

Digital transformation in civil construction in Brazil: development strategies adopted

Transformação digital na construção civil no Brasil: Estratégias adotadas de desenvolvimento

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Abstract

This study elaborates a reflection on strategies to achieve digital transformation in Civil Construction in Brazil. From the digital revolution framework, which is considered the fourth industrial revolution. This milestone promoted changes in business rules, in an unprecedented way and implied profound changes in the ways of living, working and relating. The objective is to understand the implications of the digital transformation in the civil construction industry, with regard to the scope of business and processes. Thus, we carried out a documental analysis with two civil construction companies: MRV and Cyrela, and the strategies established were analyzed from the documental approach. From the reflection presented in this study, we understand that the construction sector is in the process of searching for digital maturity, thus initiatives such as the creation of a startup ecosystem that meets the challenges of these analyzed big companies arise.

Keywords: innovation, digital transformation, productivity, civil construction.

Resumo

O presente estudo elaborou uma reflexão acerca de estratégias para atingir a transformação digital na Construção Civil no Brasil. A partir do marco da revolução digital, que é considerada como a quarta revolução industrial. Tal marco promoveu mudanças nas regras de negócio, de forma inédita e implicou em alterações profundas nos modos de viver, trabalhar e se relacionar. O objetivo é compreender as implicações da transformação digital no setor da construção civil, no que se refere ao âmbito dos negócios e processos. Assim, foi realizado um estudo de caso com duas empresas de construção civil: MRV e Cyrela, e analisadas as estratégias estabelecidas por meio da pesquisa documental. A partir da reflexão apresentada nesse estudo, entende-se que o setor da construção está no processo de busca de maturidade digital, dessa forma surgem iniciativas como a criação de um ecossistema de startup que atende a desafios dessas grandes empresas analisadas.

Palavras-chave: inovação, transformação digital, produtividade, construção civil.

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1 Introduction

At the end of the 20th century, in the 1990s, the emergence of new information and communication technologies (ICTs), especially the most compact computers and mobile cell phones, gave rise to new processes in the most diverse sectors of society. In the 21st century, the internet marks a new era, marked by very different protocols and modes of use (Schwab, 2019).

This study is limited to the administrative field and deals with the potential that digital transformations represent in the business world, within the scope of large companies in Civil Construction. The choice for the theme was because Civil Construction represents a relevant industry in the national economy, however, it still has a large productivity gap. In the development of the work, digital transformation is presented to understand the scenario that is designed over time, the impacts of the so-called digital revolution, and technological innovations, especially in the field of business. It is about the ruptures that generate transformations of the rules and of the processes.

Questions related to strategy and digital maturity are addressed to identify the possibilities and challenges that present themselves to companies. Thus, elements such as competitiveness, data, organization, values, and customers, among others, are considered in the context of the transformations and necessary adaptations of companies in the digital age. Among the actions is strategic planning that can more objectively outline the directions of companies in a scenario that requires caution, investments in innovation, and technology.

The objective of the work is to understand the implications of the digital revolution in the civil construction sector, regarding the scope of business, processes, possibilities, and potential. To achieve this, a study was carried out on two companies that operate in civil construction: MRV and Cyrela. The objective of the study is to understand the implications of digital transformation in the civil construction sector, the scope of business, and its processes. To this end, a document analysis will be carried out, which aims to answer the question: what implications does digital transformation cause in construction companies, in their businesses, and processes? Both analyzed companies operate throughout the national territory and offer elements that can contribute to the topic addressed in this study.

The digital transformation that takes place in the civil engineering business area is the subject of the theoretical framework that discusses the specifics of this sector that moves the Brazilian economy significantly. This study sought to understand the implications of the digital revolution in terms of business, processes, possibilities, and potential. The discovery and dissemination of new technologies generate unprecedented movements in the market and cause disruptions, transforming business models and processes (Rogers, 2017). Koeleman (2019) predicts clear benefits from digital transformation: increased productivity, safer operations and cost savings. This relevance comes from the fact that organizational innovations are not as prevalent in the sector when compared to new raw materials, for example (Silva Junior, Santos, & Santos, 2020).

