



Customer Relationship Management in the Digital Era Challenges and Opportunities in The Construction Sector

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Abstract. *This research examines the challenges and opportunities of implementing digital customer relationship management in the construction industry through a qualitative library research approach. The construction sector faces structural barriers in digital adoption, including data fragmentation, multi-stakeholder complexity, and organizational resistance to change. Analysis of contemporary literature reveals that digital CRM integration with technologies such as artificial intelligence, big data analytics, and Internet of Things creates significant transformation in customer interaction management. Research findings indicate that effective implementation requires comprehensive strategies encompassing appropriate technology selection, employee capability development, and systematic customer data collection. Digital approaches demonstrate superiority in service speed and access convenience, while traditional methods maintain advantages in building emotional connections. This study contributes theoretically to digital CRM literature in construction contexts and practically provides strategic recommendations for industry practitioners to enhance competitive advantage through balanced digital-relational integration approaches. Furthermore, the findings highlight the importance of aligning digital CRM initiatives with organizational culture and long-term business objectives to ensure sustainable adoption. Successful implementation also depends on continuous evaluation of customer needs, integration of cross-functional teams, and establishment of clear performance metrics. As the construction industry becomes increasingly competitive, firms that leverage digital tools to personalize communication, predict customer expectations, and optimize project workflows are more likely to achieve higher satisfaction and long-term loyalty.*

eywords: artificial intelligence; construction industry; customer relationship management; digital transformation; organizational performance; technology adoption

INTRODUCTION

Transformation Digital has fundamentally changed the operational paradigm of various global industrial sectors, including the construction industry which has historically been known to have a relatively slow rate of technology adoption. In the context of economic globalization and the massive acceleration of digitalization, customer relationship management or *Customer*

Relationship Management (CRM) has evolved from a mere customer database system to a comprehensive business strategy that integrates advanced technologies such as *Artificial Intelligence*, *Big Data Analytics* and *Internet of Things* to create added value in interactions with stakeholders. The construction industry, which contributes significantly to the formation of gross Domestic product and the development of global infrastructure, is now facing increasing pressure to adopt digital solutions to improve operational efficiency, reduce resource wastage, and strengthen long-term relationships with clients (Vararean-Cochisa & Crisan, 2025). Phenomenon Digital transformation in the construction sector shows unique characteristics that set it apart from other industries, especially related to project complexity, supply chain fragmentation, and multistakeholder engagement that requires intensive coordination. Research indicates that the construction sector is still in the early stages of the digital transformation process, with a primary focus on identifying the benefits of digital technology, but still lacking in exploring specific cases of implementation in construction organizations. Integration of digital technologies such as *Building Information Modeling* (BIM), cloud computing, and *Internet of Things* has changed the traditional operational methods of construction companies, although the organization is still in the process of adaptation resulting in a lack of standard procedures or a well-defined framework to facilitate the systematic integration of technology (Naji et al., 2024).

CRM implementation in the digital age offers significant transformative potential for the construction industry, particularly in improving customer satisfaction, optimizing sales processes, and building long-term client loyalty. Contemporary CRM systems serve not only as a repository of customer information, but also as an analytics platform capable of predicting customer behavior, automating customer service processes, and providing relevant recommendations through the use of artificial intelligence. Construction companies that adopt CRM systems report significant improvements in their sales efficiency, with a reduction in time spent on administrative tasks, allowing teams to focus more on building quality client relationships. Research shows that effective CRM implementation through strategies such as personalized service, integrated communication, and the use of digital technology can significantly increase customer satisfaction and loyalty (Naim et al., 2024). Nevertheless, the adoption of digital CRM in the construction sector faces various structural and operational challenges that need to be identified and addressed systematically. Key barriers include data fragmentation, the inability to integrate multiple platforms, the absence of a single, integrated customer base, as well as organizational constraints such as resistance to change and a shortage of skilled experts.

