

Influence of Blockchain in Marketing on Efficiency of E-customer Relationship Management: Moderating Role of Technology Adoption

*By Tareq Nael Hashem**

Current study aimed at exploring the moderating role of technology adoption on the relationship between blockchain (control over personal data, trust and transparency, improved personalization, seamless loyalty programs, enhanced customer service) and efficiency of e-customer relationship management from perspective of customer who has experience in e-shopping. Quantitative methodology was adopted, and a questionnaire was self-administered by (372) individuals who were aware of the concept of online shopping. SPSS was employed to deal with primary data, results indicated the acceptance of study's hypotheses and it appeared that blockchain technology relationship with E-CRM is moderated by technology adoption. The most influential factor of blockchain was on seamless loyalty programs which have helped in increasing the level of trust and transparency of customers' profile leading to more loyalty from them. Study recommended to shed the light on aspects that may influence organizations' acceptance of blockchain in their marketing strategies, in addition to the need to increase the attention of marketing department on aspects of trust and loyalty through online shopping channels.

Keywords: *Blockchain, E-Customer Relationship Management, Technology Adoption, Trust and Transparency, Improved Personalization*

Introduction

In the marketing sphere, the appearance of technology caused a big revolution that directly leads to new methods of linking businesses with their consumers and enabling promotional activities to take place in a different manner (Stallone et al, 2021). Within the timespan of the last couple of years, science and technology has yielded unstoppable wonders like never before, that have instigated applications, systems and methods that have been able to change the face of marketing. Whereas social media platforms and artificial intelligence are but a few big technological breakthroughs in marketing worldwide, technology has evolved to be so important to marketing strategies of all businesses across the globe, making it possible for them to reach wider audiences, to send personalized messages, and to provide unique customer experience (Rejeb et al., 2020).

Jain et al. (2021) argued that traditional marketing strategies are transformed with the help of digitalization, now it draws from the connected world of digital channels and techniques. Marketing has gained major influence by using the internet,

*Full Professor of Marketing, Marketing Department, Faculty of Business, Applied Science Private University, Jordan.

mobile devices and social media platforms as the major medium where businesses can reach consumers, create brand awareness and drive customer engagement. Gleim and Stevens (2021) agreed on the same idea arguing that via the internet, mobile applications, and social media marketing, organizations can now make a bridge directly between them and their market, producing a quick, real-time chatting where customization is an integral element.

Antoniadis et al. (2020) stated that Customer Relationship Management (CRM) has been significantly influenced by technology through transforming the way businesses interact with customers and manage relationships. Technology has provided businesses with powerful CRM software and tools that centralize customer data, streamline processes, and enhance communication. With the advent of CRM systems, businesses can efficiently track customer interactions, manage leads, and optimize sales pipelines. Additionally, technology has enabled the integration of multiple customer touchpoints, such as social media, email, and website interactions, into a unified view, allowing businesses to deliver personalized experiences across various channels. Automation and artificial intelligence capabilities within CRM systems have further enhanced efficiency by automating routine tasks, providing data-driven insights, and enabling proactive customer engagement. Overall, technology has revolutionized CRM, enabling businesses to build stronger customer relationships, improve customer satisfaction, and drive business growth which has led to the appearance of E-CRM (Tozanlı et al., 2020).

Technology adoption in all its forms have managed to change the reality of CRM through giving more focus and attention to the usability of data flowing to the organization. This has helped in supporting interested parties with the needed data regarding their relationship customers (Tan and Saraniemi, 2023). Among the technological techniques that have revolutionized CRM is the appearance of blockchain technology. This technology is a smart technology capable of achieving transparency and security during the exchange of information between customers and organizations by improving the data storage mechanism and transforming it into encrypted, tamper-proof data (Antwi, 2023).

Literature Review

Blockchain in Marketing

The advent of blockchain in the marketing industry is making a huge impact on the different activities such as transparency, security and efficiency of the marketing activity by offering new ways of doing the same. Adithya (2023) argued that blockchain technology has become immune to crashes and errors since it was invented along with cryptocurrencies like Bitcoin and, it is also known as a distributed digital ledger that records transactions on multiple computers or nodes. Via removing the necessity for intermediaries, such as banks or third-party platforms, the decentralization feature allows for smooth and traceable transactions, which in their turn cannot be changed (Tan and Saraniemi, 2023).

Blockchain can transform many key areas in the marketing practice such as customer engagement, brand protection, data storage etc. One of the applications involving the blockchain is in supply chain management, where products can be granularly tracked from shipment end to end (Wasiq et al., 2023). A supply chain that records everything from raw materials right through to final product through blockchain can guarantee that the quality and authenticity of the products are consistent, as well as the ethical origin of its inputs, which the business can communicate to their consumers and thus lead to consumer trust and satisfaction (Peres et al., 2023).

