





## Research Article

## Propensity for innovation in textile manufacturing companies at the city of Gaspar/SC, national capital of children's fashion

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### Abstract

**Objective:** To analyze the propensity for innovation in textile manufacturing companies in the municipality of Gaspar/SC. **Methodology:** characterized as descriptive, the research uses a quantitative approach. An electronic questionnaire was administered; answered by 35 textile companies based on a Local Productive Arrangement (LPA). **Results:** the results highlight, amid the implemented innovation typologies, there is a domain of process innovation. Among the main factors that motivate innovation is the adoption of more efficient production methods. The predominant problems/challenges are the lack of qualified labor and the high costs of innovation as well. **Theoretical/methodological contributions:** to offer a systematic vision about the theme of innovation applied to a productive arrangement of national relevance. **Relevance/Originality:** Assembled data as well as discussion on innovation in textile manufacturing companies for children's clothing in a specific Brazilian productive arrangement were not previously done. **Social/management contributions:** The research provides managers of textile companies with connectivity information allowing them to conclude that their efforts in the innovation process generate incremental innovations only, derived from external knowledge provided by suppliers, which generates dependence to innovate.

**Keywords:** Technology. Competitiveness. Innovation. Textile sector.

## Propensão à inovação em empresas de confecção têxtil da cidade de Gaspar/SC, capital nacional da moda infantil

### Resumo

**Objetivo:** Analisar a propensão à inovação das empresas de confecção têxtil do município de Gaspar/SC. **Metodologia:** Caracterizada como descritiva, a pesquisa utiliza a abordagem quantitativa. Foi aplicado um questionário eletrônico, respondido por 35 empresas têxteis baseadas num Arranjo Produtivo Local (APL). **Resultados:** Os resultados evidenciam que, entre as tipologias de inovação implementadas, há um domínio da inovação de processo. Dentre os principais fatores que motivam a inovação está a adoção de métodos de produção mais eficientes. Os problemas/desafios predominantes são a falta de mão de obra qualificada e os elevados custos da inovação. **Contribuições teóricas/metodológicas:** Oferecer uma visão sistemática sobre o tema de inovação, aplicado a um arranjo produtivo de destaque nacional. **Relevância/originalidade:** O levantamento dos dados e a discussão sobre a inovação em empresas de confecção têxtil de vestuário infantil, de um arranjo produtivo específico brasileiro, não haviam sido feitos anteriormente. **Contribuições sociais/gerenciais:** O estudo fornece aos gerentes de empresas de confecção têxtil a informação de que seus esforços no processo de inovação vêm gerando apenas inovações incrementais, provenientes de conhecimento externo provido pelos fornecedores, o que gera uma dependência para inovar.

**Palavras-chave:** Tecnologia. Competitividade. Inovação. Setor têxtil.

## INTRODUCTION

The current textile sector is an extremely competitive environment, in which apparel companies face challenges that require development strategies, seizing opportunities, assertive choices and consumer satisfaction (Schivi et al., 2020; Martelli, 2021). In this sense, investing in innovation is an effective strategy to modernize production processes and improve companies that maintain outdated technological, managerial and productive standards (Silva & Xavier, 2020). Innovation also meets a repositioning on the perception of the known product or process, in a specific context or use (Gomes & Teixeira, 2018; Silva & Burger, 2018).

The textile industrial segment emerges as one of the most dynamic and promotes a high consumption of its products (average of 16.7 new items purchased per person in 2021) (Global Fashion Industry Statistics [GFIS], 2022). The collections released support the assertion. China is the leader in production, while Brazil, in 5th place, produces manufactured goods in a quantity that barely supplies the domestic market, although it has the potential and availability of raw material (Instituto de Estudos e Marketing Industrial [IEMI], 2019). Economic deficiencies and poor industrial performance warn of competitive and innovation failures in the sector (Filleti & Boldrin, 2020). The level of use of industry 4.0 concepts in the textile segment is restricted to automation and internal logistics management, the digital exchange of product/process data, the near real-time production control system and production planning and scheduling software (Lalic et al., 2019).

Immersed in a context of low productivity, clothing industries strive to supply a growing and demanding market, while competing with large retail chains, which import products for resale. This encourages the outsourcing of processes to groups that share production in smaller workshops, which exploit labor and may degrade the drawing quality of the product and the credibility of the sector (Filleti & Boldrin, 2020).

Brazil's textile and clothing sector is robust. It ranks among the five largest textile industries in the world and fourth in the clothing sector (FIEG, 2018), and, in addition, it brings together modern companies with a large technological apparatus (Moura et al., 2019; Fujita & Barbosa, 2020). The panorama of the Santa Catarina textile industry (Campos, 2020) is divided between modern companies, holders of technology and commercial and managerial strategies aligned with the best in the world; those (the modern ones) adopt updated equipment, inserted in strategic processes and with strict quality control and qualification in design; and the others are accommodated in low levels of management and technology maturity (Campos, 2020).

The state of Santa Catarina is the second largest textile pole in the country (ABIT, 2021) and a powerful generator of income and jobs for cities such as Gaspar/SC, holder of the title of National Capital of Children's Fashion. However, it can be seen that society has made the sector intellectually irrelevant throughout history; a neglect alerted in Brazil, and also observed by European and North American researchers. With managerial commodity rooted in corporations, it is regrettably understandable that there is a technological impotence, a delay in development and an aversion to innovation in the textile sector (Martinez et al., 2018; Coelho Junior et al., 2019).