Next, the theoretical framework will be presented with concepts related to digital transformation, the impacts of the transformation in the organization and in civil construction in Brazil. In the following chapter, the methodological procedures were presented. And the results show the cases of the two companies MRV and Cyrela examined through document analysis. The study ends with the final considerations of this research.



2 Theoretical Reference

In this session, the applied concepts of digital transformation from the literature are presented. Initially, the digital transformation is defined and contextualized. Subsequently, the concept of digital strength and organizational agility is detailed. Finally, the concept of digital transformation and civil construction is presented.

2.1 Digital Transformation

Digital transformation is usually defined as “an effort to enable existing business models by integrating advanced technologies” (Bughin et al., 2017, p. 2). For Facin *et al.* (2022), digital technologies are highly widespread and affect a variety of systems and processes. Unifying and exploiting digital technologies is one of the biggest challenges companies face today (Hess *et al.*, 2016). The digital revolution, considered by Schwab (2019) as the fourth industrial revolution, promoted changes in business rules. According to the author, it is an unprecedented experience for humanity, as it profoundly alters the ways of living, working, and relaxing. This revolution must be better understood as it enables limitless ways to connect millions of people and gives rise to unprecedented processing power, storage, and access to knowledge. Gobble (2018) explains that digital transformation is the deep transformation of business and organizational activities, processes, and models to fully leverage the changes and opportunities of a combination of digital technologies and their impact on society.

Rogers (2017) states that to transform to the digital age, it is necessary to update the strategic mindset of managers and employees of companies. This implies thinking differently for business strategy, that is, beyond bringing technology or creating and sustaining an information technology (IT) structure. Such competencies needed for digital transformation must come from within the company as it establishes a comprehensive personal development program that helps foster the necessary digital mindset and stimulate the skill set among existing staff (Hess *et al.*, 2016).

Traditional companies, established in a pre-digital era, may even control the market, however, they face the challenge of understanding the impact of digitalization, new rules, fundamental business assumptions, and new digital competitors. Because “playing the game” is different, pre-digital companies can transform and survive the digital age. Both well-known companies and digital natives (which emerged in the era of new technologies) and immigrants (companies that emerged in the pre-digital era but managed to adapt to technologies) recognize the possibilities created by digital technologies. Thus, they can identify limitations that have already been overcome and thus bring a new competitive advantage with lower costs, faster, and with more value for customers (Rogers, 2017). In this so-called digital age, two factors contribute to companies obtaining competitive advantages: digital strength and organizational agility.

2.2 Impact of digital strength and organizational agility on business

Rogers (2017) says that digital forces are reshaping the five fundamental domains of strategy: customers, competition, data, innovation, and value. These forces impact organizations that need to change traditional business models. Digital transformation implies adapting to new trends, for example, car-sharing platforms or new digital services (Llopis-



Albert, Rubio, & Valero, 2021). Chart 1 shows how digital tools and forces influence these five domains.

Chart 1 - Fundamental Domain of Strategy

Domain	Description
Customer	Digital tools have changed the way the customer discovers, evaluates, buys and uses the product. Social networks, for example, connect us with customers and communication becomes a two-way street. Product feedback and messages are available for all to see, making users themselves more influential than advertisements and campaigns. The new ways of reaching the customer must become more personalized, abandoning mass communication. Instead of seeing the customer as a sales target, companies must sell the value of the product so that it becomes a brand ambassador.
Competition	Digital technologies change two major aspects of competition. The first is that competitors may also come from outside the industry, offering new digital offerings. The second aspect is that companies have started to cooperate with each other to overcome mutual external challenges and interdependent business models.
Data	Data is being generated in unprecedented amounts. In addition to a much larger amount, the cost to store this data is lower and, in the cloud, which is more accessible and user-friendly. The challenge now is to convert this data into precious information for the company's positioning.
Inovation	Technologies have made building prototypes cheap and testing ideas fast, so continuous verification and experimentation becomes something different from the past. In addition, experimentation generates continuous learning about the product before launch.
Value	Prior to the transformation, the customer delivery value proposition was lasting or nearly constant. In the digital age, the proposal is changeable, and the best way forward is constant evolution, considering all technologies as a way to extend and improve.