Under blockchain, counterfeit goods, ads, and tracking are also possible applications to take advantage of. The present digital advertising system is sick because it suffers from fraud, lack of transparency, and divergences of reports (Treiblmaier and Petrozhitskaya, 2023; Maseke, 2024). Tan and Salo (2023) stated that blockchain technology is built on the principle of decentralization and immutability and it can be used for tracking ad impressions, clicks and conversions, hence addressing challenges. Advertisers are able message their ads' authenticity guarantee which ensures their ads really reach users they actually mean to. Publishers in turn can have profit of money fair compensation for ads' space they offer.

Whereby, the blockchain technology could similarly impact the management of customer data as well as customers 'privacy. Unlike the traditional data storage and management infrastructure where customer data is prone to unauthorized infiltration and misuse, the blockchain technology gives an immutable, decentralized, and secure layer top it up (Bonetti et al., 2024). The most important advantage of the technology is the fact that there is no central database, which in turn provides higher security and transparency levels. Customers have control over their data which can only be used with their approval. Thus, businesses can feel more comfortable with their clients, who willingly provide their data, which thanks to that, can establish more successfully launched personalized marketing schemes and experiences (Marthews and Tucker, 2023).

Ghavidast Kouhpayeh et al. (2024) noted that blockchain-based loyalty programs can make customer engagement and devotion even more possible. This relevant move - designing virtual coins or cryptocurrencies cashable and redeemable by customers - can be used as the base for innovative and rewarding projects of retailers. Through smart loyalty schemes formed on a blockchain, customers can now enjoy the convenience of online redemption anywhere, reward transfer among brands, and clear monitoring of rewards allocation. This is a win-win both for customers and for brands trying to grow and retain their customer base (Haynes and Hietanen, 2023).

From another perspective, it was noted by Treiblmaier (2023) that blockchain still has a lot of promise for marketers, while it is crucial to understand and accept the present obstacles and boundaries it has. Scaling of blockchain along with energy consumption and regulatory control are some among the big issues which are the reason for the slow spread of blockchain technology in marketing.

In conclusion, it is worth mentioning that blockchain technology is an invaluable tool for marketers to innovate the leading processes of marketing forever. Blockchain, as an emerging technology, can be used in supply chain management,

customer data management, digital advertising, and loyalty programs to make order, security, and efficiency transparent. As a result, trust increases, customers have a positive experience, and, therefore, business thrives in the digital world (Abakah et al., 2023).

E-Customer Relationship Management (E-CRM)

Younis et al. (2024) defined E-CRM (E-Customer Relationship Management) as the utilization of electronic channels and their technologies in order to achieve management of customer relationships as well as their improved level. It takes place in the time when marketing practices meet CRM principles and strategies within the context of online and digital interactions. E-CRM was established to leverage technology to understand customer requirements, effect customer experience and establish effective long-term loyalty (Wijaya and Dewanti, 2021).

Karim et al., (2023) noted that the incorporation of blockchain technology has enhanced the effectiveness of e-Customer Relationship Management (e-CRM) by changing the way organizations deal with consumers over the internet. As the published information is distributed and encrypted, the data of customers can be stored on a blockchain, which creates greater trust in the cooperation. Ravan (2023) added that the use of blockchain in e-CRM enabled businesses enhance the efficiency and accuracy in a number of areas including customer data management, transactions, and communications. Blockchain implementation guarantees that the information of the customer is safely stored and may be shared safely decreasing the threat of customer data breaches.

Haqqizar et al., (2023) confirmed that blockchain technology created the basis for smart contracts and decentralized applications (DApps) which can be utilized for some specific e-CRM, including the loyalty programs, collecting feedbacks, and personal marketing campaigns. These automated processes are time-saving and cost-effective besides improving the general experience of interacting with the firm or company.

Nadube and Ordah (2023) agreed on the same idea adding that it was found that blockchain has a positive impact on increasing the efficiency of e-CRM in terms of providing improved data security, optimized processes and task automation, and establishing confidence among the business and customer domains in the BM environment.

Technology Adoption in CRM

Chaudhuri et al. (2023) defined the integration of technology in CRM as the state of using and addressing in business CRM systems to new technological solutions. It refers to the technology solid suspense role to boost customer relations, cut out processes short and succeed in the overall enhancement of CRM functions. Among the numerous advantages that the use of technology in CRM brings, it should be peculiar to mention a few. As a matter of straightforward fact, it facilitates the business organization by having and using one database which has all the customer data which is easier to manage (Ezzaouia and Bulchand-Gidumal, 2023).

The CRM systems plus advanced technology are able to carry out the collection, storage, and analysis of customer information, which could be meaningful for marketing and management in a decentralized manner. This is the capability that enables organizations to attain granular data on customers' behavior or interests, and tailored messages can later be sent just specifically to address each of the customers' pain points and needs (Dastjerdi et al., 2023; Al-Duwailah & Hashem, 2019; Hashem, 2021).

Bajaj et al. (2023) argued that through the automated completion of the chores like data entry, lead management, and customers tracking, everyone in the management team could establish more valuable and intellectual engagements. This will save a lot of time and resources which can be channeled in more intellectual activities. Automation, further, contributes to precision and accuracy in dealing with the customers as the risk of human error is eliminated while the operation process becomes smoother.

