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Digital Maturity for the Responsible Implementation of AI in Small and Medium-Sized Enterprises

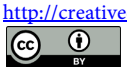
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Abstract

This study investigates the intersection between digital maturity, Artificial Intelligence (AI) adoption, and compliance with the General Data Protection Law (LGPD) in the context of Small and Medium-Sized Enterprises (SMEs). Through Systematic Literature Review (SLR) with thematic content analysis guided by the PRISMA protocol and the PCC (Population, Concept, and Context) strategy, a final sample of 26 studies published between 2019 and the first half of 2025 was analyzed. Results reveal digital maturity as a multidimensional prerequisite for responsible AI adoption, where regulatory compliance and ethical data governance ensure sustainable performance. A significant research gap remains: while technological readiness and legal requirements advanced independently, frameworks integrating these dimensions simultaneously are lacking. The main theoretical contribution proposes an integrated assessment view, suggesting SMEs shift from a purely technical perspective to a resource orchestration approach. Practical implications highlight that managers must develop internal competencies and compliance structures alongside technological acquisition to ensure institutional trust and competitive advantage.

Keywords

Digital Maturity, Artificial Intelligence, SMEs, LGPD, Data Governance

1. Introduction

The widespread access to Artificial Intelligence (AI) over the last five years has driven structural changes in organizations of various sizes and sectors, reconfiguring business models, operational workflows, and market relations. However, the breadth and depth of these changes vary according to the organizations' degree of

digital maturity, which is especially evident in the context of Small and Medium Enterprises (SMEs). These companies face significant barriers to digitalization that large organizations do not, such as financial limitations, a shortage of skilled labor, and difficulties in integrating emerging technologies into their operational routines (Brătucu et al., 2024).

Among emerging technologies, Artificial Intelligence also stands out for its potential to generate significant productivity and efficiency gains in the short term. However, successful implementation requires more than just the introduction of technological tools; it presupposes the existence of adequate infrastructure, technical skills, and an organizational culture oriented toward digital transformation (Boonmee, Mangkalakeeree, & Jeong, 2025; Tortorella, Narayanamurthy, & Thurer, 2024). Recent studies reinforce that organizational readiness and AI capability are determining factors for capturing value sustainably in small companies (Hemanth & Lakshminarayana, 2024; Kalleparambil & Akoum, 2025).

The review conducted by Schwaeke et al. (2025) indicates that AI adoption in SMEs has been expanding heterogeneously, influenced by factors such as data governance, strategic preparedness, and technological maturity. According to Al Dhaheri, Ahmad, and Papastathopoulos (2024) and Rajaram and Tinguely (2024), AI is not merely a technological asset, but a vector of structural change that requires appropriate organizational and cultural conditions. In this context, digital maturity emerges as an essential dimension for understanding the innovation and adaptation capacity of SMEs. It represents the level of integration between technological infrastructure, human skills, and strategic alignment, serving as a prerequisite for digital transformation and the responsible adoption of advanced technologies (Peretz-Andersson, Elg, & Tremblay, 2024; Maezono, 2021). Recent research directly links digital maturity to organizational performance, demonstrating that digitally mature companies achieve better results in AI application (Boonmee, Mangkalakeeree, & Jeong, 2025; Bourhlal & Alhaderi, 2025).

However, the use of AI implies intensive data processing, imposing an additional challenge on organizations to ensure information governance and the ethical and transparent use of personal data. This concern becomes particularly relevant due to the General Data Protection Law (LGPD), in force in Brazil since 2020, which establishes strict guidelines for the processing of personal data and directly impacts the use of AI-based technologies. For SMEs, compliance with the LGPD has proven especially challenging due to limited access to technical and legal resources and the absence of formal compliance structures (Gonzalez-Tamayo, Paternina-Arboleda, & Coronado-Hernandez, 2023).

In the Brazilian context, Nascimento and Silva (2023) emphasize the importance of implementing internal privacy policies, reviewing workflows, and training teams for LGPD compliance, elements also applicable to SMEs. On a global scale, recent literature has been bridging the debate on data governance and ethics with the discussion on digital maturity and AI adoption; in this sense, Rajaram and Tinguely (2024) reinforce the need for corporate practices aligned with

transparency and data protection as pillars of responsible digital transformation.

Given the aspects presented, the theme of this research is digital maturity for the responsible implementation of AI in Small and Medium Enterprises. This is because, with the rapid advancement of available technologies, it is essential for SMEs to be able to assess their capacity to adopt and integrate AI-based solutions as an instrument for improving operational efficiency, innovation, and competitiveness (Ingalagi, Mutkekar, & Kulkarni, 2021).

That said, the central problem of this study was defined as the absence of specific digital maturity assessment models focused on AI adoption in SMEs, especially in the context of LGPD compliance and ethical data governance. The objective is to identify convergences and gaps related to digital maturity, AI adoption, and LGPD compliance in SMEs that support the proposal of an integrated assessment model for responsible digital transformation, based on the mapping of scientific literature.

