Original Article

Beyond Traditional Marketing: How Blockchain and IT are Reshaping Digital Marketing in a Triple Helix Context in Iringa Municipal, Tanzania

Lusekelo Kibona

Department of Computer Science, Ruaha Catholic University (RUCU), Iringa, Tanzania.

Corresponding Author: lusekelo2012@gmail.com

Abstract - This study explored the transformative potential of blockchain and Information Technology (IT) within digital marketing, framed by the Triple Helix Model of collaboration among academia, industry, and government. Utilizing a sample of 145 respondents from Iringa Municipal, Tanzania, the research examined key indicators such as awareness and understanding of blockchain, perceptions of its impact on marketing efficiency, trust and transparency in blockchain-based marketing, data privacy concerns, and collaboration dynamics in the Triple Helix model. The findings revealed a moderate level of familiarity with blockchain concepts, significant concerns regarding data privacy, and varying perceptions of the effectiveness of government regulations. In general, the study highlighted the challenges and opportunities blockchain presents in enhancing marketing practices. It emphasized the importance of collaborative efforts to drive innovation and address regulatory hurdles. These insights contribute to a deeper understanding of how blockchain and IT can reshape marketing strategies in a rapidly evolving digital landscape.

Keywords - Blockchain, Digital marketing, Triple Helix Model, Information Technology (IT), Marketing efficiency, Data privacy, Academia-industry-government partnerships.

1. Introduction

In recent years, the rapid advancement of technology has driven profound changes in the marketing landscape, pushing businesses to innovate beyond traditional methods. Integrating blockchain technology and Information Technology (IT) has emerged as a transformative force in digital marketing, offering new ways to enhance transparency, data security, and consumer trust. This shift, particularly in the Triple Helix model, which involves collaboration between universities, industries, and governments, represents a significant evolution in how marketing strategies are developed and executed. By leveraging blockchain's decentralized and secure nature, organizations can address the growing concerns over data privacy and accountability while IT advancements further streamline marketing processes. When implemented within the Triple Helix framework, this study explores how these technologies reshape the digital marketing environment, providing a foundation for more trustworthy, transparent, and efficient marketing practices.Initially developed for cryptocurrencies, blockchain technology has gained significant traction due to its potential applications beyond finance [1]. Its decentralized nature ensures data transparency, security, and immutability, making it ideal for disrupting industries that rely on trust, efficiency, and traceability [2]. Blockchain's unique features, such as privacy and decentralization, benefit various fields, including the Internet of Things, energy, finance, healthcare, and government [1]. The technology enabled increased efficiency, enhanced traceability, and reduced costs across different industrial sectors [2]. Notably, the emergence of decentralized applications (DApps) further expanded blockchain's potential, offering highly transparent and censorship-resistant solutions [3]. Despite challenges like scalability and security, blockchain continued to evolve, with platforms like Hyperledger Besu implementing smart contracts to automate processes and reduce manual intervention [4]. In Tanzania, blockchain could enhance healthcare record management, land registration systems, and banking security [5]. However, awareness and adoption remained low, with only 25.3% of procurement experts familiar with blockchain applications in supply chain operations [6]. Globally, blockchain technology has applications in various sectors, including finance, insurance, supply chain management, energy, and healthcare [7]. In the architecture, engineering, and construction industry, blockchain integration with Building Information Modeling (BIM) processes could improve data management, security,

and collaboration [8]. Despite its potential, blockchain faces challenges in scalability, security, and regulation [7]. Integrating blockchain technology in digital marketing has shown significant potential for enhancing transparency, trust, and security. Studies have explored various applications, including decentralized advertising, tokenized rewards, and supply chain transparency [9, 10]. Blockchain's ability to ensure data integrity and eliminate intermediaries has been found to increase consumer trust and simplify marketing processes [10]. Research has demonstrated blockchain's effectiveness in reducing ad fraud, improving customer engagement, and transforming marketing analytics [11, 12]. Specific use cases such as rewarding web users for interactions, compensating content creators, and securing user data have been identified as promising areas for innovation [9]. However, challenges remain, including the need for regulatory frameworks to address data privacy concerns and promote interoperability [12].

Blockchain technology presents a transformative opportunity for the digital marketing sector, offering enhanced transparency and trust in campaign management. The technology's ability to combat ad fraud, verify ad impressions, and ensure data integrity was highlighted [13]. Blockchain also enabled the creation of customer-oriented platforms, improving interactions between consumers and businesses [9]. The studies emphasized blockchain's potential to eliminate intermediaries, making marketing processes more efficient and cost-effective [10]. However, scalability, speed, and interoperability must be addressed for widespread adoption [14]. Overall, blockchain demonstrated significant promise in reshaping digital marketing practices. Recent studies have explored the potential of blockchain technology in revolutionizing marketing practices. Blockchain can enhance customer-centric marketing by facilitating secure, verified transactions and improving data analytics [15]. It offers benefits such as combating click fraud, reinforcing trust and transparency, and enabling creative loyalty programs [16]. Blockchain-enabled marketing analytics can improve campaign transparency and effectiveness, addressing challenges in conventional marketing analytics [12].

