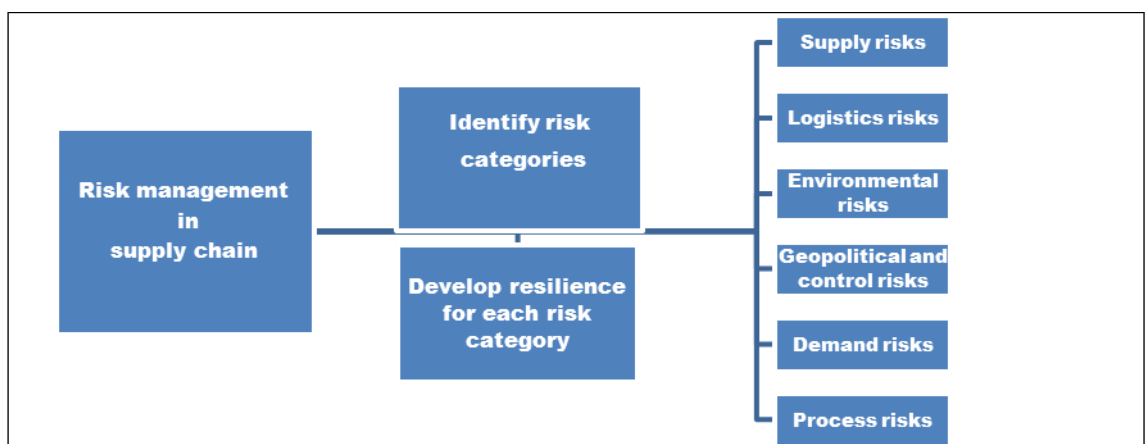

Figure 1: Supply chain risk analysis model

Source: Adapted from Bastos Junior (2007), Stank & Dittmann (2014)

In companies, the term resilience is the capacity for recovery in the face of a major rupture (Sheffi, 2005). Even well-managed supply chains suffer from unexpected events or situations that are impossible to predict, and it is imperative that organizations acquire

resilience (Christopher, 2011). Companies can develop resilience through two basic approaches (Corrêa, 2010):

• Redundancy of resources - is to maintain levels of stocks and resources at levels above those required under normal conditions. These security measures allow the company to have greater force against possible interruptions. (Corrêa, 2010). The company may also choose to maintain idle capacity or maintain multiple suppliers. Although redundancy maintains the company's operation against a breach, its use is typically temporary and expensive for organizations. (Sheffi, 2005).

• Agility and Flexibility - Agility is related to the ability to react to rupture events. It does not mean having redundancy of resources, but being able to make the information flow quickly within the organization to assess the impact of the event on the organization. (Corrêa, 2010). Increasing flexibility allows the supply chain, in addition to resisting ruptures, to respond better to market changes (Sheffi, 2005). Flexibility increases the capacity to respond to interruptions and reduces their consequences (Corrêa, 2010).

In addition to the factors cited by Corrêa (2010); Sheffi (2005) also cites organizational culture as important for building resilience in organizations. Organizations known for their rapid recovery have in common several cultural traits:

• Continuous communication among its employees;

• Decentralized power, with teams and individuals with autonomy to take the necessary actions;

• People who are passionate and committed to work;

• Conditioned and trained people in situations of disruption.

According to Sheffi (2005), when acquiring resilience, the company will be able to overcome diverse types of ruptures, also there is the increase of the competitiveness with the competitors.

The development of a risk mitigation strategy in the supply chain should consider the constant and unexpected changes that can occur both internally and externally (Wilding, 2006). Considered risk as a combination of probability of occurrence of an event and its consequences (ISO 73/2009). Management is required to reduce the probability of occurrence of such events and the resulting impact, making the chain less vulnerable.

3 Methodological procedures

The investigation was conducted through two stages; The first one consisted of a qualitative study followed by a quantitative study approach. In the qualitative stage, six respondents, occupying positions considered strategic in the company, were encouraged to express their perceptions regarding the risks of rupture that the company is subject to as well as the opinion on the strategies of resilience used. We interviewed managers from the following sectors of the company: Purchasing, Warehousing, Production, Maintenance and Quality Control.

In order to examine the results obtained in the qualitative research, the method called content analysis was used. Bardin (2006, p.38) states that content analysis consists of "a set of techniques for analyzing communications, using systematic and objective procedures for describing message content." The content analysis approach lends itself to the descriptive and explanatory and verification purposes formulated in the proposed problem. The data collected were grouped according to the categories of supply chain risks presented by Mason-Jones and Towill (1988) and applied by Bastos Junior (2007).