2. Methodology

This article constitutes a systematic literature review with thematic content analysis and content analysis which, according to Lamé (2019), is a way of synthesizing scientific evidence to answer a specific research question in a transparent and reproducible manner. The objective was to analyze the scientific production on digital maturity, artificial intelligence (AI), and compliance with the General Data Protection Law (LGPD) in the context of Small and Medium-Sized Enterprises (SMEs). To ensure a rigorous and transparent selection process, eligibility criteria were established based on the PCC (Population, Concept, and Context) strategy. Population (P) was defined as Small and Medium-Sized Enterprises (SMEs), excluding studies focused on large corporations or public administration. The Concept (C) covered digital maturity and the adoption of Artificial Intelligence (AI), specifically focusing on organizational readiness and management frameworks rather than purely technical or algorithmic developments. Finally, the Context (C) was delimited to responsible implementation, including dimensions of data governance, ethics, and regulatory compliance (such as LGPD and GDPR). This tripartite structure allowed for an analysis focused on the intersection between technological evolution and institutional responsibility within the SME ecosystem, as described in **Table 1**. Other inclusion criteria included articles in English or Portuguese; published between 2019 and 2025; peer-reviewed; and available in full text.

The established exclusion criteria were as follows: inadequate population (studies that do not present a specific scope or analysis for the SME segment); inadequate concept (studies focused strictly on technical/computational aspects of AI without a digital maturity or management approach); and inadequate context (research that ignores regulatory, ethical, or information governance aspects in technology adoption), duplicates, theses/dissertations/technical reports/grey literature, studies of large companies or the public sector without an SME scope, tech-

nical AI articles without an organizational relationship, and legal studies of LGPD without a link to digital transformation. Initially, the research questions and search strings were defined according to the objective of this study. Table 2 presents this information.

Table 1. PCC strategy (Population, Concept, Context).

Element	Definition for the Study	Related Search Terms
P (Population)	Small and Medium-Sized Enterprises (SMEs)	SMEs, Small and Medium Enterprises, Small Business.
C (Concept)	Digital Maturity and Artificial Intelligence Adoption	Digital Maturity, AI Adoption, Artificial Intelligence, Digital Transformation.
C (Context)	Responsible Implementation and Compliance (LGPD)	Data Protection, LGPD, GDPR, Governance, Ethics, Compliance.

Table 2. Research questions and summarized search strings.

Code	Research Question	Strings
Q1	What are the models, frameworks, or metrics employed to assess digital maturity in SMEs?	"digital maturity" AND "SMEs" AND "framework"
Q2	What challenges, barriers, and opportunities have been reported in the implementation of AI in SMEs?	"artificial intelligence" AND "SMEs" AND "implementation" AND "opportunities" AND "challenges"
Q3	How are SMEs reconciling LGPD with the adoption of digital and AI solutions?	"SMEs" AND "LGPD" OR "general data protection law" AND "artificial intelligence"
Q4	Are there published scientific works that integrate digital maturity, AI, and LGPD into a single model applied to SMEs?	"SMEs" AND "digital maturity" AND "artificial intelligence" AND "LGPD" OR "general data protection law"

The definition of the search strings was guided by the four research questions and constructed to identify relevant studies, avoiding the loss of articles that use different terminologies to describe similar phenomena. The literature on digital maturity, AI adoption, and LGPD compliance presents differences in terminology, which requires search strategies built from a combinatory logic that integrates linguistic variations of Portuguese and English, articulated by Boolean operators to ensure semantic breadth and thematic precision. The strings in Table 2 were used in both Portuguese and English when searching for the documents.

For Q1 "Digital maturity in SMEs", the search string used consisted of the terms "digital maturity" AND "SMEs" AND "framework". This combination was designed to identify studies that present models, frameworks, or metrics for assessing digital maturity. The term *digital maturity* is widely used in international publications, while *framework* delimits the search to studies that propose or apply analytical structures, excluding strictly conceptual research. The presence of *SMEs*

ensures the focus on the small and medium-sized enterprise segment, whose reality differs substantially from that observed in large corporations. Regarding Q2 "AI in SMEs: challenges, barriers, and opportunities", the search string was "artificial intelligence" AND "SMEs" AND "implementation" AND "opportunities" AND "challenges". This string simultaneously aggregates four fundamental dimensions for understanding AI adoption in small companies: object (*artificial intelligence*), organizational context (*SMEs*), process (*implementation*), and nature of findings (*opportunities* and *challenges*). The inclusion of *opportunities* and *challenges* is methodologically relevant as it directs the search to studies that analyze both barriers and facilitating factors for implementation. This refinement was necessary because the volume of publications on AI is extremely high, and without filtering by analytical focus, the search would retrieve purely technical articles, aiming to identify studies discussing organizational capabilities, adoption barriers, and strategic opportunities for SMEs.

