

A Survey on Integration of Blockchain with existing CRM systems

Shivaswamy D S^{1*}, Dr. Hanumanthappa M², Bharathi N³, Veena R⁴,
Harshitha B P⁵

¹Assistant Professor, Department of Computer Science, Seshadripuram College, Bangalore –560020,
Karnataka, India.

²Professor, Department of Computer Science, Bangalore University, Bengaluru, Karnataka, India

³Assistant Professor, Post Graduate Department of Computer Applications, Seshadripuram College, Bangalore
–560020, Karnataka, India.

⁴Assistant Professor, Post Graduate Department of Computer Applications, Seshadripuram College, Bangalore
–560020, Karnataka, India.

⁵Assistant Professor, Department of Commerce, Seshadripuram Evening College, Bangalore –560020,
Karnataka, India.

Corresponding Author E-mail: swamyrajds@gmail.com

ABSTRACT:

The widespread adoption of information and communication technology, coupled with online business platforms and smartphone technology, has profoundly reshaped the landscape of business-to-consumer interactions. These advancements have not only prompted organizations to restructure but have also revitalized the way value is created in the marketplace. Therefore, it enables business professionals to expand their customer reach through Customer Relationship Management (CRM) a customized targeting, thereby enhancing brand trust and loyalty. Internet-enabled technologies facilitate the creation of new digital markets and generate increased demand for products and services. These technologies significantly bolster market engagement and customer targeting. But, CRM is evolving in digital landscape where it encounters many challenges in providing secure data. To secure the data, emerging technologies like Blockchain are integrated into CRM system to overcome the challenges such as adopting new technologies, infrastructure upgradation, compatibility, and adherence to the regulations

KEYWORDS: Customer relationship Management, Blockchain, Conventional, Data Security.

Date of Submission: 05-08-2024

Date of acceptance: 16-08-2024

I. INTRODUCTION:

Modern logistics and supply chain management utilize CRM software to effectively handle customers, vendors, manufacturing, sales, and demand forecasting using mobile-connected tools. Mobile phones and RFID readers integrate with CRM systems, delivering real-time data and information that facilitate precise and prompt decision-making for transactions, inventory, and manufacturing schedules. Incorporating blockchain technology into CRM systems can greatly improve data security, transparency, and operational efficiency, providing businesses with an edge in today's rapid-moving market.

By decomposing the facilitating conditions into shared beliefs, project communication, and training, we predict that CRM adoption can be significantly enhanced through targeted intervention measures. [2]

Identifying key obstacles such as inadequate strategic planning, limited forward relations, and infrastructural issues, these findings reveal challenges that may similarly affect the adoption and effective use of blockchain in CRM systems. However, the shifting mind-sets and emphasis on organisations indicate a growing readiness for technological advancements. Implementing blockchain technology in CRM can mitigate these challenges by improving data security, transparency, and collaboration. [1]

II. LITERATURE REVIEW

The body of research on blockchain-based CRM systems is extensive, encompassing diverse facets of the technology, its practical applications, and the obstacles it presents. This review comprehensively analyses key research discoveries, particularly focusing on strategies to safeguard customer data amidst the digital

transformation.

In “Emerging Technologies in CRM: Opportunities and Challenges” by Dr. Ajeet Singh and Aakanksha, it is explained about various opportunities available for the Implementation of Technologies in CRM such as Social CRM, Chatbot’s and Virtual Assistants, Blockchain for CRM. They have mentioned that Blockchain’s rise in non-monetary applications is fueled by its core attributes of security, trust, immutability, and transparency. These strengths are bolstered by blockchain’s consensus mechanisms and distributed ledger technologies, which depend on the active participation and validation of numerous network nodes.

A paper by Mahmoud Farouk and Saad M. Darwish on “Reverse Logistics Solution in e-Supply Chain Management by Blockchain Technology”, illustrates how to solve the problem of reverse logistics in e-SCM using blockchain technology to enhance transparency and trust through the chain. They have introduced a new framework that integrates supplier relationship management (SRM) with customer relationship management (CRM) in application suite by blockchain technology. This framework can appear in digital products in reverse logistics by saving all information in blockchain to make the operation of transferring them to supplier without any extra cost or difficulty. Blockchain addresses transparency and reverse logistics challenges in e-Supply Chain Management (e-SCM) by linking Customer Relationship Management (CRM) with Supplier Relationship Management (SRM) through communication messages that translate all client and supplier transactions. This collaboration hinges on trust between partners to achieve shared goals. A single shared database across the distributed network records all transactions as a definitive source of truth for participants, facilitating efficient reverse logistics operations without additional costs. Blockchain’s tamper-proof data recording in multiple blocks ensures authenticity, origin verification, and data integrity. This peer-to-peer network, coupled with distributed time-stamping, enables autonomous management of Blockchain databases

