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Digital Transformation of Customer Relationship Management in Banking: A Review of Approaches and Technologies

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Abstract: The modern competitive banking landscape has transformed customer relationship management (CRM) beyond the old-fashioned methods with the emergence of the digital-oriented approaches to customer interaction and loyalty that contribute to enhance customer engagement and efficiency of operations. The digital transformation of CRM involves the use of sophisticated technologies like machine learning (ML), big data analytics, artificial intelligence (AI), cloud computing, and automation to provide personalized, seamless and real-time banking services. Through the combination of AI-enabled chatbots, voice interfaces, predictive analytics, and omnichannel, banks able to comprehend customer needs, optimize customer services, and build specific marketing strategies. Digital CRM enhances customer insights, customer engagement, and decision-making, as well as internal streamlining. Nevertheless, issues like data protection, the compatibility of the new system with old systems, the complexity of integration, and staff adjustment have to be handled in order to facilitate a successful adoption process. All things considered, digital CRM may assist banks in raising client satisfaction, fostering enduring partnerships, and guaranteeing a competitive edge in the rapidly expanding digital financial landscape. With the further development of financial markets, it is essential to rely on digital CRM to have sustainable growth and innovation.

Keywords: Digital CRM, Banking Sector, Digital Transformation, Artificial Intelligence (AI), Data-Driven Decision Making.

INTRODUCTION

The importance of marketing in the modern globalized society where the customer is increasingly getting conscious and the technological revolution has altered the way organizations are interacting with their customers is critical. It has also redefined the scope of financial marketing in the financial sector, shifting the focus towards delivering value-based services and building long-term customer relationships, rather than just marketing products [Loonam, J. *et al*., 2018]. This has been altered radically with the emergence of the digital transformation where CRM enables banks to communicate with customers in a more logical and smart way.

The traditional CRM systems were founded on hand-based processes and disintegrated databases that limited their ability to provide prompt and personalized services [Beula, S. and Velmurugan, V. P. 2019]. CRM is transformed into a data-driven system where digital technologies allow the use of analytics and automation and artificial intelligence to get a more accurate understanding of the customers, their interactions and retention.

The banking industry is highly sensitive when it comes to customer loyalty and customer satisfaction as a factor in keeping the industry competitive. In the digital era, customers require efficient, tailored and secure relationships [Akgül, Y., & Rubacı, H. 2019]. Therefore, the digital change is viewed by banks as a strategic need within the framework of CRM to improve the quality of services delivered and work out relationships. As big data analytics, artificial intelligence and process automation are implemented, and cloud computing is used [Garg, S. 2019], banks capable of streamlining their processes, personalizing communications, and giving real-time feedback to the customer.

The internet-based CRM tools support digital banking that provides convenient, safe, and 24/7 access to financial services by the customers via digital mediums [Chitra, K., & Subashini, B. 2013]. The customer data is used to predict behaviour by such systems and tailor financial products and boost customer satisfaction and loyalty, CRM has become a strategic core activity within the banking industry that enables the

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achievement of retention, profitable and sustainable competitive advantage in the digital age.

The purpose of this paper is to address issue of digital transformation of CRM in banking sector and to pay special attention to strategies and technologies that facilitate customer engagement, customer loyalty and customer satisfaction [Sajić, M. *et al*., 2017]. Its goals are to analyze how digital technologies like big data analytics, automation, AI change the process of CRM and what the key barriers to the implementation are and the way digital CRM can convey a strategic influence on customer experience and organizational performance [Ma, J. 2017]. The digital revolution has redefined CRM as a strategic activity in the banking sector and changed it into a relationship-based approach based on data and personalized contacts with its consumers. The banks willing to embrace the complicated technologies, were able to offer efficient, flowed and customer-cantered services, and become more agile in their operations. Proper implementation of digital CRM not only enhances customer loyalty and trust but also guarantees competitiveness in the changing digital financial landscape in the long term.

STRUCTURE OF THE PAPER

The format of paper is as following: Section II explores theoretical basis of CRM in banking sector. Section III covers the strategies and technologies that make digital CRM possible. The IV section lists cons and pros of digital transformation in CRM. Research literature is reviewed in Section V, and suggestions for future research are presented in Section VI, which closes the study.

Conceptual Framework of CRM in Banking

Customer acquisition, customer retention, customer knowledge, customer value assessment, customer information system, and customer information are the six CRM dimensions. this study develops a paradigm for customer relationship management [Alehojat, S. *et al*., 2013]. Financial institutions make use of the six CRM dimensions examined in the research. The CRM practices dimension is explained below with the help of Figure 1:

Customer Knowledge Customer: Customer knowledge pertains to a comprehensive comprehension of clients, including their needs, desires, and objectives. True client relationships can only be built when a company's operations, goods, and services are in sync with one another.

Response Customer Facility: A customer's response is the company's action in response to a customer's questions or actions (Figure. 1) [Ližbetinová, L. *et al*., 2019]. Because even subtle miscommunications can lead to contrasting impressions, it is crucial to handle these inquiries with intelligence.

Customer Information System: A wide range of banking services, along with digital financial services, loans, credit and debit cards, and even personal services, are offered by banks to entice clients. Having said that, banks do provide a few necessary modern services.