For Q3 "LGPD", data governance, and the AI being used in SMEs, the search string was "SMEs" AND "LGPD" OR "general data protection law" AND "artificial intelligence". This string reflects the need to capture both Brazilian and international studies dealing with data protection in the context of AI. Since most international publications do not use the term "LGPD," its literal translation (*general data protection law*) was incorporated to broaden the semantic reach. The presence of *artificial intelligence* directs the result to studies dealing with the intersection between data protection and AI, excluding purely legal discussions without a technological link. Finally, for Q4 "integration between digital maturity, AI, and LGPD", the following string was used: "SMEs" AND "digital maturity" AND "artificial intelligence" AND "LGPD" OR "general data protection law". This combination of search terms was developed to identify studies that simultaneously articulate the three investigation axes. The joint presence of *digital maturity* and *artificial intelligence* ensures the focus falls on research that integrates organizational capabilities and technological adoption, while *LGPD* and *general data protection law* ensure sensitivity to the regulatory dimension.

Based on these, it became possible to select contemporary literature on digital maturity, AI, and data protection, highlighting the absence of integrated approaches and confirming the originality of this study's contribution. Regarding search procedures, the review was conducted according to the PRISMA 2020 method (Liberati et al., 2009). Searches were carried out in the Scopus, Web of Science (WoS), and ScienceDirect databases from 2019 to the first half of 2025, ensuring the inclusion of recent studies aligned with the current technological and regulatory context.

The literature management and duplicate removal stage was conducted using EndNote, a specific tool to identify and consolidate repeated records from different bibliographic databases (Gusenbauer & Haddaway, 2020). After importing the results from Scopus, Web of Science, and ScienceDirect into a single library, the 'Find Duplicates' command was applied in EndNote. This tool automatically com-

pares article metadata—title, authors, year, journal name, and, most importantly, the DOI—to identify overlaps. When the DOI was present and identical, EndNote automatically flagged the record as a duplicate. In cases involving minor spelling variations in the title, differences in author name formatting, or the absence of a DOI, the system classified the pair as a "possible duplicate", displaying them side-by-side for manual review. This procedure ensures greater precision and prevents the undue exclusion of distinct studies, which is especially relevant for databases with inconsistent or incomplete metadata.

The selection of articles occurred in three stages: first, during the screening of titles, abstracts, and keywords, which identified studies that appeared most frequently across the searched databases or were directly linked to the descriptors of the four research questions. Next, during the full-text reading, articles providing substantial contributions were selected, such as framework proposals, empirical tests, analyses of organizational capabilities, or advanced discussions on data governance. Finally, the articles were organized by theme, identifying those that contributed consistently to the debate on digital maturity, artificial intelligence (AI), and data protection within the context of SMEs.

Regarding digital maturity (Q1), articles that developed or applied assessment models and addressed the relationship between technological readiness, organizational culture, and competitiveness were included. For AI adoption (Q2), studies exploring technical, cultural, and economic barriers were selected, along with those analyzing human and environmental factors in implementation. In the LGPD and data governance dimension (Q3), articles published in Brazil and other countries discussing data protection, regulation, ethics, and the legitimate use of information for training AI systems were selected. Finally, for the integration of digital maturity, AI, and LGPD (Q4), articles addressing more than one of these domains simultaneously were chosen. These procedures enabled the identification of articles that made an impactful contribution to each research question, reinforcing the consistency of the review and providing clarity on the gaps diagnosed in the literature.

The thematic synthesis of the 26 documents was conducted following a systematic approach of coding and analytical aggregation to transform the findings from the primary studies into comprehensive explanatory categories (Thomas & Harden, 2008). The data extraction methodology employed a standardized form to collect variables such as study identification, methodological characteristics, context, and key results.

The coding process was organized into three sequential stages: immersive reading and line-by-line coding of the original text (first-level codes), the aggregation of these codes into descriptive themes, and, finally, the development of higher-order analytical themes that transcended the primary findings to directly address the study's four research questions. All extraction and coding stages were carried out independently by two reviewers, and any discrepancies in the application of codes or the labeling of themes were resolved through periodic consensus meetings.

3. Results and Discussions

From the initial total of 5344 articles, 141 duplicates were identified, leaving 5,203 articles for the screening of titles, keywords, and abstracts. This procedure is recognized in the literature as an essential preliminary filter to identify studies aligned with the research scope without requiring a full reading of all records (Liberati et al., 2009). Following this process, 5,062 articles were excluded, resulting in 141 articles that were assessed for their suitability regarding the research questions (Q1, Q2, Q3, and Q4). This evaluation is widely used in systematic reviews to ensure a balance between methodological rigor and feasibility, given that reading thousands of articles in full is impractical and does not add analytical value to the study. At this stage, the thematic adherence of the studies to the research questions was evaluated quickly and objectively, excluding works that—despite mentioning terms such as "digital maturity", "artificial intelligence", "data protection", or "SMEs"—did not address these concepts substantially or lacked relevance to the proposed objectives. Additionally, purely technical studies, sector-specific analyses without a focus on SMEs, legal articles with no link to AI usage, and investigations concerning digital transformation in large corporations were also eliminated. The inclusion of dissertations or studies lacking a specific focus on SMEs was necessary due to the low frequency of SME-centered research within the database, extending beyond the established eligibility criteria. Thus, the systematic literature review resulted in a sample of 26 documents that were qualitatively analyzed regarding their theme and content across the four axes corresponding to the research questions, as described in the PRISMA 2020 flowchart (**Figure 1**).