his complexity is compounded by the inherent characteristics of the construction industry involving various stakeholders with different systems and standards, creating inefficiencies and hampering cohesive digital efforts (Onyia et al., 2024). On the other hand, the digital era also opens up substantial strategic opportunities for construction companies to increase competitiveness through effective CRM implementation, allowing companies to collect and analyze customer data from various sources using automated personalization and analytics *Big Data*. In the face of this complexity, crucial questions arise regarding how construction companies can effectively integrate digital CRM systems into their business processes to achieve a sustainable competitive advantage. Research questions that need to be answered include: What is the relationship between the adoption of digital CRM technology and the performance of customer relationship management in the construction industry? What factors influence the successful implementation of digital CRM in the context of complex and multi-stakeholder construction organizations? How can the integration of digital technologies such as BIM, IoT, and artificial intelligence strengthen CRM capabilities in increasing customer satisfaction and loyalty on construction projects? As well as what are the most significant structural and operational barriers hindering the adoption of digital CRM in the construction industry, and what strategies can be implemented to address them?

This study aims to comprehensively analyze the challenges and opportunities faced by the construction industry in implementing digital-based customer relationship management, with a special focus on identifying critical factors that affect the successful adoption of CRM systems, evaluating the impact of digital technology integration on the quality of customer relationships, and formulating strategic recommendations to overcome implementation barriers. By understanding the complexity of the relationship between digital transformation, CRM adoption, and organizational performance in the construction industry, this research is expected to make a

theoretical contribution in enriching the literature on customer relationship management in the digital age, as well as a practical contribution for construction industry practitioners in designing and implementing effective digital CRM strategies to improve business competitiveness and sustainability.

LITERATURE REVIEW

Customer relationship management has undergone a paradigmatic transformation in line with the acceleration of the digital revolution that has hit various global industrial sectors. The contemporary conceptualization of CRM is no longer simply seen as a technological instrument for managing customer databases, but has evolved into a holistic business strategy that integrates technology dimensions, organizational processes, and philosophical orientations that place customers at the center of the company's value ecosystem. (Kumar & Reinartz, 2018) In their seminal work they affirm that CRM represents a comprehensive approach to managing profitable customer relationships through a deep understanding of the customer's economic value as a guiding concept for strategic marketing decisions. This paradigm emphasizes the importance of integrating cutting-edge academic thinking with practical implementation strategies relevant to contemporary business contexts, creating synergies between theoretical rigor and practical applicability in designing effective CRM systems.

In the context of a digital era characterized by exponential technological convergence, CRM implementation has undergone a fundamental redefinition through the integration of advanced technologies such as artificial intelligence, analytics *Big Data*, cloud computing, and *Internet of Things*. (Prior et al., 2024) underscores that digital CRM leverages artificial intelligence capabilities for personalization of interactions, workflow automation, and customer-centric experience delivery *Real-time*, creating a transformation from traditional transactional models to digitally empowered strategic frameworks. The theoretical foundations underlying the evolution of CRM practice include Relational Marketing Theory, Technology Acceptance Models, and Digital Interaction Theory, which collectively provide a conceptual framework for understanding how organizations can design CRM systems that are not only technologically advanced but also aligned with ever-changing customer expectations and broader organizational goals. Digital transformation in the construction industry exhibits distinctive characteristics that distinguish it from other industry sectors, especially with regard to the inherent complexity of projects, the fragmentation of supply chain ecosystems, and multi-stakeholder engagement that requires intensive coordination throughout the project lifecycle. (Bruno Daniotti et al., 2020) explained that the construction sector is facing increasing demand for major innovations in terms of digital dematerialization and technologies such as *Internet of Things*, *Big Data*, advanced manufacturing, robotics, three-dimensional printing, technology *Blockchain*, and artificial intelligence.

The demand for simplification and transparency in information management as well as the rationalization and optimization of highly fragmented and fragmented processes is a key driver of the digitalization of the construction sector. The integration of interoperable and integrated information and communication technology tools, along with survey techniques for optimal management of building processes, covering the design, construction, and management phases, demonstrates the complexity of the digital ecosystem that must be effectively managed by contemporary construction organizations. CRM adoption in the construction industry faces unique structural and operational challenges, reflecting the inherent characteristics of the sector. (Awan & Choudhry, 2024) identifies that although CRM has gone beyond traditional frameworks and immersed itself in innovative strategies, its implementation in the context of construction requires special consideration of the dynamics caused by cutting-edge technology and human-centered approaches that are redefining business engagement with their customers. The integration of emotional intelligence in customer relationship management, combined with the transformative power of artificial intelligence, is creating a new paradigm in how construction companies can build and maintain sustainable customer relationships. This comprehensive guide integrates theoretical foundations with practical applications, providing a solid framework for construction organizations to develop effective CRM strategies and foster sustainable customer relationships, taking into account CRM implementations across different markets and cultures that offer a unique

perspective on the universal and adaptable nature of customer management (Naim et al., 2024; Onyia et al., 2024; Vararean-Cochisa & Crisan, 2025).