Although innovation is a factor of competitiveness in the textile industry (Caldeira et al., 2018; Santana et al., 2020), some limiting factors stand out in this process, such as (i) exposure to economic risks, (ii) the scarce availability of financiers, and (iii) the return of slow and insufficient consumer acceptance of new products (Silva Filho et al., 2017). Studies point out (Zhang et al., 2020) that government support through funding has a positive correlation with industrial research and development, which can be a significant point for innovation by textile companies.

Presented the context, this research asks: What is the propensity to innovation of textile manufacturing companies in Gaspar/SC? Such a survey is justified given the importance of the textile industry in the economic scenario of the Itajaí Valley (Milnitz & Luna, 2017; Menegon et al., 2021), to which the city of Gaspar/SC is part. Furthermore, the study elucidates innovation practices that contribute to facing competitive pressures, while collaborating with a reflection on alternatives aimed at the industrial development of the sector in question.

## THEORETICAL FOUNDATION

### Brazilian textile industry

Considered the largest and most complete textile chain in the West, the Brazilian textile industry is almost 200 years old, involving everything from the planting of cotton to the processes of fiber production, spinning, weaving, processing, manufacturing and wholesale and retail marketing (ABIT, 2021). The proportion achieved by the national textile industry positions it among the four largest knitwear producers in the world, making Brazil a world reference in the segment (ABIT, 2021).

The economic potential of the Brazilian textile sector, with allocation of 19.8% of the total number of workers in industrial production and participation of 5% in the total value of the production of the Brazilian manufacturing industry, in 2020 (ABIT, 2021), requires guidance and adoption of innovative methodologies, so that companies produce and maintain themselves in the long term. Small and medium-sized companies support the economy, since they represent a high percentage of the country's textile establishments. The state of Santa Catarina, for example, emerges as one of the main industrial parks. However, it faces problems related to production, due to the lack of efficient planning and market influences, such as competition with Asian countries. In view of this, it is necessary to adopt measures and strategies that drive changes in the management of these organizations and consequently for the country's economy (Milnitz & Luna, 2017; Menegon et al., 2021).

In the Itajaí Valley, one of the centers of the textile industry in the state of Santa Catarina (Milnitz & Luna, 2017; Tambosi et al., 2020), is the city of Gaspar, the object of this research, awarded in 2022 with the title of National Capital of Children's Fashion. The textile industry in Gaspar began with the arrival of European immigrants in the region, especially German immigrants in 1835 and Italians in 1875 (Oliveira & Pereira, 2017). Currently, the city is responsible for more than 50% of the children's fashion production of large department stores in Brazil and employs around 8,000 employees directly, with a concentration of almost 40% of the GDP generated in the municipality (Gaspar, 2022).

The importance of the textile and clothing sector is admirable, in view of the potential capacity to generate employment and income for the municipality, which continuously encourages the implementation of innovative methodologies by companies to circumvent competition in the competitive market.

### Innovation and its typologies

Innovation, an agent that promotes long-term economic growth, ensures competitiveness, the creation of a beneficial rupture in the economic system, changes in production patterns, and the differentiation of the company (Osterwalder & Pigneur, 2020). However, the ventures are flawed, as they concentrate on activities with low technological apparatus and low barriers to entry, such as serving only the domestic market or providing deficient services to consumers (Gavira et al., 2020; Carmona & Gomes, 2021). A management that boosts participation, the sharing of visions from all sectors of the company (Martelli, 2021), the investment in

resources, people, equipment, and research capable of creating new products or more efficient production processes are strategies that result in business competitive advantage, such as the development and increase of export activities (Negri, 2018; Bodlaj et al., 2020). In addition, collaboration with other companies plays a positive role in industrial innovation performance (Giannini et al., 2019).

The market is constantly active and immersed in a competitive environment, which requires companies to be exposed to the challenge of innovating, so that they can mold themselves to customer expectations and positively meet demand, due to consumer behavior, who crave innovative proposals (Melo et al., 2020). The theoretical conception of innovation and its importance to the economy began to be disseminated at the beginning of the twentieth century by Joseph Alois Schumpeter. In his seminal concept, the process of innovation results from new discontinuous combinations of the means of production, considered as a creative destruction that disrupts the normal evolution of the economy (Schumpeter, 1982). However, more recent studies (Bodlaj et al., 2020) point out that the minimum requirement for considering a process as a type of innovation is that the change is new to the company, but not necessarily to the market, i.e., the impacts of innovation do not always result in major economic changes.

When considering the degree of diffusion and the impacts of innovation on the economy, two typologies can be identified, namely: radical and incremental (Escrig et al., 2020). Radical innovation is the typology that expresses an entirely new product/service. Although it does not occur frequently, its potential to optimize the results of companies and, thus, contribute to challenging the dominant position of their leading competitors in the market, several authors (Escrig et al., 2020) have emphasized its importance for the survival and success of organizations in the long term (Escrig et al., 2020). Incremental innovation, on the other hand, is defined as changing the characteristics of the product/service, without changing its general structure (Ferreira et al., 2015). In addition to these, there are four other types of innovations that are mostly based on a set of changes in managerial activities (Fierro et al., 2017; Bodlaj et al., 2020), and classified by nature in organizational, marketing, product, and process innovations.