Customer Value Evaluation: A full-featured CRM application, Customer Information System (CIS) lets tailor the database to specific needs with user-defined features, so it works for company instead of the other way around.

Customer Information Process: The Customer Value Evaluation (CVE) is a tool for defining and evaluating customer value propositions. In order to determine what a customer values, used a four-part metric called the Customer Value Assessment.

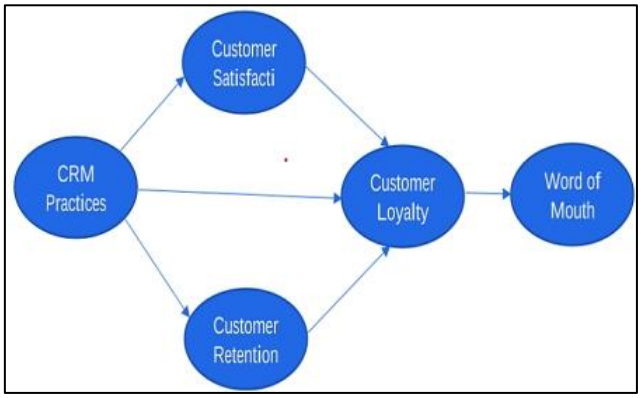

Fig 1: Conceptual Framework for CRM Practices of Banks

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Definition and Components of CRM

CRM, encompassing the understanding of consumers, discerning their needs, and responding appropriately, has become essential. An CRM system for managing customer relationships Marketing and advertising at the bank play a key role in bringing together vendors and consumers to form clientele. Building and maintaining strong customer relationships is challenging but crucial for every company's success in today's market, when customer focus should permeate all aspects of business operations. As a result of its ability to boost revenue and encourage repeat purchases through increased customer satisfaction, loyalty, and retention, CRM has become an essential strategy for all businesses [Peppard, J. 2000]. The implementation of CRM is not always successful, and this is a shame considering that CRM is one of fastest-growing administrative methods of modern business world. Banking sector firms must take seriously customer relationship management (CRM) as an investment in case they intend to achieve their business objectives.

Drivers of Digital Transformation in CRM

Digital change is driven by the possibility of engagement, which is more likely to happen with the consumer. Digital tools, such as CRM systems, social media and data analytics could assist SMEs to obtain useful customer insights regarding customer preferences and behaviour. With such insights, the SMEs can create more customized marketing campaigns and enhance customer service that translates to forging stronger relationships with the customers and enhancing customer loyalty [Joju, J. *et al*., 2017]. The digital technologies may be embraced by the banks in response to the desire of the modern customers who want individual, convenient and seamless experiences. Mobile banking applications and AI chatbots can enable banks to provide services 24/7 and live account management as well as personalized recommendations.

Additionally, the digital transformation has further led to financial inclusion whereby the banking services are availed to the underbanked population groups of people, particularly those in the rural areas [Joju, J. *et al*., 2015]. Most of the governments in the countries have come to appreciate the importance of SMEs in driving economic growth and have changed policies and programs to facilitate the digital transformation practices of the SMEs [Matosas-López, L. 2024]. Such attempts are usually in the form of funding schemes, tax breaks as well as training projects that are to help SMEs surmount the financial and ability barriers. Such alliances can provide SMEs the chance to be exposed to the latest research, best practices as well as emerging technologies to remain up-to-date on the curve in a constantly evolving digital world.

Traditional vs. Digital CRM in Banking:

Traditionally, CRM in banking industry relied on manual processes and systems which were isolated to manage customer interactions. This plan had the likelihood of curbing productivity and unified understanding of the client's needs [Abu-Shanab, E., & Anagreh, L. 2015]. Banks have converted to a more integrated and data-driven CRM model as a result of digital transformation and this model enhances customer engagement, retention and satisfaction.

Digital transformation in CRM is a collection of strategic initiatives to implement modern technologies (cloud computing, AI, big data analytics, and automation) to enhance interaction with customers and optimization of the operating processes . These technologies are useful in assisting banks to offer customers high degrees of personalization, timeliness and flow of smooth customer experiences and stay competitive in the digital era [Cvijović, J. *et al*., 2017]. Among the primary purposes of digital CRM are drawing relevant conclusions regarding customer behaviour, preferences, and expectations and providing banks with a chance to develop more responsive and adaptive approaches to customer interaction.

Applications in the Banking Sector

The use of AI in banking has transformed customer service procedure and the operations of the banks **Key applications include:**

- AI-Powered Customer Service: Chatbots and virtual assistants that are driven by AI allow banks to answer simple queries, provide real-time responses, and have 24-hour customer support.
- Voice-Based Banking Systems: Voice recognition and natural language processing (NLP) offer some convenience and accessibility to customers through the fact that they can perform banking functions by talking.
- Automation of Routine Tasks: Automation of repetitive jobs such as balance checks, transaction verifications, and fraud detection is automated by the AI [Cvijović, J. *et al*., 2017], reducing the workload of bank employees.

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- Personalized Banking Experience: Artificial intelligence data-driven models rely on customer behaviours and preferences to offer personalized recommendations on products, particular offers, and financial predictions.
- Operational Efficiency: Intelligent automation facilitates the work of companies, minimizes human errors, and helps to make decisions in the customer relationship management (CRM) systems more accurate.