The technology dimension in contemporary CRM plays a central role in shaping an organization's ability to create superior value for customers. (Kumar & Reinartz, 2018) explains that key components of a digital CRM system include platforms like Salesforce and HubSpot, predictive analytics, and omnichannel integrations that collectively increase customer engagement and loyalty. Empirical insights show that an adequate digital CRM drives profitability by increasing customer lifetime value and optimizing return on investment. In the context of the construction industry, where the sales cycle tends to be long and involves a wide range of decision-makers with diverse interests, CRM systems become a vital instrument to ensure that no business opportunity is missed and that every interaction with stakeholders is optimized to create maximum value. Automation is a fundamental aspect of modern CRM strategies, with digital CRM platforms including tools that streamline marketing operations through automated email campaigns, lead management, and retargeting workflows, reducing manual tasks while improving the reach and consistency of communication with customers.

The evolution of CRM in the digital age also reflects a fundamental shift in the power dynamics between organizations and customers. (Prior et al., 2024) confirms that customers now decide when and how they will interact with the company, creating and communicating their own messages that may be very different from those of brand owners and those that appear on social media platforms. Social CRMs, which allow users to exploit social network data for customer management purposes, have generated a large amount of data, often unstructured, that some businesses are now trying to collect, interpret, and use to create and maintain profitable long-term relationships with their customers. The customer's perspective on CRM is an important consideration, as it affects the customer experience, and it has fundamental strategic significance in determining the success of CRM implementation in construction organizations that seek to increase customer satisfaction and loyalty.

In the specific context of the construction industry, digital transformation through CRM requires a deep understanding of how technology can be integrated with existing business processes to create significant added value. (Bruno Daniotti et al., 2020) illustrates through informative case studies how the contribution of leading departments and universities in research and development activities regarding information and communication technology methods and tools for the interoperable management of different phases of the building process, including design, construction, and management, provides valuable insights for all stakeholders in the building process, including owners, designers, contractors, and facility managers, as well as the research sector. This holistic approach emphasizes the importance of integrating CRM not only as a stand-alone technology system, but as an integral part of a broader digital ecosystem that includes *Building Information Modeling*, digital project management, and multi-stakeholder collaboration systems that facilitate effective coordination throughout the construction project lifecycle (Naim et al., 2024; Onyia et al., 2024; Vararean-Cochisa & Crisan, 2025).

RESEARCH METHODS

This research uses a qualitative approach with a design *Library Research* to comprehensively explore the phenomenon of customer relationship management in the digital era in the construction sector. The literature research method was chosen for its ability to synthesize and analyze relevant scientific literature to build an in-depth understanding of the challenges and opportunities of digital CRM implementation in the context of the construction industry. The type of data used in this study is entirely secondary data sourced from reputable scientific publications, including indexed academic journals, scientific textbooks, and recent research reports published in the 2020 to 2025 time frame. The data collection technique was carried out through a systematic search of electronic academic databases such as IEEE Xplore, Springer, Emerald Insight, and ResearchGate using specific keywords that included *Customer Relationship Management*, *Digital Transformation*, *Construction Industry* and *digital CRM implementation*. The literature selection process follows strict inclusion criteria, whereby only publications that have direct relevance to the

research topic, meet academic quality standards, and present substantial empirical or conceptual findings that are included in the corpus of analysis (Scott, 2020).