Organizational innovations insert, adapt or modify business practices in the organization of the workplace or in external relations, in new strategies and management systems. Marketing innovation is characterized by driving changes in design and packaging; the price is based on demand and supply; the distribution of products is modified, with new sales channels and franchises are implemented; investment is made in publicity and promotion when there is a change in the characteristics of the product or service (Fierro et al., 2017).

Nonetheless, if a product acquires features or there is a significant improvement in the service offered to the customer, product innovation (Fierro et al., 2017) is understood as improvements in technical specifications, components and materials, or adaptation to an easy and functional mode of use (Beck & Beuren, 2017); and when the basic features of the offered products differ from all the above. In this case, a new or improved good is introduced to the intended characteristics or uses, in a new understanding of the market and the company's technology, necessarily incorporated to add value to the products (Lopes et al., 2018; Grützmann et al., 2019).

On the other hand, process innovation implies the implementation or adaptation of a new or significantly improved production or delivery method to include significant changes in order to decrease unit costs of production or delivery, to increase quality and production efficiency (Beck & Beuren, 2017; Palheta et al., 2021). In this way, systems are improved by reducing waste, and efficiency is increased or the operational form is changed.

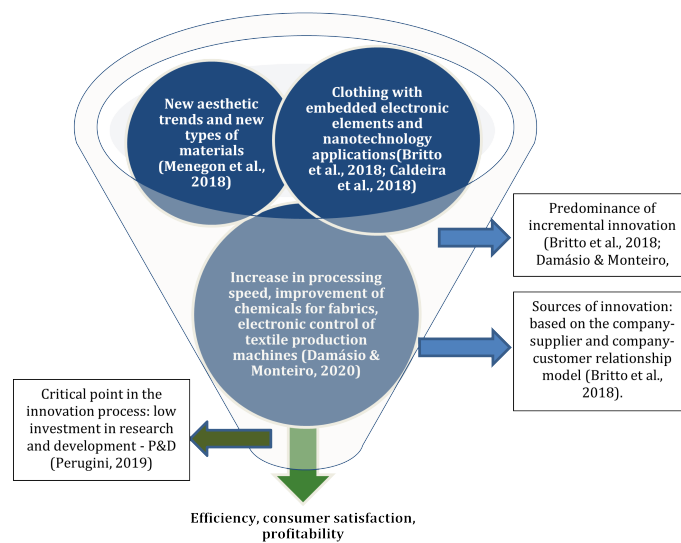
### Innovation in the textile field

Innovation may be determined when the institution positions itself, based on the perception of a product or process already known, in a specific context or use, and promotes a radical or incremental modification, in favor of consumer satisfaction when using a good or service (Beck & Beuren, 2017). Even though industrial production in this sector emphasizes product innovations, with the seasonal launch of new collections that, in turn, indicate the constant search for new aesthetic trends and new types of materials, there are few studies on product innovation to indicate that it was the least valued type in academic studies. and suggest investments in research (Menegon et al., 2018). In addition, the authors also point out that the managers' perception of minimizing waste in processes is a subject not yet understood by the academic environment, but of extreme urgency for the textile industry. In contrast to the research by Menegon et al. (2018), the innovations investigated by Ganzer et al. (2017), were perceived in an almost balanced way, in the following descending order: marketing innovations, organizational, product and process innovations.

Adapting new technologies and processes and abandoning convenience push the textile industry to follow a more assertive path, to align perspectives and maintain order (Silva & Xavier, 2020). With the growing competition, it is up to companies to be concerned with achieving competitive advantages that differentiate them in the market, in order to achieve survival, efficiency and profitability. To this end, it is necessary for them to develop new innovation practices, as indicated by some studies, Figure 1, carried out in the textile sector (see Figure 1).

Figure 1

Innovation practices in the textile sector



Note: Elaborated by the authors based on Britto et al. (2018); Caldeira et al., (2018); Menegon et al. (2018); Damásio & Monteiro (2020); Giannini et al. (2019).

Caldeira et al. (2018) identified some innovation practices recently adopted by the textile sector. In the clothing sector, there are new technologies applied to products: clothes with built-in electronic elements, controlling temperature and changing color. In the fiber segment, there are applications of nanotechnology; In the fabric sector, innovation is being made in products to cover automobiles, incorporating photonics resources, which give the fabric luminescence properties. Investment in technology is seen as a way to compete and grow through the development of new ways of producing in order to reduce costs (Caldeira et al., 2018).



Nanotechnology associated with fashion has enabled innovation and met a certain consumer demand (Britto et al., 2018). By incremental innovation, a fabric composed of citronella was developed, to protect the wearer from insects, vectors of diseases. The importance of the company-supplier and company-customer relationship in the applicability of innovation is emphasized. As a managerial contribution, nanotechnology expands the function of the product: in addition to wrapping the body, it protects from diseases, as a competitive differential for companies in this sector, increasing product sales (Britto et al., 2018).

A study by Gomes et al. (2014) indicated that the dimensions of efficiency, effectiveness, costs and process improvements are associated with innovation performance in the textile industry. The improvement dimension requires improving product quality, working conditions, and productivity, while the innovation capacity dimension is decisive in improving product performance in the textile industry (Manthey et al., 2017).