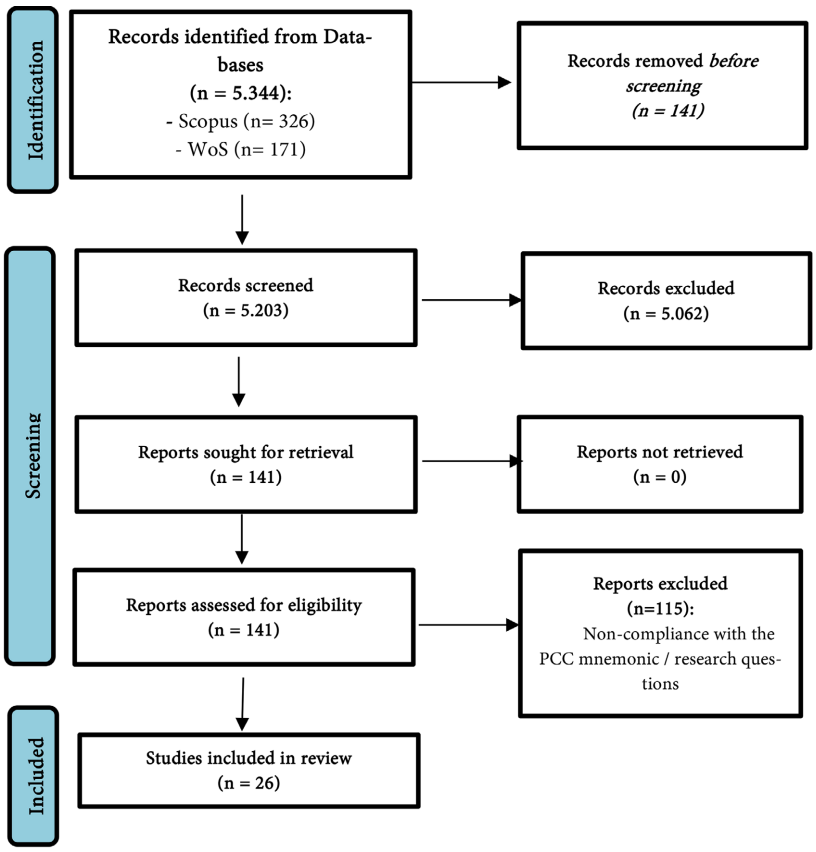
Through the thematic content analysis process, it was possible to identify articles that addressed each of the proposed research questions, as well as their primary contributions, as illustrated in **Table 3**.

The results indicated a low volume of scientific production in English regarding the LGPD with direct relevance to the research context; the only article located was by Belli, Curzi, and Gaspar (2023), which discusses AI regulation in Brazil and its interfaces with Brazilian legislation. However, there is relevant literature in this language addressing equivalent fundamentals in the GDPR, especially concerning legal bases**,** legitimate interest, and the legitimacy of personal data for AI. Among the most aligned works, notable mentions include Trigo Kramcsák (2023), who analyzes the use of legitimate interest as a legal basis for AI datasets, and Belli, Gaspar and Jawant (2024), who discuss algorithmic regulation, informational sovereignty, and data governance in AI environments. Although these studies do not explicitly mention the LGPD, they sustain essential discussions on compliance, legitimacy, and governance, serving as highly relevant references for this research.

Literature on digital maturity indicates consolidated frameworks that are seldom applied to SMEs, such as the one by Maezono (2021), concern internal controls, AI resource orchestration in manufacturing SMEs. The author proposes a framework focused on small datasets and transfer learning, suggesting a structure to improve predictive accuracy and reliability of machine learning models in data-

scarce areas by integrating first-principle calculations to validate findings. Additionally, Peretz-Andersson, Elg, Tremblay (2024) introduce a systems framework to assess the reliability of research findings. The model focuses on seven essential pillars to ensure research is: accountable, evaluable, well-formulated, effectively evaluated, controlled for bias, error-reducing, and well-calibrated with evidence supporting the claims made.

Recent models incorporate organizational readiness and AI capability, linking them to performance and showing significant evolution in recent years—shifting from a technology-centric view to approaches that integrate human skills, organizational capabilities, and innovation mechanisms (Kaur et al., 2025; Mikalef & Gupta, 2021). Although many frameworks are still geared toward large enterprises, such as those proposed by Peretz-Andersson, Elg, Tremblay (2024) and Aslanova & Kulichkina (2020), recent studies demonstrate a growing effort to adapt them to the SME context (Maezono, 2021). Contemporary models, like those by Kaur et al., (2025) and Mikalef and Gupta (2021), bridge digital maturity and AI adoption, highlighting dimensions such as digital culture, analytical capability, strategic preparation, and sustainability. The work of Tortorella et al. (2024) reinforces that maturity is a determining factor for organizational performance in digital environments.



Source: Page et al. (2024).

Figure 1. PRISMA 2020 flowchart.

Table 3. Articles and their contributions related to the research questions.

