CRM 4.0: The Role of Blockchain in Shaping the Future of Customer Relationship Management

Naveen Kumar
Salesforce Inc., Dallas, Texas, USA

Abstract - The potential of blockchain technology to revolutionize industries by enhancing transparency, security, and efficiency has been accepted widely. The integration of blockchain technology in the field of customer relationship management (CRM) has the potential to revolutionize data sharing, customer engagement, and loyalty programs. This paper investigates the current state of blockchain adoption among prominent CRM vendors. The study determines the degree to which these vendors have adopted blockchain solutions by conducting a qualitative analysis of industry reports and vendor initiatives. The integration with existing CRM systems and the restricted scope of blockchain applications are among the primary obstacles. The results contribute to the establishment of a connection between academia and industry, providing practitioners and policymakers with valuable insights for the implementation of blockchain in CRM systems. Furthermore, this research establishes a framework for the assessment of emerging technologies within enterprise systems, thereby facilitating further investigation of the role of blockchain in the evolution of CRM.

Keywords: Customer relationship management, CRM, Blockchain, distributed ledger, enterprise systems.

I. INTRODUCTION

Emerging technologies, such as Blockchain and artificial intelligence (AI), are regarded as disruptive forces capable of transforming corporate operations across several industries. These technologies are categorized as "disruptive" due to their ability to replace traditional methods and enable new approaches for problem-solving and innovation [1]. However, an alternative perspective argues that Blockchain and other distributed ledger technologies may not be disruptive in the traditional sense. This essential classification highlights Blockchain's ability to provide steady systemic changes instead of sudden upheavals [2].

The eventual disruptive or fundamental nature of Blockchain hinges on the development of specific business use cases and the overcoming of significant integration challenges. This is particularly relevant in the domain of enterprise systems (ES), where seamless integration across many platforms and data types is essential [3]. Customer relationship management (CRM) systems—enterprise systems focused on sales, service, marketing, and digital commerce—illustrate the amalgamation of these challenges.

In recent years, the CRM landscape has seen significant transformation. The emergence of CRM 3.0 marked a shift towards integrating structured data from traditional relational databases with unstructured data obtained from consumer interactions on social media sites. The challenge of reconciling these diverse data types has revealed substantial integration problems [4]. Blockchain, being a form of distributed ledger technology, poses distinct challenges for CRM integration. The whole distinct database format prompts questions about the effective integration of traditional CRM systems with Blockchain-based solutions [5].

A new paradigm, CRM 4.0, is emerging at the intersection of Blockchain and CRM. This paradigm has potential for improving customer data security, transparency, and trust; yet, research remains inadequate in assessing the sophistication and usefulness of Blockchain solutions for substantial CRM business systems. At now, a comprehensive evaluation of how Blockchain might enhance CRM skills or address existing deficiencies has not been conducted . Organizing these needs necessitates technical advancement and a thorough understanding of how Blockchain might align with CRM's strategic objectives, enabling businesses to deliver more personalized, secure, and efficient customer experiences.

1.1 Contribution of paper

i) Investigates blockchain's capabilities to improve CRM through enhanced security, transparency, and trust.
ii) Recognizes obstacles such as integration, scalability, cost, and regulatory concerns.
iii) Proposes a framework for the integration of blockchain with CRM, emphasizing architecture, interoperability, and compliance.

iv) Emphasizes applications include loyalty schemes, decentralized identities, and safe data exchange.
v) Recommends future investigations into scale, the equilibrium of automation, and applications tailored to certain industries.
vi) Highlights the significance of blockchain in addressing CRM inefficiencies and promoting innovation.