Damásio and Monteiro (2020) analyzed the main changes generated by technological innovation in the production process of a textile industry during the period from 1995 to 2015. The process of technological modernization, in the time frame, brought changes in the company's production process, in technological innovations and in labor relations, requiring the company to modernize so that it could be more competitive in the textile market, as the economic situation demanded that the production processes become more efficient in cost, productivity and quality. The changes in the production process were more incremental, as there were no radical changes in the design of the production process. The speed of processing and the quality, by electronic control, of spinning and weaving machines were increased, in addition to improving the chemicals in the finishing of the fabric (Damásio & Monteiro, 2020).

Cavalcanti and Santos (2022) analyzed the competitiveness of the Brazilian textile chain, taking into account innovation attributes such as: brand building and promotion, flexibility, and high-quality standard production. The results had indicated a low competitive advantage, motivated by the scarce investment in innovation, resulting in a negligible participation in the world market. The lack of innovations was evidenced, including the low number of patent filings aimed at this sector. For Giannini et al. (2019), the innovation model of the textile industry is still characterized by low investment in research and development, which causes restricted autonomy in its innovation capacity. Yet, the creation of sectoral development policies arising from the cooperation of the actors that make up the textile production chain, such as entrepreneurs, non-profit organizations representing the sector, together with public organizations, emerge as alternatives to define challenges and establish goals related to the insertion and advancement of textile innovations (Antero, 2006). To this end, these policies can be built from a sectoral development plan, with projections of innovative actions aimed at the modernity, efficiency and sustainability of textile and clothing production. (Kazmi & Takala, 2014; Nhung & Thuy, 2018).

Finally, Carmona and Gomes (2021) presented the mediating effect of innovative performance on the relationship between organizational learning capacity (CAO), organizational innovation capacity (CIO) and organizational performance in the textile industry in the state of Santa Catarina. Among the contributions, Carmona and Gomes (2021) found that the proposal and validation of a model that develops arguments in favor of the CAO and the CIO to leverage the innovative and organizational performance in emerging markets such as Brazil, in the textile sector, which, although neglected by the innovation literature, as a mature industry, with low technological intensity, have high innovation potential.

## METHODOLOGY

With the purpose of analyzing the propensity to innovation of textile manufacturing companies in the municipality of Gaspar/SC, this research, regarding the objectives and approach, is configured as descriptive and quantitative, since it aims to study and describe the characteristics of a group of textile companies regarding the phenomenon of innovation, from the application of indicators based on the Innovation Research body. (PINTEC) (IBGE, 2020). According to data from the City Hall of that municipality, the LPA in question is made up of 870 clothing companies, 480 factions and 85 dyeing, spinning, weaving and other (Gaspar, 2022).

In view of the diversification of companies in the sector, the non-probabilistic convenience sampling technique was adopted. For its operationalization, the questionnaire was sent to managers who own 100 companies in the children's clothing manufacturing segment, in the period that comprised the first semester of 2022. As a result of this stage, responses were obtained from 35 respondents who agreed to participate in the research. The contact data were obtained from the Gaspar Business Association (ACIG), and the public defined as an interest group is justified by the fact that it is the most representative segment of the Gaspar textile chain. It is worth noting that the children's sector encompasses about 60% of the textile LPA in the municipality of Gaspar (Gaspar, 2022).

The data collection instrument was developed based on the literature consulted and on the Innovation Survey (PINTEC), carried out by the Brazilian Institute of Geography and Statistics (IBGE, 2020). As for the structure, the instrument was composed of closed questions and divided into sections that correspond to the selected innovation indicators, namely: Section 1: Identification of respondents; Section 2: Characterization of the company; Section 3: Identification of types of innovation; Section 4: Motivations to innovate; Section 5: Impacts resulting from the implementation of innovation; Section 6: Identification of sources of innovation; and Section 7: Obstacles encountered in the innovation process.

In order to qualify the data collection instrument, a pre-test was performed with the questionnaire elaborated. To this end, it was referred to two managers of textile companies, with different levels of education, who read and answered the questions. Declining to make any adjustments to the text, the respondents indicated that the questionnaire was clear and comprehensive.

The collection was carried out through Google Forms, whose link was sent to the companies' e-mails, present in the list provided by ACIG. The data analysis stage, provided by the respondents, was performed with the help of MS Excel, used for the organization and systematization of information presented in the format of tables and graphs with descriptive statistical percentages referring to the frequency distribution of innovative activity practices, all of them present in the group of companies surveyed. In addition, the discussion of the results was interpreted in the light of the theoretical framework used as support for the investigation.

## RESULTS E DISCUSSION

In this topic of the article, the results and discussion are presented. The first part of the analysis describes the profile of the managers participating in the research, in which the absolute and relative frequencies were calculated (Table 1). In the identification of the respondents, it was found that 69% of them are male, 31% female. Therefore, there is a significant disparity related to the occupation of management positions between genders. Regarding the age group, there is a prevalence of young managers, aged between 18 and 39 years (68%), while the percentage corresponding to the elderly (6%) denotes being the least expressive in the context of management.

**Table 1**

*Profile of the managers*

Item		Frequency		
		Absolute	Relative	Acumulate
Sex	Female	11	31%	11
	Male	24	69%	35
Age	18 a 29	12	34%	12
	30 a 39	12	34%	24
	40 a 49	5	14%	29
	50 a 59	4	11%	33
	60 +	2	6%	35
Education level	Complete high school	13	37%	13
	Complete Higher education	11	31%	24
	Incomplete Higher education	8	23%	32
	Completed Postgraduate	3	9%	35
Management experience	1 - 5 years	12	34%	12
	6 - 10 years	9	26%	21
	11 - 15 years	2	6%	23
	16 - 20 years	3	9%	26
	21 +	9	26%	35

Note: Prepared by the authors.