Data analysis techniques adopt a thematic analysis approach to identify, analyze, and report on patterns or themes that emerge from the collected literature. The analysis process begins with an in-depth reading of the entire literature to gain a holistic understanding of the central issues Discussed, followed by systematic coding to identify key concepts, categorize findings based on theoretical and practical dimensions, and synthesize insights from various sources to build a coherent narrative of the phenomenon being studied. The main variables that are the focus of the analysis include the adoption of digital CRM technology as an independent variable, customer relationship management performance as a dependent variable, as well as implementation barriers and supporting factors as moderator variables. Measurement of variables is carried out conceptually through the identification of indicators that appear in the literature, such as the level of technology integration, customer satisfaction, operational efficiency, and customer loyalty, paying special attention to the specific context of the construction industry that has unique characteristics in terms of project complexity and multi-stakeholder involvement (Onyia et al., 2024).

RESULTS AND DISCUSSION

Transforming the Customer Relationship Management Paradigm in the Digital Era

A comprehensive analysis of the literature shows that the digital revolution has created a fundamental shift in the conceptualization and practices of customer relationship management in the construction sector. The research findings show that the implementation of *Customer Relationship Management* It is no longer perceived as a simple technological instrument for the management of consumer databases, but has transformed into a holistic business strategy that integrates advanced technological dimensions, organizational process restructuring, and a philosophical orientation that places customer satisfaction as the epicenter of the company's value ecosystem. (Khotimah & Budianto, 2024) Affirm that the motivation for implementing a customer relationship management strategy includes building unique relationships with clients and legal implementation *Pareto* in customer segmentation. Their research reveals the crucial phenomenon that a substantial majority of consumers leave companies due to poor service quality, indicating a critical urgency for construction organizations to adopt a responsive and customer satisfaction-oriented system, given that the financial impact of customer loss can reach very substantial value in industries with high project transaction values.

Comparative studies conducted (Stafrezar & Susanto, 2024) reveals significant differences between digital customer relationship management strategies and traditional approaches in the context of consumer satisfaction. Their analysis of customers from companies that implemented both strategies showed that organizations implementing digital systems demonstrated competitive advantages in the dimensions of service response speed and ease of access to information, while conventional approaches maintained advantages in building deeper emotional connections with customers. These findings imply that the construction industry faces a strategic dilemma in determining the optimal model that balances operational efficiency with relational quality. (Fernandes et al., 2023) reinforcing this argument through a comprehensive literature review demonstrating that the application of modern systems as a component of the *Business Intelligence* successfully improve organizational performance in a multidimensional manner, including financial, marketing, and operational aspects. Analysis of various scientific publications indicates the dominance of the most prominent influence on marketing and financial performance, which indicates the strategic relevance of the implementation of digital technology in achieving sustainable competitive advantage.

Integration of Digital Technology in Strengthening Relational Capabilities

A literature review identifies that the integration of advanced digital technologies such as *Artificial Intelligence*, *Analytic Big Data*, and *Internet of Things* has created a new paradigm in the management of interactions with construction industry stakeholders. (Muhammad Shofiudin et al., 2024) Identify trends in the implementation of artificial intelligence in customer relationship management systems which are mostly used to support the service needs of customer service centers and determine more effective marketing strategies through comprehensive data interpretation. This technology enables construction organizations to automate customer service processes, predict consumer behavior with high accuracy, and provide relevant personalized recommendations in a timely manner. *Real-time*, creating a transformation from traditional transactional models to digitally empowered strategic frameworks.

In (Fathoni et al., 2025), it is emphasized that social media platforms and digital ecosystems play a crucial role in increasing customer loyalty in the era of *Society 5.0*, where companies have the opportunity to offer a more personalized experience to consumers while underlining the importance of online reputation management in building trust. Their research reveals that digital technology provides an opportunity for organizations to create sustainable customer relationships through the provision of relevant content, personalized interactions, and effective reputation management. (Walenta et al., 2023) Explains that digital technology-based business strategies aim to manage and strengthen relationships between organizations and customers through improving service quality, customer satisfaction, and strengthening long-term customer loyalty and retention. Effective implementation can help construction companies improve customer satisfaction, obtain more substantial economic benefits through strategies *Up-Selling* and *Cross-selling*, as well as building ongoing relationships with clients.