II. BACKGROUND

2.1 Customer Relationship Management (CRM)

Academic studies have defined CRM as a manifestation of the novel marketing strategy referred to as relationship marketing (RM), also known as one-to-one marketing. While enhanced revenue from repeat sales, stemming from effective customer relationship management, is a claimed advantage of CRM, a CRM benefits framework suggests that organizations can achieve advantages at operational, tactical, and strategic levels. These include enhanced customer data, process and service management, increased productivity, refined market segmentation, key account management, channel management, and improved customer satisfaction, among others [6]. Multiple perspectives for CRM have been suggested, including the operational-analytical-collaborative framework, which posits that CRM systems focus on automation and efficiency, data analysis, and interactions, correspondingly [7]. Gartner, Inc., defines CRM as a strategy focused on maximizing revenue and profitability while enhancing customer satisfaction and fostering customer loyalty. In accordance with this mandate, Gartner categorizes CRM software systems into five dimensions: sales, marketing, customer service, digital commerce, and cross-CRM. This dispersion allows numerous niche vendors to offer specialized solutions that technically qualify as CRM, despite not resembling traditional CRM systems, which originated as basic contact databases and evolved to automate sales processes like lead management.

2.2 Blockchain

Blockchain is a distributed ledger that is both tamper-evident and tamper-resistant, typically characterized by decentralization. [8] pioneered the inaugural and most used Blockchain application by developing a peer-to-peer payment system (Bitcoin). Blockchain is characterized as a digital, decentralized transaction log, with identical copies preserved across several computer systems governed by various authorities. Each block has a header with information and data consisting of a collection of transactions. Cryptographic approaches uphold the network's regulations that inhibit data tampering and equivocation [9]. As additional blocks are appended, the preceding blocks become exceedingly difficult to modify. New blocks are duplicated across ledger copies across the network, and any discrepancies are automatically addressed using predefined rules (i.e., consensus method). Nodes in the network seek to achieve consensus on the subsequent block to be appended by employing a consensus protocol that guarantees decentralized governance, quorum, performance, authentication, integrity, nonrepudiation, and Byzantine fault tolerance [10]. Numerous consensus mechanisms exist, including proof of work (PoW), wherein a user generates the subsequent block by being the first to resolve a computationally demanding puzzle; proof of stake (PoS), in which selected validators, determined by their blockchain holdings, are tasked with validation; delegated proof of stake (DPoS), where participants elect and can revoke delegates' rights to validate blocks; and proof of authority (PoA), which utilizes the value of identities, allowing validators to stake their reputation rather than coins. Blockchain systems are classified into three categories: public, consortium, and private. In a public blockchain, all data are accessible to the public, and participation in the consensus process is open to anyone (permissionless). A private blockchain is a concentrated network predominantly governed by a single entity, whereas a consortium blockchain is maintained by several businesses. Records of private and consortium Blockchain systems may be public or private; however, only authorized nodes can participate in the consensus process (permissioned) [11].

2.3 Blockchain & CRM

The integration of Blockchain with CRM can enhance customer experiences, provide significant customer value, increase data confidentiality, and facilitate efficient data exchange [12]. The advanced security capabilities of Blockchain provide it an optimal choice for mitigating the effects of harmful assaults by either avoiding data loss or enhancing recovery efforts [13]. Blockchain provides verifiable transactions that provide comprehensive transparency. Transparency greatly affects consumer trust, which in turn influences customer relationships and loyalty [14]. The capacity of blockchain to enable trust without human connection may, ironically, create a trust deficit in B2B buyer-seller relationships, resulting in several negative outcomes [15]. The implementation of Ricardian contracts—legally enforceable, machine-readable agreements—via Blockchain may lead to the obsolescence of the B2B sales job. Loyalty management, an aspect of the Marketing dimension of CRM, is the most extensively examined area regarding Blockchain technology in CRM. Blockchain is posited to facilitate real-time exchange and redemption of rewards points [16], augment the capabilities of multi-brand and firm exchanges through token utilization [17], and bolster social capital and community sentiment among consumers

[18]. Lufthansa, Singapore Airlines, Cathay Pacific, and Air Asia have transformed their air miles reward programs into digital wallets utilizing Blockchain and gamification to enhance customer experience and brand value, hence increasing brand loyalty. The figure depicts the notable advantages of using blockchain technology into Customer Relationship Management (CRM) systems. Blockchain fortifies security by guaranteeing data integrity and thwarting illegal access, while simultaneously empowering consumers by affording them more control over their personal information [19]. It facilitates cost reduction by diminishing middlemen and operational expenditures. Moreover, blockchain facilitates transparent transactions via immutable and verifiable records, hence enhancing confidence among stakeholders. Ultimately, it enhances data quality by preserving precise, uniform, and decentralized records. Collectively, these advantages provide blockchain a revolutionary alternative for contemporary CRM systems[20].