Source: Rogers (2017).

Digitization will bring significant improvements to the value chain, increasing efficiency, reducing costs, and generating greater collaboration and innovation (Llopis-Albert, Rubio, & Valero, 2021). In this sense, the pursuit of digital transformation will lead executives to face major issues of organizational change. One of these issues is agility in adapting and following trends. To develop this organizational agility Rogers (2017) suggests that the company focus on three initiatives: allocating resources, adequate measurement, and aligning incentives for employees. Note these three initiatives to develop organizational agility in Chart 2:

Chart 2 - Initiatives to develop organizational agility

Allocate resources	Change what is measured	Align incentives
Decide which investments will leverage the company and realize which ones should be avoided.	Define indicators that make it possible to look in new directions. Analyze results that show different phases of transition to a new business model.	Compensate and promote employees who drive the necessary changes to the strategy. Leadership must reinforce behaviors necessary for the organization.

Source: Rogers (2017).



The executives' challenges related to (i) enabling the organization to develop truly new ideas, processes, initiatives, and perspectives and (ii) disseminating and infusing this transformation in the organization. Digital transformation should not only be limited to correct strategic planning but also to execute the previously planned strategy (Rogers, 2017). Strategic planning is central to guiding this organizational change so that the actions taken by the departments are coordinated and directed toward a common objective (Porter, 2004). Strategic planning, according to Kuazaqui (2015), involves the survival and sustainability of the company with an analysis of the market where it is inserted, its financial and human resources, production processes, and other areas of the company.

For this, it is important to identify the digital priorities necessary to maintain a competitive advantage. The external look must be attentive to how their competitors are digitizing themselves, the impact of digitization on customers' perception of value on products, and how companies inside and outside the sector can meet this expectation. Once the gaps are identified, the company must devise strategies to provide a short-term financial impact while starting the digital transformation process. This transformation will happen when leaders adopt a holistic approach when formulating indicators in the three categories (i) digital assets, (ii) digital use in the relationship with stakeholders (customers and suppliers), and (iii) digitally skilled employees (Gandhi, Khanna, & Ramaswamy, 2016).

Regarding digital assets, this indicator measures how much companies invest in hardware, software, data, and IT services. Another aspect analyzed in this one is the extent to which organizations are digitizing their physical assets, for example, if they have smart buildings or use big data to obtain greater performance in systems (Bughin & Zeebroeck, 2015). In this sense, Hess *et al.* (2016) highlight the importance of coordinating and aligning the many strategies of a company considering digital transformation in order to build a digital business strategy that combines IT actions and investments with the business strategy.

Regarding the use of digital in customer and supplier relationships, industry-leading companies already take advantage of online commerce platforms, digital marketing, and customer interactions through social networks. The most significant impact indicator is the search for employees with digital skills. Increasing the proper use of digital tools by employees will increase the company's productivity. Companies in leading industries have a workforce that is 13 times more digitally engaged than the rest of the economy (Bughin & Zeebroeck, 2015). In agreement, Hess *et al.* (2016) indicate that digital skills are difficult to develop internally in companies, so developing partnerships can speed up this process.

2.2 Digital Transformation and Civil Construction

Construction is one of the most relevant sectors of the economy, moving US\$ 10 trillion spent on goods and services per year and in addition to employing 7% of the world's working population. It is projected that by 2025 the amount spent in the sector will be US\$ 14 trillion (Bughin *et al.*, 2017). In Brazil, according to the Brazilian Institute of Geography and Statics (IBGE, 2019), it added more than 230 billion BRL to the national Gross Domestic Product (GDP), representing 3.2%. Adding the last 5 years, more than one trillion reais were added to the national GDP. In addition, the relative share of civil construction in the total employed population averaged 7.3% from 2000 to 2017.

