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CASE STUDY

Digital maturity in the early-stage real estate development process: multiple case studies from Brazil

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ABSTRACT

Goal: This study aims to analyze the adoption and integration of computerized systems in the early-stage real estate development process, assessing digital maturity levels and identifying key opportunities for innovation and operational improvement.

Design / methodology / approach: Multiple case studies were conducted in three Brazilian real estate development companies. A structured checklist based on theoretical foundations of digital maturity and Construction 4.0 principles was applied to identify systems, subprocess activities, and their integration levels.

Results: Findings indicate selective adoption of digital technologies across subprocesses. Big Data platforms, cloud computing, and BIM were widely used, contributing to improved managerial visibility and integration, while pillars such as IoT and robotics were absent. Digital maturity levels varied, with more mature organizations demonstrating better systemic integration and analytical support.

Limitations of the investigation: Limitations include the qualitative nature of the study and the focus on a small sample of companies in one country, which may limit generalizability.

Practical implications: The results provide actionable insights for real estate developers aiming to enhance operational efficiency and strategic decision-making through targeted digital investments and process integration.

Originality / Value: This research contributes to operations and production management literature by systematically linking technology adoption to organizational maturity and innovation in a sector where digitalization remains under-explored.

Keywords: Digital Maturity; Real Estate Development; Innovation; Technology Adoption; Construction 4.0.

1 INTRODUCTION

The construction industry is undergoing a period of transformation with the consolidation of the Fourth Industrial Revolution, also referred to as Industry 4.0, whose advancement has the potential to reconfigure the sector's production processes. This new scenario proposes the articulation between physical and digital environments through cyber-physical systems, establishing an ecosystem in which intelligent devices communicate, exchange information, and interact in an integrated manner (Moura and Romeira, 2023; Rehman, 2023; Pittri et al., 2025).

In this context, the concept of Construction 4.0 emerges, understood as the application, within the construction industry, of technological advances and production systems derived from Industry 4.0, with the purpose of promoting the updating and reorganization of the phases of the project life

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cycle, from conception and planning to execution and maintenance. This approach is oriented toward enhancing operational efficiency, strengthening sustainability, increasing productivity, and expanding the economic feasibility of projects (Statsenko et al., 2022; Khan and Emon, 2025; Jaiswal et al., 2026).

Beyond technological advances, construction organizations currently face increasing pressure arising from market volatility, growing customer expectations, sustainability requirements, intensified competition, and the need for faster responses to economic and regulatory changes (Bezerra et al., 2024; Lu et al., 2024; Vararean-Cochisa and Crisan, 2024). These challenges have reinforced the importance of digital transformation as a means of improving organizational adaptability, enhancing information management, and supporting strategic decision-making in increasingly uncertain environments (Browder et al., 2024; Osorio Gómez et al., 2024).

Within the construction industry, real estate development plays a critical role by defining the technical, legal, financial, and commercial foundations upon which projects are subsequently executed (Moorhead et al., 2021). Moreover, real estate development can be understood as a broader macroprocess encompassing processes that extend from the early-stage real estate development to the post-construction process (Miles et al., 2015). In this sense, a macroprocess represents a set of processes and/or subprocesses grouped by common objectives (Ministério da Gestão e da Inovação em Serviços Públicos [MGI], 2024).

Therefore, the present study focuses specifically on the early-stage real estate development process, which comprises the subprocesses that precede physical construction, including market research and product definition, feasibility analysis, land acquisition, legal approvals, and project launch (Miles et al., 2015; Moorhead et al., 2024). These subprocesses are characterized by high levels of uncertainty, intensive information processing, and complex decision-making requirements, making them particularly sensitive to the quality, availability, and integration of organizational information (Moorhead et al., 2022; Moorhead et al., 2024).

Previous studies have highlighted that decisions made during the early-stage real estate development may significantly influence project feasibility, risk exposure, financial performance, and overall project success (Costello and Preller, 2010; Geltner et al., 2014). Nevertheless, despite the economic relevance of these activities, investments in digital technologies within real estate development remain comparatively limited, and many organizations continue to rely on spreadsheets, isolated databases, and fragmented workflows that restrict organizational learning and process integration (Ullah et al., 2018; Cakmak and Akturk, 2024).

At the same time, technological solutions such as Business Intelligence platforms, Building Information Modeling (BIM), cloud-based systems, and artificial intelligence applications have increasingly been recognized as important mechanisms for improving information quality, operational coordination, and strategic decision-making (Al-haimi et al., 2025; Hart et al., 2025).

Despite growing interest in digital transformation within the construction industry, important knowledge gaps remain. Existing studies have predominantly focused on construction execution, manufacturing environments, specific digital technologies, or isolated aspects of organizational digitalization (Naji et al., 2024). Comparatively less attention has been devoted to understanding how computerized systems are adopted, integrated, and strategically utilized throughout the early-stage real estate development process. Furthermore, empirical evidence remains limited regarding the relationship between systems integration and digital maturity in organizations operating in this context (Ullah et al., 2026).

Addressing this gap is particularly relevant because the benefits associated with digital transformation do not depend exclusively on the adoption of digital technologies themselves, but also on the extent to which such technologies are integrated into organizational processes and decision-making structures (Verhoef et al., 2021; Osorio Gómez et al., 2024). Consequently, understanding how computerized systems support the early-stage real estate development process may contribute to advancing both theoretical discussions on digital maturity and practical initiatives aimed at improving organizational performance (Gong and Ribiere, 2021; Osorio Gómez et al., 2024; Ullah et al., 2026).

Therefore, this study seeks to answer the following research questions: 1) How are computerized systems adopted throughout the early-stage real estate development process? 2) How do these computerized systems relate to the technological pillars of Construction 4.0? 3) How does systems integration influence the digital maturity of real estate development companies?

To address these questions, this paper analyzes the computerized systems used throughout the early-stage real estate development process in three Brazilian real estate development companies. The identified systems are examined in relation to Construction 4.0 technological pillars and the digital maturity levels observed in each organization.

The study contributes to the literature by expanding the discussion of digital transformation beyond construction execution and into strategic pre-construction activities. More specifically, it provides empirical evidence that digital maturity in real estate development is associated not only with the presence of digital technologies but also with the degree of integration established among systems, workflows, and organizational decision-making processes.

2 THEORETICAL BACKGROUND

This study is grounded on three complementary theoretical perspectives. First, it examines the early-stage real estate development process, emphasizing the subprocesses that precede the production process and establish the technical, legal, financial, and commercial foundations of real estate projects.

Second, it discusses the concepts of Construction 4.0 and digital transformation, highlighting the role of computerized systems in supporting information management, process execution, communication, and decision-making within construction organizations.

Third, it addresses digital maturity and systems integration, exploring how the effective integration of computerized systems contributes to organizational digitalization and supports the implementation of data-driven management practices.

Together, these perspectives provide the theoretical foundation for analyzing how computerized systems are adopted and integrated throughout the early-stage real estate development process and how such integration relates to different levels of organizational digital maturity.

2.1 Early-stage real estate development process

Real estate development companies operate in a business environment characterized by high capital intensity, long investment cycles, significant exposure to market fluctuations, and extensive regulatory requirements. Their activities involve the coordination of technical, legal, financial, commercial, and institutional dimensions, requiring the continuous evaluation of risks and opportunities throughout the project lifecycle (Ayodele and Olaleye, 2022; Brill, 2022). In this context, decision-making processes are strongly influenced by the quality of available information and by the ability to anticipate market demands, regulatory constraints, and economic conditions (Ayodele and Olaleye, 2022; Robson & Greenhalgh, 2023).

From a technical perspective, real estate development may be understood as a broader macroprocess through which an individual or organization assumes responsibility for planning, structuring, and facilitating the realization of a real estate project, encompassing from land identification and acquisition to the delivery of completed units to the market. This macroprocess integrates knowledge from engineering, architecture, and law to enable the development of real estate ventures in a legal, organized, and economically sustainable manner (Miles, 2015; Cadman, 2019; Peiser and Hamilton, 2019; Wiest, 2023; Fink, 2024).

Within this broader macroprocess, the present study focuses specifically on the early-stage real estate development process, which comprises the subprocesses that precede physical construction and establish the foundations for subsequent project execution. These subprocesses typically include market research and product definition, feasibility analysis, land acquisition, legal approvals, and project launch (Kron, 2015; Beber and Scheer, 2023).

Figure 1 illustrates the early-stage real estate development process and its main subprocesses.

Figure 1 - Early-stage real estate development process with its subprocesses and timelines
Source: Designed from Caribé (2022) and Souza (2004).

Although represented sequentially, these subprocesses often occur iteratively and are subject to adjustments resulting from technical, legal, financial, and market-related constraints (Peiser and Hamilton, 2019; Ratcliffe et al., 2021). Consequently, the duration and complexity of each subprocess may vary considerably according to the characteristics of the development project and its surrounding environment. In practice, subprocesses such as market research and product definition, feasibility analysis, land acquisition, legal approvals, and project launch may extend over long periods, conditioned by legal, land-related, and institutional factors (Peiser and Hamilton, 2019; Reed, 2021).

The early-stage real estate development process is particularly relevant because decisions made during these phases influence project feasibility, risk exposure, resource allocation, and value creation throughout the remaining stages of the development lifecycle. Previous studies indicate that inaccuracies in market assessments, feasibility studies, land acquisition decisions, or regulatory analyses may generate impacts that extend beyond the planning phase and affect project performance during construction and operation (Geltner et al., 2014; Miles et al., 2015).