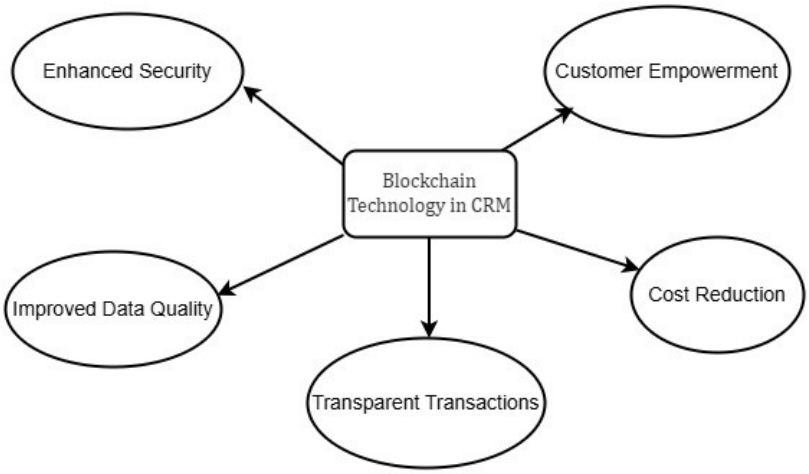

Figure 1 Benefits of Integrating Blockchain Technology in CRM

Table 1Comparison of CRM, Blockchain, and their Integration: Features, Strengths, Challenges, and Future Opportunities

Category	**Definition**	**Key Features**	**Goals**	**Dimensions**	**Strengths**	**Challenges**	**Notable Use Cases**	**Potential Risks**	**Future Opportunities**
Customer Relationship Management (CRM)	A strategy and technology framework for managing customer relationships, evolving from contact databases to advanced sales systems.	- Automation (sales, marketing, customer service) - Data analysis for insights - Customer interaction and loyalty building.	- Revenue optimization - Profitability - Customer satisfaction and loyalty.	- Operational: Automation and efficiency - Analytical: Data-driven insights - Collaborative: Interaction management.	- Improved segmentation and targeting - Better service management - Productivity gains.	- Integrating structured and unstructured data. - Data silos due to limited integration capabilities.	- Lead management - Sales automation - Loyalty management for brand engagement.	- Over-reliance on structured frameworks - Limited integration of modern data sources (e.g., social media).	- AI-driven personalization - Broader customer engagement and predictive insights.
Customer Relationship Management (CRM)	A strategy and technology framework for managi	- Automation (sales, marketing, customer service) - Data	- Revenue optimization - Profitability	- Operational: Automation and efficiency -	- Improved segmentation and targeting	- Integrating structured and unstructured	- Lead management - Sales automation - Loyalt	- Over-reliance on structured frameworks -	- AI-driven personalization - Broader customer engagement and predictive