Even though it is a sector of great impact on the economy, analyses show that there is a gap of US\$ 1.6 trillion due to a lack of productivity. In the last two decades, construction



productivity growth has not followed that of other sectors, while construction increases on average by 1% per year, the manufacturing sector has a productivity growth of 3.6%, and the economy, in general, grows by 2, 8%. In a sample of countries analyzed in the McKinsey survey, at least 25% of construction companies achieved productivity growth equal to the overall economy. If it follows the growth of the economy, the added value of the sector could increase by 1.6 trillion USD per year (Bughin et al., 2017). The analyzes show that Brazil has one of the worst productivities in the world for the civil construction sector.

One of the suggested ways to increase productivity is the use of digital technologies in services. Servitization refers to the process of transforming the offer of integrated solutions that involve products and services. They add value to the firm by increasing the possibility of delivering products and services based on information captured from customers through digital platforms (Coreynen, Matthyssens, & Van Bockhaven, 2017). Koeleman *et al.*, (2019) presented key industry characteristics that make digital transformation particularly challenging, note these civil sector characteristics in Chart 3:

Chart 3 - Characteristics of civil construction

Characteristic	Description
Fragmentation	Along the value chain of construction projects, many specialists operate at a specific time or a specific discipline. At each stage of construction, several contractors and subcontractors can carry out the work. For the implementation of digital solutions, it therefore requires coordination of changes among all contractors and with the short schedule it makes this task even more difficult.
Lack of replication	Projects are often one-off ventures with unique features that need a bespoke designer and delivery. Digital transformation requires standardization so that it can be used on a large scale.
Transience	A new construction project will involve hiring a new group of contractors for execution. Not being able to follow up on other projects with the same contractors to execute, makes it difficult to develop a standard way of working that can be replicated to other projects. The high turnover of employees at construction sites or in projects also makes it difficult to perpetuate the standardization of activities.
Decentralization	Large engineering and construction companies are federated, with their business units and divisions following their own processes rather than the entire company having the same pattern. This may have been because many organizations grew by acquiring smaller ones.

Source: Koeleman et al., (2019)

The construction sector is second to last in the McKinsey Digitization Index ranking, with gaps in all three categories (digital assets, digital use in stakeholder relationships (customers and suppliers), and digitally skilled employees). The civil construction sector presents several challenges given its low productivity. Thus, this very challenging scenario is also marked by great technological opportunities. Digital transformation can contribute to accelerating innovation, and more specifically digital platforms related to innovations in products, services, and business models (Facin *et al.*, 2022).



3 Methodological procedures

To pragmatically understand the premises presented above, a case study was carried out with two civil construction companies: MRV and Cyrela. Thus, established strategies and actions are taken, and results already disclosed were analyzed.

The first company described is MRV, which has been in the real estate market since 1979 and has the largest presence in Brazil in the construction of houses and apartments in more than 160 cities. It is the largest partner of the *Minha Casa Minha Vida Program* (PMCMV), a government real estate credit initiative that facilitates purchases through differentiated product lines, and flexible payments and has partnerships with other real estate financing banks. According to the Technical Information Ranking of Construction (ITC) – 2016-19, which measures the number of square meters built, it has been the largest construction company in the country for four years.

The second company is Cyrela, which has been working with high-end products since 1962. The company has several product lines to serve other audiences as well. More than 200,000 housing units have already been delivered. It is a company with several awards, including “Best companies in customer satisfaction 2018” and “Top Real Estate 2017 and 2018”. The choice of analysis of these two companies is due to their emerging as innovators in the civil construction sector, each one has several awards in the innovation theme and are always in innovation events as speakers. Both construction companies are active in residential construction, but their target audiences are different, with different incomes. Because they are different customers, they may have different strategies to add value to their products.

The applied research methodology is called documentary, which seeks to capture a phenomenon from the perspective contained in the documents. This, in the context of the qualitative approach, consists of a broad examination of original materials (Kripta *et al.*, 2015). The analyzes were based on publications made by the company itself or news published in various vehicles. From the survey carried out, it was possible to understand how the two companies are moving towards digital transformation internally. Both presented similar transformation strategies and results, validating the previously described theory.