In the quantitative study, the questionnaire was designed to analyze perceived risk levels and the resilience strategies employed. In this stage, 54 individuals were interviewed among suppliers, customers and the company employees. In the total of 54 questionnaires answered, 18 responses from suppliers, 6 clients and 16 from employees of the company surveyed were obtained, and 14 respondents did not identify themselves. Measurement scales were used with 5 points where 1 corresponded to low risk and 5 to high risk. The information obtained with the application of the questionnaires was analyzed with the aid of the SPSS program.

4 Qualitative research analysis

In this chapter the results obtained in the qualitative research are demonstrated. In this stage, six professionals were interviewed who hold positions considered strategic by the company: Warehouse Coordinator, PCP Coordinator, Buyer, Production Manager, Maintenance Supervisor and Quality Analyst. Respondents have an average of 8.5 years of

work in the company and over 26 years of age. The schooling focuses on three respondents with incomplete secondary or higher education and three respondents have a postgraduate course. This experience provides greater knowledge of the rupture events that were evidenced in the interviews.

4.1 Perceived Rupture Risks

The answers obtained in the interviews were grouped according to the research model adopted in this study, identifying the categories of risk of rupture and strategies of resilience adopted by the company.

Risks of supply

When questioned about the recent rupture events in the company, the respondents pointed out that several materials, mainly raw materials, presented supply problems. One respondent says: "[...] the company recently experienced a lack of process packaging and the problem was identified in the last hour [...]". The company also had problems with the quality of the product provided.

The reasons attributed to the ruptures were diverse, such as delays in receiving requests; lack of raw material in the market or reduction of supply due to the off-season causing a temporary shortage.

The raw materials used are purchased from a few suppliers. All the respondents agree that the existence of few supply options is not ideal because "we are at the mercy of the supplier, in quantity, in price, delivery, etc." Another respondent says that "there is a risk of not getting a good price on the purchase".

Logistics Risks

The company works with several suppliers of transport services: cooperatives, freelancers and transporters. The perceptions about the quality of transport services pointed

out by the respondents show that it is not clearly understood the impact of logistics as a cause of ruptures in the company. Most, that is, four in six of the interviewees, consider the transport services good or great, although the same respondents point to delay in delivery as one of the reasons for lack of merchandise. For 33% of the respondents, transport can improve, because "often the product is transported refrigerated, damaging the packaging" and "the excess speed can lead to the load being compromised".

Environmental Risks

The environmental issues were reminded by the respondents, and the main item remembered was water, a fundamental raw material in a juice industry. There is concern from everyone about the risk of contamination and that it will affect the quality of the water used in the process: "there is no containment barrier for oil storage tanks." Also, "contamination of soil and water can make it difficult to renew the company's environmental license"

Although not directly mentioned in environmental risks, the company is also exposed to risks arising from the behavior of crops and fruit crops. This risk caused some disruptions according to the respondents.

Control Risks

Natural disasters were not perceived by most of the interviewees as shocking. Only two of the six interviewees pointed to the rains as a risk factor for the activity.

The Brazilian economic policy has provoked a favorable perception on the part of the great majority of the interviewees. Only one respondent shows concern about inflation: "if inflation increases, it will impact on the increase of raw material and materials in general" and another on strikes, especially in transport as risk factors for activities: "strikes and paralyzes of the transportation sector can hurt us, especially when we work with reduced inventories. "

Risks of Demand

The increase in production capacity due to the expansion of the equipment provided the company with certainty regarding the increase in demand for the company's products.

This fact can be evidenced in the respondents' responses to the demand risk: "In order to increase demand, the company is prepared, but I do not see the same if sales fall, because the company only manufactures juices."

Process Risks

Process risks were not directly perceived by most respondents. One among the six respondents attributed the rupture in packaging to the lack of efficient inventory control. "We only observe the stocks in the computerized system". Inventory and cost control processes were mentioned by only one respondent: "inventory and cost controls need to be improved, we have a lot of disagreements and our inventories are increasing."

4.2 Resilience Strategies

All respondents consider it important to have a strategy to avoid shortages. But no clear resiliency strategy has been identified. The actions taken in situations of rupture indicate that the company adopts a corrective attitude in all cases, actions were only taken after the rupture events.