Research Question Topic (Q)	Authors/Studies	Main Contributions
Q1 Digital maturity in SMEs	Peretz-Andersson et al. (2024); Maezono (2021); Aslanova & Kulichkina (2020); Mikalef & Guota (2021)	Development and application of digital maturity frameworks; integration between technological readiness and AI capability; relationship between maturity, organizational culture, and competitiveness; influence of maturity on the sustainability of digital transformation.
Q2 Artificial Intelligence in SMEs	Tortorella, Narayanamurthy, & Thurer (2024); Boonmee, Mangkalakeeree, & Jeong (2025); Ingalagi, Mutkekar, & Kulkarni, 2021; Govori & Sejdija (2023); Arroyabe et al. (2024); Al Dhaheri, Ahmad, & Papastathopoulos (2024); Saleem et al. (2024); Kalleparambil & Akoum (2025); Kaur et al. (2025)	Identification of technical, cultural, and economic barriers to AI adoption; influence of leadership and organizational readiness; AI as a factor for automation and innovation; impact of sustainability and digital culture on implementation success.
Q3 LGPD and data governance in SMEs	Gonzalez-Tamayo, Paternina-Arboleda, & Coronado-Hernandez (2023); Nascimento & Silva (2023); Trigo Kramcsák (2023); Belli, Curzi, & Gaspar (2023); Belli, Gaspar, & Jaswant (2024)	Challenges of LGPD compliance in SMEs; gaps in resources and legal knowledge; legal foundations for data use in AI; integration between regulation, ethics, and governance; emerging relationship between data sovereignty and digital maturity.
Q4 Integration: Maturity + AI + LGPD	Trigo Kramcsák (2023); Belli, Curzi, & Gaspar (2023); Belli, Gaspar, & Jaswant (2024)	Articulation between AI regulation, data protection, and digital maturity; legitimacy in data use for AI; importance of data sovereignty and governance as pillars of digital transformation; evidence of theoretical and practical gaps in the integration of the three domains.

Source: Elaborated by the authors (2026).

Complementarily, the study by Peretz-Andersson, Elg, Tremblay (2024) introduces the perspective of resource orchestration, indicating that more mature companies can more effectively coordinate technological, human, and relational resources. This reinforces that digital maturity is a multidimensional and progressive construct that sustains both technological adoption and ethical governance.

Recent literature on AI in SMEs shows a high volume of publications but low alignment between their premises and practice (Tortorella, Narayanamurthy, & Thurer, 2024). This indicates a saturation of conceptual studies to the detriment of applied research, justifying the investigation of mechanisms that facilitate the effective adoption of these technologies by aligning academic expectations with the actual execution capabilities of these organizations. Emerging studies point to the influence of human and environmental factors (Al Dhaheri, Ahmad, & Papastathopoulos, 2024; Schwaeke et al., 2025) and highlight ethical and cultural challenges (Saleem, Al-Breiki, & Asad, 2024), demonstrating significant progress with greater empirical robustness and an expansion of the analyzed variables. Tech-

nical, cultural, financial, and qualification barriers remain central (Tortorella, Narayanamurthy, & Thurer, 2024), but new dimensions have been identified, such as environmental turbulence, social influence, hedonic motivation, institutional pressures, and perceived value expectations (Al Dhaheri, Ahmad, & Papastathopoulos, 2024; Kaur et al., 2025; Schwaeke et al., 2025).

The literature reveals a consensus that LGPD compliance is one of the most significant challenges faced by SMEs in digital transformation (Gonzalez-Tamayo, Paternina-Arboleda, & Coronado-Hernandez, 2023). The difficulties encountered include resource limitations, a shortage of specialized professionals, and a lack of formal compliance structures. While national literature is robust, it remains fragmented; in this sense, the compliance difficulties in SMEs described by Gonzalez-Tamayo et al. (2023) are noteworthy. They identified AI adoption in SMEs as a complex process driven by regulatory barriers, scarce financial resources, and obsolete IT infrastructure. The authors also highlight human and organizational challenges, including a lack of leadership preparedness and a gap in qualified talent. Similarly, Belli, Gaspar, and Jaswant (2024) emphasized that legal uncertainty and the complexity of algorithmic compliance act as strategic barriers to AI implementation in SMEs, outstripping the agility of technological tools. Thus, risk governance and the management of discriminatory biases require operational structures that are often absent in these environments, evidencing a mismatch between ethical guidelines and practice.

Nascimento and Silva (2023) propose an institutional repositories with an operational guidelines that balance organizational structure with innovation, focusing on active participation, technological experimentation, and continuous training. The model emphasizes the practical link between teaching and innovation in the educational context, while Trigo Kramcsák (2023) analyzes legitimate interest as a legal basis for AI, reinforcing the need for ethical and institutional maturity. In other words, using "legitimate interest" as a foundation for developing AI systems offers the necessary flexibility for innovation but imposes significant governance challenges. This legal basis should not be interpreted as unrestricted permission, but rather as a mechanism that demands high ethical and institutional maturity. For the author, the legal sustainability of AI depends on a rigorous balance: the organization must be able to demonstrate, through safeguards and proportionality tests, that technological advancement does not compromise the fundamental rights of data subjects. Thus, institutional maturity becomes the pillar that transforms the uncertainty of legitimate interest into a robust and transparent compliance strategy.