A paper “Modeling the Integrated Customer Loyalty Program on Blockchain Technology by Using Credit Card” by Jaewon Choi, explained how to implement an integrated customer loyalty program process in credit card-based blockchain technology and how to identify the importance of blockchain technology to improve customer loyalty programs

Blockchain-based CRM systems provides valuable perspectives on leveraging this technology to bolster the security of data amidst the ongoing technology to revolutionize and modernize traditional ways of doing things within an organization. While several studies have explored the integration of blockchain with Customer relationship management system research across various sectors is essential to tackle existing challenges and explore forthcoming prospects in this swiftly evolving digitalized environment.

Obstacles in Conventional CRM Systems and Cybersecurity

Conventional CRM systems have long been instrumental in overseeing customer data and fostering business connections. Yet, these systems encounter notable hurdles, especially concerning confidentiality and security of data. With organizations increasingly adopting digital transformation, the accumulation of sensitive customer data grows exponentially. This valuable data becomes a prime target for cyber threats, as criminals perpetually refine tactics to exploit vulnerabilities in Conventional CRM systems. Consideration of these challenges is paramount for businesses aiming to protect customer trust and uphold service integrity in today’s digital landscape.

Conventional CRM systems face significant challenges due to their centralized architecture. Centralization, with its reliance on a single control point, exposes these systems to heightened risks of cyber-attacks and data breaches. In the event of a security breach, hackers could potentially compromise all stored customer data, causing severe repercussions for businesses and their clientele alike. The centralized structure of these systems creates a vulnerability where any system malfunction or outage could destabilize the entire CRM infrastructure, causing prolonged downtime and potential revenue loss. These vulnerabilities emphasize the critical importance of adopting more resilient and decentralized CRM solutions in today’s digital landscape.

Data privacy remains a critical issue for organizations using Conventional CRM systems. As consumer awareness of data privacy grows, safeguarding sensitive customer information becomes paramount. Conventional CRM systems often face difficulties in staying abreast of advancing data protection measures laws like GDPR. Non-compliance can lead to substantial fines, damage to reputation, and a loss of consumer belief.

Furthermore, incorporating diverse digital technologies into an organization’s infrastructure poses challenges for Conventional CRM systems. Technologies such as AI, ML, and IoT enhance system complexity, generating new vulnerabilities for potential cyberattacks. Maintaining the security of consumer information in this interrelated environment requires continuous alertness and adaptability, qualities that Conventional CRM systems may find difficult to achieve.

Human error significantly contributes to the vulnerability of Conventional CRM systems. Employees responsible for managing consumer information often represent the most vulnerable point in an organization’s

security framework. Instances like phishing attacks or misconfigurations can lead to the inadvertent exposure of sensitive information. While educating employees to identify and mitigate such risks is vital for maintaining data security, the persistent nature of human error poses an ongoing challenge.

The growing complexity of cyber threats presents a formidable hurdle for Conventional CRM systems. Hackers continually innovate with fresh methods and technologies to capitalize on organizational vulnerabilities, complicating efforts for businesses to maintain an edge. Furthermore, the escalation of state-backed cyber assaults and the establishment of sophisticated cybercrime networks have elevated the scale of coordination and resources committed to malicious endeavours.

Conventional CRM systems encounter significant hurdles regarding confidentiality and security of data, such as centralized architecture vulnerabilities, data privacy apprehensions, integration complexities with other digital technologies, human errors, and the dynamic landscape of cyber threats. These challenges underscore the necessity for more secure alternatives, like blockchain technology based CRM systems, to safeguard consumer information and uphold trust in the era of digital transformation.

Foundational Tenets of Blockchain and its impact on CRM Systems.

Blockchain technology rests on three core tenets: Peer-to-peer network, Immutability and Cryptographic techniques. These pillars shape blockchain's distinct qualities and hold profound inferences for fortifying the security and trustworthiness of consumer information within CRM system.

