Industry 4.0: A Case Study on Strategy and Innovation in a Brazilian Auto Parts Company

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Abstract. Innovation in small and medium-sized companies can be favored by the use of technologies covered by Industry 4.0 and differentiated strategies can be decisive for competitiveness. Although smaller companies are slower in terms of implementing technologies when compared to large organizations, they denote innovation capacity and strategies. The method used to carry out this paper was a single case study in a medium-sized auto parts company located in São Paulo/Brazil. The results showed that the company studied broke the pattern and found a strategic way out to face the challenges of using new technologies. The digitization project implemented by the company, supported by some of the pillars of Industry 4.0, provided positive results for its internal processes and paved the way for the creation of a digital competence school and a startup to offer digital solutions in a practical and competitive way. The strategy adopted by the company corroborates the perspective that to take advantage of Industry 4.0 opportunities, new business models need to be considered.

Keywords: Industry 4.0 · Competitiveness · Digital transformation · Business models

1 Introduction

The use of technologies covered by Industry 4.0 can favor innovation in small and medium-sized companies and offer benefits for improving the efficiency of their internal processes. Opportunities related to the use of these technologies can expand the range of benefits to be obtained from business model innovation [1].

The innovation strategies added to Industry 4.0 are presented differently in relation to the size of the companies. While for large companies these strategies are guided by business models centered on novelty, smaller companies rely on business models centered on the efficiency of their processes [2].

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Small and medium-sized companies play an important role in the debate on digital transformation and new business development. Although they have a competitive disadvantage compared to large companies, given their limitations in technical and financial resources, they have innovation capabilities and strategies [3] and as a result can generate new flexible organizational processes and structures [4].

In this way, Industry 4.0 technologies can promote changes in production processes and allow the development of new business models and new forms of management and organizational strategies [5]. The necessary requirements and benefits that small and medium-sized companies can obtain with the implementation of Industry 4.0 are still little explored in the literature and generate research gaps [6].

This paper aims to fill part of these gaps through the following question: How are small and medium-sized auto parts companies in Brazil adapting their strategies for the transition to Industry 4.0? Aiming to identify and analyze the innovation strategy in a medium-sized auto parts company, in Brazil, for the implementation of technologies covered by Industry 4.0.

In the search for an answer to the proposed question, the case of an auto parts company was chosen as the object of analysis, whose innovation strategy differs from the standard established by others of the same size and segment, as will be discussed in the results section.

2 Literature Review

Industry 4.0 has an important and long-term strategic impact on global industrial development, as it signals a growing demand for research on the issues, challenges, and solutions related to the design, implementation, and management of smart manufacturing systems [7]. In this way, it represents a technology based opportunity to change the way companies generate value for their customers [8].

In this context, companies seek to understand how Industry 4.0 can impact professional skills and competencies and the company's organizational structure [9], also discussing the role of these new technologies in the creation or destruction of jobs [10]. However, despite the impact of the use of new technologies, especially digitalization and advanced automation, on the workforce, the human role within the smart manufacturing system is expected to remain dominant [11].

On the other hand, the difficulty of obtaining qualified labor for small and medium-sized companies can make it difficult for them to develop the expertise necessary for the successful implementation and use of digital manufacturing technologies [12]. In addition, in many cases, companies underestimate the cost and difficulties of introducing new technical solutions into an organized system, a problem that is more critical for small and medium-sized companies, despite having greater adaptability [13].

Therefore, companies must develop skills to provide employees with a sense of ownership, trust and a culture of interconnectivity and information transparency [14], in order to take advantage of technologies to adapt new processes to the detriment of the organization's redesign.

Another aspect to be highlighted deals with innovation management, which refers to the company's ability to adjust to market changes and promote the organization's

adaptability through learning and the balance between knowledge and technological exploitation [15].

In turn, a business model can be considered an architecture of product and information flows, which includes the description of the various business actors and their functions, composed of a system of interdependent activities that goes beyond the limits of the focal company [16].

It is also considered that in relation to the use of new technologies, companies can present different levels of maturity and the integration of these various technologies can generate solutions according to the needs of each company [17].

Thus, despite the difficulties mentioned, companies must start a digital transformation journey, which considers changes throughout the company, including its organization, physical infrastructure, human resources, process and operations management and manufacturing technologies [18].

In this context, the transition to Industry 4.0 is presented as a possible path for companies in the search for competitiveness. Therefore, it will be necessary to define manufacturing models and plan transformation programs [19]. Therefore, this transition should not be seen as the solution to the challenges to be faced, but as a strategy to rethink the business model as a whole [9].

3 Method

The method used to carry out this paper was the single case study, which is characterized by a way of investigating an empirical topic in depth, through a set of pre-specified procedures, which reveals "how" and "why" questions and contributes to the construction of theory [20]. For the selection of the case under analysis, aspects related to the use of technologies covered by industry 4.0, innovation strategies and business model were considered.