The study applies content analysis to identify and interpret the dimensions of digital transformation. The purpose of content analysis is the inference of knowledge regarding the conditions of production and reception of messages (Bardin, 2016). To identify digital technologies, readings and interpretations of texts extracted from websites, reports, files, and reports from the civil construction sector of each analyzed corporation were undertaken. This method follows that indicated by the documentary research by Silva Junior, Santos, and Santos (2020) in a study in the sector. Finally, an analysis was made with the compilation of notes, mainly in startups, which were the engines of technological change in these two companies.

The script to extract information from the companies analyzed in the content analysis was to read and underline the reports to investors from which data on the strategies of these companies were extracted. Subsequently, prominent news was collected involving the two construction companies from the last five years. Regarding the presentation of the data, in this work the dimensions, already proposed in the literature, were used to identify the implementation of digital transformation strategies. No on-site interviews were carried out, but one of the authors has a degree in Civil Engineering and knowledge of these companies as their competitors. The material collected was sufficient to answer questions about this research’s process, possibilities and potential. Theoretical models mainly look at Rogers (2017), focused

on business transformation, and Koeleman et al., (2019). They point out in their studies how civil construction is outdated in relation to other areas in the target dimensions of the study.

4 Results and discussions

To define the digital transformation strategy, it is first necessary to understand the company's current digital maturity and define the desired maturity and in what timeframe it will be achieved. The desired maturity is confidential information for each company and that says a lot about its market strategy. Because this information is fundamental to the company, it is not disclosed. Therefore, this work will only analyze the data of the defined strategies, not considering the starting maturity nor the projected maturity.

It was observed that the strategies for digital transformation are similar between the two construction companies with initially the structuring of an innovation area bringing people specialized in the subject. Innovation guidelines and strategies are defined via a committee and passed on to the innovation area to execute. The innovation area is responsible for leading and monitoring the projects within the company, validating the results and presenting them to a committee. The two companies already present initiatives to approach startups and create an ecosystem, either through an accelerator or a research and development center in civil construction.

4.1 MRV

MRV presents a systematization and management of innovation that provides for the reduction of uncertainties. For the results to be effective, a systemic view of the process and support from various areas of the organization is necessary. The benefits of systematization are:

- Increase in the profitability of the product portfolio
- Reduction of time and costs for new product development
- Improved success rate in product launches
- Increased reliability of products, processes, and services
- Adequate documentation and project history; providing learning from mistakes and successes of the projects carried out
- Leveraging the best of creative, managerial and technical talents of employees

Systematization has three pillars: a) strategic innovation planning; b) product development processes and c) organization for innovation. In the strategic planning of innovation, there is a committee that meets monthly to discuss innovation topics. It is responsible for organizing the strategic planning, defining the company's technological strategy, and establishing guidelines for the implementation of actions, studies, and indicates plans and actions related to innovation (tests and adoption of new business models, technology, systems, and platforms, association, commercial relationships, and investments, etc.) and digital transformation (information systems and application programming, investments in IT equipment, etc.) and also accompanies the entire funnel of innovation projects from approval to progress.

Product development processes – which project leadership is chosen depends on the case at hand. Initiatives in this pillar evolve from initial abstract ideas to concrete and physically achievable solutions. Teams must identify new business opportunities, lead projects and execute actions.



Organization for innovation – the innovation management methodology is defined and monitored. The following points are managed in the MRV:

- Identification of the company's strategic vision
- Organizational culture
- New product development processes
- Information Monitoring
- Project management
- Tools used
- Indicators established to monitor innovation
- Impact of new developments on the business.

MRV has won several awards with the theme of innovation, one of which is the Whow Award, which has three evaluation criteria: Relevance of the innovation (what is the impact on the environment in which it is inserted), Projection of the future (what is the perspective of the innovation to consolidate in the future) and Added Value (what is the innovation's ability to add value to the business) (Basilio, 2020). Therefore, the company emerges as a reference of digital transformation in the sector.

In the last five years there has been an investment of more than BRL 250 million in digital transformations in construction processes and solutions with a total focus on the consumer. There are more than 30 multidisciplinary teams created to work on solutions. According to the commercial head, “technology played a fundamental role in the entire process of the company”. The solutions already worked on by MRV include a marketplace to decorate and furnish the decorated virtual apartment, photovoltaic plates for the generation of clean energy, shared bicycles, use of drones in the works, Bot in customer service, property purchase contract with a language simpler, among others (Bianchetti, 2020). MRV was the first construction company in which the customer can make an entirely digital purchase.