Enhanced Customer Engagement: The AI applications promote the interactive and responsive and user-friendly patterns of service delivery, which, in turn, strengthen the customer relations and loyalty.

In general, the banking industry has a future of applying AI-based tools such as chatbots, voice recognition interfaces, and predictive analytics to create highly personalized, effective and responsive customer service experiences.

Strategies and Technologies Enabling Digital Crm

The use of AI, cloud computing, big data, and automation helps banks to increase customer engagement and optimize operations. Successful tactics are cantered on individualization, real-time analytics and smooth, multichannel communication to enhance customer relationships.

Strategies for Effective Digital CRM Implementation

Digitization of CRM in the banking industry can only be successfully implemented through the incorporation of new technology, combined with proper planning and alignment of an organization [Abu-Shanab, E., & Anagreh, L. 2015]. Banks need to take a comprehensive view involving the use of technology, individuals and processes to provide personalized, safe and consistent customer experiences in all channels. The strategies below provide the important enablers to proper digital CRM transformation.

Customer-Centric Strategy Formulation

Digital CRM implementation is based on a customer-centric approach. Rather than concentrating on products or services, the banks have to be customer-oriented, which means that their strategies have to be designed based on customer needs, behaviours and preferences. The utilization of big data analytics and AI-facilitated insights enables institutions to know customer journeys and anticipate their future needs. This facilitates one-to-one communication, product suggestions and proactive interaction . Customer-centric model is known to increase satisfaction as well as create long-term loyalty and trust.

Integration with Legacy Systems

The coexistence of modern CRM platforms with old banking systems is one of the greatest challenges to digital CRM adoption. To sustain the flow of its operations and data accuracy, banks must be able to integrate core banking applications, data warehouses, and digital CRM tools with ease. APIs, middleware and cloud-based integration solutions can be used to facilitate seamless data flow and interoperability. Effective integration can reduce redundancy, data synchronization in real-time, and have a single perspective of the customer at all touchpoints.

Employee Training and Organizational Culture Change

The digital CRM success is determined by the technological infrastructure and human flexibility. It is necessary to involve the staff in continuous employee training programs to make them accustomed to new digital tools and CRM capabilities. Besides, a digital-first organizational culture promotes collaboration, innovation, and responsiveness [Kaur, J., & Kaur, B. 2016]. The emphasis of change management programs should be on the shift in mindset to customer-oriented values and also to enable the employees to work with data to make better decisions and service delivery.

Data Governance and Privacy Management

As data sets of customers continue to expand exponentially, it has become essential to have strong data governance and privacy management systems. Banks should have clearly defined data collection, storage, access and sharing policies that comply with the regulatory requirements of the GDPR and the regulations by the RBI. The application of robust encryption, anonymization and access control operations guarantees the safety and privacy of customer data. Good governance improves transparency as well as instills customer trust in online banking systems.

Omni-Channel Consistency

The current generation of customers requires smooth integration of all banking channels such as mobile applications, online services, Automated Teller Machines, and even physical locations to be uniformly integrated and provide the customer a consistent experience [Achouche, S. *et al*., 2019]. Omni-channel CRM strategies allow banks to offer

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consistent services and one-to-one interaction irrespective of any channel of interaction. The communication and transaction histories are integrated across platforms to make sure that information of the customer remains current. Not only does this help to enhance the efficiency of the services but also establishes a stronger customer confidence due to continuity and convenience.

CRM Strategies Adopted by Banking Companies

Indian banking industry has experienced an amazing growth in the last 10 years as a result of economic reforms and digitization. The banks in the public and private sectors have changed into profit-oriented organisations as they maintain their developmental roles within the economy. Innovatively, the private sector banks have been in a better strategic position to learn the customer behaviour and build a long-term relationship [Githuku, W. A., & Kinyuru, R. N. 2018]. They also provide more and more value-added services and class-banking strategies targeting particular customer segments. Conversely, face-to-face communication is still an alternative that is valuable to use in the case of rural branches and mid-sized banks in order to provide them with a personal touch with the client population.

Technologies Driving Digital CRM Transformation

The emergence of digital technologies, including e-commerce platforms, social media, and mobile apps has completely transformed the environment of marketing activities. All these technological innovations have helped to transform the general, one-size-fits-all campaigns to more targeted and data-driven marketing campaigns The most significant elements of digital transformation in marketing are data analytics, CRM tools and a customer-focused approach. Some of the Technologies that are used in digital CRM are explained below:

Blockchain and Distributed Ledger Technology (DLT)

Blockchain and DLT have transformed the digital banking functions by authorizing clear, safe, and unalterable transaction systems. Blockchain is also used in CRM systems to guarantee integrity and authenticity of customer data where there is trust in the data management. It is decentralized and less likely to commit data breaches and fraud, and enhances transparency of customer relations and finance . In addition, smart contracts are useful in supporting automated service agreements and improving the level of operations and compliance in digital CRM applications.

Artificial Intelligence and Machine Learning:

The AI and ML innovations have turned out to be one of the most important technologies of digital CRM, particularly predictive analytics and personal marketing. These instruments analyze historical and real-time data and forecast the customer behaviour, preferences, and market trends with a high level of accuracy. Banks apply the algorithms of ML and predict loan defaults, creditworthiness, and investment portfolios, which leads to the reduction of financial risks and the enhancement of efficiency. Banks can also use AI-driven models to become more customer-centric by segmenting customers and creating tailored offers, communication options, and loyalty programs [Amnur, H. 2017]. Empirical data shows that AI-based predictive analytics have been able to bring significant performance, service accurate, and customer satisfaction improvements to financial institutions that implement them.