Inventory and product cost issues are also taken into account in decisions, some of which are shared with higher hierarchical levels.

5 Quantitative Research Analysis

5.1 Risks of Rupture

In this section, the 34 questions regarding the risks of supply chain rupture were analyzed. The issues are grouped into six categories, according to the model proposed for this research, allowing the analysis of risks related to the supply of raw material, logistics and transport services, relation with environment, control, demand and processes. We chose to analyze the responses considering the three groups identified (Company, Clients and

Suppliers). Considering the Likert scale used in the research (1 = Low Risk, 2 = Moderately Low Risk, 3 = Medium Risk, 4 = Moderately High Risk, 5 = High Risk).

The category with the highest risk perceived in the Company surveyed (TIAL) is that of Supply, with the mean perceived score of 3.05 (table 1), setting it as a high risk for being above the 3 = Average Risk score. The risks of rupture due to lack of raw material (Supply) presented individually, the greatest risk in the evaluation of the managers of TIAL. The mean score was 3.69. Also, the dependency of the sole supplier is high risk. These perceptions confirm the data obtained with TIAL employees during the qualitative stage, with situations where there was a lack of material recently, and because the company had few suppliers of certain raw materials was considered a concern.

Table 1.
Average risk for TIAL by category

Risk Category	Average Risk
Supply	3,05
Demand	2,65
Processes	2,50
Environmental	2,46
Logistics	2,08
Control	1,76

Source: Research Data, 2019

The risks perceived by customers are the highest. Logistics and process risks were considered high with a mean of 3.17 and 3.19, respectively. All other categories presented a classification higher than 2.0 (table 2). Several issues were classified as high risk among customers. The lack of raw material or the commodity for resale, figured as the highest perceptions of risk. Transport services then appear along with the lack of reliability and the lack of skilled workforce.

Table 2

Average risks for customers, by category.

Risk Category	Average Risk
Logistics	3,17
Processes	3,19
Demand	2,97
Supply	2,47
Environmental	2,47
Control	2,19

Source: Research Data, 2019

The risks perceived by the suppliers obtained an average score lower than 3, being considered low. Table 3 shows the risks assessed by the respondents in each category searched.

Table 3:

Average risks for suppliers, by category.

Risk Category	Average Risk
Supply	2,09
Processes	2,10
Demand	2,04
Environmental	1,88
Logistics	1,85
Control	1,56

Source: Research Data, 2019

The greatest perceived risks were related to the loss of sales contracts, unplanned downtime, dependence on exclusive supplier, lack of cost competitiveness, lack of skilled labor and lack of raw material for the process. It was observed the distribution of risks in the categories of processes, supply and demand, demonstrating the concern with competition in the market, represented by the category of demand risk.

Resilience Strategies

In this section, the 30 questions regarding the resilience strategies used by the respondents were analyzed. As in the previous section, the questions were grouped according to the model proposed for this research, allowing the analysis of the identified groups.

TIAL respondents indicated the most commonly used strategies to avoid or minimize the effects of rupture. The most used categories of strategies are those that represent the process strategies followed by the demand and supply strategies. These three strategies obtained a mean score higher than 3.0 (table 4) and were considered as very used. The most commonly used strategy is information security followed by the development of alternative vendors. Among the most used strategies are all the questions related to process risk. Supply-chain strategies also appear to be heavily used, such as procurement of suppliers and increased levels of input inventories. As for demand strategies, TIAL uses more frequently the increase of inventories for customer service.

Table 4:

Average use of strategies by TIAL by categories

Risk Category	Average Risk
Processes	3,69
Demand	3,54
Supply	3,28
Environmental	2,66
Logistics	2,74
Control	2,56

Source: Research Data, 2019

In the clients, the most commonly used categories of resilience strategies were those related to demand, processes and supply (table 5), obtaining an average score considered "very used". Although control and logistics strategies are little used, some actions related to these categories were perceived as being very used by clients. The issue related to property security and contracts with logistics operators are among the most used strategies.

Table 5:

Average use of strategies by clients, by category

Risk Category	Average Risk
Demand	3,56
Processes	3,17
Supply	3,03
Environmental	2,33
Control	2,43
Logistics	2,31

Source: Research Data, 2019

From the strategies used by suppliers, two categories are highly utilized (table 6). Attention is focused mainly on demand and process strategies. The supply strategy is less used, presenting an average of 2.84; considered low. In the environmental strategy, only the training to obtain certificates of quality presents high utilization. The strategies related to the process are among the most used, demonstrating the concern on the part of the suppliers in improving their internal processes.