In addition to their strategic importance, these early-stage activities are characterized by high levels of uncertainty, intensive information processing, and complex decision-making requirements. Organizations must continuously collect, analyze, and integrate information originating from multiple internal and external sources, including market data, financial indicators, legal documentation, regulatory requirements, and technical studies. As a result, the effectiveness of the development process depends not only on managerial expertise but also on the organization's ability to manage information efficiently and support decision-making through appropriate technological and organizational mechanisms (Moorhead et al., 2022).

2.2 Construction 4.0, digital transformation and computerized systems

The increasing need to improve productivity, efficiency, sustainability, and organizational responsiveness in a complex and highly competitive environment has accelerated the adoption of digital technologies across the construction industry (Verhoef et al., 2021; Naji et al., 2024). Within this context, the principles of Industry 4.0 have been progressively incorporated into construction activities, giving rise to the concept of Construction 4.0, which promotes the integration of digital technologies throughout the project lifecycle to enhance operational performance, information management, and value creation (Statsenko et al., 2022; Moura and Romeira, 2023; Rehman, 2023).

Construction 4.0 is supported by nine technological pillars, including: big data, robotics, simulations, the Internet of Things (IoT), cybersecurity, cloud computing, additive manufacturing, systems integration, and augmented reality (Boston Consulting Group, 2015). These pillars structure a digital ecosystem capable of expanding interoperability, automating processes, and supporting data-driven decision-making.

It is noteworthy that, although part of the recent literature has begun to treat artificial intelligence as a specific pillar of Construction 4.0, in this article it is understood as a transversal enabling technology that enhances and integrates the classical pillars of Construction 4.0, especially Big Data, simulations, systems integration, autonomous robotics, and IoT.

At the organizational level, the adoption of digital technologies is commonly associated with the broader concept of digital transformation. Rather than representing the isolated implementation of technological tools, digital transformation involves organizational change processes that reshape workflows, decision-making structures, information management practices, and business models (Vial, 2019; Hanelt et al., 2021). Consequently, the benefits associated with digital transformation depend not only on the availability of digital technologies but also on the extent to which they are effectively integrated into organizational processes and strategic objectives (Warner and Wäger, 2019; Hanelt et al., 2021).

This perspective is particularly relevant in the context of early-stage real estate development, where decision-making depends on the continuous processing of information originating from multiple sources and stakeholders. In such environments, digital transformation may contribute to reducing information asymmetries, improving coordination among organizational functions, increasing process transparency, and enhancing responsiveness to market and regulatory changes (Kraus et al., 2021; Siachou et al., 2021). Therefore, the successful implementation of digital transformation initiatives requires not only technological investments but also organizational capabilities capable of supporting information integration and knowledge generation across business processes (Correani et al., 2020).

At the operational level, digital transformation is commonly enabled through computerized systems that support information management, process execution, communication, and decision-making activities (Jäkel et al., 2024; Killedar et al., 2025). Within the construction and real estate sectors, these systems may include Enterprise Resource Planning (ERP) systems, Customer Relationship Management (CRM) platforms, Business Intelligence (BI) tools, Building Information Modeling (BIM) environments, document management systems, and other specialized applications designed to support specific business functions (Jäkel et al., 2024; Solano and Cruz, 2024; Zierz and Lordsleem Júnior, 2026).

In the context of early-stage real estate development, such systems can assist subprocesses including market research and product definition, feasibility analysis, land acquisition, legal approvals, and project launch (Baum, 2020). Consequently, the effective use of computerized systems depends not only on their individual functionalities but also on their ability to exchange information and support integrated organizational processes (Hodapp & Hanelt, 2022; Goonetillake et al., 2023).

2.3 Digital maturity and systems integration

The adoption of computerized systems alone does not necessarily result in effective digital transformation, particularly when such systems are implemented in a fragmented manner and operate as isolated information silos (Uzule and Verina, 2023). As discussed previously, digitalization should be understood as a structured process of organizational change that extends beyond the implementation of technological tools and encompasses data governance, interoperability, and the integration of information flows across organizational processes (Verhoef et al., 2021). As a result, organizations may possess multiple computerized systems while still facing significant limitations in information sharing, process coordination, and decision-making.

In this sense, the concept of digital maturity becomes central to assessing the degree of technological development of companies. Digital maturity refers to the organizational capacity to integrate technologies into business processes, generate intelligence from data, and align digital resources with corporate strategy (Silva et al., 2024; Tabim et al., 2024; Wahdaniyah et al., 2025). Rather than focusing exclusively on technology adoption, digital maturity emphasizes how digital resources are embedded within organizational structures, processes, and decision-making practices.

Several digital maturity models suggest that higher levels of maturity are associated with greater integration among systems, processes, and organizational functions. In more digitally mature organizations, information can circulate more efficiently across departments, enabling consistent automation, improved analytical capabilities, and more informed decision-making (Schumacher et al., 2016; Gong and Ribiere, 2021). From this perspective, systems integration should not be viewed merely as a technological characteristic, but as an organizational capability that supports interoperability, knowledge generation, and value creation through digital technologies.

According to the Oslo Manual (OECD/Eurostat, 2018), process innovation involves the implementation of new or significantly improved methods, including relevant changes in techniques and software. Therefore, the adoption of computerized systems in the early-stage real estate development process can be understood as a form of technological and process innovation capable of contributing to higher levels of organizational digital maturity within the construction industry.

3 MATERIALS AND METHODS

The research is characterized as applied, with a qualitative approach and a descriptive purpose, aiming to understand the use of computerized systems by real estate development companies in the early-stage real estate development process and to analyze their degree of integration in light of the Construction 4.0 pillars and digital maturity. The methodological strategy adopted was a multiple case study, as it enables an in-depth investigation of organizational phenomena in real contexts and at different levels of technological development (Yin, 2018; Robaina et al., 2021).

Thus, a non-probabilistic sampling method was adopted, in which the selection of sample elements did not occur randomly, but rather based on criteria previously defined by the researchers. The pre-established criteria for defining the sample were: (i) innovation and adaptation: companies that use emerging technologies such as digital platforms and tools; (ii) reputation and recognition: having recognition for innovation; (iii) infrastructure and capacity: possessing technological infrastructure; (iv) team and culture: having qualified professionals, training programs, and a culture of innovation; and (v) availability: being available to participate in the research.

The companies were selected because they actively perform the main subprocesses associated with the early-stage real estate development process, including market research and product definition, feasibility analysis, land acquisition, legal approvals, and project launch. Furthermore, the selection sought to include organizations presenting different levels of organizational structure, technological adoption, and operational scale, thereby enabling a comparative analysis of computerized systems usage and digital maturity within the same industry context. Because the objective of the study was not statistical generalization but analytical exploration, the selected cases were considered adequate to investigate how computerized systems are adopted, integrated, and utilized throughout the early-stage real estate development process.

Therefore, a sample composed of three Brazilian real estate development companies was defined, referred to as Real Estate Development Company A, Real Estate Development Company B, and Real Estate Development Company C, with their identities preserved, and selected for meeting the previously established criteria, thus characterizing convenience sampling.

Data collection occurred exclusively through the application of a checklist as a field research tool based on direct observation of organizational processes, computerized systems, and workflows associated with the early-stage real estate development process. The observations were conducted during on-site visits, allowing the researchers to examine the activities performed, the computerized systems employed, their functionalities, and their interactions with organizational processes.

No structured interviews or self-administered questionnaires were conducted, and the information recorded in the checklist was collected directly by the researchers through observation and documentary verification whenever available. This procedure ensured methodological consistency across the analyzed cases and allowed the application of uniform evaluation criteria throughout the study. Future studies could complement direct observation with semi-structured interviews involving employees and managers, allowing the incorporation of organizational perceptions regarding the adoption, use, and integration of computerized systems.

Initially, a pilot checklist was developed and applied to Real Estate Development Company A, with the purpose of verifying the clarity, coherence, and comprehensiveness of the instrument. Although Real Estate Development Company A participated in the pilot application, the adjustments introduced after the pilot checklist were limited to improvements in wording, terminology standardization, and instrument clarity. No modifications were made to the assessment dimensions, indicators, adherence scale, scoring criteria, or digital maturity classification.

Therefore, the information collected from Real Estate Development Company A remained fully compatible with the data subsequently collected from Real Estate Development Companies B and C, making reapplication unnecessary. After these refinements, the final checklist was structured and subsequently applied to Real Estate Development Company B and Real Estate Development Company C.

The instrument was constructed based on the theoretical framework, encompassing the subprocesses of the early-stage real estate development process, the pillars of Construction 4.0, and the elements associated with digital maturity. The checklist made it possible to identify the activities carried out in each subprocess and the computerized systems used, thereby establishing the level of adherence of these systems to the pillars of Construction 4.0, as well as defining the level of digital maturity of the analyzed companies and conducting a comparative analysis among the studied cases.

The methodological framework adopted is summarized in Figure 2, which systematizes the stages of the research, from the construction of the theoretical framework and development of the pilot checklist to the application of the final instrument and the comparative analysis of the cases.