	ng customer relationships, evolving from contact databases to advanced sales systems.	analysis for insights - Customer interaction and loyalty building.	- Customer satisfaction and loyalty.	Analytical: Data-driven insights - Collaborative: Interaction management.	- Better service management - Productivity gains.	data. - Data silos due to limited integration capabilities.	y management for brand engagement.	Limited integration of modern data sources (e.g., social media).	insights.
Blockchain	A decentralized, tamper-resistant distributed ledger recording transactions with cryptographic security and consensus mechanisms.	- Cryptographic security - Immutability of data - Decentralized governance - Consensus mechanisms (e.g., PoW, PoS).	- Secure, transparent, decentralized data management.	- Decentralized validation - Immutability and integrity of records - Public, private, and consortium Blockchain types.	- Fraud resistance - Decentralized operations - Automated conflict resolution through consensus.	- Energy-intensive mechanisms - High costs and slower processing. - Privacy concerns in public Blockchains.	- Cryptocurrency (e.g., Bitcoin) - Digital asset tracking - Identity verification and supply chain automation.	- Scalability issues - Risks to privacy in public networks.	- Energy-efficient consensus protocols (e.g., PoS) - Broader adoption in healthcare, finance, and other industries.
Integration of Blockchain & CRM	Combines CRM's customer relationship focus with Blockchain's strengths in transparency, security, and decentralization.	- Enhanced security - Transparent and auditable transactions - Streamlined data sharing - Smart contracts for automation.	- Improve customer trust and engagement - Real-time rewards exchange - Cross-brand loyalty enhancements.	- Enhances loyalty programs through gamification and tokenization - Secure customer data sharing. - B2B automation.	- Mitigates data breaches - Boosts trust through transparent transactions - Supports multi-brand collaboration.	- Trust gaps due to reduced human interaction - Technical integration challenges with existing CRM systems.	- Lufthansa, Singapore Airlines, Cathay Pacific using Blockchain for digital loyalty wallets. - Real-time token exchange.	- Over-automation may displace human roles (e.g., B2B sales) - Dependency on technical compatibility.	- Blockchain-enabled loyalty programs across industries - Advanced CRM functionalities with smart contracts.

Table 1 presents a comprehensive comparison of CRM, Blockchain, and their interaction. It emphasizes the principal attributes, objectives, parameters, advantages, obstacles, significant applications, possible hazards, and

future prospects of each domain. CRM is defined as a customer-centric strategy and technological framework that emphasizes process automation, customer data analysis, and management of customer interactions [21]. Blockchain is characterized as a decentralized ledger system that prioritizes security, transparency, and immutability. The table culminates in a synthesis of Blockchain-CRM integration, highlighting its potential to augment loyalty programs, bolster consumer trust, and alleviate security concerns, while also addressing technological limitations and organizational opposition [22].

Table 2 Blockchain Offerings by Leading Vendors: Capabilities, Use Cases, and Integration with CRM Systems

Vendor	**Blockchain Offering**	**Key Features**	**Integration Capability**	**Use Cases/Applications**	**Current Challenges**	**Future Prospects**
Adobe	Content Credentials (Beta)	Tracks artwork metadata for tamper-evident attribution.	Limited; works with Microsoft Dynamics 365 for CRM-related functionalities.	Metadata tracking in digital content management.	No direct blockchain integration in CRM.	Limited scope unless broader CRM integration is explored.
Microsoft	Azure Blockchain (retired); Third-party solutions like ConsenSys Quorum and Smart Stamp Document Sealing	Provides blockchain-based document sealing; integration into various enterprise platforms, including CRM.	High; works across CRM, ERP (SAP, Dynamics), and document management systems.	Document sealing, cross-platform integration for secure transactions.	Dependency on third-party services.	Potential to expand blockchain offerings through partnerships like ConsenSys.
Oracle	Oracle Blockchain Cloud Service (OBCS)	Distributed applications, smart contracts, and integration adapters for CRM.	Strong; adapters available for Oracle CRM (Siebel) and third-party CRMs like Salesforce.	Cross-border payments, secure data sharing in financial services.	Limited awareness and adoption in smaller markets.	Positioned to lead in CRM blockchain integration due to strong ecosystem support and cross-platform adapters.
Pegasystems	Blockchain Innovation Kit	Ethereum-based smart contracts, KYC, and Client Lifecycle Management (CLM).	Moderate; compatibility issues with Pega versions.	KYC and CLM, sample smart contracts for disease management.	Compatibility issues and lack of updates.	Requires renewed investment in compatibility and broader applications.
Salesforce	Salesforce Blockchain	Custom blockchain-based objects; provenance tracking for goods.	Limited; supports third-party solutions via AppExchange, such as IBM Blockchain Platform for Salesforce.	Provenance tracking, lead generation from aftermarket product transactions.	Lack of scalability and minimal in-house focus.	May rely on third-party applications for broader adoption of blockchain in CRM.