Table 6:

Average use of resilience strategies by suppliers, by categories

Risk Category	Average Risk
Demand	4,07
Processes	4,06
Supply	2,84
Environmental	2,50
Logistics	2,19
Control	2,18

Source: Research Data, 2019

The above results allowed the construction of the Risk Matrix and Resilience Strategies, according to figures 1, 2 and 3. The Matrix relates the probability of occurrence

of the risk, with the impact caused in the organization, according to the perception of the interviewees. The probability of risk varies on the following scale: mild, moderate high, very high and the highest. Impact is measured by scale: insignificant, mild, moderate, severe and catastrophic.

Levels of risk were categorized into: Level 4: Negligible; Level 3: Light; Level 2: Moderate; 1: Severe. The catastrophic level was not observed in the respondents' perceptions. Therefore, it was not punctuated in the model, even though the prediction of occurrence was made.

The treatment levels, according to the probability of occurrence and the impact caused, according to this model, the levels of treatment: Level 1: Immediate action (red color); Level 2: Medium and short-term inventory expansion (orange color); Level 3: Monitoring and management more attentive (yellow color); Level 4: Tolerable risk (green color), as shown in figure 1

Figure 1:
The answers obtained were grouped according to the adopted research model, identifying the categories of risk of rupture and strategies of resilience adopted by the company.
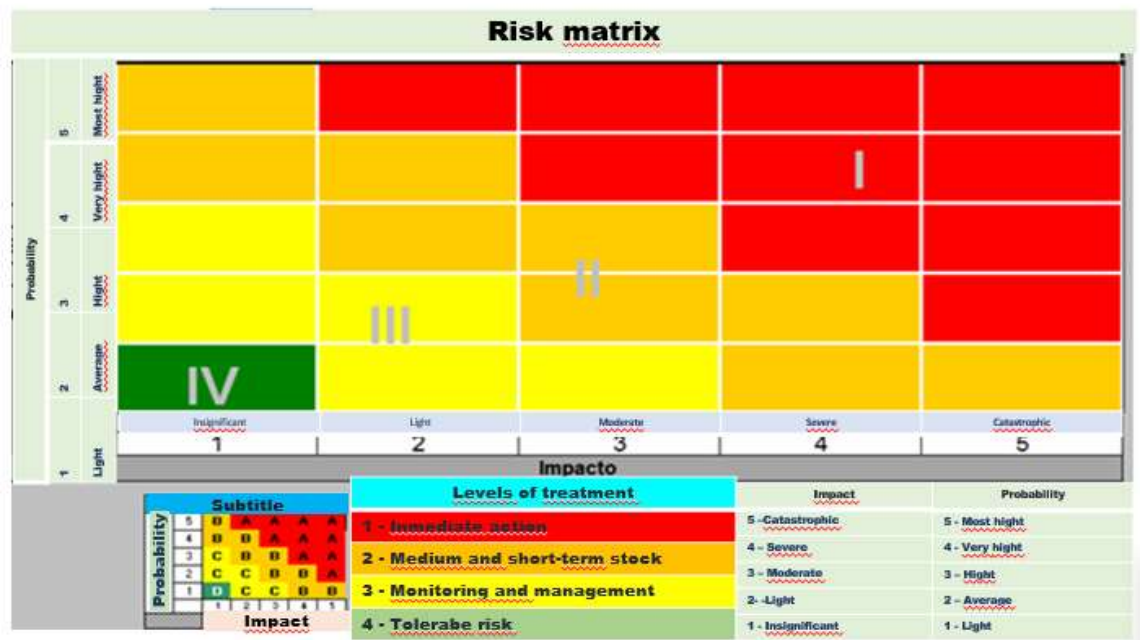

Figure 1: Answers were grouped according to the adopted research model
Source: Research Data, 2019

The perceptions of the respondents about the risks of inventory rupture were mapped according to the matrix shown in figure 2. The risks that have internal causes or the organization itself are marked with the symbol in blue; Those that are attributed to suppliers are discriminated against with brown stars; Those who are supposed to be the cause of market and customer relations are highlighted with the green light. According to the figure, no severe or even catastrophic risks were observed. This situation indicates that the organization has the mastery of its executive market actions, at least in the short term.