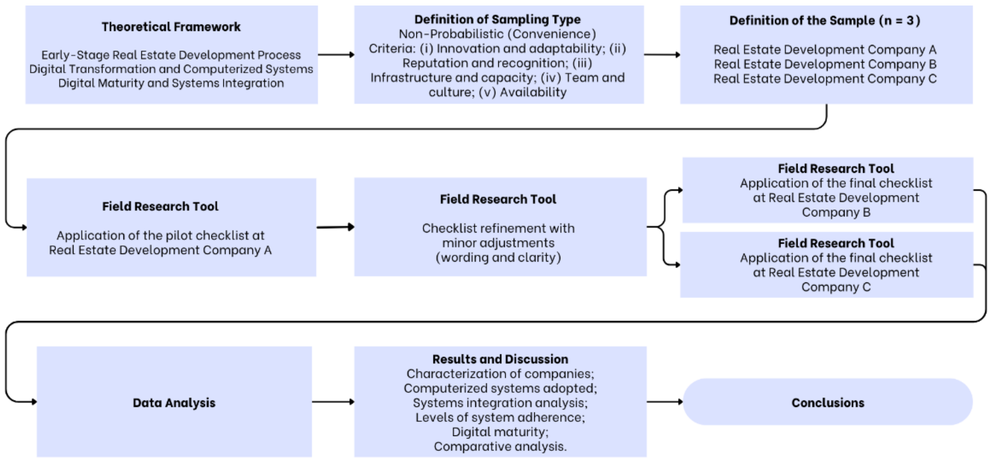

Figure 2 - Methodological framework of the research

Source: The authors themselves.

The checklist used to verify the use of computerized systems in the early-stage real estate development process begins with the characterization of the company, including information on years of operation, market profile, project typology, annual volume, digital transformation training, certifications, and adopted systems. Next, the organizational structure is described, including the departments involved, internal workflows, and the team responsible for the process. Finally, the instrument details the subprocesses carried out, identifying the systems used, their functionalities, and the respective level of adherence.

For transparency and reproducibility purposes, the corresponding completed checklists for the analyzed companies are provided in the appendices as supplementary material. To preserve confidentiality, all company-identifying information was removed, and the cases are presented anonymously as Real Estate Development Company A, Real Estate Development Company B, and Real Estate Development Company C.

In order to systematically organize the evaluation criteria employed in the research, Table 1 presents the scale of adherence levels adopted to examine the degree of adequacy of computerized systems to the activities of the early-stage real estate development process in the analyzed development companies.

Table 1 – Scale of adherence levels of computerized systems

Level	Classification	Description of the level of adherence
1	Very low adherence	The system requires high manual intervention or has little relevance to the analyzed activity.
2	Low adherence	The system provides limited support to the activities, requiring its use to be complemented by other tools or manual processes.
3	Moderate adherence	The system partially meets the activity requirements, presenting functional limitations or a low level of automation.
4	Good adherence	The system adequately meets the activity requirements, promoting organization, efficiency, and a satisfactory level of automation.
5	Fully adherent	The system is highly effective, fully meeting the demands of the activity in an integrated, agile, and automated manner.

Source: The authors themselves.

The adherence assessment was conducted exclusively by the researcher using the predefined evaluation criteria presented in Table 1, ensuring methodological consistency and comparability across all analyzed cases. The assessment considered the degree to which each computerized system supported the subprocesses associated with the early-stage real estate development process, taking into account aspects such as functionality, automation, integration, and decision-support capabilities.

The five-level adherence scale adopted in this research is grounded in consolidated references on ordinal scales and organizational maturity models. The choice of five levels is methodologically supported by Likert-type scales, widely used to measure gradual levels of performance (Likert, 1932).

The structure of the scale is also supported by maturity and technological readiness models, such as the Capability Maturity Model (Paulk et al., 1993) and digital maturity models applied to Industry 4.0 and digital transformation (Schumacher et al., 2016; Gong and Ribiere, 2021). Adapted to the context of real estate development, the scale considered criteria such as systemic integration, degree of automation, and decision support, ensuring theoretical coherence and methodological consistency.

The digital maturity assessment was based on the consolidated results obtained from the checklist application across all analyzed subprocesses of the early-stage real estate development process. The evaluation considered not only the presence of computerized systems, but also their level of adherence to organizational activities, degree of automation, information integration capabilities, and support for decision-making. This approach is consistent with contemporary digital maturity models, which emphasize the effective integration of digital technologies into business processes rather than their mere adoption (Schumacher et al., 2016; Gong and Ribiere, 2021).

The collected data were analyzed through a qualitative comparative analysis of the three case studies. Initially, the computerized systems identified in each subprocess of the early-stage real estate development process were mapped and categorized according to their functionalities. Subsequently, the degree of adherence of these systems to organizational activities and their relationship with the technological pillars of Construction 4.0 were assessed. The results were then consolidated to evaluate the digital maturity level of each company, enabling the identification of similarities, differences, and emerging patterns across the analyzed cases.

4 RESULTS AND DISCUSSION

The results obtained from the case studies conducted with three Brazilian real estate development companies are presented below. The analysis encompasses organizational characterization, the early-stage real estate development process, and the computerized systems adopted in each context. The findings are examined in light of the pillars of Construction 4.0 and the adherence levels defined in the methodology, enabling the identification of the degree of digital maturity of the investigated organizations. Moreover, the findings are subsequently compared with previous studies to identify convergences and divergences and to clarify the implications of the observed patterns for digital maturity in the early-stage real estate development process.

4.1 Characterization of the real estate development companies

For a better analysis, Table 2 summarizes the main characteristics of the analyzed real estate development companies, highlighting aspects related to years of operation, headquarters and geographic scope, predominant market segment, company size, production structure, recent performance, and the profile of adopted computerized systems.

Table 2 – Summary of the characterization of the studied real estate development companies

Company	Years of operation	Headquarters / Coverage	Main segment	Product developed	Size / Employees	Production and performance	Production model	Computerized systems used
Real Estate Development Company A	22 years	Recife – Pernambuco / Operations in the states of Pernambuco and Ceará	Economic	Single-story houses in subdivisions and gated communities	Large / 1,294 employees	33 completed projects; 8 in progress; average of 2–3 annual launches	Scale and standardization	Geolocation systems (Google My Maps), cloud-based project management platforms (Smartsheet), CRM (Salesforce), Business Intelligence solutions
Real Estate Development Company B	57 years	Recife – Pernambuco / Operations in Recife, the Recife Metropolitan Area (RMR), and the Pernambuco coast	Mid / High standard	Multi-story residential, commercial, and hotel buildings	Large / 796 employees	57 projects developed, 6 ongoing	Conventional production practices	Digital solutions for business management, task organization, project control, and document management; spreadsheets for feasibility analysis; Business Intelligence; occasional use of BIM
Real Estate Development Company C	56 years	São Paulo – São Paulo / National operations in 10 states (analysis performed in Pernambuco Regional)	Economic	Multi-story residential buildings	Large / over 5,700 employees; publicly traded on São Paulo Stock Exchange	72 projects launched in 2025 (≈ 25,000 units)	In-situ cast concrete walls; scale and standardization	Market analysis and land prospecting systems; spreadsheets for feasibility; project management and scheduling systems; Business Intelligence with managerial dashboards

Source: The authors themselves.

Additionally, the organization of Table 2 allows for a comparative visualization of the structural, strategic, and technological differences among the studied cases, providing contextual support for the digital maturity analysis and for the interpretation of the results discussed in the subsequent sections.

Table 2 highlights significant differences regarding company size, operational scale, territorial scope, and market positioning, elements that directly impact their organizational structure, production capacity, and the level of complexity of the developed projects. These distinctions are also reflected in the strategies adopted and in the degree of process formalization.

These differences reinforce the heterogeneous nature of the real estate development sector described in the literature, where organizations operate under distinct market conditions, investment strategies, and levels of organizational complexity. As discussed by Miles et al. (2015) and Peiser and Hamilton (2019), such characteristics influence not only project development strategies but also the organizational capabilities required to manage information, risks, and decision-making processes.

The differences observed among the three cases are consistent with this perspective, as the companies' organizational scale, geographic scope, market positioning, and production models are accompanied by distinct approaches to information management and digitalization. This suggests that differences in digital maturity should not be interpreted independently of the organizational context in which digital technologies are adopted.

Consequently, differences in technological adoption and digital maturity among the analyzed companies should be interpreted within the broader context of their operational scale and organizational structure. The detailing of the early-stage real estate development process in each of the studied companies is presented below.

4.2 Early-stage real estate development process of the companies

The three analyzed companies structure the early-stage real estate development process into five main subprocesses: market research and product definition, feasibility study, land acquisition, legal approval, and project launch. Although the general sequencing is similar, the way information flows and is consolidated differs substantially among the cases.

In Real Estate Development Company A, the early-stage real estate development process begins with the strategic identification of the need to acquire a new land plot, communicated by the Planning Department or by the General Directorate of Planning and Management. Based on this demand, the Prospecting team conducts the market research and product definition subprocess, analyzing the company's presence in the municipality, the available landbank, and the legal, commercial, and locational characteristics of the prospected areas. Once a compatible opportunity is identified, the feasibility analysis begins; otherwise, new areas are mapped.

The feasibility analysis includes registering the land in the company's database, followed by a technical analysis of urban planning parameters, environmental restrictions, and legal constraints. When favorable, economic-financial feasibility simulations, analytical studies, slope maps, and on-site inspections are carried out, culminating in the presentation of a proposal to the owner. Once negotiations are approved, a purchase option agreement is formalized, establishing a deadline for technical and legal due diligence, involving multidisciplinary departments and the analysis of risks and opportunities prior to the final land acquisition decision.