The case chosen as the object of analysis is a medium-sized auto parts company, located in São Paulo/Brazil, which has been operating in the automotive market for over 50 years. The choice of the case is justified by the strategic differential that the company presents in relation to others in the same segment and size. Data were collected in the second half of 2021 through semi-structured open interviews with a focus on strategies aimed at Industry 4.0 and through direct observations.

The interview was conducted with the CEO of the company, as he is the person involved with all processes relevant to digital transformation. In addition to the questions proposed in the interview, some information was spontaneously provided by the respondent and is portrayed in the results and discussions.

Direct observations were carried out during a technical visit to the factory premises and it was monitored by the managers of each area. During the visit, it was possible to know the details of the production processes and technologies used, which allowed a better foundation and favored the conduction of the interview with the chief executive officer.

All stages of the research ensured confidentiality to the participating company regarding the identification of the company and the research respondent. Thus, throughout this paper, the company will be named as "Innovative company".

4 Results and Discussions

The results found in the search are shown in tables and figures. Table 1 shows the questions and a summary of the answers obtained on strategies and competences of the company studied.

Table 1. Strategy and competence for industry 4.0

	Questions	Answers
1	How do you rate your ability and skills to adapt to technological changes?	Open and receptive to technological changes, without preexisting paradigms
2	How do you consider the alignment of your company's strategies and organizational culture to Industry 4.0?	The company's culture was already open to changes, which facilitated alignment with innovation strategies
3	How can the transition affect your company's competitiveness?	Opening the way for new business, making the company more competitive
4	What strategies does your company use to make the transition to Industry 4.0?	Systemic vision, training of personnel and exchange of knowledge and experiences
5	Are the strategies adopted by the company bringing results? Which are?	It motivated teams, productivity gains, creation of an independent business unit (startup) and a digital competence school
6	How does the market influence the decision to invest in new technologies?	For the competitiveness and survival of the company in a sustainable way
7	Has the digital transformation caused changes in the organizational structure and strategic planning of the company?	An artificial intelligence department was created and strategic planning began to prioritize new business models

Source: Prepared by the authors

In the analysis of the questions (Table1), it was observed that the company has a broad and differentiated vision to carry out the transition since its proposals and directions include innovative strategies that go beyond the internal environment and the standard business model. This differentiated aspect contrasts with the idea that smaller companies are guided by business models centered on the efficiency of their processes, while large companies prioritize business models centered on novelty [2].

The company's main manager considers himself an open-minded professional, just as the company's culture is open to change. Regarding the use of new technologies, the respondent used the expression "it is necessary to think big", in order to outline strategies with a broad and systemic view, corroborating the perspective that new business models require companies to obtain new ways of thinking. Inside and outside the corporate environment [21].

In the search for competitiveness, companies need to plan transformation programs [19], which is in line with the interviewee's perspective, for whom the use of technologies can open paths for new business and make the company more competitive.

Regarding the choice of strategies to carry out the transition, although the researched company could acquire new machines (option A), it opted for a digitalization process focused on maximizing human capacity, using existing machines and equipment (option B). The interviewee justifies that the choice for the digitization project was due to the high investment required for the acquisition of new machines.

However, it emphasizes that the decision to invest can be affected by the competitiveness of the market and the need for the company to survive in a sustainable way, corroborating the idea that the adaptation of companies to market changes can occur through learning and the balance between knowledge versus technological exploitation [15].

For a better understanding of some answers about the strategies adopted, Fig. 1 illustrates the "anxieties" raised by the manager, the strategic solutions found, the means used and the results obtained.