Figure 2
The answers obtained were grouped according to the adopted research model, identifying the categories of risk of rupture and strategies of resilience adopted by the company.
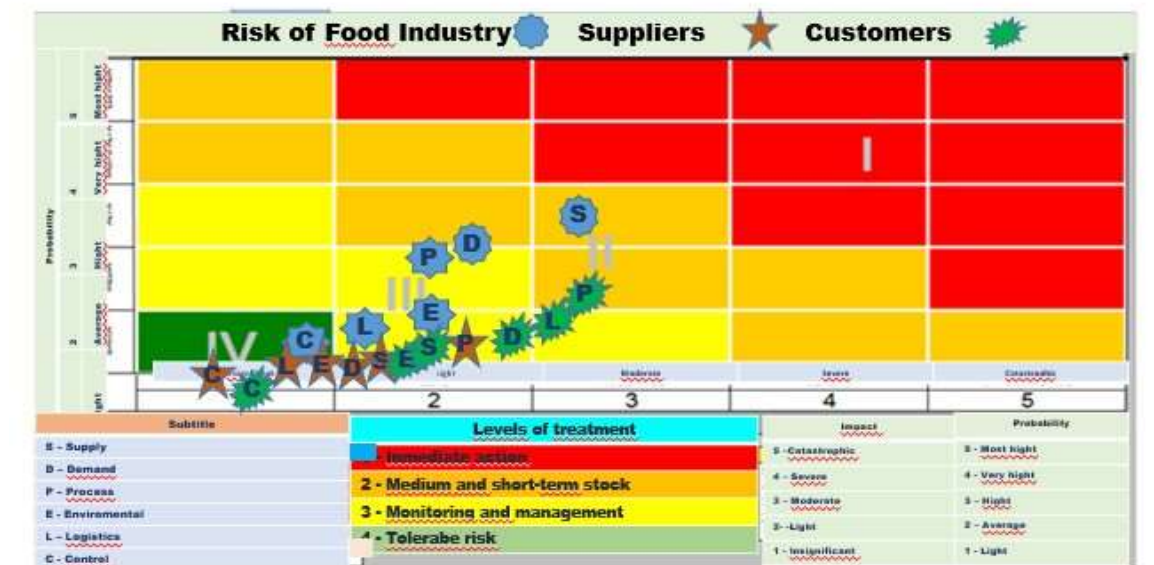

Figure 2: The answers obtained were grouped according to the adopted research model

Source: Research Data, 2019

The strategies of resilience, according to the model created for this analysis, were pointed out, as shown in figure 3. No strategy of resilience, assuming a high risk of inventory rupture was pointed out by the respondents. The resiliency strategies supported by the organization itself, that is, whose actions are aimed at correcting problems and implementations of solutions within the company, are of insignificant impact, light and

moderate impact. Those that are based on suppliers, have proven to be the most worrying, intense and whose impacts must provide the most consistent results in the company. The strategies are specific, in relation to the monitoring and management of stocks, market and corporate orientation.

The strategies supported in direct actions in the clients were evaluated as at most at the moderate level, that is, the clients were not considered as risk agents and preventive actions as intense as the suppliers, as shown in figure 3.

Figure 3:
The answers obtained were grouped according to the adopted research model, identifying the categories of risk of rupture and strategies of resilience adopted by the company.
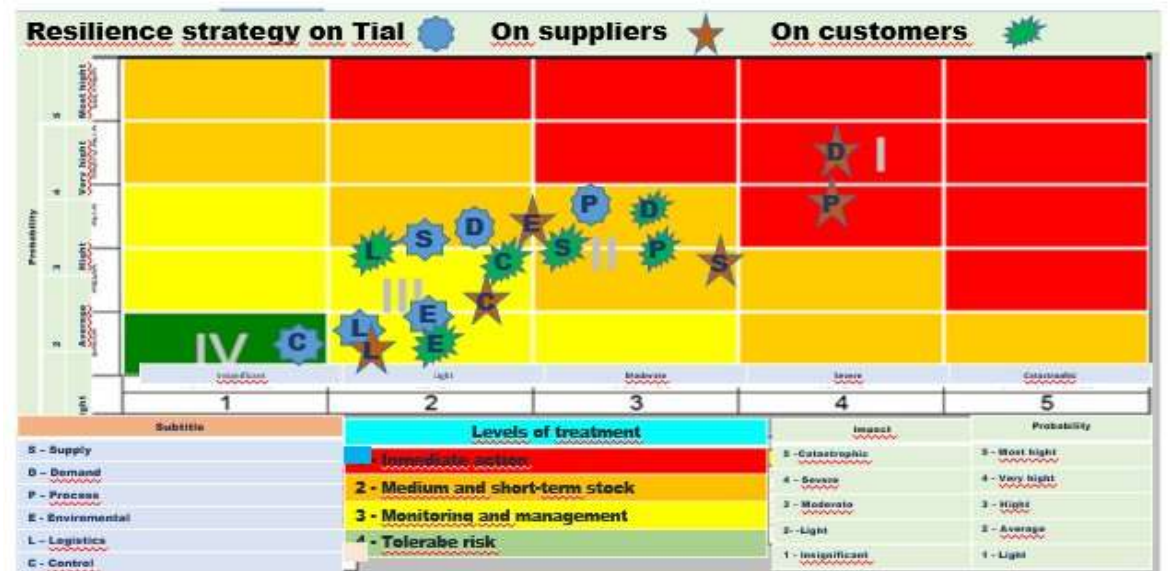