Regarding the level of education, complete high school is the predominant education among the respondents (37%), followed by higher education (31%). However, the percentage of postgraduates is extremely low. Therefore, it was asked how many years of management experience the professional has accumulated in his entire career. The majority of managers (34%) stated that they have between 1 and 5 years of experience in a management position, a reality that is proportionally related to the age group of the respective respondents.

Regarding the characterization of the companies, the absolute and relative frequencies were calculated (Table 2). One highlighted characteristic refers to the total number of organizations typified as large, and only one (6%) was identified in this study that corresponds to this profile.

**Table 2**

*Characterization of the companies*

Item		Frequency		
		Absolute	Relative	Acumulated
Company Size	Micro	0	0%	0
	Small	18	51%	18
	Medium-sized	15	43%	33
	Large	2	6%	35
Scope of action	Municipal	1	3%	1
	Regional	2	6%	3
	National	30	86%	33
	International	2	6%	35

Note: Elaborated by the authors.

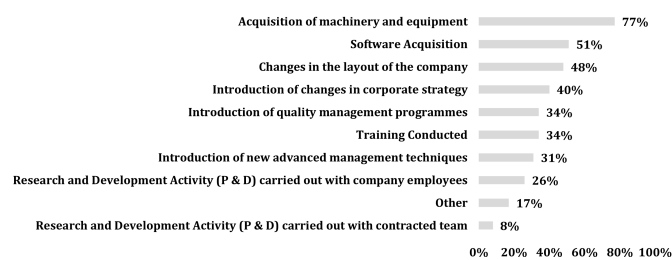
On the other hand, the small profile is the most predominant among the companies analyzed (51%), a condition that can be a barrier to the development of high-impact innovation for these respective clothing companies.

Regarding the scope of action, the national market was found to be the main dimension defined by the companies (86%) for the offer of their productions. Conversely, the expansion of the Brazilian textile sector, to an international context, encounters several barriers to competitiveness, derived from the absence of adequate policies to promote technology and innovation, in addition to high tax rates and high labor costs (Cavalcanti & Santos, 2022). Thereby the strengthening of the internationalization of textile and clothing production in the municipality of Gaspar presents itself as a great challenge.

After highlighting the initial considerations about the profile of the managers and industries participating in this research, the core purpose, determinant of the presentation of the data to achieve the objective of this study is presented. In this sense, the analysis of the questions that addressed data in relation to the innovation of the textile industries in the municipality of Gaspar is highlighted. When questioning managers about the types of innovations introduced in companies recently (Figure 2), it was found that the acquisition of machines to optimize the manufacturing process emerges as the main action developed by entrepreneurs (77%), followed by the acquisition of software (51%) to improve management and changes in the company's layout (48%). Investment in these aspects, in the textile sector, is a viable alternative to compete and grow, with the development of new ways of producing and reducing costs as well. (Caldeira et al., 2018; Damásio & Monteiro, 2020). On the other hand, it is noted that investment in the execution of research and development (R&D) activities with company employees (26%), as well as R&D with a hired consulting team (8%), show the lowest rates of implemented innovation.

**Figure 2**

*Identification of the types of innovations recently introduced in companies*



Note: Prepared by the authors

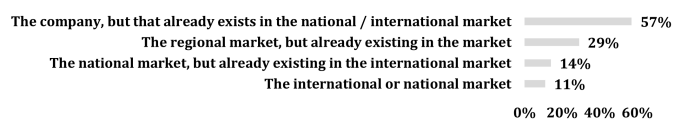
Hence, the answers demonstrate that among the typologies of innovation (Fierro et al., 2017) present in textile manufacturing companies in the municipality of Gaspar, there is a predominance of process innovation, based on organizational structure innovation.

The favorable aspects for innovation and competitiveness of Brazilian textile and clothing companies, namely: management and dissemination of knowledge, creativity and cooperation, are strengthened by the existence of a sector specialized in active research and development (Caldeira et al., 2018).

Considering the impact of innovation on the market levels (Figure 3), the research shows that the innovations adopted by most companies (57%) were relevant within the scope that encompasses the company's own organization, even if it already exists in the national/international market. Innovation benefits all levels of the textile sector, while employing common methods. There is a need for companies in the textile sector to face the challenge of innovating, as a condition to remain in the market, by creating or perfecting innovative methods that meet the production chain (Caldeira et al., 2018; Menegon et al., 2018). Innovation has been recognized as one of the main pillars resulting from the increase in the competitiveness of companies and in the economic development of the industrial textile sector (Moreira et al., 2016).