SAP	SAP Cloud Platform Blockchain	Integration of Hyperledger Fabric and Multichain within SAP HANA Data Suite.	Strong; focused on integrating blockchain with SAP's existing ERP and CRM platforms.	Enhancing supply chain transparency and secure data exchanges.	Low visibility in current offerings.	Potential to revive blockchain as part of broader intelligent enterprise solutions.

Table 2 examines the blockchain solutions provided by prominent suppliers in the CRM sector. It enumerates prominent firms including Adobe, Microsoft, Oracle, Pegasystems, Salesforce, and SAP, detailing their blockchain-related products, essential features, integration capabilities, existing use cases, and obstacles [23]. The table further examines the future prospects for each provider, delineating opportunities for enhancement and innovation. The report highlights the differing degrees of blockchain usage, integration sophistication, and strategic emphasis among providers, offering insights into overarching market trends.

III. MOTIVATION OF THE WORK

The CRM market is swiftly transforming, propelled by the demand for enhanced security, transparency, and customer-centric methodologies. Contemporary CRM systems have substantial obstacles [24][25]:

i) *Data Silos and Integration Challenges*: Conventional CRM systems encounter difficulties in combining structured and unstructured data across platforms, resulting in inefficiencies and constrained insights.
ii) *Data Privacy and Security*: Given the growing risk of data breaches and rigorous rules (e.g., GDPR), safeguarding sensitive consumer information has emerged as a paramount responsibility.
iii) *Customer Trust and openness*: Customers want enhanced openness about the management and utilization of their data, a need that traditional systems inadequately provide.
iv) *Operational Inefficiencies*: Current loyalty and reward programs frequently exhibit complexity and lack the necessary interoperability for effortless cross-brand or multi-firm transactions.

Blockchain technology is a viable answer to these challenges, characterized by its decentralized and tamper-proof architecture, which guarantees safe and verifiable transactions [26]. The integration of blockchain with CRM systems is still in its infancy, and its potential is predominantly unexploited owing to technological, financial, and strategic obstacles. This research seeks to fill these gaps by investigating the optimal integration of blockchain into CRM to augment existing functionalities, increase customer experiences, and handle upcoming difficulties [27].

IV. PROBLEM STATEMENT

Although blockchain has shown its disruptive potential in sectors like banking and supply chain, its incorporation into CRM systems encounters considerable challenges:

i) *Integration Complexity*: Conventional CRM systems depend on centralized databases and procedures, which are incompatible with the decentralized design of blockchain.
ii) *Scalability and Cost*: Blockchain systems, particularly those employing Proof of Work (PoW), encounter difficulties associated with elevated computational expenses and reduced transaction velocities, rendering them unsuitable for extensive CRM operations.
iii) *Confidence Deficit in Automation*: Although blockchain diminishes the necessity for intermediaries, an overdependence on automation may result in diminished confidence in customer-facing procedures, especially in B2B contexts.
iv) *Restricted Awareness and Adoption*: The majority of CRM suppliers have not emphasized blockchain, leading to a scarcity of use cases and market ambiguity around its relevance.
v) *Regulatory and Compliance Challenges*: The decentralized and immutable characteristics of blockchain may contravene data privacy legislation, including the right to be forgotten.

These concerns underscore the necessity for a methodical approach to tackle the technical, operational, and strategic challenges related to blockchain implementation in CRM.

V. PROPOSED FRAMEWORK FOR BLOCKCHAIN-CRM INTEGRATION

5.1 Strategic Alignment

Establish objectives and use cases for blockchain implementation in CRM, including the enhancement of loyalty programs, the augmentation of data security, and the optimization of procedures. Involve stakeholders to synchronize business objectives with technical specifications, guaranteeing quantifiable success indicators (e.g., customer satisfaction, efficiency enhancements).