Recent studies expand this debate by integrating elements of AI regulation, data processing legitimacy, and the legal foundations of algorithmic systems, linking LGPD, GDPR, and international principles (Belli, Curzi, & Gaspar, 2023; Belli, Gaspar, & Jaswant, 2024; Trigo Kramcsák, 2023). These studies show that digital maturity is not just about infrastructure or processes, but also about ethical, institutional, and regulatory maturity. Consequently, a consolidated notion of data governance emerges as a structuring component of digital transformation; that is,

governance is now seen as a prerequisite for responsible AI, as it involves transparency mechanisms, appropriate legal bases, accountability, and informational sovereignty.

Regarding the integration of digital maturity, AI, and LGPD, it was found that despite progress in these three domains individually, there is a scarcity of studies integrating them into a single model applied to SMEs. Belli, Curzi, and Gaspar (2023) highlight that although Brazil has advanced with the Brazilian Artificial Intelligence Strategy (EBIA) and Bill 2338/2023, gaps remain that may compromise governance effectiveness. These gaps relate to lacking technical infrastructure and equipment, ineffective inspection and enforcement due to budget constraints, a lack of qualified technical personnel in regulatory bodies, a lack of coordination between different agencies and federative entities, and insufficient funding for oversight bodies and AI safety research.

Trigo Kramcsák (2023) proposes legitimacy criteria for data use in AI, linking transparency to organizational ethical maturity. For this author, legitimacy in data use for AI systems transcends mere formal legal compliance, anchoring itself in criteria of active transparency and organizational ethical robustness. He proposes that using legitimate interest as a legal basis must be supported by a rigorous balancing test, which assesses proportionality between corporate objectives and the rights of data subjects. In this context, transparency is not limited to the duty to inform but requires the explainability of algorithmic processes, while ethical maturity is presented as a governance criterion ensuring data processing integrity. Thus, institutional compliance acts as a filter that validates the project's purpose, ensuring that technological innovation does not occur at the expense of individuals' informational self-determination.

Belli, Gaspar, and Jaswant (2024) connect sovereignty and data flows to digital maturity and regulatory interoperability within the BRICS; in other words, data geopolitics and technical cooperation among emerging countries could be a solution for institutional gaps. For the authors, digital autonomy results not only from creating local laws but from building regulatory interoperability that allows for secure information sharing between nations, strengthening collective digital maturity. This scenario suggests that overcoming Brazilian institutional gaps, such as the lack of infrastructure noted in previous studies, can be mitigated through technical partnerships and shared compliance standards. Thus, data sovereignty ceases to be a protectionist barrier and becomes a governance asset, where the integration of regulation and technology acts as an engine for economic development and legal certainty.

The works of Belli, Curzi and Gaspar (2023), Belli, Gaspar, and Jaswant (2024), and Trigo Kramcsák (2023) offer important points of convergence by discussing legal bases, data legitimacy, and the ethical implications of AI, but they do not yet coordinately articulate digital readiness, technological adoption, and regulatory governance. This gap is particularly relevant because literature shows these elements are interdependent: mature companies adopt AI more effectively; AI only

generates sustainable value when accompanied by governance and compliance; and the LGPD requires internal capabilities typical of digitally mature companies.

These studies indicate that digital maturity is inseparable from a nation's regulatory maturity and that SMEs require frameworks that combine technological readiness, compliance, and data ethics in an integrated and simultaneous manner, rather than as isolated steps. For SMEs, the framework should be a single tool operating under axes where compliance is part of the AI architecture. It must provide for the legitimate interest test (Trigo Kramcsák, 2023) and translate complex international requirements (Belli, Curzi, & Gaspar, 2023) by offering interoperability guidelines Belli, Gaspar, & Jaswant, 2024). This allows SMEs to use global security standards that facilitate international partnerships (as in the BRICS), guided by ethics as an error-reduction mechanism and efficiency to avoid rework and sanctions—transforming technological readiness into market value and customer trust. Given this, the need for an integrated framework that articulates these three dimensions is confirmed.

4. Final Considerations

This study analyzed the intersection between digital maturity, AI adoption, and LGPD compliance in SMEs using the PRISMA protocol. The results reveal that while the literature on maturity and AI is vast, its practical application in SMEs remains limited by structural barriers and frameworks excessively tailored to large organizations. The analysis highlights that regulatory compliance, though a recent development, has consolidated itself as an essential dimension of responsible digital transformation. The primary theoretical contribution lies in the proposition of an integrated perspective: digital maturity acts as an enabler for AI, while data governance and the LGPD ensure the process's ethical and strategic sustainability. From a practical standpoint, this study guides SME managers to move beyond a purely technological view, prioritizing the simultaneous development of competencies and compliance structures. Regarding limitations and opportunities for future research, the need for empirical studies in the Latin American context and the development of quantitative metrics integrating digital readiness, ethics, and regulation are emphasized.

As a future research agenda, it is recommended to: i) propose an integrated digital maturity framework focused on responsible AI adoption and LGPD compliance; ii) conduct case studies and empirical validations in Brazilian and Latin American SMEs; and iii) develop specific metrics to simultaneously measure digital readiness, data governance, and innovation capacity.