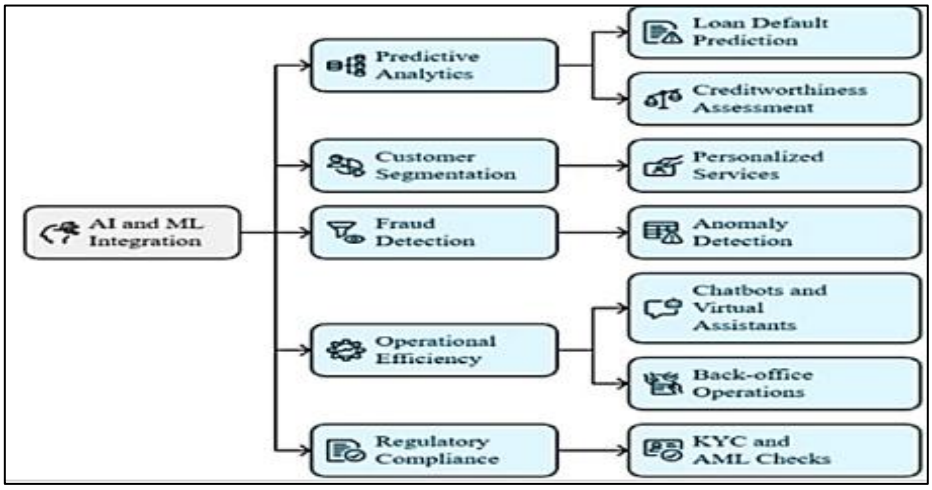

Fig 2: AI and ML Integration in Digital CRM for Banking

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The digital transformation that is facilitated in marketing refers to a paradigm shift in the way organizations think and implement their marketing strategies. Figure 2 demonstrates the manner in which AI and ML are incorporated into CRM systems to support smarter decision-making and individual financial solutions. The shift in marketing practices from traditional to digital ones is characterized by the increasing relevance of technology and data-based knowledge in determining current-day marketing practices.

Customer-Centric Approach and Personalisation

Relationship Management Software for Customers CRM Connecting potential customers with businesses offering goods and services is a primary objective of the bank's promotion and advertising division. Updates to the customer journey are necessary for banks in regards to customer-centric analytics. To better serve their clients, traditional banks have expanded their digital channels to include mobile applications and other remote access points [Sivaraks, P. *et al*., 2011]. Additionally, financial institutions create digital products, which are items offered by financial institutions that can be accessed online. The CRM, or customer relationship management system, is becoming an essential.

Data-Driven Decision Making

A client-centric strategy, CRM systems, and data analytics are essential parts of this shift, which helps businesses improve the efficacy of their marketing and get better results. The Data science that is AI-driven in BI systems facilitates strategic long-term planning, holistic risk analysis, and competitive positioning [Nguyen, T. H. *et al*., 2007]. To make strategic decisions, it is common to incorporate past information, performance levels and forecasts to determine trends and future issues or opportunities [Asad, M. *et al*., 2018]. Data analytics is practice of collecting and analyzing large volumes of data to make actionable insights that may be used to guide marketing strategies. With the help of customer behaviour and preferences, as well as engagement pattern analysis, companies able to craft their marketing campaigns in a more tailored and efficient way.

Benefits and Challenges of Digital CRM in Banking

CRM digital transformation has a number of advantages, yet it has some issues. The following are the advantages and obstacles of the digital transformation in CRM:

BENEFITS OF DIGITAL CRM

These are some of the advantages of digital transformation in CRM:

Enhanced Customer Insights: Digital transformation can help organizations collect and examine extensive data about customers, which can be useful in customer behaviour, preferences, and trends. These insights help organizations make decisions that are evidence-based, personalize customer experience and increase customer satisfaction.

Customer Engagement: Digital transformation allows the organization to reach customers in many forms, such as websites, mobile applications, social media, and email. This is a multichannel interaction that improves the interaction with customers, brand awareness, and customer relationships.

Personalized Experiences: Digital transformation allows organizations to provide personalization through the use of customer data and analytics. Personalization assists in customizing marketing messages, deals, and suggestions to specific customers to increase customer attraction and loyalty

Streamlined Processes and Efficiency: Digital transformation automates manual work, streamlines operations, and enhances efficiency of the operations.

Data-Driven Decision Making: Digital transformation provides organizations with real-time and past data, which is useful in making decisions that are driven by data. Through customer data and trends analysis, organizations are able to make prudent decisions with regard to marketing, sales and customer service programs.

Challenges of Digital CRM in Banking

In the next section, discuss the complexity of Transformation of CRM:

Data Security and Privacy: The digital transformation enhances the volume of customer data gathered and stored. There is a serious issue of data security and privacy , because organisations must meet the data protection laws and safeguard the data of the customers against cyber-attacks.

Integration Complexity: The process of digital transformation may be complicated and hard when it comes to integrating different systems, platforms

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and data sources [Eid, R. 2007]. Organizations should make sure the CRM systems, marketing automation tools, customer service systems and other pertinent systems are well integrated so as to have a coherent and cohesive picture of customer information.