With the land acquisition validated, the legal approvals subprocess begins, including land regularization, approval of the architectural design, environmental licensing, and issuance of the construction permit. After registration of the development memorial, pursuant to Brazilian Law No. 4,591/1964, the project is officially launched. However, part of the commercial activities takes place in advance, with the definition of marketing and sales strategies. The early-stage real development process concludes with the project launch and transition to the production process, demonstrating its integrated and multidisciplinary character.

In Real Estate Development Company B, the early-stage real estate development process is conducted by the New Business Department, responsible for the subprocesses of market research and product definition, feasibility analysis, and land acquisition. Opportunities are identified based on strategic guidelines from senior management; however, no structured landbank management system or real-time digital monitoring was observed. Market research involves product definition jointly with the Product Department, competitor analysis, and verification of urban planning parameters, and may be conducted internally or outsourced.

The feasibility analysis is also coordinated by the New Business Department and encompasses analyses from economic-financial, technical, and legal perspectives. The Product Department develops preliminary implementation studies, often outsourced, while the Budget Department prepares parametric estimates to support financial evaluation. Legal due diligence is conducted by external advisors. During land acquisition, negotiations occur with outsourced legal support, without a formally defined standardized workflow.

After acquisition, the New Business Department conducts the legal approvals subprocess, with participation from the Product Department in preparing the preliminary design and subsequently developing the legal project. Approvals are obtained from the relevant authorities, including land regularization, licensing, and registration of the development. The project launch is prepared in advance by the Marketing and Sales teams, with the definition of the project name and visual identity even before official registration. Once the development is registered, sales begin through the company's internal team and partner real estate agencies, concluding the cycle and initiating the production process.

In Real Estate Development Company C, the early-stage real estate development process is conducted in an integrated and multidisciplinary manner, with a clear distribution of responsibilities among the Prospecting, Market Intelligence, Economic Studies, Business, Technical Engineering, Legal, Legal Approvals, and Commercial Departments. Market research and product definition is initiated by the Prospecting Department, while, in parallel, the Market Intelligence Department analyzes socioeconomic and demographic data, guiding product definition based on demand evidence.

The feasibility analysis is coordinated by the Prospecting Department, with participation from the Economic Studies, Technical Engineering, and Legal areas. The economic-financial feasibility analysis is developed in spreadsheets that are periodically updated with macroeconomic indicators. Technical feasibility considers urban planning parameters and the physical constraints of the land, while legal due diligence evaluates ownership, encumbrances, and legal risks. Once the business attractiveness is confirmed, the Business and Legal Departments jointly conduct the land acquisition, adapting negotiations to the specific characteristics of each transaction.

The legal approvals subprocess occurs in parallel with land acquisition, seeking to enable registration of the development with the project ready for commercialization. The Legal Approval Department, supported by Technical Engineering Department, develops projects and obtains urban and environmental approvals. After property transfer and registration of the development, commercial strategies, previously structured by the Commercial Department, are intensified. The early-stage real development process concludes with the official launch and transition to the production process, demonstrating a high level of organization and technical support for decision-making.

Although the three companies follow a similar sequence of subprocesses, important differences were observed regarding information flows, coordination mechanisms, and the degree of process formalization. These findings corroborate the literature on early-stage real estate development, which emphasizes that subprocesses such as market research and product definition, feasibility analysis, land acquisition, and legal approvals are highly information-intensive and depend on effective coordination among multiple organizational functions (Moorhead et al., 2022; Moorhead et al., 2024). The results also suggest that differences in process integration may influence the capacity of organizations to support decision-making and respond to uncertainties throughout the development cycle.

The cases nevertheless differ in how these information-intensive activities are coordinated: Real Estate Company C presents a more integrated configuration, whereas Real Estate Companies A and B rely more heavily on fragmented or partially standardized information flows. This difference provides an important basis for interpreting the distinct levels of digital maturity identified in the subsequent analysis.

Having understood the dynamics of the early-stage real estate development process in each company, it becomes pertinent to examine the computerized systems that support the different described activities.

4.3 Computerized systems used by the real estate development companies

In Real Estate Development Company A, the use of computerized systems varies according to each subprocess, revealing a fragmented yet functional adoption of these technologies. In market research and product definition subprocess, Microsoft Power BI stands out, used for landbank management through dashboards, as well as Google My Maps, employed for spatial mapping of land plots. These tools relate to the pillars of Big Data, simulations, and cloud computing, and also contribute, albeit in a limited manner, to systems integration within the Construction 4.0 context.

In the feasibility analysis subprocess, Microsoft Excel and Google Sheets spreadsheets are used for economic-financial analyses and land registration, as well as Autodesk Civil 3D, based on BIM technology, for slope mapping and topographic modeling. While the spreadsheets show limited adherence to technological pillars, Civil 3D establishes a more direct connection with the pillars of simulations and systems integration. However, low automation is observed in urban planning and legal analyses, which are predominantly carried out manually.

In the land acquisition, legal approvals, and project launch subprocesses, the company adopts Smartsheet for collaborative schedule management, Power BI for performance monitoring, and the systems Salesforce (CRM) and Lais, the latter incorporating artificial intelligence (AI) via chatbot functionality. These tools align with the pillars of cloud computing, systems integration, and Big Data, with Lais also approaching the simulations pillar by using AI to qualify potential clients (leads). However, no application of pillars such as IoT, robotics, additive manufacturing, or augmented reality was identified.

In Real Estate Development Company B, the adoption of computerized systems occurs in a punctual and heterogeneous manner, with greater concentration in the market research and product definition and project launch subprocesses. Notable tools include the Geobrain platform for spatial analysis, ClickUp for task management, BIM tools (Revit and Archicad) for preliminary studies, and Power BI and CV CRM in the commercial phase, demonstrating partial adherence to the pillars of Big Data, simulations, and cloud computing.

In the feasibility analysis, land acquisition, and part of the legal approvals subprocesses, electronic spreadsheets and poorly integrated operational controls predominate, with low levels of automation and limited interoperability. Although the ConstruCode system is used as a document repository and municipal digital systems are employed for licensing, systemic integration remains restricted, indicating a gap in the broader application of Construction 4.0 principles throughout the early-stage real estate development process.

In Real Estate Development Company C, a comprehensive, integrated, and strategic adoption of computerized systems is observed across all subprocesses of early-stage real estate development. Key tools include Geofusion for market intelligence, the internal Vision tool using artificial intelligence for predictive pricing analysis, the cross-functional use of Power BI for managerial dashboards, and the intensive application of BIM (Revit) from initial studies through to the construction-ready design stage, reinforcing integration and digital continuity throughout the process.

In the feasibility analysis, land acquisition, legal approvals, and project launch subprocesses, the company combines automated spreadsheets integrated with BI, Microsoft Project for schedule management, Autodoc for document control, Google Earth and the Terreno Livre system for landbank management, as well as testing the Zenerate platform. This set of tools demonstrates a strong relationship with the pillars of Big Data, simulations, cloud computing, and systems integration, positioning the company at an advanced level of alignment with Construction 4.0 principles, although technologies such as IoT and robotics are not present in the analyzed process.

Table 3 summarizes the main computerized systems used in each subprocess of the early-stage real estate development process across the three companies analyzed. The comparative organization allows a structured visualization of the tools adopted and their degree of alignment with the technological pillars of Construction 4.0 throughout the different stages of the process.

Table 1 - Summary of the main computerized systems used in each subprocess

Subprocess	Real Estate Development Company A	Real Estate Development Company B	Real Estate Development Company C
Market Research and Product Definition	Power BI (management dashboards and landbank monitoring); Google My Maps (spatial mapping)	Geobrain (spatial analysis); ClickUp (task management); Revit and Archicad (preliminary BIM modeling)	Geofusion (market intelligence); Vision (predictive AI); Power BI (management dashboards)
Feasibility Study	Excel and Google Sheets (economic-financial analysis); Autodesk Civil 3D (topographic BIM)	Excel (economic-financial analysis); Revit (architectural BIM studies)	Automated Excel integrated with BI (economic-financial analysis); Revit (BIM modeling); Zenerate (AI-assisted design); Power BI (management dashboards)
Land Acquisition	Smartsheet (schedule and task management); Power BI (management dashboards)	Spreadsheets (operational controls)	Google Earth (spatial analysis); Terreno Livre (landbank management); Power BI (management

			dashboards); Revit (preliminary designs)
Legal Approval	Smartsheet (schedule management); Power BI (deadline monitoring dashboards)	Municipal digital systems (permit submission and approval); ConstruCode (document repository); ClickUp (workflow management)	Microsoft Project (schedule management); Autodoc (document control); Revit (legal BIM design)
Project Launch	Salesforce (customer relationship management – CRM); Lais (AI for lead qualification); Power BI (management dashboards)	CV CRM (customer relationship management); Power BI (commercial BI dashboards)	Power BI (strategic dashboards); Geofusion (market intelligence); Vision (predictive analyses); Revit (construction-ready design)
Alignment with Construction 4.0 pillars	Big Data; cloud computing; system integration; simulations associated with BIM modeling and automation in data consolidation via BI	Big Data; cloud computing; simulation (preliminary BIM); system integration limited to specific activities	Big Data; cloud computing; simulation (BIM modeling and predictive analyses); system integration throughout the process

Source: The authors themselves.

The synthesis presented in Table 3 shows that, although the three companies adopt computerized systems throughout the early-stage real estate development process, the incorporation of Construction 4.0 pillars occurs in a selective manner and is predominantly concentrated in Big Data, cloud computing, simulations (especially through BIM), and, to varying degrees, systems integration. It is also observed that pillars such as the Internet of Things (IoT), robotics, additive manufacturing, augmented reality, and cybersecurity were not structurally identified in the analyzed subprocesses.