On the other hand, technologists are present-day CRM would ever provide a company with cutting edge analytical and reporting tools. Among its many features, the modern CRM with an array of data analytical tools can produce detailed instantaneous reports, graphs and charts with aggregate metrics for the business as well as customer profiles. Many data analytics offer businesses invaluable insights to base their decision on facts, by identifying trends and maximizing their CRM efforts for better customer engagement and retention (Hilali et al., 2023).

Hypotheses Development

Going through the literature in order to develop our current hypotheses, we have seen that Treiblmaier and Petrozhitskaya (2023) stated that the blockchain-based program based on 5,059 Twitter tweets indicated more positive reviews compared to the paper-based one. In addition, a survey of 206 consumers' evidences that people regard the blockchain-based program more positively than the paper-based one when it comes to accrual, relevance, expiration, and transferability. In addition to that,

Boukis (2020) shed light on the potential implications of blockchain technology for brand–consumer relationships. Boukis (2020) ignited an exploratory discussion around how blockchain applications and platforms can affect consumer–brand relationships, drawing on a number of real-life examples of blockchain adoption. Boukis (2020) confirmed that blockchain features impact on various areas of interest for strategic brand management, such as the adoption of digital currencies, brand storytelling, use of blockchain-enabled loyalty programs, role of intermediaries in online advertising, counterfeit consumption, brand transparency and trust for brands in online marketplaces, amongst others.

On the same idea, Utz et al. (2023) indicated that the developed customer loyalty program restores trust, reduces distrust, and resolves customer ambivalence by providing four features: strengthened customer agency, truthfulness and justifiability through means of end-user interface in data access. However, Safitri (2024) stated that a research gap that still needs to be explored encompasses the long-term effect of blockchain on marketers and the ROI of blockchain-backed

projects, while regulatory implications of implementing blockchain in marketing also warrant further investigation. Blockchain technology has a massive potential to speed up the marketing operations through its organizational trust and transparency advantages and business innovations could be applied.

Organizations now are getting more benefits from fuzzy data that they get; they can – through E-CRM – give more attention to their customers' preferences in addition to presenting more secured platform for their interaction with customers through the services that are provided by blockchain. From that point, we aim in this current research to shed the light on the moderating role of technology adoption on the relationship between blockchain in marketing (control over personal data, trust and transparency, improved personalization, seamless loyalty programs, enhanced customer service) and the efficiency of E-CRM from perspective of customers who have experience in online shopping.

In other words, the study sought to answer the following question:

What is the moderating role of technology adoption on the relationship between blockchain in marketing and efficiency of e-CRM?

Answering this question was attainable through reaching the following objectives:

- Identify blockchain in marketing field
- Explore the relationship between blockchain and e-CRM
- Examine the moderating influence of technology adoption on the relationship between blockchain in marketing and e-CRM in terms of (control over personal data, trust and transparency, improved personalization, seamless loyalty programs, enhanced customer service).

It is worth mentioning here that we have built our problem statement here under the premises of Relationship Marketing Theory (RMT). This theory revolves around building relationship with customers in order to increase organizational awareness of their preferences and support organizational efforts to satisfy them and gain their loyalty. In this case, the study employed technology adoption through blockchain as an approach to realize a more beneficial and healthier relationship with customers. Stemming from study gap and argument, we have built a model in order to highlight the relationship between variables and extract study's hypotheses in figure 1. It is worth mentioning that the incorporation of variables in the current study are informed by the following reasons:

- Blockchain in Marketing

In making blockchain the subject of study in the research, the study seeks to establish the nature of influence that this emerging technology has on marketing strategies. Thanks to its decentralised, secure and transparent system, the establishing elements of the marketing can witness a change in the four different areas of marketing including data security, transaction transparency and the establishment of the credibility of customers.

- Efficiency of E-Customer Relationship Management (e-CRM)