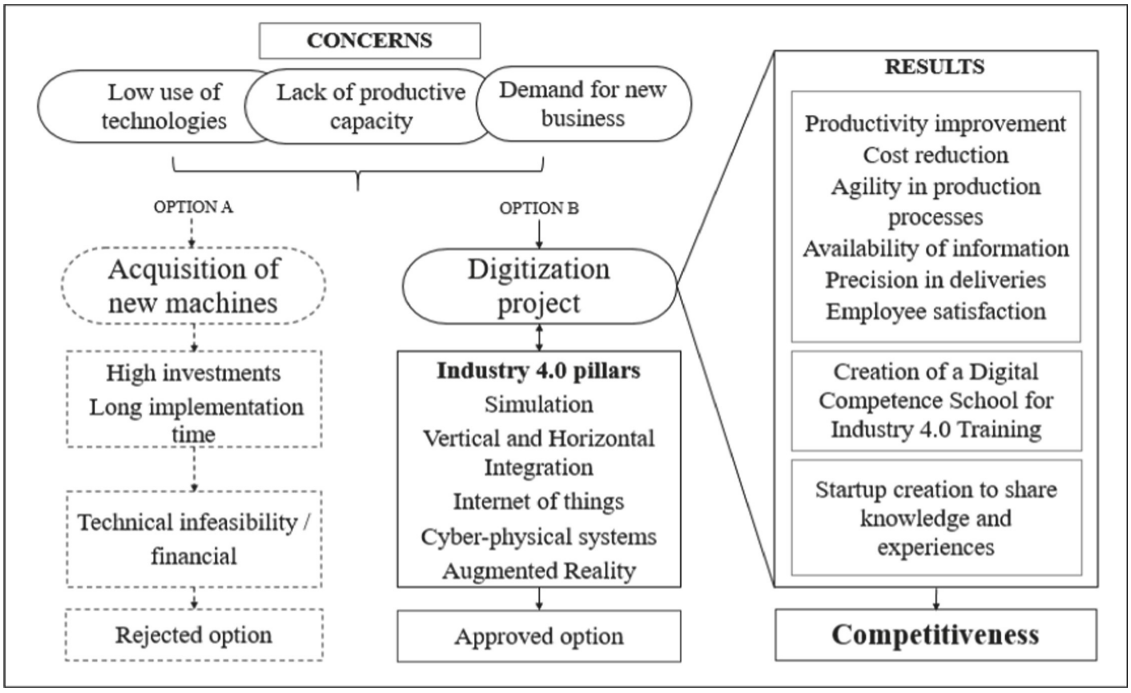

Fig. 1. Concerns and strategies of the "Innovative company" (Source: Prepared by the authors)

According to spontaneous statements by the interviewee, the awakening of the anxieties raised (Fig. 1) occurred due to the company's inability to participate in the competition of a new business, given the lack of productive capacity. Added to this issue was the low use of technologies and the search for new market demands, which could significantly transform your company.

The digitization project started in 2018 was supported by some of the pillars of Industry 4.0, which provided opportunities for results such as improved productivity, cost reduction, agility in production processes, availability of information, precision in deliveries and employee satisfaction.

Regarding the adaptation of employees to the use of these new technologies, in the opinion of the interviewee, at first there was resistance to changes, which was undone

by the perception that technology can be an ally and not a threat to the worker. An issue also addressed in the literature which discusses the role of technology in the creation or destruction of jobs [10].

In addition to the internal results obtained, the digitalization project, thinking about the sustainability of the ecosystem, paved the way for the creation of a school of digital competence to prepare for Industry 4.0, with a view to training young people from the local community and employees' children.

An important aspect to highlight is the difficulty of obtaining labor for small and medium-sized companies can make it difficult to implement and use digital manufacturing technologies [12], in this way the creation of the school of digital competence can be seen as a tool for the sustainability of the company's ecosystem.

Before finishing the explanations in Fig. 1, regarding the creation of the startup, it is worth detailing the actions and results obtained with the implementation of the digitization project, as shown in Table 2.

Table 2. Digitization project strategy

Actions	Results
Formation of a corporate intelligence group	Stimulation of creativity; Broader participation of employees; Maximization of human capacity
Installation of sensors in a business unit	Autonomous data capture of variables
Creation of best pattern recognition algorithms in real time	Optimization of processes and consumption of materials, and guidance of operators
Creation of a command system and activity record	Establishes human-machine communication in real time

Source: Prepared by the authors

As stated by the interviewee, all the actions developed to implement the project brought good results as evidenced (Fig. 1) which justified the investment made in technology and training of employees.

Still, in relation to the return on investment, the company creatively adopted an innovative strategy with the creation of a digital competence school and a startup to offer digital solutions to other companies in a practical and competitive way.

It should be noted that this new business unit is independent and is not subordinated to the formal structure of company. In this way, the team formed for the development and implementation of the digitization project began to divide its activities between the referenced company and the startup.

The strategies adopted by "Innovative company" validate the perspective that to take advantage of the potential provided by Industry 4.0, new business models need to be considered to improve the efficiency of the process as a whole [22].

5 Conclusions

The objective of this study was to identify and analyze the innovation strategy in an auto parts company, in Brazil, for the implementation of technologies covered by Industry 4.0. The analysis of the case studied made it possible to understand how a medium-sized auto parts company adapted its strategies to transition to Industry 4.0.

The results indicated that differentiated strategies, with the involvement of top management, and the participation of employees with creativity and innovation, can facilitate the path to the use of new technologies, even in smaller companies.

The digitization project implemented met its main objective of maximizing human capacity and opened the door to other innovative strategies and creative responses, both with the foundation of the school of digital competence and the creation of a startup.

The startup was configured as a bold business model to offer services with digital solutions in a practical and competitive way. In this way, it provided innovation by incorporating, independently, the provision of technological services, with the use of skilled labor and the know-how acquired in the development of the digitization project.

The school of digital competence collaborated with the company's strategy to increase the density of knowledge and promote the qualification of the workforce in a continuous way since the school's initial proposal was to qualify the local community and employees' children in relation to the technologies covered by the Industry 4.0.

The main contribution of this paper was to identify how the strategy for using technologies can make room for creating new businesses and managing companies in the automotive sector. Based on the findings, this paper advanced some steps to fill research gaps on necessary requirements and the benefits generated by the implementation of Industry 4.0 in small and medium-sized companies.

As with all research, especially as it is a single case study, the results obtained cannot be generalized to all companies. As a proposal for future studies, it is recommended to analyze the organizational impact of the implementation of new technologies in smaller companies.

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