This pattern is consistent with previous studies showing that digital transformation in construction is typically heterogeneous across organizational dimensions, with digital technologies and applications being adopted at different levels and concentrated in specific functions, processes, or organizational capabilities (Wijayarathne et al., 2024; Zhu et al., 2024; Lima et al., 2026).

However, the present cases provide a more specific perspective by showing that this selectivity also characterizes the early-stage real estate development process, where data-intensive activities such as market analysis, feasibility assessment, and commercial planning tend to concentrate digital solutions, while other activities remain dependent on spreadsheets, manual procedures, or isolated systems.

The concentration of digital initiatives around Big Data, cloud computing, BIM-based simulations, and systems integration suggests that digital transformation in early-stage real estate development follows a distinct trajectory from that commonly observed in construction execution environments. Since the analyzed subprocesses are predominantly focused on information processing, planning, and decision-making activities, technologies associated with data management and organizational coordination appear to be more relevant than technologies traditionally linked to the production process, such as robotics or additive manufacturing.

4.4 Diagnosis of the adherence of computerized systems and digital maturity

It was found that Real Estate Development Company A uses systems in all subprocesses; however, with different levels of adherence. In the market research and product definition and feasibility analysis subprocesses, adherence was classified as medium (level 3), due to the predominant use of spreadsheets and support tools, with low integration and limited automation of urban planning and economic-financial analyses.

In the land acquisition, legal approvals, and project launch subprocesses, good adherence (level 4) was observed, particularly due to the use of Smartsheet for schedule control, Power BI for performance monitoring, and Salesforce and Lais for commercial management supported by artificial intelligence. Despite these advances, limitations persist regarding system integration and the consolidation of information throughout the entire process.

Overall, the company presents an intermediate level of digital maturity, characterized by the adoption of relevant tools and the occasional presence of technologies aligned with Construction 4.0. However, the fragmentation of solutions, reliance on manual procedures, and absence of more robust systemic integration prevent the achievement of a more advanced stage of digital transformation in the early-stage real estate development process.

In Real Estate Development Company B, digitalization occurs in a heterogeneous manner, with medium adherence (level 3) in market research and product definition, low adherence (level 2) in the feasibility analysis, and very low adherence (level 1) in Land Acquisition, demonstrating a strong dependence on spreadsheets and manual processes in these subprocesses.

In the legal approvals subprocess, medium adherence (level 3) was observed, with the use of municipal systems, ClickUp, and ConstruCode; however, integration remains limited and partially compulsory in nature. The project launch subprocess showed good adherence (level 4), standing out due to the use of Power BI and CV CRM, with commercial dashboards, real-time updates, and greater integration among departments, making it the most digitally mature subprocess.

In general, Real Estate Development Company B presents partial digital maturity, with relevant but fragmented initiatives concentrated in specific subprocesses. The absence of systemic integration throughout the entire process, combined with low automation in the initial and strategic subprocesses, indicates significant opportunities for advancement toward a more integrated early-stage real estate development process aligned with Construction 4.0 principles.

The diagnosis of Real Estate Development Company C revealed high levels of adherence of computerized systems across all subprocesses of early-stage real estate development. Market research and product definition and project launch subprocesses achieved level 5, due to the integrated use of Geofusion, Vision (AI), and Power BI, with strong application of Big Data, predictive analytics, managerial dashboards, and high interdepartmental integration.

In the feasibility analysis, land acquisition, and legal approvals subprocesses, adherence was classified as level 4, reflecting the consistent use of automated Excel spreadsheets, Power BI, Revit (BIM), Microsoft Project, Autodoc, and the Terreno Livre system. Relevant integration was observed among technical, economic, and land analyses, with digital continuity throughout the process, although some limitations remain, such as tools still in experimental stages and the absence of more advanced predictive automation in certain subprocesses.

Overall, Real Estate Development Company C presents advanced digital maturity, characterized by high systemic integration, intensive use of data, artificial intelligence, and BIM modeling as strategic decision-support tools. Although not all Construction 4.0 pillars are present, the set of practices adopted positions the organization at a higher level of digitalization within the analyzed early-stage real estate development context.

Figure 3 presents a comparative chart of adherence levels to computerized systems across the different subprocesses of early-stage real estate development for the three analyzed companies. The unified representation allows visualization of variations in digital maturity throughout the process, highlighting distinct patterns of technological adoption among the studied cases.

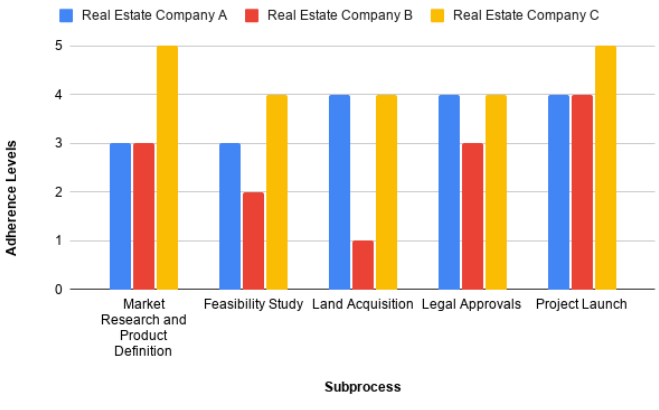

Figure 3 - Comparative bar chart of adherence levels to computerized systems

Source: The authors themselves.

Figure 3 reinforces the cross-case pattern identified in the preceding analysis. Real Estate Company C maintains consistently high adherence across the subprocesses, while Real Estate Company A presents intermediate levels with stronger performance toward the later stages. Real Estate Company B shows greater variability, particularly between the initial subprocesses and project launch. These patterns reinforce the interpretation that digital maturity is not evenly distributed across organizational processes and that integration across subprocesses is a relevant distinguishing factor among the cases.

A recurring pattern observed across the three case studies concerns the relationship between systems integration and digital maturity. Although all companies employed multiple computerized systems, higher levels of digital maturity were consistently associated with greater interoperability, information sharing, and process integration rather than with the mere number of technologies adopted. This result is consistent with recent maturity models for construction organizations, which treat digital infrastructure and business-process digitalization as relevant dimensions of organizational digital maturity rather than assessing maturity solely from the presence of digital technologies (Han et al., 2024).

Real Estate Company C, which demonstrated the highest maturity level, was also the organization exhibiting the most integrated digital environment, whereas Real Estate Companies A and B showed lower maturity levels despite adopting several digital tools. These findings suggest that systems integration constitutes a critical enabling factor for digital maturity in the early-stage real estate development process.

4.5 Comparative analysis of the case studies

The comparative analysis highlights distinct levels of digital maturity among the three real estate development companies, especially regarding systemic integration, workflow standardization, and alignment with the pillars of Construction 4.0. Although all companies use computerized systems throughout the early-stage real estate development process, the depth, articulation, and strategic nature of these solutions vary significantly.

Real Estate Development Company C presents the most structured and integrated model, with consistent use of Business Intelligence, artificial intelligence, and BIM across all subprocesses, consolidating a data-driven management approach and a high level of interdepartmental integration.

Real Estate Development Company A is positioned at an intermediate level, with good operational organization and relevant use of BI and CRM systems; however, it still shows gaps in full systems integration and maintains dependence on manual analyses in strategic subprocesses.

Real Estate Development Company B demonstrates partial digital maturity, with important initiatives concentrated mainly in the launch stage, but with weaknesses in standardization and integration throughout the initial subprocesses.

Table 4 presents, in a synthetic and comparative manner, the main results of the analysis among the three studied real estate development companies, highlighting the differences regarding the adoption of computerized systems, the level of integration among subprocesses, and the degree of digital maturity in the early-stage real estate development process.

Table 2 - Comparative analysis of the real estate development companies in the case studies

Subprocess	Real Estate Development Company A	Real Estate Development Company B	Real Estate Development Company C
Market Research and Product Definition	Power BI + Google My Maps; urban analyses mostly manual	Geobrain + preliminary BIM; fragmented and poorly integrated use	Geofusion + AI (Vision) + integrated Power BI
Feasibility Analysis	Excel + Autodesk Civil 3D (topographic BIM)	Standalone Excel + BIM limited to architectural study	Automated Excel + BI integration + BIM
Land Acquisition	Structured Smartsheet for schedule control	Non-standardized process; sporadic use of spreadsheets	Structured interdepartmental coordination; implementation of dedicated system
Legal Approvals	Cloud-based schedule (Smartsheet) + Power BI dashboards	Public systems + document repository; limited integration	Structured technical-legal integration + digital document management
Project Launch	CRM + AI for lead qualification	Specialized CRM + commercial BI	Integrated strategic dashboards + predictive analyses
Digital Maturity Level	Intermediate	Partial	High

Source: The authors themselves.

A closer examination of Table 4 indicates that the differences among the companies are not uniform across the early-stage real estate development process. Real Estate Company A shows greater digital structuring in land acquisition, legal approvals, and project launch, whereas its market research and feasibility activities remain more dependent on spreadsheets and manual analyses. Real Estate Company B presents the greatest weaknesses in land acquisition and feasibility, with more structured digital support emerging only at the project launch stage. Real Estate Company C, in contrast, maintains a more consistent digital configuration across the subprocesses, combining Business Intelligence, artificial intelligence, BIM, and dedicated systems for land and document management.