By filling the gap identified in the literature, this study contributes to advancing the debate on responsible digital transformation in SMEs, offering conceptual and practical pathways for ethical, inclusive, and sustainable AI adoption. By connecting technology, regulation, and governance, a new approach to digital maturity is proposed—one that strengthens competitiveness and institutional trust in a market increasingly driven by data and AI.

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Author Contributions

Conceptualization, João Azevedo, Rejane Frozza and Liane Mahlmann Kipper; methodology João Azevedo and Liane Mahlmann Kipper; validation, Rejane Frozza; formal analysis, Rejane Frozza and Liane Mahlmann Kipper; investigation, João Azevedo; resources, João Azevedo; data curation, João Azevedo, Rejane Frozza and Liane Mahlmann Kipper; writing—original draft preparation, João Azevedo; writing—review and editing, Rejane Frozza and Liane Mahlmann Kipper; visualization, João Azevedo, Rejane Frozza and Liane Mahlmann Kipper; supervision, Liane Mahlmann Kipper; project administration, Liane Mahlmann Kipper; funding acquisition, João Azevedo All authors have read and agreed to the published version of the manuscript.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

References

Al Dhaheri, M. H., Ahmad, S. Z., & Papastathopoulos, A. (2024). Do Environmental Turbulence, Dynamic Capabilities, and Artificial Intelligence Force SMEs to Be Innovative? *Journal of Innovation & Knowledge, 9,* Article ID: 100528. https://doi.org/10.1016/j.jik.2024.100528

Arroyabe, M. F., Arranz, C. F. A., Fernandez De Arroyabe, I., & Fernandez de Arroyabe, J. C. (2024). Analyzing AI Adoption in European SMEs: A Study of Digital Capabilities, Innovation, and External Environment. *Technology in Society, 79,* Article ID: 102733. https://doi.org/10.1016/j.techsoc.2024.102733

Aslanova, I. V., & Kulichkina, A. I. (2020). Digital Maturity: Definition and Model. In *Proceedings of the 2nd International Scientific and Practical Conference "Modern Management Trends and the Digital Economy: From Regional Development to Global Economic Growth" (MTDE 2020)* (pp. 432-438). Atlantis Press. https://doi.org/10.2991/aebmr.k.200502.073

Belli, L., Curzi, Y., & Gaspar, W. B. (2023). AI Regulation in Brazil: Advancements, Flows, and Need to Learn from the Data Protection Experience. *Computer Law & Security Review, 48,* Article ID: 105767. https://doi.org/10.1016/j.clsr.2022.105767

Belli, L., Gaspar, W. B., & Singh Jaswant, S. (2024). Data Sovereignty and Data Transfers as Fundamental Elements of Digital Transformation: Lessons from the BRICS Countries. *Computer Law & Security Review, 54,* Article ID: 106017. https://doi.org/10.1016/j.clsr.2024.106017

Boonmee, C., Mangkalakeeree, J., & Jeong, Y. (2025). Towards Sustainable Digital Transformation: AI Adoption Barriers and Enablers among SMEs in Northern Thailand. *Sustainable Futures, 10,* Article ID: 101169. https://doi.org/10.1016/j.sftr.2025.101169

Bourhlal, A., & Alhaderi, K. (2025). Digital Transformation and SME Performance: A Systematic Literature Review. In C. El Mokhi, *et al.* (Eds.), *Progress in Intelligent Computing and Secure Communication Systems* (pp. 345-357). Springer. https://doi.org/10.1007/978-3-031-99997-0_31

Brătucu, G., Ciobanu, E., Chițu, I. B., Litră, A. V., Zamfirache, A., & Bălășescu, M. (2024). The Use of Technology Assisted by Artificial Intelligence Depending on the Companies' Digital Maturity Level. *Electronics, 13,* 1687. https://doi.org/10.3390/electronics13091687

Gonzalez-Tamayo, L. A., Maheshwari, G., Bonomo-Odizzio, A., Herrera-Avilés, M., & Krauss-Delorme, C. (2023). Factors Influencing Small and Medium Size Enterprises Development and Digital Maturity in Latin America. *Journal of Open Innovation: Technology, Market, and Complexity, 9,* Article ID: 100069. https://doi.org/10.1016/j.joitmc.2023.100069

Govori, A., & Sejdija, Q. (2023). Future Prospects and Challenges of Integrating Artificial Intelligence within the Business Practices of Small and Medium Enterprises. *Journal of Governance and Regulation, 12,* 176-183. https://doi.org/10.22495/jgrv12i2art16

Gusenbauer, M., & Haddaway, N. R. (2020). Which Academic Search Systems Are Suitable for Systematic Reviews or Meta-Analyses? Evaluating Retrieval Qualities of Google Scholar, PubMed, and 26 Other Resources. *Research Synthesis Methods, 11,* 181-217. https://doi.org/10.1002/jrsm.1378

Hemanth, J., & Lakshminarayana, K. (2024). The Role of AI in Shaping Bangalore's IT Sector: A Comprehensive Analysis of Emerging Trends and Technologies. *The Academic: International Journal of Multidisciplinary Research, 2,* 1010-1015. https://theacademic.in/wp-content/uploads/2025/01/87.pdf