The technology has shown relevance in various marketing aspects, particularly in supply chain management and internal operations [17]. These advancements allow marketers to target consumers more effectively, penetrate existing markets, and create new online marketplaces [16]. However, adopting blockchain in marketing also raises concerns about data privacy and the need for regulatory frameworks to manage these issues [12]. In Tanzania, blockchain and artificial intelligence significantly influenced SME marketing practices, highlighting the potential for enhanced customer experiences and business growth [18]. Data-driven technologies, including blockchain and programmatic advertising, were found to facilitate customer-centric marketing by enabling secure transactions and

targeted advertising [15]. The adoption of Industry 4.0 technologies, such as IoT, cloud computing, and big data analytics, was identified as crucial for integrating supply chain management and marketing processes [19]. Blockchain's application in marketing addressed challenges related to big data, privacy, and fraud, with research streams focusing on e-commerce, data analytics, and security [20]. These studies collectively emphasized the transformative potential of blockchain and associated technologies in revolutionizing marketing strategies and customer engagement.

Information Technology (IT) was crucial in enhancing marketing efforts and supply chain resilience through various technologies. IT integration in marketing strategies enabled businesses to leverage digital platforms, social media, and data analytics for personalized customer engagement and competitive advantage [21]. In international marketing, IT reshaped traditional strategies and opened new opportunities for global expansion [22]. The Internet of Things (IoT) and blockchain technologies addressed privacy concerns in smart marketing systems while harnessing big data for improved decision-making [23]. In supply chain management, IT tools like Artificial Intelligence (AI), IoT, and blockchain enhance resilience by providing real-time visibility, predictive analytics, and secure information sharing. Digital platforms and cloud-based solutions fostered collaboration and agility, enabling organizations to respond swiftly to disruptions and uncertainties in the global business environment [24].

IT played a crucial role in enhancing marketing efforts and business competitiveness in Tanzania. IT resources, human skills, and industry-specific knowledge significantly influence firms' capabilities and competitive advantage in the tourism sector [25]. For Small and Medium Enterprises (SMEs), integrating blockchain and artificial intelligence technologies substantially impacted marketing strategies, improving customer experiences and driving business growth [18]. IT usage in SMEs facilitated market accessibility, increased profitability, and expanded marketing coverage, although only a small percentage of businesses utilized IT for marketing campaigns [26].

On a broader scale, IT transformed international marketing practices by reshaping traditional strategies and creating new business opportunities worldwide [27]. These findings underscore the importance of IT in enabling blockchain-based solutions and leveraging data analytics to enhance marketing efforts in Tanzania.The Triple Helix model, focusing on collaboration among academia, industry, and government, has been widely studied for its role in driving innovation and knowledge-based development. Research has shown that this collaboration can foster the adoption of new technologies, including Industry 4.0 and blockchain [28]. The model emphasizes the enhanced role of universities in the transition to a knowledge-based society

[29] and highlights the importance of knowledge capitalization and innovation [30]. Studies have explored the current state of the Triple Helix model, identifying potential weaknesses and proposing new frameworks to strengthen collaboration [31]. The model's explanatory power has been enhanced by integrating various social science concepts, and its application has expanded to multiple disciplines [29].

Researchers have also proposed region-specific Triple Helix models to address local economic challenges and promote technology adoption [28]. In emerging economies, new technology-based firms leverage Triple Helix collaborations to overcome resource constraints and accelerate early internationalization [32]. However, challenges remain in implementing effective Triple Helix collaborations, including clearer role definitions, strengthened partnerships between higher education institutions and the private sector, and improved research commercialization [31]. To maximize the benefits of the Triple Helix model, it is essential to continuously realign strategies to meet the changing needs of network actors and foster a virtuous cycle of innovation adoption and valorization [28, 31].

The problem addressed in this study stemmed from the growing challenges in digital marketing, particularly concerning transparency, data privacy, and consumer trust. Traditional marketing approaches have struggled to keep pace with the increasing demand for secure and transparent interactions between consumers and brands, leading to a trust deficit in digital platforms. Despite the innovation potential, the lack of integration between blockchain technology and information technology within the Triple Helix framework has limited the capacity for collaboration between academia, industry, and government. This study explored how blockchain and IT could reshape digital marketing practices to overcome these challenges, fostering greater trust and accountability.