Change Management and Employee Adoption: Digital transformation involves a change of culture in the organization. The employees should learn to embrace new technologies, processes and working mechanisms. Digital transformation initiatives should be embraced with change management, as well as sufficient training and support for the employees.

Legacy System Compatibility: Integrating new digital technologies into old systems can be challenging for enterprises. Incompatibility may also present itself, and organizations must deal with it to allow a fluency in data flow and information exchange between systems.

LITERATURE REVIEW

This review focuses on the AI use in banking CRM, its applications in enhancing customer experience via personalized customer service, automation, predictive analytics, and fraud detection, and the problem of data privacy and ethical issues.

Bhat (2019) provides a historical overview of the progress of primary drivers of digitization and digital banking in the sector. We also look at the significance of fintech, how it affects traditional banks, and the difficulties the traditional banking sector faces when putting digital ideas into practice. The study examines the influence of digitalization on customer satisfaction and experience, and also its potential influence on banking industry market. It also assesses advantages and disadvantages of digitization from a regulatory perspective and emphasizes value of cybersecurity in digital banking world. This study intends to deliver an in-depth analysis of the positives and cons of digital transformation in the banking industry [Bhat, S., & Pub, I. 2019].

Agrawal (2019) Through the completion of several customer surveys, an effort has been made to ascertain the CRM practices of ICIC and SBI banks in the Western UP region. CRM is one of the developing business techniques in contemporary situation that directly influences the growth and profitability of banking sector. It is a customer-focused approach that interacts with consumers. It enables the banking sector to discover their most profitable consumers and targeting them to build a long term profitable and mutual beneficial connection with the customers. In Indian banking sector, Customer Relationship Management is still under developing stage [Agrawal, V. 2019].

Daqar and Smoudy (2019) This study aims to investigate how CRM affects consumer purchasing behavior. The researcher used primary data through a close-ended structured survey distributed at banks clients in Palestine, and the second source of data is the interviews with selective banks top management in Palestine who work with CRM. The outcomes of this research effort demonstrated that there is a favorable significant association between CRM and consumer buying behavior. The researchers found that Consumers Buying Behavior significantly predicted CRM. Consumer purchasing behavior was proven to be a strong predictor of CRM. Additionally, respondents agreed that sales promotion is the most significant instrument that influences consumers' purchasing decisions, while integrated marketing communication tools have no discernible effect [Daqar, M. A. A., & Smoudy, A. K. 2019].

Kebede and Tegegne (2018) studied the impact of CRM techniques on the performance of commercial banks in Ethiopia's Amhara region. However, in the context of enterprises in developing nations like Ethiopia, the dearth of research papers on CRM continues to be a significant problem. By putting CRM best practices into reality, this research idea will help the bank perform better, particularly in terms of customer happiness. For aim of this study, dimensions of CRM practices include Key Customer Focus, Knowledge Management, CRM organization and Technology-Based CRM [Kebede, A. M., & Tegegne, Z. L. 2018].

Hassan and Bin-Nashwan (2017) A review of empirical studies from various journals and conference papers, spanning the years 2005 to 2015, is conducted. It founds are various in terms of publication trend, sectors, CRM classification, and nations researched. Service quality (SQ), service access (SA), and handling complaints (HC) are the three characteristics that have been widely employed in previous research that examine the influence of CRM on customer satisfaction and customer loyalty. Customer loyalty and satisfaction are proven to be impacted by these aspects. The study serves academics as well as professionals in the context by contributing to the

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existing research on CRM while offering insights into what drives CRM in real practice [Bin-Nashwan, S. A., & Hassan, H. 2017].

Iriqat and Daqar (2017) seeks to examine the impact of CRM on Long-term Customers' Loyalty in Palestinian banking business. The data was acquired through distributing surveys on the Palestinian banks staff. The dependent variable "long-term customers' loyalty" and CRM, which includes service quality, customer databases, problem-solving, employee behavior, and CRM system integration, have a positive and strong linear relationship, according to the results of this study's multiple regression analysis tests. At the end, the two predictors explained 48.2% of variance in long-term customers' loyalty [Iriqat, R. A., & Daqar, M. A. M. A. 2017].

Table I presents some of the recent research on CRM and digital transformation in banking sector, with focus on AI, BI, digital literacy, service quality, and E-CRM. The results indicate better customer experience, loyalty, and personalization, and the issues are the question of data privacy, limitation of scope, and skills gaps. The future prospects include wider use and safe and technology-based CRM implementation.