Figure 3: The answers obtained were grouped according to the adopted model

Source: Research Data, 2019

The intense presence of resilience strategies in the category of processes of TIAL Company indicates that companies employ the professionalization of their management as the main means to acquire resilience in the supply chain.

Conclusions

In this section, we present the main conclusions about the results found, the limitations, recommendations and suggestions for future research. In the course of the research, the importance of risk management in chains is highlighted. Needs to reduce rupture and to improve results are highlighted in this paper.

The risks of rupture perceived in TIAL are mainly related to the supply of raw material caused, among other factors, by the seasonality of the fruits. The dependence of exclusive supplier is evidenced by the existence of few companies qualified by TIAL in the supply of most of its inputs. Another high-risk factor is the loss of a sales contract for competitors, which can be understood as a result of ruptures or entry of new competitors in the market, with better price, quality, support, etc.

Finally, unplanned downtime is also a high risk factor perceived, in part, as a result of the recent installation of new equipment that needs adjustments. Among the identified resilience strategies, investments in process improvement and the use of strategic stocks showed high utilization in the supply chain studied. These practices are in line with Sheffi's (2005) claim that companies seek resilience through resource redundancy, agility and flexibility. Considering that redundancy is limited and expensive for organizations, the use of this type of strategy should be used considering its consequences for the overall result.

The results should be considered within the limitations of the research, whose focus was the supply chain of a single company. Other focus firms could be researched through the theoretical model presented. Eventually, surveys of other companies in other segments can be carried out since the supply chains are complex. Another limitation was the number of respondents that could be higher, especially in the client group.

Thus, the results of this work are inserted in productive environments with complex relationships between suppliers and customers. Research is important to the company because both the risks and the strategies used to reduce these risks become known. However, the company should not be considered as "definitive", because both the supply chain and the risk events are dynamic.

Because it is an interdependent supply chain, the high risks identified in an agent or event increase the chances of rupture losses. The lack of any component of the final product results in its non-manufacturing and consequently the unavailability of the product to the customer. It is therefore necessary to identify the high risks of disruption and to define adequate resilience strategies.

On the analytical model adopted for this research, some conclusions can be highlighted, such as:

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The model has been shown to be consistent for new theoretical and executive explorations for studies of this nature. Although it was not the purpose of this study to structure it in order to provide discriminant, convergent and nomological depth validations, the study architecture allows advances in this analytical direction. Businesses, according to literature in the field, are increasingly risky, and organizations look for analytical foundations and models of the most diverse risks, as a means to try to heal them with strategies of resilience. This field of study is in a state where conjectures and hypotheses of already robust research are allowed, but above all consistent, timely and important.

The studies on this model, in order to provide a significant advance in descriptive, predictive and good potential phenomena control, consistent with corporate risks and their respective strategies of resilience, certainly need to be deepened in essential questions of the requirements of scientific studies, such as: the excellence of epistemological foundations that consistently justify the importance and pertinence of this field of knowledge; the explanation and the clear exposition of the subjects and objects, the theoretical state of the art, as well as the ability to contribute to the advancement of substantive knowledge; the structures and morphological contexts typical of the environments in which the risk of rupture may present itself and cause corporate, economic and social problems; and finally the technological possibilities of the studies in this area, considering that, more commonly these analyzes are based on qualitative bases and parameters. Significant advances in this field must consider new frontiers of qualitative research.

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