Ingalagi, S. S., Mutkekar, R. R., & Kulkarni, P. M. (2021, January). Artificial Intelligence (AI) Adaptation: Analysis of Determinants among Small to Medium-Sized Enterprises (SME's). In *IOP Conference Series: Materials Science and Engineering* (Vol. 1049, No. 1, p. 012017). IOP Publishing. https://doi.org/10.1088/1757-899X/1049/1/012017

Kalleparambil, S. A., & Akoum, M. (2025). AI Organisational Readiness for SMEs: A Tailored Model for AI Adoption Success. *Journal of Information & Knowledge Management, 24,* Article ID: 2550076. https://doi.org/10.1142/s0219649225500765

Kaur, R., Kumar, R., & Aggarwal, H. (2025). Systematic Review of Artificial Intelligence, Machine Learning, and Deep Learning in Machining Operations: Advancements, Challenges, and Future Directions. *Archives of Computational Methods in Engineering, 32,* 4983-5036. https://doi.org/10.1007/s11831-025-10290-z

Lame, G. (2019). Systematic Literature Reviews: An Introduction. *Proceedings of the Design Society: International Conference on Engineering Design, 1,* 1633-1642. https://doi.org/10.1017/dsi.2019.169

Liberati, A., Altman, D. G., Tetzlaff, J., Mulrow, C., Gøtzsche, P. C., Ioannidis, J. P. A. et al. (2009). The PRISMA Statement for Reporting Systematic Reviews and Meta-Analyses of Studies That Evaluate Health Care Interventions: Explanation and Elaboration. *PLOS Medicine, 6,* e1000100. https://doi.org/10.1371/journal.pmed.1000100

Maezono, A. M. (2021). *O efeito da maturidade digital sobre a efetividade dos controles internos nas organizações prestadoras de serviços*. Dissertação de mestrado profissional, Universidade Presbiteriana Mackenzie, Repositório Institucional Mackenzie.

Mikalef, P., & Gupta, M. (2021). Artificial Intelligence Capability: Conceptualization, Measurement Calibration, and Empirical Study on Its Impact on Organizational Creativity and Firm Performance. *Information & Management, 58,* Article ID: 103434. https://doi.org/10.1016/j.im.2021.103434

Nascimento, B. L. C. D., & Silva, E. M. D. (2023). Lei Geral de Proteção de Dados (LGPD) e repositórios institucionais: Reflexões e adequações. *Em Questão, 29,* 1-17. https://doi.org/10.1590/1808-5245.29.127314

Page, M. J., McKenzie, J. E., Bossuyt, P. M., Boutron, I., Hoffmann, T. C., Mulrow, C. D. et al. (2024). A declaração PRISMA 2020: Diretriz atualizada para relatar revisões sistemáticas. *Revista Panamericana de Salud Pública, 46,* 1-19. https://doi.org/10.26633/rpsp.2022.112

Peretz-Andersson, E., Tabares, S., Mikalef, P., & Parida, V. (2024). Artificial Intelligence Implementation in Manufacturing SMEs: A Resource Orchestration Approach. *International Journal of Information Management, 77,* Article ID: 102781. https://doi.org/10.1016/j.ijinfomgt.2024.102781

Rajaram, K., & Tinguely, P. N. (2024). Generative Artificial Intelligence in Small and Medium Enterprises: Navigating Its Promises and Challenges. *Business Horizons, 67,* 629-648. https://doi.org/10.1016/j.bushor.2024.05.008

Saleem, I., Al-Breiki, N. S. S., & Asad, M. (2024). The Nexus of Artificial Intelligence, Frugal Innovation and Business Model Innovation to Nurture Internationalization: A Survey of SME's Readiness. *Journal of Open Innovation: Technology, Market, and Complexity, 10,* Article ID: 100326. https://doi.org/10.1016/j.joitmc.2024.100326

Schwaeke, J., Peters, A., Kanbach, D. K., Kraus, S., & Jones, P. (2025). The New Normal: The Status Quo of AI Adoption in SMEs. *Journal of Small Business Management, 63,* 1297-1331. https://doi.org/10.1080/00472778.2024.2379999

Thomas, J., & Harden, A. (2008). Methods for the Thematic Synthesis of Qualitative Research in Systematic Reviews. *BMC Medical Research Methodology, 8,* Article No. 45. https://doi.org/10.1186/1471-2288-8-45

Tortorella, G. L., Powell, D., Hines, P., Mac Cawley Vergara, A., Tlapa-Mendoza, D., & Vassolo, R. (2024). How Does Artificial Intelligence Impact Employees' Engagement in Lean Organisations? *International Journal of Production Research, 63,* 1011-1027. https://doi.org/10.1080/00207543.2024.2368698

Trigo Kramcsák, P. R. (2023). Can Legitimate Interest Be an Appropriate Lawful Basis for Processing Artificial Intelligence Training Datasets? *Computer Law & Security Review, 48,* Article ID: 105765. https://doi.org/10.1016/j.clsr.2022.105765