Table 1: Comparative Analysis of Recent Studies on CRM and Digital Transformation In Banking
AuthorsFocus Area Objectives Key Findings Limitations Research Gaps

Authors	**Focus Area**	**Objectives**	**Key Findings**	**Limitations**	**Research Gaps**
Bhat (2019)	Digital banking evolution, fintech, cybersecurity	To provide a historical overview of digital banking, identify drivers of digitization, analyze fintech impact, and examine regulatory challenges and cybersecurity requirements.	Digitalization enhances customer satisfaction and operational efficiency. Fintech disrupts traditional banking but drives innovation. Cybersecurity is a critical requirement for digital ecosystems. Regulatory advantages and disadvantages influence adoption pace.	Limited empirical validation; mostly conceptual and descriptive. Focused more on general trends than specific technological impacts.	Need for more empirical studies on customer experience outcomes. Lack of region-specific insights on digital transformation challenges. Insufficient study on cybersecurity readiness frameworks.
Agrawal (2019)	CRM practices in SBI and ICICI Bank (Western UP)	To analyze CRM practices through customer questionnaires and assess their role in customer-centric strategies.	CRM directly influences banking growth and profitability. Helps identify profitable customers, improving long-term relationships. CRM in Indian banks remains underdeveloped.	Limited to two banks in one geographic region. Relies solely on questionnaire-based data.	Need for comparative studies across diverse Indian regions and bank categories.- Lack of advanced CRM technology adoption analysis.
Daqar & Smoudy (2019)	CRM and consumer buying behavior (Palestine)	To investigate how CRM influences consumer buying behavior using surveys and interviews.	Strong positive relationship between CRM and consumer buying behavior. Sales promotion significantly impacts customer decisions.	Study limited to Palestinian banks; findings may not generalize globally. Self-reported data may contain biases.	Need for studies linking CRM with digital marketing tools. Limited exploration of cross-cultural CRM effects.

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			Integrated Marketing Communication tools have no significant effect.		
Kebede & Tegegne (2018)	CRM practices and bank performance (Ethiopia)	To examine CRM dimensions (Knowledge Management, Key Customer Focus, Tech-based CRM, CRM organization) and their effect on bank performance.	CRM practices significantly improve bank performance and customer satisfaction.- CRM is under-researched in developing countries like Ethiopia.	Narrow scope limited to Amhara region commercial banks.- Lack of technological capability assessment in CRM implementation.	Need for longitudinal studies to measure long- term CRM impact. Exploration of digital/AI-based CRM tools is missing.
Hassan & Bin-Nashwan (2017)	Review of CRM studies (2005–2015)	To review CRM literature across industries and countries, identifying common dimensions influencing satisfaction and loyalty.	Service quality, service access, and complaint handling are key CRM dimensions CRM significantly affects customer satisfaction and loyalty across sectors.	Review lacks sector-specific depth for banking. Limited inclusion of recent digital CRM advancements.	Need for updated reviews including AI-driven CRM. Lack of insights into CRM implementation barriers in emerging markets.
Iriqat & Daqar (2017)	CRM and long-term customer loyalty (Palestine)	To study CRM's impact on long-term customer loyalty using regression analysis.	Strong positive relationship between long-term loyalty and CRM. CRM dimensions such as employee behavior, service quality, problem-solving, and system integration significantly influence loyalty. CRM explains 48.2% of loyalty variance.	Focused only on employees' perspectives, not customers. Limited to Palestinian banking context.	Need for multi-stakeholder (customers + employees) studies.- Insufficient analysis of technology-enabled CRM systems.

CONCLUSION AND FUTURE WORK

The digital revolution is redefining CRM in the banking sector. Using modern skills like big data analytics, ML, AI, and blockchain, banks can offer customers efficient, convenient, and customized service. The paper outlines the conceptual framework of CRM, focusing on essential dimensions like customer knowledge, response, information systems, customer-focused processes, and value evaluation. Digital CRM strategies help create a better understanding of customers, engage customers more effectively, improve operational efficiency, and enable better-informed decisions. But data privacy issues, legacy system integration, and organizational change management remain serious considerations. When banks effectively align technology use with strategic planning and the workforce's willingness, they can create stronger customer relationships, build trust, and achieve sustainable competitive advantage. In general, digitalization of the CRM is a revolutionary solution to improving the banking

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services in a more competitive and technological world.

Researchers can consider how digital CRM can use new technologies in the future, such as increased predictive analytics, the IoT, and AR. Also, there can be research to explore how to increase digital inclusion, customer experience in different demographic groups, and adaptive CRM models to address changing customer behaviours, regulations, and market trends within the banking industry.