The company has been positioning itself in the market as a housing solutions platform, capable of providing the housing option that best adapts to the moment in the customer's life, whether with the purchase of ready-made apartments or in the plan, purchase of land through its Urba platform or renting through startup Luggo. Among the strategies to complement the business, MRV also created an attraction program for startups, which brings ready-made solutions for the challenge published on its website. The challenges proposed now are Augmented reality in civil construction, Discounts on customers' electricity bills, Operational Efficiency, Quality, and Customer Experience. This direction is in line with MRV's digital transformation goals, as "we want to continue taking a unique and assertive digital journey" (commercial head). The company's website reinforces these plans by indicating that after the partnership with Oracle, they managed to count more than 6 thousand leads generated in 6 months; 97% of units leased. This idea reinforces the suggestion by Hess *et al.* (2016) when recommending partnerships to streamline this process.

In June 2020, the construction company announced the creation of the first research and development center in civil construction in Brazil. It is an investment of 1 million BRL in three years. The center will be launched in Belo Horizonte, where the company is based. The project aims to encourage the development of technologies, new processes, construction methods, and material tests to improve the quality of products delivered to consumers (C3, 2020).

4.2 Cyrela

Cyrela understood that building, selling, and delivering apartments is no longer enough for her. During the crisis, he realized that he should start a project whose basis was to “destroy” these old foundations and start building a digital ecosystem. In this sense, the understanding of Facin *et al.* (2022), who assess that organizations apply digitization more comprehensively to reinvent their products, processes, and value chains and to enter new markets.

Working together with startups at Cyrela began in 2015, with an exclusive focus on cost reduction. The first partnership project was with the startup Nuveo, where Cyrela provided its knowledge on the topic of payment of Urban Property and Territorial Tax (IPTU) on delivered units, and after Nuveo developed the product, it could sell it to competitors. This partnership was so successful that in the first year there were savings of 1 million BRL. Allowing Nuveo to make the solution available to other companies did not harm Cyrela, as it would not make competitors sell more, just be as efficient as in managing IPTU payment.

To improve the relationship with startups, in mid-2017 Cyrela structured a co-working space with the aim of boosting startups linked to the real estate sector, which is how MITHub was born. What the company realized is that it wouldn't be able to leave the innovative civil construction sector if it didn't bring these startups into the house. According to the Director of Digital Transformation, “We want to connect Cyrela with startups, people, projects, and corporations willing to challenge the status quo and design the real estate and construction market of the future”. Therefore, from 2016 to 2021, there were more than 70 contracts signed with startups, such as Quinto Andar and Homeland. In addition to creating the digital ecosystem with a startup, it stimulated the structuring of other fronts, such as encouraging the adoption of a culture of innovation in the company and the creation of new businesses. Cyrela launched in 2018 the fintech Cash Me In, which offers loans with real estate as collateral, with rates from 0.99% p.m. + IPCA. The portfolio in March 2020 was 480 million BRL. This is the first internal project that is on the way to being a spin-off of the developer's innovation area. Another startup is Mude.me, which is a platform that helps organize house parties and brings the hook with the real estate market where the gift list can be used as a fundraiser for a down payment on a property of their own.

The company sees that the adoption of product innovation has a direct impact on the customer, an example is delivering the product at the exact point of the best location in the property for an internet signal. Cyrela has several partnerships with companies to improve the customer's purchase journey through innovation, the objective is for the customer to feel well taken care of and comfortable, realizing that Cyrela is the best place for them to shop. The improvement in the journey increases the chance of repurchasing by customers (CYRELA, 2020). In this sense, the company is in line with the trends of digital transformation. The rise of digital transformation encourages organizations to quickly adapt their processes to changing conditions to remain well-positioned in the future. On the one hand, organizations must deal with more technology-related issues than ever before and the ability to deal with those issues. (Tutida *et al.*, 2022).