5.2 Architectural Design

Design a blockchain architecture specifically suited for CRM requirements:

i) *Blockchain Type*: Employ public blockchains for transparency (e.g., loyalty programs) or private/consortium blockchains for confidential information.
ii) *Consensus Mechanisms*: Select energy-efficient approaches such as Proof of Stake (PoS) or Proof of Authority (PoA).
iii) *Smart Contracts*: Automate customer relationship management processes (e.g., contract renewals, loyalty redemption) via modular and reusable smart contracts.

5.3 Integration Framework

Facilitate effortless connection with current CRM systems:

i) Develop middleware solutions that facilitate interoperability between blockchain and CRM systems. Utilize APIs and plugins to incorporate blockchain functionalities into widely-used systems (e.g., Salesforce, Oracle).
ii) Align data between blockchain and CRM databases to ensure consistency.

5.4 Security and Regulatory Adherence

Address regulatory and security issues:

Utilize decentralized identification (DID) technologies for consumer authentication while maintaining privacy.

i) Encrypt sensitive information and retain just necessary blockchain hashes to guarantee adherence to rules (e.g., GDPR).
ii) Establish automated monitoring systems for blockchain operations to guarantee data integrity and regulatory compliance.

5.5 Pilot Execution

Implement a pilot system to assess blockchain-integrated CRM functionalities, including secure data sharing and tokenized loyalty programs. Execute iterative testing to enhance performance and guarantee scalability and usability in practical scenarios.

5.6 Expanded Implementation

Gradually enhance blockchain adoption:

i) Initiate with non-essential CRM services (e.g., loyalty programs) prior to expanding to fundamental activities.
ii) Educate stakeholders and personnel on blockchain-integrated procedures for effective implementation.
iii) Assess system performance and consumer input to inform optimization efforts.

5.7 Ongoing Innovation

Encourage continuous advancement:

i) Investigate sophisticated applications, such blockchain-enabled predictive analytics or fraud mitigation.
ii) Engage with external stakeholders to establish industry-wide blockchain networks.
iii) Embrace new technologies to enhance efficiency via lightweight protocols and hybrid blockchain models.

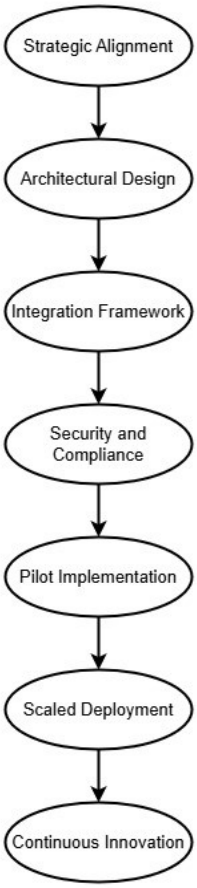

Figure 2 proposed framework

VI. FUTURE RESEARCH DIRECTIONS

The amalgamation of blockchain with CRM offers promising prospects; yet, several aspects necessitate more investigation:

a. *Scalability and Performance*: - Investigate sophisticated consensus algorithms and Layer 2 scaling solutions (e.g., sidechains) to provide high-throughput and cost-effective operations appropriate for enterprise-level CRM systems.
b. *Standardization and Protocols*: It includes Establish standardized data exchange protocols and APIs to enable blockchain integration across various CRM systems and sectors.
c. B*alancing Automation and Human Interaction*: Examine the social and psychological effects of blockchain-driven automation on customer trust and loyalty, ensuring that human components remain essential to relationship management.
d. Investigation of Novel Use Cases: o In addition to loyalty programs, analyze applications such as:
   i) Fraud Prevention: Immediate identification and prevention of fraudulent transactions.
   ii) Personalized Marketing: Blockchain-facilitated analytics for providing hyper-personalized consumer experiences.
   iii) Identity Verification: Ensure secure client onboarding with decentralized identity solutions.

e. R*egulatory Compliance and Ethical Considerations*: - Examine the ramifications of data privacy legislation on blockchain applications, emphasizing the reconciliation of immutability with the right to data erasure.
Assess blockchain's impact on industry-specific CRM difficulties, including healthcare data exchange, retail loyalty programs, and customer management in financial services.