REFERENCES

1. Loonam, J., Eaves, S., Kumar, V., & Parry, G. "Towards digital transformation: Lessons learned from traditional organizations." *Strategic Change* 27.2 (2018): 101-109.
2. Beula, S. and Velmurugan, V. P. "Recent Trends in Customer Relationship Management With Special Referance To Life Insurance Corporation India," *Int. J. Res. Anal. Rev*., 6.1, (2019): 184–194,
3. Akgül, Y., & Rubacı, H. "Digital customer engagement dimensions in digital transformation and a framework suggestion for retail banking." *Journal of Life Economics* 6.3 (2019): 239-248.
4. Garg, S. "Predictive analytics and auto remediation using artificial inteligence and machine learning in cloud computing operations." *Available at SSRN 5267117* (2019).
5. Chitra, K., & Subashini, B. "Data mining techniques and its applications in banking sector." *International Journal of Emerging Technology and Advanced Engineering* 3.8 (2013): 219-226.
6. Sajić, M., Bundalo, D., Bundalo, Z., & Pašalić, D. "Digital technologies in transformation of classical retail bank into digital bank." *2017 25th telecommunication forum (TELFOR)*. IEEE, (2017).
7. Ma, J. "Design of Bank Credit Card Customer Relationship Management System Based on MVC Mode." *2017 2nd International Conference on Materials Science, Machinery and Energy Engineering (MSMEE 2017)*. Atlantis Press, (2017).
8. Alehojat, S., Chirani, E., & Delafrooz, N. "Conceptual Framework of CRM Process in Banking System." *Arabian Journal of Business and Management Review* 1.2 (2013): 341-352.
9. Ližbetinová, L., Štarchoň, P., Weberová, D., Nedeliaková, E., & Juříková, M. "The approach of SMEs to using the customer databases and CRM: Empirical study in the Slovak Republic." *Sustainability* 12.1 (2019): 227.
10. Peppard, J. "Customer relationship management (CRM) in financial services." *European management journal* 18.3 (2000): 312-327.
11. Joju, J., Vasantha, S., & Manoj, P. K. "Future of brick and mortar banking in Kerala: Relevance of branch banking in the digital era." *International Journal of Civil Engineering and Technology* 8.8 (2017): 780-789.
12. Joju, J., Vasantha, S., & Manoj, P. K. "E-CRM: A perspective of Urban and Rural Banks in Kerala." *International Journal of Recent Advances in Multidisciplinary Research* 2.09 (2015): 0786-0791.
13. Matosas-López, L. "The importance of customer relationship management systems to business management and marketing strategies." (2024).
14. Abu-Shanab, E., & Anagreh, L. "Impact of electronic customer relationship management in banking sector." *International Journal of Electronic Customer Relationship Management* 9.4 (2015): 254-270.
15. Cvijović, J., Kostić-Stanković, M., & Reljić, M. "Customer relationship management in banking industry: Modern approach." *Industrija* 45.3 (2017).
16. Kaur, J., & Kaur, B. "The influence of e-CRM competitive advantage on e-CRM performance in the Indian banking industry." *Strategic Change* 25.5 (2016): 537-550.
17. Achouche, S., Yalamanchi, U. B., & Raveendran, N. "Method, apparatus, and computer-readable medium for performing a data exchange on a data exchange framework." U.S. Patent No. 10,387,195. 20 Aug. (2019).
18. Githuku, W. A., & Kinyuru, R. N. "Digital banking and customer relationship in banking industry in Kenya." *International Academic Journal of Human Resource and Business Administration* 3.2 (2018): 14-32.
19. Amnur, H. "Customer relationship management and machine learning technology for identifying the customer." *JOIV: International Journal on Informatics Visualization* 1.1 (2017): 12-15.
20. Sivaraks, P., Krairit, D., & Tang, J. C. "Effects of e-CRM on customer–bank relationship

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quality and outcomes: The case of Thailand." *The Journal of High Technology Management Research* 22.2 (2011): 141-157.
21. Nguyen, T. H., Sherif, J. S., & Newby, M. "Strategies for successful CRM implementation." *Information management & computer security* 15.2 (2007): 102-115.
22. Asad, M., Ahmad, I., Haider, S. H., Salman, R., Asad, D. M., Ahmad, I., & Salman, D. R. "A crital review of Islamic and conventional banking in digital era: a case of Pakistan." *International Journal of Engineering & Technology* 7.4 (2018): 57-59.
23. Eid, R. "Towards a successful CRM implementation in banks: An integrated model." *The service industries journal* 27.8 (2007): 1021-1039.
24. Bhat, S., & Pub, I. "Exploring the Impact of Digital Transformation on The Banking Sector: Opportunities and Challenges." *International Journal of Management* 10 (2019): 132-143.
25. Agrawal, V. "Customer Relationship Management Practices in Banking: A Comapartive Study of SBI and ICICI Bank." *Research Journal of Humanities and Social Sciences* 10.4 (2019): 1025-1028.
26. Daqar, M. A. A., & Smoudy, A. K. "The impact of consumer buying behavior on customer relationship management in the banking sector." *International Review of Management and Marketing* 9.4 (2019): 39.
27. Kebede, A. M., & Tegegne, Z. L. "The effect of customer relationship management on bank performance: In context of commercial banks in Amhara Region, Ethiopia." *Cogent Business & Management* 5.1 (2018): 1499183.
28. Bin-Nashwan, S. A., & Hassan, H. "Impact of customer relationship management (CRM) on customer satisfaction and loyalty: A systematic review." *Journal of Advanced Research in Business and Management Studies* 6.1 (2017): 86-107.
29. Iriqat, R. A., & Daqar, M. A. M. A. "The Impact of customer relationship management on long-term customers' loyalty in the Palestinian banking industry." *International Business Research* 10.11 (2017): 139.
30. Gupta, A. K., Polu, A. R., Narra, B., Buddula, D. V. K. R., Patchipulusu, H. H. S., & Vattikonda, N. "Leveraging deep learning models for intrusion detection systems for secure networks." *Journal of Computer Science and Technology Studies* 6.2 (2024): 199-208.
31. Narra, B., Buddula, D. V. K. R., Patchipulusu, H., Vattikonda, N., Gupta, A., & Polu, A. R. "The integration of artificial intelligence in software development: Trends, tools, and future prospects." *Available at SSRN 5596472* (2024).
32. Achuthananda, R. P., Bhumeka, N., Dheeraj Varun Kumar, R. B., Hari Hara, S. P., & Navya, V. "Evaluating machine learning approaches for personalized movie recommendations: A comprehensive analysis." *J Contemp Edu Theo Artific Intel: JCETAI-115* (2024).
33. Waditwar, P. "The Intersection of Strategic Sourcing and Artificial Intelligence: A Paradigm Shift for Modern Organizations." *Open Journal of Business and Management* 12.06 (2024): 4073-4085.
34. Bitkuri, V., Kendyala, R., Kurma, J., Mamidala, J. V., Attipalli, A., & Enokkaren, S. J. "A Survey on Blockchain-Enabled ERP Systems for Secure Supply Chain Processes and Cloud Integration." *International Journal of Technology, Management and Humanities* 10.04 (2024): 126-135.
35. Mamidala, J. V., Bitkuri, V., Attipalli, A., Kendyala, R., Kurma, J., & Enokkaren, S. J. "Machine Learning Approaches to Salary Prediction in Human Resource Payroll Systems." *Journal of Computer Science and Technology Studies* 6.5 (2024): 341-349.
36. Waditwar, P. "AI for Bathsheba Syndrome: Ethical Implications and Preventative Strategies." *Open Journal of Leadership* 13.03 (2024): 321-341.
37. Attipalli, A., Kendyala, R., Kurma, J., Mamidala, J. V., Bitkuri, V., & Enokkaren, S. J. "Privacy Preservation in the Cloud: A Comprehensive Review of Encryption and Anonymization Methods." *International Journal of Multidisciplinary on Science and Management IJMSM* 1.1 (2024).
38. Tamilmani, V., Maniar, V., Singh, A. A., Kothamaram, R. R., Rajendran, D., & Namburi, V. D. "A Review of Cyber Threat Detection in Software-Defined and Virtualized Networking Infrastructures." *International Journal of Technology, Management and Humanities* 10.04 (2024): 136-146.
39. Singh, A. A. S., Kothamaram, R. R., Rajendran, D., Deepak, V., Namburi, V. T., & Maniar, V. "A Review on Model-Driven Development with a Focus on Microsoft PowerApps." *International Journal of*