These differences indicate that digital maturity is not determined solely by the presence of computerized systems, but by the extent to which they are embedded in and connected across the subprocesses of the early-stage real estate development process.

This pattern is consistent with previous studies on digital transformation in the construction sector, which have shown that digitalization is frequently characterized by uneven technological adoption and difficulties in achieving integration across organizational processes. Aghimien et al. (2022), for example, emphasize the importance of integration and digital partnering for overcoming fragmented practices in construction organizations, while Liu et al. (2023) demonstrate that stakeholder, lifecycle, and project-management integration are relevant mechanisms for fostering digitalization.

More recent research on construction digital maturity similarly indicates that digital maturity depends on dimensions extending beyond technology adoption, including digital infrastructure, business-process digitalization, organizational capabilities, and performance (Han et al., 2024). The present findings converge with these studies by showing that companies using multiple digital tools may still exhibit limited digital maturity when those tools remain fragmented.

However, the cases analyzed here extend this discussion to the early-stage real estate development process, where information-intensive activities such as feasibility analysis, land acquisition, legal approvals, and product definition precede physical construction and require coordination across several organizational functions. This finding is consistent with Moraes Costa da Silva et al. (2026), who identified computerized systems and digital technologies as relevant to decision-making in the early-stage real estate development process, while also indicating that research specifically addressing this domain within the Construction 4.0 context remains limited.

The comparative analysis also revealed several opportunities for innovation and operational improvement. Among the most relevant were the reduction of spreadsheet dependence in strategic subprocesses, the expansion of interoperability among computerized systems, the adoption of integrated data management practices, and the broader use of analytical tools to support decision-making. These opportunities were particularly evident in Companies A and B, where fragmented information flows limited the potential benefits associated with digital transformation initiatives.

5 CONCLUSION

This study analyzed the application of computerized systems in the early-stage real estate development process in light of Construction 4.0 principles, based on three case studies. The results demonstrate that the mere adoption of digital tools does not guarantee technological maturity; rather, the degree of systems integration, workflow standardization, and the strategic use of data for decision support throughout the entire project lifecycle are decisive factors. The findings indicate that systems integration emerged as the principal factor distinguishing organizations with higher levels of digital maturity from those exhibiting fragmented digitalization initiatives.

Moreover, the findings contribute to the growing body of knowledge on digital transformation in construction by demonstrating that, within the context of early-stage real estate development, digital maturity is more strongly associated with systems integration and information continuity than with the isolated adoption of digital technologies.

This finding is consistent with previous research emphasizing that digital maturity depends on the integration of digital infrastructure, business processes, and organizational capabilities rather than on technology adoption alone (Aghimien et al., 2022; Han et al., 2024). It also complements the findings of Moraes Costa da Silva et al. (2026), which identified computerized systems and digital technologies as relevant to decision-making in early-stage real estate development while highlighting the limited development of research in this specific domain.

Thus, the present study extends these discussions by providing empirical evidence from three real estate development companies and by identifying systems integration as a distinguishing characteristic of higher digital maturity in the early-stage process. This perspective extends existing discussions on Construction 4.0 by emphasizing the strategic importance of interoperability and process integration in information-intensive environments.

Real Estate Development Company C stood out due to its high level of systems integration, use of artificial intelligence, consolidated dashboards, and digital continuity between the development and production stages, representing an advanced stage of digital maturity. Real Estate Development Company A presented an intermediate level, with good operational organization but gaps in full systems integration. Real Estate Development Company B demonstrated partial maturity, with relevant yet fragmented initiatives.

The comparative analysis revealed that organizations exhibiting higher levels of digital maturity were not necessarily those using a greater number of computerized systems, but rather those capable of integrating information flows across subprocesses and supporting decision-making through connected digital environments. This finding reinforces systems integration as a critical enabling factor for digital transformation in the early-stage real estate development process.

It was observed that the initial and strategic subprocesses, especially market research and product definition and feasibility analysis, still concentrate digital weaknesses in some companies, particularly regarding the automation of urban planning and economic-financial analyses. In contrast, the project launch subprocess proved to be the most digitalized phase across all three cases, driven by CRM and Business Intelligence tools.

The study also identified important opportunities for innovation and operational improvement, particularly related to the reduction of spreadsheet dependence, the expansion of interoperability among computerized systems, the automation of information-intensive activities, and the strengthening of data-driven decision-making practices. These opportunities were especially evident in companies presenting lower levels of digital maturity and fragmented information management structures.

As a limitation, the reduced number of analyzed companies is highlighted, which does not allow for statistical generalizations. In addition, data collection was based on direct observation of organizational processes, computerized systems, and workflows, complemented by documentary verification when available, without structured interviews with employees. Consequently, the findings primarily reflect the observed organizational practices and may not fully capture employees' perceptions regarding the adoption, integration, and use of computerized systems.

Nevertheless, the study holds relevance within the investigated regional context by providing an in-depth diagnosis of organizations operating in a representative market undergoing digital transformation. The findings contribute to understanding the dynamics of computerized systems adoption, systems integration, and digital maturity within the early-stage real estate development process.

For future research, expanding the sample to include companies of different sizes and regions is recommended, enabling broader comparative analyses. The inclusion of new contexts may reveal distinct patterns of digital maturity and deepen the discussion on guidelines for consolidating Construction 4.0 in the early-stage real estate development process.

Moreover, future studies could also incorporate interviews with professionals involved in the early-stage real estate development process to examine how organizational perceptions, practices, and capabilities influence the adoption and integration of computerized systems. Finally, longitudinal research could further investigate how systems integration and digital maturity evolve over time within real estate development organizations.

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APPENDIX A – CHECKLIST: REAL ESTATE DEVELOPMENT COMPANY A

1.0 COMPANY PROFILE

Real Estate Development Company A is a construction and real estate development company headquartered in Recife, Pernambuco, Brazil, with 22 years of experience in the affordable housing sector. Operating primarily in the Northeast region of Brazil, the company develops single-story residential units for low- and middle-income families, particularly beneficiaries of government housing programs. To date, it has delivered 33 developments, eight of which are currently under construction, and launches approximately two to three projects annually. The company holds PBQP-H Level A certification and is the first certified B Corporation in Pernambuco. To support its early-stage real estate development process, it employs integrated digital solutions, including Google My Maps, Smartsheet, Salesforce, and Business Intelligence (BI) tools, which assist activities ranging from land prospecting and feasibility studies to project registration and launch, improving operational efficiency, information traceability, and decision-making.

2.0 ORGANIZATIONAL STRUCTURE OF THE COMPANY

The early-stage real estate development process is primarily coordinated by the Sales and Real Estate Development Division, under the General Planning and Management Directorate. The main departments involved are Prospecting, responsible for market research, product definition, feasibility analysis, and land acquisition; Licensing, responsible for property regularization, legal approvals, and development registration; and Sales and Marketing, responsible for project launch and commercialization activities. Additional support is provided by the Planning, Sustainability, Product Engineering, Cost Engineering, Architecture and Urban Planning, and Legal departments, the latter being outsourced.

2.1 Team responsible for the early-stage real estate development process

(X) Architect and Urban Planner	Quantity: 10
(X) Civil Engineer	Quantity: 1
(X) Business Administrator	Quantity: 4
( ) Economist	Quantity: Not Available

( ) Lawyer	Quantity: Not Available (outsourced legal services)
(X) Other: Forestry Engineer	Quantity: 1
(X) Other: Biologist	Quantity: 1

3.0 CHARACTERIZATION OF THE EARLY-STAGE REAL ESTATE DEVELOPMENT PROCESS IN THE COMPANY

3.1 Subprocesses managed within the early-stage real estate development process

Subprocess	Performed by the Company?
Market Research and Product Definition	(X) Yes ( ) No
Feasibility Analysis	(X) Yes ( ) No
Land Acquisition	(X) Yes ( ) No
Legal Approvals	(X) Yes ( ) No
Project Launch	(X) Yes ( ) No

3.2 Computerized systems used in the early-stage real estate development process

Subprocess	Uses a Computerized System?	System Name	Level of Adherence[1] (1–5)	Remarks
Market Research and Product Definition	(X) Yes ( ) No	Power BI; Google My Maps	3	No specialized systems for automated urban and commercial analyses; activities are predominantly manual.
Feasibility Analysis	(X) Yes ( ) No	Excel and Google Sheets; Autodesk Civil 3D	3	Urban and financial analyses are mainly spreadsheet-based, with no integrated specialized systems.
Land Acquisition	(X) Yes ( ) No	Smartsheet; Power BI	4	System implemented after the purchase option agreement, providing effective contract and deadline management.
Legal Approvals	(X) Yes ( ) No	Smartsheet; Power BI	4	Good system support, although dependent on non-integrated external procedures.
Project Launch	(X) Yes ( ) No	Salesforce; Lais; Power BI	4	Consistent use of CRM and AI tools, with limited integration with previous subprocesses.

[1] **Level of Adherence:**

1 – Very Low Adherence: The system barely meets the activity requirements, requires extensive manual work, or has little relevance; **2 – Low Adherence:** The system provides limited support for the activity, requiring complementary tools or processes; **3 – Moderate Adherence:** The system partially meets the activity requirements but presents limitations or low automation; **4 – High Adherence:** The system adequately supports the activity, efficiently automating and organizing the process; **5 – Full Adherence:** The system is highly effective, fully covering the activity requirements in an integrated, agile, and automated manner.