Impact of Implementation on Customer Trust and Loyalty

Findings from various studies show that the trust dimension plays a crucial mediating role in the relationship between the implementation of a customer relationship management system and consumer loyalty. (Roisah et al., 2020) demonstrates through his research that the implementation of customer relationship management strategies through customer trust building has a positive and significant influence on consumer loyalty. Their findings indicate that an effective system not only increases transactional satisfaction, but also builds the foundation of trust that is a critical determinant of long-term loyalty in the construction industry. The research underscores that while digital technologies play a transformative role in the operationalization of strategies, the relational dimension and trust remain important foundations that cannot be ignored, especially in the context of the construction industry that relies on high-value projects and long-term collaborative relationships. In (Fahmi Abdul Azis et al., 2023) it is stated that reinforcing this argument by demonstrating that the combination of customer relationship management systems with product innovation has a significant influence on customer loyalty, both simultaneously and partially. These findings indicate that an integrative approach that focuses not only on technology but also on the differentiation of value propositions through innovation results in a more substantial impact on the formation of consumer loyalty. In the context of the construction industry, where competitive differentiation is often difficult to achieve due to the homogeneity of products and services, the integration of digital technology capabilities with product or service innovation is a critical strategy to create a sustainable competitive advantage and build client loyalty that is not easily swayed by competitors' offers.

Comparative Analysis of Digital versus Traditional Strategies

Comparative studies conducted (Stafrezar & Susanto, 2024) Provides valuable insights into the trade-offs between digital and traditional approaches in customer relationship management. Their research measured various critical aspects such as response speed, service comfort, communication quality, and customer loyalty, revealing that companies with digital systems tend to be superior in service speed and access convenience parameters, while traditional

approaches show advantages in building closer emotional relationships with clients. These findings have significant strategic implications for construction organizations, indicating that the choice between the two approaches is not mutually exclusive, but rather needs to be considered based on customer segmentation and specific relational contexts.

In(Fernandes et al., 2023), it is stated that through a comprehensive literature review it was identified that the effective and efficient use of technology resulted in significant improvements in organizational performance in three critical dimensions: financial, marketing, and operational. Their analysis revealed that the most dominant influence was seen on marketing and financial performance, indicating that investments in digital systems yield *Multiplier effect* which creates added value not Only in the relational dimension with customers, but also in the operational efficiency and profitability of the construction organization. Khotimah and Budianto (2024) add perspectives on implementation procedures that can be carried out through three strategies: *one-to-one marketing* which emphasizes personalization of interactions, partnership programs that build long-term collaborations, and ongoing marketing that focuses on customer retention through consistent communication.

Structural Challenges and Implementation Optimization Strategies

The literature analysis identifies the various structural and operational challenges that construction organizations face in adopting a digital-based customer relationship management system. (Walenta et al., 2023) underlines that successful implementation depends on the organization's ability to engage all internal stakeholders and establish appropriate strategies, including selecting technology vendors that fit organizational needs, providing comprehensive training for employee capability development, and systematic collection of customer data as a foundation for data-driven strategic decision-making. This complexity is compounded by the inherent characteristics of the construction industry involving various stakeholders with different systems and standards, creating inefficiencies in the integration of technology platforms and hampering cohesive digital efforts. Furthermore, (Khotimah & Budianto, 2024) identify the various impacts and obstacles that must be faced in implementation, including the challenges in changing organizational culture and ensuring the adoption of technology at all levels of the hierarchy. Resistance to change from personnel accustomed to conventional operational methods as well as a lack of skilled experts capable of operating complex digital systems are significant organizational barriers. (Muhammad Shofiudin et al., 2024) Adding that the integration of artificial intelligence in systems requires a deep understanding of how technology can be integrated with existing business processes to create significant added value, rather than simply the implementation of technology without consideration of the organization's specific operational context.

Strategic Opportunities and Implementation Policy Recommendations

The digital era opens up substantial strategic opportunities for construction organizations to increase competitiveness through the implementation of an effective customer relationship management system. (Fathoni et al., 2025) Provide practical recommendations for adaptation in the era *Society 5.0*, including providing content relevant to customer needs, creating personalized interactions based on individual preferences, and effectively managing online reputation to build trust and drive customer loyalty and growth. Ability to collect and analyze customer data from multiple sources using automated personalization and analytics *Big Data* Provide a competitive advantage in understanding client needs and responding proactively to the changing dynamics of the increasingly complex and competitive construction market. Digital transformation in customer relationship management is also opening up a broader collaborative dimension in the construction project ecosystem. Integrated CRM platform enables visualization *Real-time* project progress, transparency of communication between stakeholders, and comprehensive documentation that can be accessed by all stakeholders. (Fahmi Abdul Azis et al., 2023) Identifies that the integration of digital systems with product innovation creates a distinctive value proposition, enabling construction organizations to offer value-added services such as predictive maintenance, historical data-driven consulting, and personalized optimization recommendations based on facility usage