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Humanities, Science Innovations and Management Studies 1.1 (2024): 43-56.
40. Padur, S. K. R. "AI-augmented platform engineering: Redefining developer experience through autonomous, self-optimizing enterprise systems." *International Journal of Science, Engineering and Technology* (2024).
41. Gangineni, V. N., Tyagadurgam, M. S. V., Pabbineedi, S., Penmetsa, M., Bhumireddy, J. R., & Chalasani, R. "AI-Powered Cybersecurity Risk Scoring for Financial Institutions Using Machine Learning Techniques (Approved by ICITET 2024)." *Journal of Artificial Intelligence & Cloud Computing* (2024).
42. Sagili, S. R., Goswami, C., Bharathi, V. C., Ananthi, S., Rani, K., & Sathya, R. "Identification of Diabetic Retinopathy by Transfer Learning Based Retinal Images." *2024 9th International Conference on Communication and Electronics Systems (ICCES)*. IEEE, (2024).
43. Sagili, S. R., & Kinsman, T. B. "Drive dash: Vehicle crash insights reporting system." *2024 International Conference on Intelligent Systems and Advanced Applications (ICISAA)*. IEEE, (2024).
44. Padur, S. K. R. "Securing Oracle Integration Cloud ERP ecosystems, zero trust architecture, data governance, and compliance automation." *International Journal of Science, Engineering and Technology* 12.4 (2024): 10-5281.
45. Sagili, S. R., Chidambaranathan, S., Nallametti, N., Bodele, H. M., Raja, L., & Gayathri, P. G. "NeuroPCA: Enhancing Alzheimer's disorder Disease Detection through Optimized Feature Reduction and Machine Learning." *2024 Third International Conference on Electrical, Electronics, Information and Communication Technologies (ICEEICT)*. IEEE, (2024).
46. Sagili, S. R., Veeranjaneyulu, K., Puli, B., Sundaramoorthy, P., Murugadoss, R., & Keerthana, N. V. "Advancing Cervical Cancer Identification using Generative-based Adversarial Networks: An Integrative Learning Methodology." *2025 6th International Conference for Emerging Technology (INCET)*. IEEE, (2025).
47. Routhu, K. K. "Beyond Automation: AI-Powered Employee Engagement Journeys in Oracle HCM Cloud." *KOS Journal of AIML, Data Science, and Robotics* 1.1 (2024): 1-6.
48. Routhu, K. K. "The future of HCM: Evaluating Oracle's and SAP's AI-powered solutions for workforce strategy." *Journal of Artificial Intelligence, Machine Learning & Data Science* 2.2 (2024): 2942-2947.
49. Sannapureddy, R., Nadella, V. M., & Nelavelli, S. "Edge–Cloud Continuums for Latency-Sensitive Tasks." *International Journal of AI, BigData, Computational and Management Studies* 5.4 (2024): 189-201.
50. Arigela, A. K., Brahmareddy, A., Sreenivas, T. S., Selvan, M. P., Venu, N., & Lal, D. K. "Optimizing Energy Efficiency and Latency in IoT Devices Through AI-Based Adaptive Protocols in Fog-Edge Computing Environments." *Congress on Smart Computing Technologies*. Singapore: Springer Nature Singapore, (2024).
51. Nadella, V. M. "Al-Native 6G Network Management." *American International Journal of Computer Science and Technology* 6.1 (2024): 23-37.

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