3.3 Evaluated functionalities of the computerized systems

Market research and product definition

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Partial integration through shared databases and dashboards; systems are not fully integrated.
Process automation	( ) Yes (X) No	Most urban, legal, and commercial analyses rely on manual procedures.
Dashboard or management report generation	(X) Yes ( ) No	Power BI dashboards support landbank monitoring and strategic decision-making.
Performance indicator monitoring	(X) Yes ( ) No	Indicators related to housing inventory and market expansion are monitored through Power BI.
Real-time data updating	(X) Yes ( ) No	Google My Maps and dashboards allow continuous updates and access to current information.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based platforms can be accessed through mobile devices.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	No BIM applications were identified in this subprocess.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified for these systems.

Feasibility Analysis

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Partial integration through shared cloud-based spreadsheets and BIM-compatible tools.
Process automation	( ) Yes (X) No	Urban, technical, and financial analyses are predominantly performed manually.
Dashboard or management report generation	( ) Yes (X) No	No dedicated dashboard or reporting systems were identified in this subprocess.
Performance indicator monitoring	( ) Yes (X) No	Performance indicators are not systematically monitored through specialized systems.
Real-time data updating	(X) Yes ( ) No	Google Sheets enables simultaneous updates and information sharing.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based tools allow remote access from multiple devices.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	Autodesk Civil 3D is used for terrain modeling and slope analysis.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified for the systems used.

Land Acquisition

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Supports collaboration and information sharing among multiple departments.
Process automation	(X) Yes ( ) No	Workflow tracking and deadline management are partially automated.
Dashboard or management report generation	(X) Yes ( ) No	Provides project tracking views and management reporting features.
Performance indicator monitoring	(X) Yes ( ) No	Enables monitoring of project progress and contractual deadlines.
Real-time data updating	(X) Yes ( ) No	Information is updated and shared in real time across teams.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based platform accessible from multiple devices.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	No BIM applications were identified in this subprocess.

Functionality	Yes/No	Remarks
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

Legal Approvals

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Shared platforms support coordination between licensing and other departments.
Process automation	(X) Yes ( ) No	Workflow tracking, task management, and deadline control are partially automated.
Dashboard or management report generation	(X) Yes ( ) No	Power BI dashboards provide real-time management information.
Performance indicator monitoring	(X) Yes ( ) No	Licensing deadlines and commitments are continuously monitored.
Real-time data updating	(X) Yes ( ) No	Cloud-based systems enable real-time information updates and access.
Mobile device compatibility	(X) Yes ( ) No	Smartsheet and Power BI are accessible through multiple devices.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	No BIM applications were identified in this subprocess.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

Project Launch

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	CRM and AI platforms integrate sales channels, customer data, and marketing activities.
Process automation	(X) Yes ( ) No	AI-powered chatbot automates lead capture and initial customer interactions.
Dashboard or management report generation	(X) Yes ( ) No	CRM platform supports sales tracking and management reporting.
Performance indicator monitoring	(X) Yes ( ) No	Sales and lead management metrics can be monitored through CRM tools.
Real-time data updating	(X) Yes ( ) No	Customer interactions and lead information are updated in real time.
Mobile device compatibility	(X) Yes ( ) No	Systems are cloud-based and accessible through mobile devices.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	No BIM applications were identified in this subprocess.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

APPENDIX B – CHECKLIST: REAL ESTATE DEVELOPMENT COMPANY B

1.0 COMPANY PROFILE

Real Estate Development Company B is a construction and real estate development company headquartered in Recife, Pernambuco, Brazil, with 57 years of experience in the construction industry. Operating primarily in Recife, its metropolitan region, and coastal municipalities of Pernambuco, the company focuses on the development and construction of high-end residential and commercial real estate projects for high-income customers and investors. To date, it has delivered 57 developments, six of which are currently under construction. The company's portfolio is predominantly composed of multi-story condominium buildings with comprehensive amenities and high-quality finishing standards. The company has received several industry awards, including the Ademi-PE Trophy, holds the Great Place to Work certification, and maintains an internal innovation committee focused on technology and process improvement. To support its early-stage real estate development process, the company employs a range of digital solutions, including real estate ERP platforms, project and task management systems, Business Intelligence (BI) tools, electronic spreadsheets for feasibility analysis, document management systems, and Building Information Modeling (BIM) technologies, supporting activities from land prospecting and feasibility analysis to legal approvals and project launch.

2.0 ORGANIZATIONAL STRUCTURE OF THE COMPANY

The early-stage real estate development process is primarily coordinated by the New Business Department, which is responsible for market research and product definition, feasibility analysis, land acquisition, and legal approvals. The main departments involved are New Business, Product, Budgeting, Legal, Marketing, and Sales, which are linked to different corporate divisions, including the Real Estate Development, Engineering, Market, and People and Management Directorates. Additional support is provided by outsourced legal and architectural consulting teams involved in due diligence, land acquisition, and preliminary design studies. The process is characterized by multidisciplinary collaboration among technical, legal, financial, commercial, and managerial teams throughout the early-stage real estate development lifecycle.

2.1 Team responsible for the early-stage real estate development process

(X) Architect and Urban Planner	Quantity: 7
(X) Civil Engineer	Quantity: 5
(X) Business Administrator	Quantity: 1
( ) Economist	Quantity: Not Available
(X) Lawyer	Quantity: 1
( ) Other: Not Available	Quantity: Not Available
( ) Other Not Available	Quantity: Not Available

3.0 CHARACTERIZATION OF THE EARLY-STAGE REAL ESTATE DEVELOPMENT PROCESS IN THE COMPANY

3.1 Subprocesses managed within the early-stage real estate development process

Subprocess	Performed by the Company?
Market Research and Product Definition	(X) Yes ( ) No
Feasibility Analysis	(X) Yes ( ) No
Land Acquisition	(X) Yes ( ) No
Legal Approvals	(X) Yes ( ) No
Project Launch	(X) Yes ( ) No

3.2 Computerized systems used in the early-stage real estate development process

Subprocess	Uses a Computerized System?	System Name	Level of Adherence[1] (1–5)	Remarks
Market Research and Product Definition	(X) Yes ( ) No	Geobrain; ClickUp; Revit; Archicad; ConstruCode	3	Limited and isolated use of digital tools; BIM restricted to preliminary studies, with low automation and system integration.
Feasibility Analysis	(X) Yes ( ) No	Microsoft Excel	2	Isolated system use, with no integration, automation, dashboards, or real-time information sharing.
Land Acquisition	(X) Yes ( ) No	Microsoft Excel	1	Predominantly manual processes, with no dedicated systems supporting the

Subprocess	Uses a Computerized System?	System Name	Level of Adherence[1] (1–5)	Remarks
				subprocess.
Legal Approvals	(X) Yes ( ) No	Digital systems of municipalities; ClickUp; ConstruCode; BIM	3	Partially compliance-driven adoption, with limited integration and no management dashboards or performance indicators.
Project Launch	(X) Yes ( ) No	Power BI; CV CRM; BIM	4	Good cross-functional integration, but limited process integration.

[1] Level of Adherence:

1 – Very Low Adherence: The system barely meets the activity requirements, requires extensive manual work, or has little relevance; 2 – Low Adherence: The system provides limited support for the activity, requiring complementary tools or processes; 3 – Moderate Adherence: The system partially meets the activity requirements but presents limitations or low automation; 4 – High Adherence: The system adequately supports the activity, efficiently automating and organizing the process; 5 – Full Adherence: The system is highly effective, fully covering the activity requirements in an integrated, agile, and automated manner.

3.3 Evaluated functionalities of the computerized systems

Market Research and product definition

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Basic integration through ClickUp; limited interoperability among systems.
Process automation	( ) Yes (X) No	Activities are mainly supported by digital tools but with limited automation.
Dashboard or management report generation	( ) Yes (X) No	No management dashboards or reporting tools were identified.
Performance indicator monitoring	( ) Yes (X) No	No systematic monitoring of performance indicators was observed.
Real-time data updating	(X) Yes ( ) No	ClickUp enables real-time updates and information sharing.
Mobile device compatibility	(X) Yes ( ) No	ClickUp and cloud-based platforms support mobile access.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	Revit and Archicad are used for preliminary architectural studies.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

Feasibility Analysis

Functionality	Yes/No	Remarks
Integration among departments	( ) Yes (X) No	Spreadsheet used in isolation, with no system integration.
Process automation	( ) Yes (X) No	Financial analyses are performed manually using spreadsheets.
Dashboard or management report generation	( ) Yes (X) No	No dashboard or automated reporting functionality identified.
Performance indicator monitoring	(X) Yes ( ) No	Basic financial indicators are monitored through spreadsheets.

Functionality	Yes/No	Remarks
Real-time data updating	( ) Yes (X) No	No real-time sharing or collaborative updating was observed.
Mobile device compatibility	( ) Yes (X) No	No mobile access or cloud-based functionality was identified.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	BIM tools are not used in this subprocess.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

Land Acquisition

Functionality	Yes/No	Remarks
Integration among departments	( ) Yes (X) No	No integrated systems supporting cross-department collaboration.
Process automation	( ) Yes (X) No	Activities are conducted predominantly through manual procedures.
Dashboard or management report generation	( ) Yes (X) No	No dashboard or reporting tools were identified.
Performance indicator monitoring	( ) Yes (X) No	No systematic monitoring of performance indicators was observed.
Real-time data updating	( ) Yes (X) No	No real-time data sharing or updating mechanisms were identified.
Mobile device compatibility	( ) Yes (X) No	No mobile-compatible systems were identified.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	BIM tools are not used in this subprocess.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

Legal Approvals

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Basic integration through ClickUp and ConstruCode.
Process automation	( ) Yes (X) No	Most approvals still depend on external administrative procedures.
Dashboard or management report generation	( ) Yes (X) No	No management dashboards were identified.
Performance indicator monitoring	( ) Yes (X) No	No systematic monitoring of performance indicators was observed.
Real-time data updating	(X) Yes ( ) No	ClickUp and ConstruCode support real-time information updates.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based platforms are accessible through mobile devices.
Use of BIM (Building Information Modeling)	( ) Yes (X) No	BIM is used by outsourced teams for technical project development.
Technical support or dedicated maintenance team	( ) Yes (X) No	No dedicated technical support structure was identified.