VII. CONCLUSION

The fusion of blockchain technology with CRM signifies a revolutionary transition towards a more secure, transparent, and effective method of maintaining customer interactions. By tackling significant issues like data silos, privacy problems, and operational inefficiencies, blockchain has the capacity to transform organizational interactions with customers. This study underscores the advantages and obstacles related to blockchain implementation in CRM, accentuating its potential to improve client trust, loyalty, and data security.

Nonetheless, attaining widespread use necessitates surmounting integration problems, scaling constraints, and regulatory obstacles. The suggested framework acts as a guide for organizations to strategically adopt blockchain technologies in customer relationship management, starting with specific use cases like loyalty programs and progressively integrating into core operations via iterative implementation.
Future research must concentrate on scaling blockchain applications, standardizing integration protocols, and harmonizing automation with human involvement to maintain the integrity of relationship management. Exploring unique use cases and industry-specific applications, blockchain-CRM integration can facilitate CRM 4.0, establishing new benchmarks for customer engagement and organizational efficiency.

REFERENCES

[1] Shanks, G., Jagielska, I., and Jayaganesh, M. 2009. "A Framework for Understanding Customer Relationship Management Systems Benefits," *Communications of the Association for Information Systems* (25:1), pp. 263–288.

[2] Soltani, Z., and Navimipour, N. J. 2016. "Customer Relationship Management Mechanisms: A Systematic Review of the State of the Art Literature and Recommendations for Future Research," *Computers in Human Behavior* (61), Elsevier Ltd, pp. 667–688.

[3] Nakamoto, S. 2008. "Bitcoin: A Peer-to-Peer Electronic Cash System," *Online*.

[4] Narayanan, A., Bonneau, J., Felten, E., Miller, A., Goldfeder, S., and Clark, J. 2016. *Bitcoin and Cryptocurrency Technologies Introduction to the Book*.

[5] Garriga, M., Dalla Palma, S., Arias, M., De Renzis, A., Pareschi, R., and Andrew Tamburri, D. 2021. "Blockchain and Cryptocurrencies: A Classification and Comparison of Architecture Drivers," in *Concurrency and Computation: Practice and Experience* (Vol. 33), John Wiley and Sons Ltd, April.

[6] Zheng, Z., Xie, S., Dai, H., Chen, X., and Wang, H. 2017. "An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends," in *Proceedings - 2017 IEEE 6th International Congress on Big Data, BigData Congress 2017*, pp. 557–564.

[7] Ghazaleh, M. A., and Zabadi, A. M. 2021. "BlockChain (BC) Upending Customer Experience: Promoting a New Customer Relationship Management (CRM) Structure Using Blockchain Technology (BCT)," *Journal of Management and Sustainability* (11:1), Canadian Center of Science and Education, p. 203.

[8] Sharma, S. G., Ahuja, L., and Goyal, D. P. 2018. "Building Secure Infrastructure for Cloud Computing Using Blockchain," in *2018 Second International Conference on Intelligent Computing and Control Systems (ICICCS)*, IEEE, June, pp. 1985–1988.

[9] Collomb, A., DE FILIPPI, P., and SOK, K. 2019. "Blockchain Technology and Financial Regulation: A RiskBased Approach to the Regulation of ICOs," *European Journal of Risk Regulation* (10:2), pp. 263– 314.

[10] Kim, S.-B., and Kim, D.-Y. 2016. "The Impacts of Corporate Social Responsibility, Service Quality, and Transparency on Relationship Quality and Customer Loyalty in the Hotel Industry," *Asian Journal of Sustainability and Social Responsibility* (1:1), pp. 39–55.