patterns. This capability not only increases customer satisfaction during the construction phase, but also creates sustainable business opportunities through post-construction services that generate *recurring revenue* and strengthen long-term relationships with clients.

An analysis of practical implementation reveals that construction organizations that successfully adopt digital CRM show a significant increase in *Conversion Rate* prospect becomes an actual contract, reduction *Customer Churn*, and increased value *Lifetime Value* customer. (Muhammad Shofiudin et al., 2024) explains that artificial intelligence in CRM systems allows for more precise Customer segmentation, identification of purchase patterns, and prediction of future needs that facilitate a proactive approach in relationship management. In a construction industry characterized by long sales cycles and the complexity of multi-stakeholder decision-making, the ability to anticipate client needs and provide relevant solutions before explicit requests are delivered creates substantial competitive differentiation and strengthens an organization's market position. In (Roisah et al., 2020), it is Emphasized that the importance of building customer trust as a foundation for creating long-term loyalty, indicates that technology strategies should always be integrated with a relational approach that prioritizes building trust through service consistency, communication transparency, and reliability in meeting commitments. (Stafrezar & Susanto, 2024) indicates that organizations that are able to integrate the advantages of digital systems in operational efficiency. With the strength of traditional approaches in building emotional connections will gain a superior competitive position in an increasingly competitive market. The digital transformation in customer relationship management in the construction industry represents a paradigmatic shift that requires a fundamental strategic reorientation in how organizations build and maintain relationships with stakeholders, where while implementation faces significant structural and operational challenges, the opportunity to create superior value for customers and achieve sustainable competitive advantage makes an investment in systems digital as a strategic imperative for construction organizations oriented towards long-term business growth and sustainability.

CONCLUSION AND RECOMMENDATION

A comprehensive review of the contemporary literature reveals that the implementation of digital customer relationship management in the construction industry faces a paradox between transformative opportunities and complex structural barriers. The integration of advanced technologies such as artificial intelligence, *big data analytics*, and *the Internet of Things* creates superior capabilities in service personalization, customer behavior prediction, and interaction process automation, but faces organizational resistance, data fragmentation, and limited human resource capabilities. The research findings indicate that successful implementation depends on an integrative approach that balances the operational efficiency advantages of digital systems with the power of emotional connections of traditional approaches, where the trust dimension plays a crucial mediating role in building long-term customer loyalty. The theoretical contribution of this research enriches the literature on customer relationship management in the digital age by identifying the critical factors influencing the adoption of technology in the context of the construction industry that have unique characteristics, while practically providing a strategic framework for practitioners to design effective implementation through the selection of appropriate technologies, the development of organizational capabilities, and *hybrid* strategies which optimizes the synergy between technological and relational dimensions to achieve sustainable competitive advantage.

Based on the research findings, construction organizations need to adopt a phased implementation approach that starts with mapping the existing digital ecosystem, identifying the specific needs of stakeholders, and developing a digital transformation *roadmap* that is integrated with the organization's business strategy. A top priority should be given to the development of human resource capabilities through a comprehensive training program that focuses not only on the technical aspects of the system's operations, but also on changing the mindset and organizational culture that supports technology adoption. The selection of a technology vendor should consider the ability to integrate with existing systems, scalability for future growth, and

adequate *after-sales* support to ensure operational sustainability. Construction organizations are advised to implement a *hybrid strategy* that combines the advantages of digital systems in operational efficiency with a traditional approach to building emotional relationships, tailored to customer segmentation and specific project contexts. Future research needs to explore specific implementations in the context of local construction organizations taking into account organizational cultural factors and domestic market characteristics, as well as evaluate the long-term impact of technology adoption on the profitability and competitive sustainability of Indonesian construction organizations.

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