Peer-to-peer network in blockchain system, involves distributing data across numerous nodes rather than consolidating it in a single central location. This arrangement eradicates the risk of a critical vulnerability and minimizes the likelihood of data breaches, requiring an attacker to gain control over the majority of the nodes. Within CRM systems, decentralization offers a robust and resilient structure for handling customer data, markedly enhancing security and diminishing susceptibility to attacks and breaches when contrasted with centralized systems.

Immutability is a foundational principle of blockchain technology, ensuring that once data is entered into the blockchain, it cannot be altered or tampered with. Each block in the chain is connected with a unique cryptographic hash of the preceding block, forming a secure and unchangeable sequence. Any effort to modify the data in a block would alter its hash, triggering an alert across the network and rendering the entire chain invalid. In CRM systems, immutability is pivotal for safeguarding the integrity and reliability of consumer information. By guaranteeing that consumer information cannot be altered or corrupted, blockchain technology based CRM systems significantly elevate security and transparency. This fosters a heightened level of trust between businesses and their clientele, underpinned by the immutable nature of blockchain technology.

Cryptography is a key element of blockchain technology, crucial for securing data and ensuring privacy. Blockchain uses techniques like public-key cryptography and hashing algorithms to protect information. Public-key cryptography uses a pair of keys: a public key for everyone and a private key kept secret. This method secures transactions and safeguards customer data in CRM systems, allowing only authorized users to access and modify sensitive information.

Integrating blockchain principles into CRM system holds great potential for significantly enhancing their security, integrity, and privacy. Decentralization creates a stronger and more robust infrastructure, minimizing exposures to cyberattacks and data breaches. Immutability ensures that customer data remains unaffected and secure, thus fostering trust between businesses and their customers. Cryptography further strengthens security by encrypting customer data, limiting access to authorized users only and safeguarding sensitive information from unauthorized parties.

In summary, integrating these core principles - decentralization, immutability, and cryptography - into CRM systems offers a viable solution to the security and privacy challenges encountered with conventional methods. This approach enables businesses to elevate the security, integrity, and reliability of consumer information, providing a more robust and privacy-conscious solution in today's digital era of transformation.

The following features play an important role in providing specific security measures:

- ❖ **Data Storage:** Decentralized storage enhances data security by distributing data across multiple nodes or locations rather than storing it centrally in a single location. This reduces the risk of data breaches because compromising one node does not result in the exposure of all data, as would be the case in a centralized storage system.
- ❖ **Secure Sharing:** Blockchain technology facilitates for securing the consumer information and transparent data sharing among approved authorities while preserving confidentiality and consumer information through cryptographic techniques. This ensures that sensitive information remains confidential while enabling

verified parties to access and interact with shared data securely and efficiently.

- ❖ **Permanence Records:** Permanence safeguards the integrity and authenticity of records, preventing fraud and unauthorized alterations.
- ❖ **Data Tracking:** The blockchain technology offers a transparent and auditable ledger of all trades, simplifying tracking and audit processes.
- ❖ **Accessibility:** Cryptographic techniques ensure that only authorized parties can access and manage data securely.
- ❖ **Privacy Preservation:** Advanced cryptographic techniques ensure the confidentiality of information, prioritizing the privacy and security of users and their data.

Customer Relationship Management

Customer Relationship Management (CRM) encompasses four fundamental components: understanding, selling, servicing, and targeting, necessitating a deep understanding of both the market and customers. Emerging technologies in CRM are revolutionizing numerous industries, including CRM itself, which focuses on enhancing satisfaction, loyalty, and business success by managing and nurturing customer relationships. Integrating these technologies into CRM systems offers businesses opportunities to refine their customer-centric strategies, but it also poses challenges that require careful consideration for successful implementation.

CRM has become indispensable in modern business strategies, enabling effective management of customer interactions and the cultivation of enduring relationships. Recent technological advancements have significantly transformed the CRM landscape, presenting new avenues and obstacles for businesses seeking to elevate customer engagement and satisfaction. This research paper aims to analyse and explore emerging CRM technologies, their future prospects, and the challenges businesses may encounter in adopting and implementing these technologies effectively.

CRM systems play a crucial role for contemporary businesses aiming to enhance customer relationships, streamline operations, and foster growth. By centralizing customer data and delivering actionable analytics, CRM systems enable businesses to deliver exceptional customer experiences, retain valuable clients, and drive sustainable growth. As digital transformation advances, the importance of secure and efficient CRM systems will only grow, reinforcing their status as a cornerstone of organizational strategy.