Project Launch

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Strong integration among Sales, Marketing, and Product departments.
Process automation	(X) Yes ( ) No	CRM supports automated sales management and customer tracking.
Dashboard or management report generation	(X) Yes ( ) No	Power BI provides management dashboards and commercial reports.
Performance indicator monitoring	(X) Yes ( ) No	Commercial performance indicators are systematically monitored.
Real-time data updating	(X) Yes ( ) No	CRM platform supports real-time data updates and access.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based systems are accessible through mobile devices.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	BIM supports product development and commercial communication.
Technical support or dedicated maintenance team	(X) Yes ( ) No	CRM platform includes technical support services.

APPENDIX C – CHECKLIST: REAL ESTATE DEVELOPMENT COMPANY C

1.0 COMPANY PROFILE

Real Estate Development Company C is a large-scale construction and real estate development company headquartered in São Paulo, Brazil, with 56 years of experience in the housing sector. The company specializes in affordable residential developments and operates in 10 Brazilian states across four regions, primarily serving low- and middle-income families through government housing programs. In 2025, it launched 72 developments totaling approximately 25,000 housing units and employed more than 5,700 direct workers. The company is publicly traded on the Brazilian stock exchange (B3) and holds several certifications, including ISO 9001:2015, PBQP-H Level A, NDT Certification, and the Caixa Casa Azul+ Seal. The case study was conducted at its Pernambuco regional office, which launches approximately five developments per year. To support the early-stage real estate development process, the company uses digital tools for market analysis, land prospecting, feasibility studies, project management, schedule control, and Business Intelligence (BI) dashboards, contributing to process standardization and decision-making.

2.0 ORGANIZATIONAL STRUCTURE OF THE COMPANY

The early-stage real estate development process involves multiple departments, reflecting the company's integrated and multidisciplinary organizational structure. The main departments directly involved are Prospecting, Market Intelligence, Economic Studies, Business Development, Legalization, Technical Engineering, Legal, and Commercial. These departments collaborate throughout the subprocesses of market research and product definition, feasibility analysis, land acquisition, legal approvals, and project launch. Supporting activities are distributed among different corporate divisions, ensuring coordination between technical, legal, commercial, and strategic functions during the early-stage real estate development process.

2.1 Team responsible for the early-stage real estate development process

(X) Architect and Urban Planner	Quantity: 4
(X) Civil Engineer	Quantity: 6
(X) Business Administrator	Quantity: 2
(X) Economist	Quantity: 2
(X) Lawyer	Quantity: 2
( ) Other Not Available	Quantity: Not Available
( ) Other Not Available	Quantity: Not Available

3.0 CHARACTERIZATION OF THE EARLY-STAGE REAL ESTATE DEVELOPMENT PROCESS IN THE COMPANY

3.1 Subprocesses managed within the early-stage real estate development process

Subprocess	Performed by the Company?
Market Research and Product Definition	(X) Yes ( ) No
Feasibility Analysis	(X) Yes ( ) No
Land Acquisition	(X) Yes ( ) No
Legal Approvals	(X) Yes ( ) No
Project Launch	(X) Yes ( ) No

3.2 Computerized systems used in the early-stage real estate development process

Subprocess	Uses a Computerized System?	System Name	Level of Adherence[1] (1–5)	Remarks
Market Research and Product Definition	(X) Yes ( ) No	Geofusion; Vision; Power BI	5	High integration with AI, Big Data, and cloud-based analytics.
Feasibility Analysis	(X) Yes ( ) No	Excel; Power BI; Revit (BIM); Zenerate (experimental)	4	High integration with AI, Big Data, and cloud-based analytics.
Land Acquisition	(X) Yes ( ) No	Google Earth; Terreno Livre; Power BI; Revit (BIM)	4	Consistent system use with ongoing land management improvements.
Legal Approvals	(X) Yes ( ) No	Microsoft Project; Autodoc; Revit (BIM)	4	Good document control and compliance management.
Project Launch	(X) Yes ( ) No	Microsoft Project; Power BI; Geofusion; Vision; Revit (BIM)	5	High integration, analytics automation, and digital continuity.

[1] Level of Adherence:

1 – Very Low Adherence: The system barely meets the activity requirements, requires extensive manual work, or has little relevance; 2 – Low Adherence: The system provides limited support for the activity, requiring complementary tools or processes; 3 – Moderate Adherence: The system partially meets the activity requirements but presents limitations or low automation; 4 – High Adherence: The system adequately supports the activity, efficiently automating and organizing the process; 5 – Full Adherence: The system is highly effective, fully covering the activity requirements in an integrated, agile, and automated manner.

3.3 Evaluated functionalities of the computerized systems

Market research and product definition

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Information is integrated across multiple departments through BI dashboards and internal systems.
Process automation	(X) Yes ( ) No	AI-based tools support automated market analysis and predictive pricing.
Dashboard or management report generation	(X) Yes ( ) No	Power BI provides dashboards and strategic management reports.
Performance indicator monitoring	(X) Yes ( ) No	Market and business indicators are continuously monitored.
Real-time data updating	(X) Yes ( ) No	Cloud-based platforms enable continuous data access and updates.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based platforms allow remote access across devices.

Functionality	Yes/No	Remarks
Use of BIM (Building Information Modeling)	( ) Yes (X) No	BIM was not identified in this subprocess.
Technical support or dedicated maintenance team	(X) Yes ( ) No	Internal IT team develops and maintains proprietary systems.

Feasibility Analysis

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Economic Studies, Prospecting, and Technical teams share integrated data and analyses.
Process automation	(X) Yes ( ) No	Automated spreadsheets and analytical tools support feasibility assessments.
Dashboard or management report generation	(X) Yes ( ) No	Power BI dashboards support analysis and decision-making.
Performance indicator monitoring	(X) Yes ( ) No	Financial and business indicators are monitored through BI dashboards.
Real-time data updating	(X) Yes ( ) No	Integrated dashboards provide near real-time information updates.
Mobile device compatibility	(X) Yes ( ) No	Power BI and cloud-based tools support mobile access.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	Revit is used for preliminary design and model-based cost estimation.
Technical support or dedicated maintenance team	(X) Yes ( ) No	Internal teams maintain and update proprietary tools and analytical models.

Land Acquisition

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Land acquisition data are shared through BI dashboards and corporate platforms.
Process automation	(X) Yes ( ) No	Land management processes are being enhanced through Terreno Livre implementation.
Dashboard or management report generation	(X) Yes ( ) No	Power BI dashboards support monitoring and decision-making.
Performance indicator monitoring	(X) Yes ( ) No	Land acquisition and negotiation indicators are monitored through BI tools.
Real-time data updating	(X) Yes ( ) No	Cloud-based storage and BI tools enable continuous information updates.
Mobile device compatibility	(X) Yes ( ) No	Google Earth and cloud-based platforms support mobile access.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	Revit models support preliminary design and cost assessments.
Technical support or dedicated maintenance team	(X) Yes ( ) No	Corporate systems are supported by internal technology teams.

Legal Approvals

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	Shared platforms support coordination among legal, technical, and development teams.
Process automation	( ) Yes (X) No	Activities are digitally managed but without advanced workflow automation.
Dashboard or management report	( ) Yes (X) No	No dashboard or automated reporting tools were

Functionality	Yes/No	Remarks
generation		identified in this subprocess.
Performance indicator monitoring	(X) Yes ( ) No	Project schedules and approval milestones are systematically monitored.
Real-time data updating	(X) Yes ( ) No	Cloud-based repositories allow continuous information updates.
Mobile device compatibility	(X) Yes ( ) No	Cloud-hosted systems support remote and mobile access.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	Revit is used for legal project development and regulatory compliance.
Technical support or dedicated maintenance team	(X) Yes ( ) No	Corporate systems are supported by internal technology resources.

Project Launch

Functionality	Yes/No	Remarks
Integration among departments	(X) Yes ( ) No	High integration across Commercial, Market Intelligence, Product, and Development teams.
Process automation	(X) Yes ( ) No	AI and BI tools support automated analysis and decision-making.
Dashboard or management report generation	(X) Yes ( ) No	Power BI dashboards used for commercial management.
Performance indicator monitoring	(X) Yes ( ) No	Continuous monitoring of commercial KPIs.
Real-time data updating	(X) Yes ( ) No	Dashboards and management systems provide real-time updates.
Mobile device compatibility	(X) Yes ( ) No	Cloud-based platforms support mobile access.
Use of BIM (Building Information Modeling)	(X) Yes ( ) No	Revit ensures digital continuity between early-stage development and construction.
Technical support or dedicated maintenance team	(X) Yes ( ) No	Internal IT team develops and maintains proprietary systems.