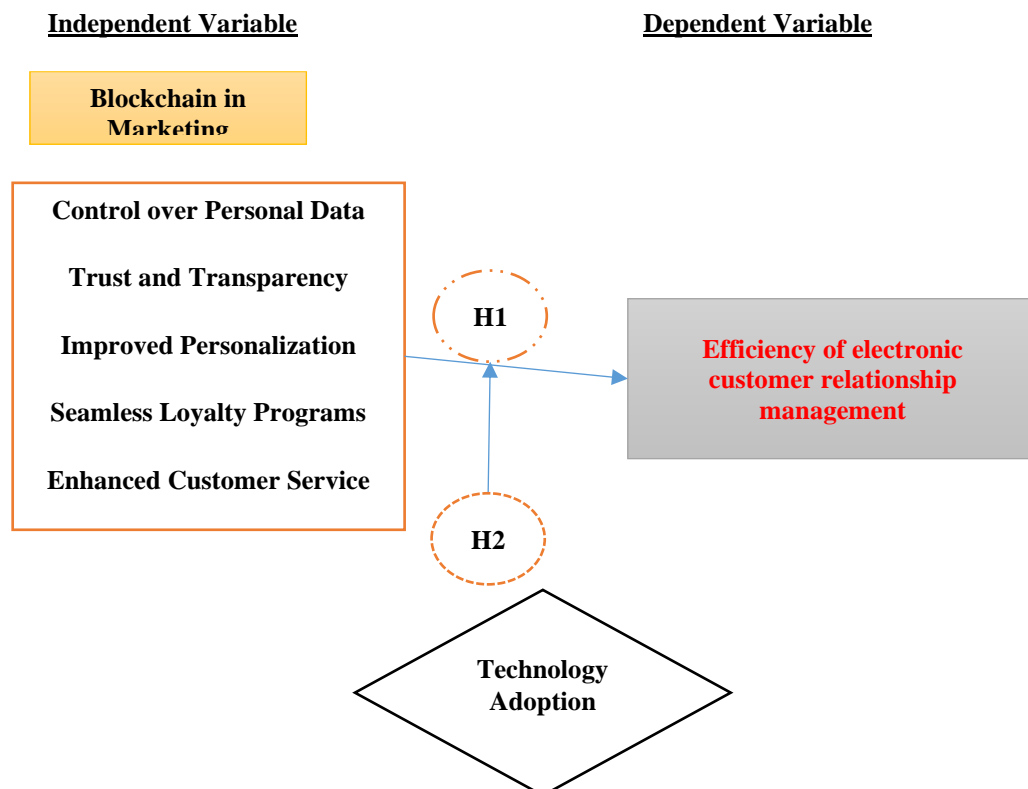
Explaining the concept of e-CRM in terms of the extent of its efficiency shifts the emphasis to the recognition of the opportunities of managing customer relations on the Web. Regarding the impact of blockchain on the efficiency of e-CRM, knowledge may help to enhance customers' interaction, to develop targeted marketing communications, and customer loyalty programme.

- Moderating Role of Technology Adoption

Consequently, by including technology adoption as the moderating variable, the study explains contingencies that determine the connection between blockchain in marketing and e-CRM efficiency. This is because the extent of assimilation of the technology affects the manner in which organizations apply blockchain for marketing and e-CRM and the efficiency it has within the customer relationships and organizational performances.

Thus, by incorporating these variables in the study, the research seek to contribute to an understanding of how; blockchain affects marketing, improves e-CRM, and the mediating role of technology adoption. This approach creates a lever that enables further analysis of the coexistence and interaction between blockchain, e-CRM, and technology adoption aiming at helping organizations harness blockchain to enhance customer relations in technology advanced world.

Figure 1. Study Model



Methods and Materials

The current study along with its model hypothesized the following:

H1: Blockchain in marketing has a statistically significant influence on efficiency of E-CRM

H2: Technology adoption moderates the relationship between blockchain in marketing and efficiency of E-CRM

Accepting or rejecting these hypotheses was done depending on quantitative approach was a way to reach primary data. It was seen that quantitative methodology was best suited due to its ability to collect primary data from a larger sample size which can lead to more generalized results.

The main tool adopted in the study was the questionnaire, the questionnaire was built through the aid of previous studies including Treiblmaier and Petrozhitskaya (2023); Boukis (2020); Utz et al. (2023) and Safitri (2024) and consisted of two main sections. The first took into perspective demographics of study sample, while the other section contained statements related to adopted sub-variables including (Control over Personal Data, Trust and Transparency, Improved Personalization, Seamless Loyalty Programs and Enhanced Customer Service). The questionnaire was built on likert 5-point scale and was arbitrated by a group of academics in the field of the sake of validity.

Population of study consisted of consumers who have experience in online shopping. Researcher has chosen a sample of (400) individuals to represent the study's population. After application process, researcher was able to collect primary data from (372) individuals which indicated a response rate of (93%) as statistically acceptable.

Dealing with collected primary data was done depending on statistical package for social sciences SPSS. For demographics we depended on frequencies and percentages, as for questionnaire analysis we have relied on mean and standard deviation. Testing hypotheses was done through multiple regression, and we have used Cronbach's Alpha test in order to make sure that the questionnaire was reliable and consistent with study's aim and objectives.

Analysis and Results

Demographics

Results of demographics' analysis found that majority of respondents were males forming 55.4% of the sample who were above 51 years old forming 35.2%. in addition to that, results indicated that majority of respondents held a diploma forming 40.6% and they had an income that ranged between \$1001-\$1499 forming 34.7%.

Questionnaire Analysis

Analysis of questionnaire was done in two phases, the first took into account mean and standard deviation of sample responses to questionnaire which indicated that all statements were positively received by respondents given that all statements scored a mean that was higher than mean of scale 3.00. the highest variable was “control over personal data” which scored a mean of 4.17/5.00. while the least mean was scored by “E-CRM” with a mean of 3.85/5.00. looking deeper into questionnaire analysis, it was found that the highest statement that responses have answered positively was “I have the ability to grant and prevent permission to websites according to my own desire” scoring a mean of 4.33/5.00 compared to the least positive statement which was “Deleting my profile guarantees that all information inside it are also deleted” with a mean of 3.75/.500 but still positive as it scored higher than mean of scale.