Blockchain

Blockchain technology originated as the underlying framework for Bitcoin in 2009, initially maintaining a low profile. As its reputation for reliability grew, the broader potential of blockchain became increasingly evident and gained recognition beyond its initial enthusiasts. Since then, the technology has advanced rapidly, continually revealing new use cases and applications.

Trends such as early adoption by enterprises, evolving usage patterns, increased research and development expenditures, and growing venture capital investments indicate that blockchain technology is approaching a crucial juncture for integration into mainstream and corporate environments. While investment opportunities in pure blockchain ventures remain limited, the technology holds significant implications for public companies across diverse sectors. The surge in venture capital funding for blockchain-related start-ups is accelerating, with many poised to disrupt large markets in their early phases of development. [3]

Blockchain technology is crucial because it solves the double-spending problem. This issue arises when the same digital currency or asset is spent multiple times, potentially causing fraud and reducing the value of the currency. To illustrate, consider a concert ticket: if the ticket is digital and not properly secured, multiple people could use the same ticket to enter the venue, causing confusion and overcrowding. Similarly, in digital currencies like Bitcoin, it's essential that each unit of currency is uniquely spent once to prevent financial fraud and ensure stability.

Blockchain technology resolves this issue by establishing transparency and verification for all transactions. When a transaction is initiated, it is broadcasted across a network of miners—computers dedicated to maintaining the blockchain. These miners validate the transaction to ensure the digital currency hasn't already been spent. Once validated, the transaction is recorded in a block and added to the blockchain, creating an immutable and transparent ledger that eliminates the possibility of double-spending. This decentralized verification process guarantees the security and trustworthiness of digital currencies.

Through incorporating foundational blockchain security features, CRM systems can elevate data protection, operational efficiency, and trust levels, thereby enhancing the customer experience and securing sensitive information effectively.

Important Key features of Blockchain Technology in CRM are:

- ❖ **Secure Identity Management**

Blockchain technology revolutionizes customer identity verification through its decentralized and tamper-proof system. By securely storing each customer's identity on the blockchain, personal information is shielded from unauthorized access and fraud.

The immutable nature of blockchain guarantees that once an identity is verified and recorded, it remains unalterable, establishing a dependable and secure method for managing customer identities. This innovative approach not only enhances security but also instils confidence in businesses and customers alike, fostering a trustworthy environment for interactions and transactions.

❖ **Smart Contracts**

Smart contracts are automated agreements where the terms are written into code and execute themselves. In CRM systems, these contracts streamline tasks like customer on boarding, service agreements, and transactions. They eliminate intermediaries, reduce human error, and enforce contract terms automatically, boosting efficiency and security for businesses.

❖ **Tokenization**

Tokenization in CRM refers to the process of replacing sensitive data, like payment details or personal information, with unique identifiers (tokens) that are securely managed on the blockchain. This approach allows sensitive information to be exchanged and processed without exposing the actual data, thereby minimizing the risk of data breaches and ensuring compliance with data protection regulations.

❖ **Access Control**

Blockchain technology facilitates strong access control mechanisms through decentralized ledger management of permissions and access rights. It allows assigning distinct access levels to each user or system component, with all modifications transparently documented on the blockchain. This ensures that only approved personalities can access or alter consumer information, establishing a secure and auditable framework for managing permissions and thwarting unauthorized access attempts.

❖ **Methodology**

Blockchain technology leverages distributed storage of data across multiple nodes, employs strong encryption techniques to safeguard data, and incorporates thorough auditing processes to ensure integrity and accountability. This combination ensures that sensitive information is securely managed, prevents unauthorized access or tampering, and allows for transparent verification of data transactions, thus enhancing overall security and operational efficiency.

❖ **Storing Data**

Blockchain technology operates by distributing data across a network of computers called nodes in a decentralized manner. Each node stores a complete copy of the blockchain, promoting data redundancy and resilience against both data loss and tampering attempts. Information is organized into blocks, with each block linked to the previous one through cryptographic hashes, forming an immutable chain. This design guarantees the integrity of stored data and creates a system where any attempt to alter information would necessitate modifying all subsequent blocks, a computationally impractical feat that enhances security and ensures data authenticity.

❖ **Data Encryption**

Blockchain uses advanced cryptographic techniques in order to secure data. Two primary methods used are Hashing and Public-Private Key Encryption. In Hashing, data stored within a blockchain undergoes hashing using cryptographic algorithms such as SHA-256. A hash refers to a fixed-length string of characters generated from the data, which uniquely identifies that specific set of data. If any modification is made to the data, no matter how small, the resulting hash will change entirely. This property ensures that any tampering or alteration of the data can be easily detected because the original and modified data will produce different hashes. Therefore, hashes serve as a reliable method for verifying the integrity and authenticity of data stored on a blockchain.