**Figure 3**

*Impact of innovation on market levels*

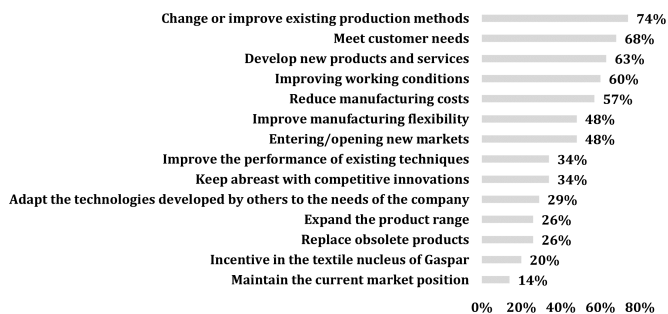


Note: Elaborated by the authors

Regarding the reasons or causes that encouraged the company to innovate (Figure 4), the results indicate that, in the search for increased productivity, managers clarify that the main reasons are the prospects of changing or improving existing production methods (74%) in order to meet the needs of customers (68%) who, based on this condition, meet the needs of customers (68%). In turn, it results in the encouragement of the development of new products and services (63%). In an overview of the innovations carried out in the Brazilian textile and clothing industry, it is possible to observe prominence in relation to process innovations over product innovations (Moreira et al., 2016).

**Figure 4**

*Reasons or causes that encouraged companies to innovate*



Note: Elaborated by the authors

The development of new products and services in the companies investigated in this research can be enhanced by strengthening the culture of cooperation in the LPA. To this end, local and regional representative organizations need to restructure their programs to support the promotion of innovation activities that, among the main scopes, seek to develop cooperation as an organizational practice. It can be observed that only 20% of the companies present a context in which innovation activities are encouraged by the Textile Center of Gaspar-SC, highlighting that one of the objectives of this entity, created in 2018 to represent the interests of entrepreneurs in the local sector, is to boost the exchange of experiences, the improvement and enhancement of business and the continuous improvement of the local textile chain (Commercial and Industrial Association of Gaspar [ACIG], 2022).

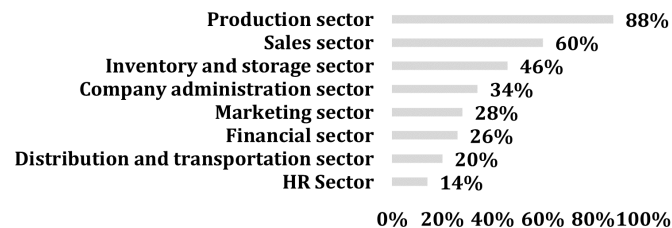
In terms of benchmarking, it is noted that only 29% of the companies surveyed practice adaptations of technologies created by others to meet their needs, such as expanding the range of products and replacing obsolete products and services. In this case, it is inferred that the products offered supply the market and that most companies choose to adhere to new methodologies, little used by other organizations, but which are effective. An example of successful innovation in the textile industry is the use of microfibre (from the 1970s onwards) in the creation of new fabrics. Among other results, this insertion reduced costs and allowed the implementation of new technical characteristics in the final product (Menegon & Zambarda, 2019; Osterwalder & Pigneur, 2020; Palheta et al., 2021).

The finding of the low rate of adherence to the practice of benchmarking is reinforced by the identification that only one third of the companies (34%) investigated in this research are managed by managers who claim to monitor the innovations of the competition as an incentive to innovate. In addition, it is noteworthy that only 14% of companies constitute a scenario in which their managers want to maintain their current market position. This denotes that those responsible for the management of companies do not want to stagnate them in the position they are in, but with a visionary behavior, they intend to continuously improve and develop within the sector (Britto et al., 2018; Caldeira et al., 2018; Menegon et al., 2018; Carmona & Gomes, 2021).

In addition, the data show that the sectors most benefited from innovations implemented within companies (Figure 5) are, in due order: i) the Production sector (88%), a fact that is mainly justified by the motivation of managers to introduce innovations that enable improvements in manufacturing methods and also in the acquisition of machinery and equipment; ii) sales sector (60%), which results in the expansion of the scope of product offerings for the domestic market; and iii) the inventory and storage sector (46%), since the management of logistics operational activities tends to be significantly optimized with the introduction of innovations, such as the acquisition of machinery and equipment, the acquisition of software and changes in the company's layout, identified as the most present practices in the companies surveyed.

**Figure 5**

*Sectors of the companies benefited by the innovations introduced*



Note: Elaborated by the authors

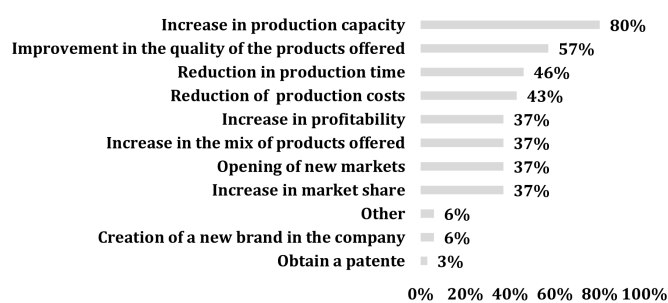
However, the human resources (14%) and distribution and transportation (20%) sectors are evidenced as the ones that are least impacted by the innovations introduced in clothing companies, which are part of the sample of this study. Although innovative practices and routines have great potential for impact on these sectors, labor costs are part of the opposite direction that prevents the increase in competitiveness of the Brazilian textile and manufacturing chain. (Cavalcanti & Santos, 2022). In addition to this nationwide bottleneck, the Brazil cost, understood as the set of structural difficulties that negatively impact the country's economy, impeding its growth and competitiveness, can be interpreted as a buffer against the impact of innovations on the distribution of companies' products. However, despite the difficulties, the impacts of innovation activities can be perceived and associated with various areas within organizations, such as the product, processes, aspects related to the environment, and also to regulations and standards (Moreira et al., 2016; Gavira et al., 2020; Martelli, 2021).