[11] Gligor, D. M., Pillai, K. G., and Golgeci, I. 2021. "Theorizing the Dark Side of Business-to-Business Relationships in the Era of AI, Big Data, and Blockchain," *Journal of Business Research* (133:January), Elsevier Inc., pp. 79–88.

[12] Wang, L., Luo, X., and Xue, B. 2018. "Too Good to Be True? Understanding How Blockchain Revolutionizes Loyalty Programs," *Americas Conference on Information Systems 2018: Digital Disruption, AMCIS 2018* (August).

[13] Weldon, M. N., and Epstein, R. 2019. *Beyond Bitcoin: Leveraging Blockchain to Benefit Business and Society*.

[14] Antoniadis, I., KONTSAS, S., and SPINTHIROPOULOS, K. 2019. "Blockchain and Brand Loyalty Programs: A Short Review of Applications and Challenges," *Procedia of Economics and Business Administraion* (5:1), pp. 8–16.

[15] Idian, Maria Joy I., Mohummad Kamrul Hassan, and Akaa Samuel Terzungwe. "Artificial Intelligence, Blockchain, Machine Learning, and Customer Relationship Management." *Bincang Sains dan Teknologi* 2, no. 01 (2023): 16-20.

[16] BOPPANA, VENKAT RAVITEJA. "Blockchain Applications in CRM for Supply Chain Management." *EPH-International Journal of Business & Management Science* 10, no. 1 (2024): 77-86.

[17] Bhat, Mrs Leena Milind. "Artificial Intelligence and Blockchain for Enhancing Customer Relationship Management (CRM) Systems: A Review of Emerging Trends and Challenges." *Library Progress International* 44, no. 3 (2024): 23183-23203.

[18] Kumari, Sharda, Bidyut Sarkar, and Gaurav Singh. "Blockchain-based CRM solutions: Securing customer data in the digital transformation era." *International Journal of Computer Trends and Technology* 71, no. 4 (2023): 27-36.

[19] Udegbe, S. "Impact of blockchain technology in enhancing customer loyalty programs in airline business." *Int. J. Innov. Res. Adv. Stud* 4, no. 6 (2017): 257-263.

[20] Boukis, Achilleas. "Exploring the implications of blockchain technology for brand–consumer relationships: a future research agenda." *Journal of Product & Brand Management* 29, no. 3 (2019): 307-320.

[21] Bezovski, Zlatko, Tamara Jovanov, and Riste Temjanovski. "The impact and the potential disruption of the blockchain technology on marketing." *Journal of Economics* 6, no. 1 (2021): 13-23.

[22] Wang, Zeyu, Mingyu Li, Jia Lu, and Xin Cheng. "Business Innovation based on artificial intelligence and Blockchain technology." *Information Processing & Management* 59, no. 1 (2022): 102759.

[23] Ahram, Tareq, Arman Sargolzaei, Saman Sargolzaei, Jeff Daniels, and Ben Amaba. "Blockchain technology innovations." In *2017 IEEE technology & engineering management conference (TEMSCON)*, pp. 137-141. IEEE, 2017.

[24] French, Aaron M., and Marten Risius. "Redefining the customer service relationship through blockchain." *International Journal of Electronic Commerce* 28, no. 1 (2024): 63-83.

[25] Dhanalakshmi, A., Xu Hui, and R. Supriya. "Technological advancements in E-Commerce and customer relationship management." *International Journal of Engineering and Management Research* 10, no. 6 (2020): 9-20.

[26] Ali, Azad I., and David T. Smith. "Blockchain and mortgage lending process: A study of people, process, and technology involved." *Online Journal of Applied Knowledge Management (OJAKM)* 7, no. 1 (2019): 53-66.

[27] Varma, Parminder, Shivinder Nijjer, Bhalinder Kaur, and Sandhir Sharma. "Blockchain for transformation in digital marketing." In *Handbook of Research on the Platform Economy and the Evolution of E-Commerce*, pp. 274-298. IGI Global, 2022.