Cyrela created an area focused on thinking about innovation and positioning the company as an innovator. Through committees, the Company assesses whether a particular front is a business opportunity and whether it is better to develop it internally or to look for partners. 2020). Another attribution of the innovation area is to carry out proofs of concept, improve processes and incorporate technologies and digital resources throughout the company. Some of the technologies sought are artificial intelligence and big data. The forecast is that 10



years from now, the way of prospecting land, designing projects, and selling will be completely different.

The scenario for smaller companies with less capital can be more challenging and the search for external partnerships with startups should be prioritized so that large disbursements do not occur. The best way would be like Cyrela's first project, offering a risk contract without involving investment on the part of the company. In it, Cyrela passed on all its knowledge on the subject and problem so that the startup could develop the product, after the product was working, the startup could offer the solution to other competitors. This strategy is consistent with Koeleman *et al.*, (2019) suggestion, which indicates that the company should choose the right time to start developing enterprise-wide use cases. This will usually happen after scaling the project-level use cases developed in the first pilots and stabilizing them across the enterprise.

From the case analysis, both Cyrela and MRV are protagonists in Brazil's digital transformation of the civil construction sector. The two companies already present real estate solution platforms and created business models, such as real estate financing and real estate rental. The analysis was carried out in two large companies consolidated in the real estate market that in times of crisis managed to invest in technology to reduce costs. The digital age has promoted transformations in business rules. These transformations require organizations to be able to reimagine the business model digitally, for this it is necessary that the digital strategy is clear and supported by leaders who encourage a culture capable of changing and inventing the new.

5 Final considerations

Digital is changing fundamental aspects of how companies do business. And no organization can afford to be left out as industries transform around them. Through this study, it is possible to affirm that the civil construction market lags behind other sectors when it comes to digital maturity. Studies show that capturing productivity can bring millions to the sector and the biggest difficulty is achieving digital transformation in the short term.

The objective of this work was to understand the implications of the digital revolution in the construction sector, in terms of business and processes. To achieve this, a study was carried out in two companies that operate in the civil construction: MRV and Cyrela. Regarding the processes, there was an organizational innovation of both spin-in and spin-off of startups for these two large organizations that were able to take advantage of the nascent companies that have greater freedom of digital transformation because they are more flexible. Within the scope of possibilities, entry into adjacent civil construction markets, such as rental, when not only looking at the sale, but the delivery of the house and associated service. And finally, the potential for innovation is highlighted by digital transformation, such as, for example, making a sale in a digital way, without the insertion of a broker, that is, the robotization of customer service.

As mentioned, it is not enough to invest in the purchase of innovative technologies and systems, it is necessary to have a clear and widespread digital strategy for the entire company, invest in employees so that, in addition to knowing how to use new technologies, they develop innovative thinking, monitor the market and its digital practices and have a systemic view of the company's entire value system so that opportunities can be seen in all areas. Digital transformation shapes customer behavior, changing their value perspective. It also brings



competitors that previously only operated outside the sector, increasing pressure on companies with low digital maturity. From the reflection presented in this study, it is understood that the construction sector is in the process of seeking digital maturity. Many initiatives, for example, startups seek digitization and the use of technology, but are still in their infancy with less than five years of partnership.

The delay compared to other sectors necessitates significant investments, including impactful initiatives such as establishing a startup ecosystem and a research and development center dedicated to civil construction. While the digital maturity levels of the analyzed companies were not disclosed, it was evident that their strategies for digital transformation are alike. This involves establishing an innovation department staffed with experts in the field. Innovation directives and strategies are formulated through a committee and then delegated to the innovation department for implementation. This department is tasked with spearheading and overseeing projects within the company, verifying their outcomes, and presenting them to the committee for evaluation.

The limitations of the study occur due to the time available for disclosing the companies' strategies to the public, in the form of corporate governance. Therefore, this work analyzed only the data of the defined and disclosed strategies, not taking into account the starting maturity nor the projected maturity. As a development of future studies, it is suggested to analyze the main technologies that were well accepted in the civil construction scenario and the consumer's perception when companies apply these technologies for a better experience.

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