In the second phase, reliability of study tool was tested depending on Cronbach’s Alpha. It was seen that alpha value scored in all variables higher than 0.70 which meant that the tool was reliable and consistent.

Table 1. *Questionnaire Analysis*

Statement	μ	σ	Alpha
I have the maximum control over my personal data and information	4.151	1.135	0.906
I have the ability to grant and prevent permission to websites according to my own desire	4.331	1.007	
I can only give access to the information I feel can be accessible	4.185	1.123	
I am satisfied with the degree of privacy I have over the internet	4.183	1.069	
I have never faced any troubles leaving my financial data online or on any website	4.005	1.007	
Control over Personal Data	4.171	.911	
I can easily verify the authenticity of any interaction on the web	3.992	1.005	0.902
My transaction on the web are all protected according to my own need and desire	3.935	1.143	
I can re-verify all previous transactions and interactions with the website or application whenever I want	3.973	1.043	
I think I can trust applications to protect my personal data	3.978	1.064	
If these websites weren’t trustworthy, they wouldn’t have given me rewards and discounts	3.965	1.034	
Trust and Transparency	3.969	.898	
My profile contains all the transactions and interactions that I have made with the website	3.906	1.022	0.942
I can access and edit my personal data whenever I want through the profile	3.965	.924	
I can edit the settings of my profile according to my own preferences	3.957	.995	

All recommendations reach me through the profile and on private bases	3.970	.989	
I get relevant marketing recommendations and I am satisfied with them	3.914	1.073	
Improved Personalization	3.942	.902	
I enjoy loyalty discounts and rewards whenever I buy online which is convenient for me	3.930	.929	0.911
I can track my loyalty points whenever I need	3.997	1.075	
My points and rewards are saved in my profile for future use	3.903	1.060	
I can redeem any point I get any time I decide to do so	4.027	1.053	
All loyalty points and rewards on the website are transparent and can be redeemed for real	4.003	1.034	
Seamless Loyalty Programs	3.972	.886	
I can edit the settings of communication any time I want	4.140	1.075	
Deleting my profile guarantees that all information inside it are also deleted	3.750	1.017	
I do all my queries and complaints are dealt with through my profile and are answered on the spot	3.895	.959	
There are many automated services that are designed for my own convenience	4.013	.950	
I have never faced a problem in dealing with any issue on the website	4.161	1.111	
Enhanced Customer Service	3.992	.887	
The website guarantees that I control who ever have access on my profile	4.161	.996	0.811
The process of managing and deleting my profile is easy and not multi-stepped	3.987	1.047	
It doesn't take a long time to answer my queries and resolve my issues	3.777	1.295	
All my transactions are protected and trusted in my profile	3.320	1.557	
The website makes sure that no harm can reach my profile and they always notify me with any suspicious actions	4.011	1.086	
E-CRM	3.851	.917	
Algorithm of the website is easy to follow and comprehend	3.927	1.068	0.917
Accessibility of the website is smooth and its connectivity is satisfactory	4.065	1.044	
The website platform is user friendly and can suit all ages	4.032	1.027	
There is Chatbot and assistants if I needed any help	4.177	1.067	
There are continuous upgrading and development on the website all the time	3.777	1.023	
Technology Adoption	3.996	.907	

Hypotheses Testing

H1: Blockchain in marketing has a statistically significant influence on efficiency of E-CRM

The hypothesis mentioned above was analyzed using multiple regression analysis which revealed a strong positive correlation ($r = 0.803$) between the independent variables and the dependent variable. The independent variables explained an additional **64.5%** of the total variation in the dependent variable. It is worth mentioning that the F value was statistically significant at the 0.05 level, suggesting that Blockchain in marketing has a statistically significant influence on efficiency of E-CRM.

Table 2. Hypotheses 1 Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.		
		B	Std. Error	Beta			R	R 2
1	(Constant)	.352	.141		2.495	.013	.803 ^a	.645
	Control over Personal Data	.121	.066	.120	1.840	.067		
	Trust and Transparency	.040	.072	.039	.552	.581		
	Improved Personalization	.283	.079	.279	3.564	.000		
	Seamless Loyalty Programs	.169	.089	.164	1.905	.058		
	Enhanced Customer Service	.263	.083	.254	3.169	.002		

By using Correlation matrix, it was found that the highest relationship was between **Seamless Loyalty Programs and e-CRM** as shown in the following table 4:

Table 3. Correlation Matrix

		Control over Personal Data	Trust and Transparency	Improved Personalization	Seamless Loyalty Programs	Enhanced Customer Service	E-CRM
ECRM	Pearson Correlation	.723**	.711**	.758**	.765**	.761**	1
	Sig. (2-tailed)	.000	.000	.000	.000	.000	
	N	372	372	372	372	372	372