In addition to the internal and external difficulties to the companies in the sector, the results obtained by the innovation process implemented (Figure 6) indicate that 80% of the clothing companies surveyed obtained an increase in production capacity. The benefits related to production were also identified in the aspects related to manufacturing productivity, that is, in the improvement of the quality of the products offered (57%). In terms of competitiveness, one of the factors to be considered important in the evaluation of the performance of companies concerns the production with high quality standards and, not only, the profit obtained (Cavalcanti & Santos, 2022).



**Figure 6**

*Results obtained by the innovation process implemented in the company*



Note: Elaborated by the authors

This is followed by a decrease in production time by 46%, as well as in production costs by 43% of the garments. Meanwhile, only 3% of companies obtained patents (Figure 5) and/or created new brands (6%) after implementing innovation methodologies. Thus, these results reinforce evidence that the lack of innovations in the textile sector is due to the low number of patent filings, the development of high value-added products and brands with a high productivity system. By maintaining such behavior, the possibility of internal market loss is increased, widening the deficit in the trade balance (Cavalcanti & Santos, 2022).

When problematizing the development and introduction of innovations in organizations, it is important to investigate their possible and main sources of funding (Figure 7). From this perspective, there was a significant contribution of customers (63%) and suppliers (54%) in the implementation of innovations in the companies surveyed. The search for information about customers and the market allows the company to better understand the needs, facilitating the development of innovation and acceptance in the market, mainly by being able to anticipate the offer, depending on the desires of the clientele. Ideas and information that the company receives from customers, such as satisfaction surveys, help it identify needs and provide a personalized product (Caldeira et al., 2018; Beuren et al., 2020).

**Figure 7**

*Sources of innovation for companies*



Note: Elaborated by the authors

The specialized literature points out that a significant portion of the innovations in this sector come from the acquisition of machinery and equipment, as well as from new types of raw materials (Moreira et al., 2016) that originally come from the supply chain. One of the characteristics of the textile and clothing chain is that it is a consumer of technologies, considering that most innovations happen exogenously to companies, mainly through suppliers. (Britto et al., 2018).

The relationship with the customer positively influences the innovative capacity of the company, and is important in the development of ideas and product launches, process and organizational innovations, and the business strategy, to identify opportunities more efficiently and reduce the risks of innovation. Good leadership practices and relationship with customers and society, and access to information and knowledge undoubtedly have

a positive and significant impact on the generation of innovation, given the importance of these resources for the development of dynamic capacity (Vasconcelos & Oliveira, 2018).

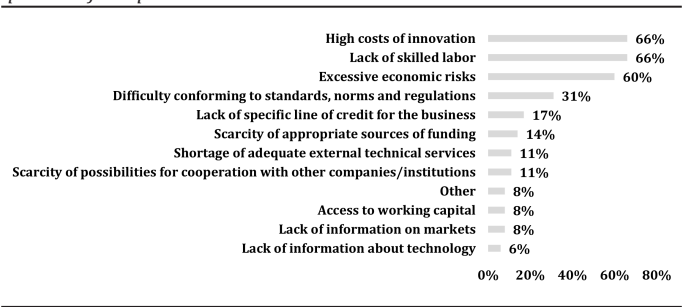
Partnerships with universities and research institutes (3%) and participation in fairs, conferences and seminars (8%) represent the least used sources of innovation by companies. The relational distancing of these clothing companies from educational and research institutions reveals, for the purposes of innovation and economic growth of the LPA, an opposition to what is evidenced by empirical studies (Caldeira et al., 2018) which, when addressing the role of external agents in stimulating innovation, elucidate that the actions of the government and universities "should be considered as the main agents of stimulating innovation in the Brazilian textile sector" (Caldeira et al., 2018, p. 19).

Due to the ease of acquiring knowledge and information, as well as using them in the production process of companies, sources such as customers, consulting, fairs and exhibitions, also become relevant for the expansion of innovations in the sector (Moreira et al., 2016). Obtaining and sharing information can be used to improve or develop new products or services, new marketing methods, to reduce the risks of the innovation process and transaction costs (Milnitz & Luna, 2017; Menegon et al., 2021).

Regarding the problems and obstacles that prevented/hinder the innovation process of companies (Figure 8), it was identified that high costs (66%) and lack of qualified labor (66%) are the main barriers that hinder the development and adoption of innovations. To solve the problem of the lack of qualified labor, it would be ideal to work together with educational institutions, to provide opportunities for students and professors, through internships or research/extension projects, to work in the company, by offering services and obtaining a return on learning. Thus, they would encourage studies by the academic community, invest in knowledge and professionalization of the company, avoiding excessive expenses. This relationship can provide the qualification of the student/trainee to work according to the needs of the company.

**Figure 8**

*Difficulties, problems or obstacles that impeded/hindered the innovative process of companies*



Note: Elaborated by the authors

With regard to excessive economic risks, obstacles considered by the managers of 60% of the companies surveyed, it is evident that there are different types of uncertainties related to the return on financial capital invested in innovation. At first, companies can define their needs and define what the necessary expenses will be. For better direction, the search for an external source of decision-making support can be an effective alternative. Thus, the company tends to define with greater certainty what is the best way to raise funds to achieve the objectives that have been set.