Whereas, in Public-Private Key Encryption, when data is encrypted with a user's public key, it can only be decrypted by that user's corresponding private key. This ensures that only the intended recipient, who holds the private key, can access and decrypt the data. This asymmetric encryption mechanism enhances both the security and privacy of transactions and communications in blockchain networks, as it prevents unauthorized access to sensitive information.

❖ **Auditing**

The inherent transparency and immutability of blockchain position it as an ideal platform for conducting audits. Here's how it works:

➤ **Transparency:** Every transaction and modification is logged on the blockchain, visible to all network participants. This transparency guarantees traceability and verification of all actions taken.

- **Immutability:** Once information is stored on the blockchain, it becomes immutable, meaning it cannot be changed or removed. This characteristic guarantees the integrity of the audit trail, ensuring that all records remain permanent and resistant to tampering.
- **Automated Audit Trails:** Blockchain systematically logs every transaction with a timestamp and cryptographic signature, establishing a thorough and precise audit trail. This enables auditors to authenticate transactions reliably and confirm their chronological sequence with accuracy.
- **Smart Contracts:** Offers a powerful tool for automating compliance and audit procedures within blockchain systems. These contracts are capable of enforcing rules and executing actions automatically, triggered by predefined criteria. By leveraging smart contracts, organizations can ensure that all transactions conform to regulatory standards without the need for manual oversight, thereby enhancing efficiency and reliability in compliance and audit processes.

III. CONCLUSION

Blockchain technology presents a promising opportunity to transform the safeguarding of customer data in CRM systems amid the ongoing digital revolution. With its capability to deliver secure and transparent solutions, blockchain technology holds potential to elevate data security, optimizing the processes, and supports cross- industry alliance. Nevertheless, effectively integrating blockchain technology into Customer Relationship Management system requires overcoming hurdles like embracing new technologies, integrating with current infrastructure, ensuring interoperability, and adhering to regulatory standards. These challenges must be addressed to fully leverage the transformative benefits of blockchain in enhancing CRM capabilities. Despite these challenges, empirical evidence demonstrates that deploying blockchain-based CRM systems can yield significant cost efficiencies, enhanced operational effectiveness, and increased financial viability. To fully harness the advantages of blockchain driven CRM systems, continued investigation and collaboration within the industry are essential. As digital environments continue to evolve, businesses are urged to adopt forward thinking solutions using blockchain to efficiently safeguard and manage consumer information amidst dynamic market conditions.

References

- [1]. Ketikidis, P.H., Koh, S.C. L., Dimitriadis, A., Gnasekaran, A., &Kehajova, M. (2008). The Use of Information Systems for Logistics and Supply Chain Management in South East Europe: Current Statusand Future Direction, *Omega*, no.36, pp.592-599
- [2]. R. Thurasamy, K. Sherah and M. Chiun Lo, "Explaining intention to use an enterprise resource planning (ERP) system: an extension of the UTAUT model," 2020.
- [3]. Bogart, Spencer, and Kerry R., —The Blockchain Report: Welcome to the Internet of Value!, NeedhamInsights, 2015.
- [4]. Glazer, and Emily, —JPMorgan Quietly Tests 'Blockchain' with 2,200 Clients - WSJ, *The Wall StreetJournal*, 2016.
- [5]. Sharda Kumari1, Bidyut Sarkar, Gaurav Singh (2023), Blockchain-based CRM Solutions: Securing Customer Data in the Digital Transformation Era, *International Journal of Computer Trends and Technology*2231 – 2803
- [6]. Dr. Ajeet Singh, Aakanksha (2023), *Emerging Technologies in CRM: Opportunities And Challenges*, ISSN: (P)0048-7325 (e) 2454-7026
- [8]. Mahmoud Farouk, Saad M. Darwish (2020), Reverse Logistics Solution in e-Supply Chain Management by Blockchain Technology, *Egyptian Computer Science Journal*, ISSN-1110-2586
- [9]. Jaewon Choi(2018), Modeling the Intergrated Customer Loyalty Program on Blockchain Technology by Using Credit Card, *IJFRCSCEJournal*
- [11]. How Technology is changing the Future of Logistics. (March 5, 2019)from <https://www.shapiro.com/blog/howtechnology-is-changing-the-future-of-logistics/>