** . Correlation is significant at the 0.01 level (2-tailed).

H2: Technology adoption moderates the relationship between blockchain in marketing and efficiency of E-CRM

Table 5 presented a substantial statistical correlation between blockchain in marketing and efficiency of E-CRM, with a p-value of 0.000 ($R^2 = 0.639$). Upon incorporating the Technology adoption in the subsequent phase, we saw a substantial

increase in the overall interpretation variable, with an R2 value of 0.4%. The inclusion of the Technology adoption and blockchain in marketing variable resulted in a substantial increase of 0.8% in the overall interpretation variable, as indicated by the R2 value. This indicated that **technology adoption moderates the relationship between blockchain in marketing and efficiency of E-CRM**

Table 4. Hypothesis 2 Testing

ANOVA								
Model		Sum of Squares	df	Mean Square	F	Sig.	R	R 2
1	Regression	199.076	1	199.076	653.962	.000 ^b	.799 ^a	.639
	Residual	112.634	370	.304				
	Total	311.710	371					
2	Regression	200.329	2	100.164	331.841	.000 ^c	.802 ^b	.643
	Residual	111.381	369	.302				
	Total	311.710	371					
3	Regression	202.926	3	67.642	228.823	.000 ^d	.807 ^c	.651
	Residual	108.784	368	.296				
	Total	311.710	371					

Discussion

We hypothesized in current study that technology adoption moderates the relationship between blockchain in marketing (control over personal data, trust and transparency, improved personalization, seamless loyalty programs, enhanced customer service) and efficiency of customer e-CRM. We have employed the quantitative methodology in order to test our hypothesis. We developed a questionnaire and it was self-administered by (372) customer who has experience in e-shopping. SPSS results indicated the acceptance of our hypothesis as it turned out that technology adoption is able to moderate the relationship between blockchain and efficiency of e-CRM with focus on seamless loyalty programs.

Results indicated that blockchain increases the efficiency of e-CRM through multiple services on the level of loyalty programs such as rewards, discounts, and sales that are seemed to be convenient for customers. In addition to that, analysis indicated that through blockchain, customers are able to track their profiles and points in order to redeem them whenever it is possible in addition to the level of transparency and trust that blockchain presents in terms of loyalty programs.

Results also indicated that blockchain technology has an ability to transform the effectiveness of that e-Customer Relationship Management (e-CRM) via data security improvement and data integrity gain, through use of transaction transparency and trust, implementation of process automation and smooth operation through smart contracts, application of personal and precise marketing, and increase of consumer trust and confidence through using blockchain technology to enhance the transparency and accountability. This agreed with Utz et al. (2023) and Safitri (2024) who noted that as the blockchain technology is meant to be at the disposal, companies are offered a tool for optimization of data management, process automating, customer experience improvement and more efficient and effective e-CRM.

As for the moderation hypothesis, results reached indicated that due to the existence of the intermediary twist, technology adoption has close association with the blockchain and e-Customer Relationship Management (e-CRM) relationships. The high degree of integration and the usage of blockchain technology in e-CRM practices is defined mainly by the businesses' readiness to join and support the competing technologies. Key rate of technology adoption factors which are inculcation of new knowledge by the employees, training sessions held on time and organizational support enable the use of blockchain technology in e-CRM to a satisfactory degree of effectiveness. However, the businesses can achieve operational excellence only when the offering of blockchain technology is accepted there, and hence, organizations are able to fully leverage the capabilities of blockchain, and secondly the management of data becomes better through which the operations are streamlined and finally customer experience is perfected. As agreed on by Rane (2023); Treiblmaier and Petrozhitskaya (2023) and Boukis (2020) who saw that while one side of the coin can be very positive for the marketing campaign and useful in data security, the other can be very unfavorable holding the blockchain back from maximizing its potential, thereby limiting efficiency gains in e-business relationship management. This is the reason that the technology adoption is the main moderator which decides the impact of the decentralized technology blockchain on the efficiency of e-CRM systems.

Based on above discussion, current study was limited to opinions of customer who were involved with online shopping. There was no intervention from organizations of any kind, and the development of the problem, tool and results didn't depend on any financial or annual reports that are concerned with a certain organization.

We suggest as a future research to investigate the aftereffects of blockchain utilization for e-customer relationship management over some time. The latter implies conducting a behavioral research of continuous impact of blockchain on customers' opinion, behavior and loyalty over a protracted period of time. Studies of this type may add new dimensions to the on-going developmental processes in blockchain-centered CRM as well as unveil the lasting impact this technology has on customer relationships.