The results also highlight the difficulty in adapting to standards, norms and regulations. It was found that one-third of the companies surveyed (31%) present this bottleneck as an issue to be solved. Therefore, knowing regulatory, social and sustainable aspects allows the organization to stand out when developing ideas, and achieve superior innovative performance (Vasconcelos & Oliveira, 2018).

Innovation is involved in an intense process of knowledge and information development (Beuren et al., 2020). The quality of information can be reflected in the innovation of products and processes, via knowledge, which, in turn, is characterized as information in a given context in which meaning and interpretation are attributed. This knowledge relates to innovation, the emergence of a new idea or invention and its transformation into a business (Alves & Ceolin, 2019; Osterwalder & Pigneur, 2020).

By investing in innovative knowledge, textile companies can leverage sales and develop enterprises, to stand out in the market, such as companies that invest the most in this sector, belonging to developed countries and known worldwide. Investing in research and development (R&D) is one of the keys to enabling the company's progress, especially financially. With new products and processes, the company maximizes technological capacity and increases productivity.

### CONCLUSIONS

In order to verify the propensity to innovation of textile manufacturing companies in Gaspar/SC, this research was guided according to the theoretical assumptions of innovation and adaptation of the data collection instrument of the survey carried out by PINTEC in Brazilian industries. From the systematization of indicators, the results present empirical information that, in a general context, evidences a reality in which the organizations that make up the sample of this study have, in their sectoral trajectory, significant advances in the implementation of innovations. However, they still face several challenges such as excessive economic risks, high costs to innovate and a lack of skilled labor.

The innovations introduced in the surveyed clothing companies predominate in the operational manufacturing processes, of an incremental nature, more present in their efforts to reduce production time and costs. Thus, the increase in production capacity was identified as the main result obtained as a result of the innovations. Another factor that stands out in increasing the innovative efficiency of these companies is the acquisition of software. Process management, with the use of more advanced innovations and linked to modern computing resources, has become a necessary condition for organizations to achieve excellent manufacturing performance and productivity. This result compares to that observed by Lalic et al. (2019), where process management is an incorporation of innovation brought from industry 4.0 to the textile segment, even if still on a small scale, from the production control system almost in real time.

The best strategy for promoting innovation identified in the study is still focused on the allocation of financial resources directed to the updating of machinery and equipment. Their main sources for innovation related to market activities, specifically, are customers and suppliers, a result corroborated by the study by Giannini et al. (2019), who realized that companies seek external knowledge provided by suppliers, which generates a dependence to innovate.

The dependence on technologies from suppliers suggests that public policies aimed at increasing innovation in the textile sector should stimulate the process of cooperation between universities/research institutes, companies and the government. Government funding policies could significantly promote research and science development in enterprises (Zhang et al., 2020). Thus, it would be possible to expand the capacity of organizations to solve the problems and obstacles that prevent or hinder the innovation process.

One possibility to mitigate the weaknesses and improve the innovative activities of the LPA would be the collective elaboration of a sectoral development plan, which incorporates in its objectives, among other things, actions to foster cooperation processes focused on P&D and proposals for the qualification of the actors who carry out operational and strategic processes in the textile production

chain. The potential contribution of this recommendation to the LPA, in addition to being based on the empirical reality diagnosed in this study, is based on studies already carried out in the textile sector in other countries (Kazmi & Takala, 2014; Nhung & Thuy, 2018).

In addition, the elaboration and, subsequently, periodic updates of a sectoral plan can be made possible from the expansion of the activities covered by the Textile Center of Gaspar-SC, since this entity represents the interests of entrepreneurs in the sector. To this end, the insertion of an observatory of innovation and competitiveness of the local textile sector, in the organizational structure of the referred Center, in partnership with other public and private entities, can be a viable alternative for the elaboration of this planning instrument, in addition to technical and scientific research, consultancies to support decision-making and holding forums for debates on contemporary issues associated with innovation.

Finally, considering that this study is limited to the empirical analysis of the activities of a group of entrepreneurs in a specific context, it is not recommended to generalize the results obtained to understand the reality of other LPAs. To further the analysis, it is proposed to replicate the study with a larger sample of entrepreneurs, as well as in textile production agglomerations located in other regions, in order to promote a comparative framework. It is also recommended to study: the mapping of the network of public and private actors inserted in the textile production chain of the municipality of Gaspar, in order to identify their roles and levels of power so that they can establish joint actions (Tambosi et al., 2020) to foster innovation; and, as an attention to the trend of digitalization of industrial processes, the analysis of the propensity to introduce smart manufacturing technologies (Industry 4.0) in the textile chain in question and their contributions to the promotion of manufacturing practices aligned with the principles of the Circular Economy.

### Conflict of interest statement

The authors declare that there is no conflict of interest.

### Authors' statement of individual contributions

Roles	Contributions			
	Hora G. B.	Mondini V. E. D.	Tenfen G. M.	Barros T. S.
Conceptualization	■	■	■	■
Methodology	■	■	■	■
Software			■	
Validation	■	■		■
Formal analysis	■	■	■	■
Investigation	■	■	■	■
Resources			N. A.	
Data Curation	■	■	■	■
Writing - Original Draft	■	■	■	■
Writing - Review & Editing	■	■	■	
Visualization	■	■	■	
Supervision	■	■		
Project administration	■	■		
Funding acquisition			N.A.	

Note: Acc. CRediT (Contributor Roles Taxonomy): <https://credit.niso.org/>



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