Conclusion and Recommendations

The blockchain does have the potential to significantly augment the customer relationship management (CRM). Blockchain technology brings in an increase in CRM by ensuring the participation of all parties in the stable, decentralized and transparent platform that aids in managing customer data and interactions. Through the blockchain, customer data can be securely mitigated in a tamper-free and transparent way, so you ensure data authenticity another related matter in the trust-building process. Through this way you will be able to build the trust of your customers and signal that you've got the transparency needed by your customers because of the various things like personalized marketing campaigns, secure transactions and finally the control of customer's data. Besides, blockchain uses

smart contracts as a tool to execute CRM tasks by bringing automation and optimization of customer relations management into it. In brief, through utilizing blockchain in CRM, businesses can develop customer relationships stronger, bring better customer experience, and operation execute at a maximum.

Study recommended to shed the light on aspects that may influence organizations' acceptance of blockchain in their marketing strategies, in addition to the need to increase the attention of marketing department on aspects of trust and loyalty through online shopping channels.

Theoretical and Practical Implications

The current study was carried out in order to highlight the moderating influence of technology adoption on the relationship between blockchain and e-CRM from customers' perspective. From a theoretical point of view, the study might be efficient with technology acceptance from the perspective of customers as the moderator being the mediating factor. This can fill in the gap in knowledge and theory about the role of blockchain technology in shaping people's perceptions and behaviors. It could shed light on theories and tend to explain the position of blockchain in customer trust, satisfaction, and loyalty while managing and using e-customer relationships.

From a practical perspective and, the findings could be a very helpful tool for businesses implementing blockchain technology in their marketing or customer management strategy from a customers' perspective. It also can assist in sharing how blockchain integrated CRM could be communicated clearly examples of the benefits to the customers. The study in this regard could assist firms in form mutual knowledge with the customers around the expectations, various challenges and the barriers related to blockchain technology. Through the prism of the above insights' orgs can build and bring specific marketing programs and educational programs to their clients to the enhanced awareness levels of what is blockchain and its right use in CMR. This can later be reflected in the improved customer satisfaction, trustworthiness and connection.

References

- Abakah EJA, Ullah GW, Adekoya OB, Bonsu CO, Abdullah M (2023) Blockchain market and eco-friendly financial assets: Dynamic price correlation, connectedness and spillovers with portfolio implications. *International Review of Economics & Finance*, 87, 218-243.
- Adithya ARH (2021) Sistem Informasi E-CRM Berbasis Web untuk Peningkatan Loyalitas serta Pelayanan. *Journal Portal Data*, 1(2).
- Al-Duwailah F, Hashem TN (2019) The impact of knowledge management on CRM approaches. *Management and Organizational Studies*, 6(1), 19-30.
- Antoniadis I, Spinthiropoulos K, Kontsas S (2020) Blockchain applications in tourism and tourism marketing: A short review. *Strategic Innovative Marketing and Tourism: 8th ICSIMAT, Northern Aegean, Greece, 2019*, 375-384.
- Antwi WO (2023) Prospecting Blockchain-augmented CRM, and the Emerging Usage of DLT in Reward Programme Decisions Amongst Finnish Companies.

- Bajaj P, Anwar I, Yahya AT, Saleem I (2023) Factors Influencing Adoption of IoT and Its Impact on CRM in Banks: Examining the Moderating Role of Gender, Age, and Bank Ownership Type. *Human Behavior and Emerging Technologies*, 2023.
- Bonetti E, Bartoli C, Mattiacci A (2024) Applying blockchain to quality food products: A marketing perspective. *British Food Journal*, 126(5), 2004-2026.
- Boukis A (2020). Exploring the implications of blockchain technology for brand–consumer relationships: a future research agenda. *Journal of Product & Brand Management*, 29(3), 307-320.
- Chaudhuri R, Chatterjee S, Kraus S, Vrontis D (2023) Assessing the AI-CRM technology capability for sustaining family businesses in times of crisis: the moderating role of strategic intent. *Journal of Family Business Management*, 13(1), 46-67.
- Dastjerdi M, Keramati A, Keramati N (2023) A novel framework for investigating organizational adoption of AI-integrated CRM systems in the healthcare sector; using a hybrid fuzzy decision-making approach. *Telematics and Informatics Reports*, 11, 100078.
- Ettaouia I, Bulchand-Gidumal J (2023) The impact of information technology adoption on hotel performance: Evidence from a developing country. *Journal of Quality Assurance in Hospitality & Tourism*, 24(5), 688-710.
- Ghavidast Kouhpayeh M, Doshman Ziari E, Rousta A (2024) Using the structural equation modeling method in building customer trust in the blockchain-based marketing ecosystem. *International Journal of Nonlinear Analysis and Applications*, 15(5), 337-352.
- Gleim MR, Stevens JL (2021) Blockchain: a game changer for marketers? *Marketing Letters*, 32, 123-128.
- Haqqizar N, Widyaningsih TW, Dewi MA (2023) Agile Scrum Model for Development of e-Customer Relationship Management to Support Warehouse Rental Services. *Journal SISKOM-KB (Sistem Komputer dan Kecerdasan Buatan)*, 6(2), 118-124.
- Hashem DTN (2021) The reality of internet of things (IoT) in creating a data-driven marketing opportunity: mediating role of customer relationship management (CRM). *J. Theor. Appl. Inf. Technol*, 99(2), 329-342.
- Haynes P, Hietanen J (2023) Marketing without trust?—Blockchain technologies in the sharing economy as assemblage and pharmakon. *Journal of Business Research*, 163, 113940.
- Hilali D, Tahour A, SADIQI K (2023) CRM adoption in higher education: a literature review. *African Scientific Journal*, 3(20), 601-601.
- Jain D, Dash MK, Kumar A, Luthra S (2021) How is blockchain used in marketing: a review and research agenda. *International Journal of Information Management Data Insights*, 1(2), 100044.
- Karim RA, Rabiul MK, Kawser S (2023) Connecting e-customer relationship management and e-loyalty to willingness to recommend a bank service: the sequential mediating roles of e-satisfaction and e-service quality. *Global Knowledge, Memory and Communication*.
- Marthews A, Tucker C (2023) What blockchain can and can't do: Applications to marketing and privacy. *International Journal of Research in Marketing*, 40(1), 49-53.
- Maseke BF (2024) Enhancing Marketing Transparency and Trust through Blockchain Technology. *South Asian Journal of Social Studies and Economics*, 21(3), 83-92.
- Nadube PM, Ordah JM (2023) E-customer relationship management and e-marketing performance of deposit money banks in Port Harcourt. *BW Academic Journal*, 19-19.
- Peres R, Schreier M, Schweidel DA, Sorescu A (2023) Blockchain meets marketing: Opportunities, threats, and avenues for future research. *International Journal of Research in Marketing*, 40(1), 1-11.
- Rane N (2023) Enhancing customer loyalty through Artificial Intelligence (AI), Internet of Things (IoT), and Big Data technologies: improving customer satisfaction, engagement,

- relationship, and experience. *Internet of Things (IoT), and Big Data Technologies: Improving Customer Satisfaction, Engagement, Relationship, and Experience (October 13, 2023)*.
- Ravan AA (2023) Investigating the impact of e-customer relationship management (eCRM) and digital innovation on the strategic competitive performance of small and medium-sized enterprises in Guilan province. *International Journal of Business Management and Entrepreneurship*, 2(4), 61-72.
- Rejeb A, Keogh JG, Treiblmaier H (2020) How blockchain technology can benefit marketing: Six pending research areas. *Frontiers in blockchain*, 3, 3.
- Safitri K (2024) Blockchain Technology in Marketing: Exploring Decentralized Solutions for Trust and Transparency: Literature Review Study. *International Journal of Economic Literature*, 2(3), 681-697.
- Stallone V, Wetzels M, Klaas M (2021) Applications of Blockchain Technology in marketing —A systematic review of marketing technology companies. *Blockchain: Research and Applications*, 2(3), 100023.
- Tan TM, Salo J (2023) Ethical marketing in the blockchain-based sharing economy: Theoretical integration and guiding insights. *Journal of Business Ethics*, 183(4), 1113-1140.
- Tan TM, Saraniemi S (2023) Trust in blockchain-enabled exchanges: Future directions in blockchain marketing. *Journal of the Academy of Marketing Science*, 51(4), 914-939.
- Tozanlı Ö, Kongar E, Gupta SM (2020) Trade-in-to-upgrade as a marketing strategy in disassembly-to-order systems at the edge of blockchain technology. *International Journal of Production Research*, 58(23), 7183-7200.
- Treiblmaier H (2023) Beyond blockchain: How tokens trigger the internet of value and what marketing researchers need to know about them. *Journal of Marketing Communications*, 29(3), 238-250.
- Treiblmaier H, Petrozhitskaya E (2023) Is it time for marketing to reappraise B2C relationship management? The emergence of a new loyalty paradigm through blockchain technology. *Journal of Business Research*, 159, 113725.
- Treiblmaier H, Petrozhitskaya E (2023) Is it time for marketing to reappraise B2C relationship management? The emergence of a new loyalty paradigm through blockchain technology. *Journal of Business Research*, 159, 113725.
- Utz M, Johanning S, Roth T, Bruckner T, Strüker J (2023) From ambivalence to trust: Using blockchain in customer loyalty programs. *International Journal of Information Management*, 68, 102496.
- Wasiq M, Bashar A, Akmal S, Rabbani MR, Saifi MA, Nawaz N, Nasef YT (2023) Adoption and applications of blockchain technology in marketing: A retrospective overview and bibliometric analysis. *Sustainability*, 15(4), 3279.
- Wijaya D, Dewanti R (2021) Analysis of The Effect of Electronic Customer Relationship Management and Perceived Value on E-Customer Loyalty Through E-Customer Satisfaction on XYZ. Com.
- Younis JA, Al-Shammari H, Hejase HJ, Massoud M, Hejase AJ (2024) E-satisfaction as a mediator between consumer loyalty and E-CRM: The context of Lebanese e-commerce. *International Journal of Innovative Research and Scientific Studies*, 7(3), 978-996.