The study's objective was to investigate how blockchain technology and information technology, within the context of the Triple Helix model, could transform digital marketing strategies. It aimed to identify the potential benefits of integrating these technologies to enhance transparency, improve data security, and build consumer trust in digital marketing practices. By examining the interplay between academia, industry, and government, the study sought to provide insights into innovative approaches that could address existing challenges in the digital marketing landscape.The study's main contribution was that it provided a comprehensive analysis of how blockchain and information technology, within the framework of the Triple Helix model, reshaped digital marketing strategies. It offered valuable insights into the potential of blockchain to enhance transparency, accountability, and consumer trust in marketing while also addressing critical challenges such as

data privacy and scalability. By integrating perspectives from academia, industry, and government, the study advanced understanding of how these sectors could collaborate to drive innovation and create more secure and efficient marketing ecosystems.The remaining part of the paper is organized as follows: Methodology is presented in Section 2, results and discussion of the study are presented in Section 3, and the conclusion and recommendations are in Section 4.

2. Methodology

The study's methodology employed a mixed-methods approach, combining quantitative and qualitative data collection techniques to analyse blockchain comprehensively and IT's impact on digital marketing in a Triple Helix context. The study's sample size consisted of 145 participants, selected through a purposive sampling method to ensure representation from academia, industry, and government sectors. Data were gathered using structured questionnaires and in-depth interviews. The questionnaires were designed to capture participants' awareness, perceptions, and experiences related to blockchain technology in marketing, while the interviews offered deeper insights into the challenges and opportunities blockchain presented. Quantitative data were analyzed using descriptive statistics, and qualitative data were thematically analyzed to identify key patterns and themes. The methodology ensured a balanced perspective from all three sectors of the Triple Helix model, providing a holistic understanding of the role of blockchain and IT in reshaping digital marketing strategies.

3. Results and Discussion

The results and discussion section provided an in-depth analysis of the findings from the study, highlighting the significant insights gathered from the respondents regarding the impact of blockchain and IT on digital marketing strategies within the Triple Helix framework. The data revealed a range of perspectives on how these technologies reshaped marketing practices, addressed key challenges, and created new opportunities for collaboration among academia, industry, and government. By analyzing both quantitative and qualitative responses, the section aimed to draw meaningful conclusions that contribute to the ongoing discourse on the evolving landscape of digital marketing.

3.1. Demographic Information of the Respondents

The study involved a diverse sample of 145 respondents from Iringa Municipal, Tanzania. Demographic information collected included age, gender, education level, occupation, and industry or sector. This diverse sample provided a broadrepresentation of the local population, allowing for a comprehensive analysis of the impact of blockchain and IT on digital marketing in the region. By examining various occupations and sectors, the study aimed to uncover insights into how different groups perceived and engaged with these technologies in the marketing landscape.

3.1.1. Age of the Respondents

The age distribution of respondents in the study, as shown in Table 1, highlighted various perspectives. The largest group, comprising 50 individuals aged 25-34 years, represented approximately 34.5% of the sample. This demographic was particularly engaged with the implications of blockchain technology and digital marketing, often reflecting a blend of familiarity with digital tools and a strong interest in emerging technologies. Respondents in this age bracket noted their readiness to adapt to new marketing strategies driven by advancements in blockchain, emphasizing their belief in the potential for increased efficiency and transparency in digital marketing practices.

Following closely, the group of respondents aged 35-44 years accounted for 24.1% of the sample, totaling 35 individuals. This group brought valuable insights drawn from their professional experiences, with many highlighting the challenges and opportunities they perceived in integrating blockchain into existing marketing frameworks. Their discussions often centered around the need for education and training to fully leverage the benefits of blockchain technology, suggesting that while they recognized its potential, they also felt the need for greater clarity on its practical applications. The younger demographic of 18-24 years, although the smallest group with 20 respondents (13.8%), expressed a keen enthusiasm for blockchain's role in shaping future marketing landscapes. They demonstrated an awareness of contemporary digital trends and a desire to be at the forefront of technological advancements. Conversely, the group aged 45 years and above, representing 27.6% of the respondents with 40 individuals, exhibited a mix of skepticism and cautious optimism. Many shared their concerns regarding data privacy and security, reflecting their experiences with past technological shifts. Overall, the age distribution provided a rich tapestry of views, illustrating how varying experiences and perspectives influenced the understanding and expectations surrounding blockchain in marketing.

3.1.2. Gender of the Respondents

The gender distribution among respondents in the study, as per table 1, indicated a predominance of male participants, who comprised 55.2% of the sample, totaling 80 individuals. This significant representation provided insights into men's perspectives regarding blockchain technology and its implications for digital marketing. Many male respondents expressed a strong familiarity with digital tools and technologies, often discussing their experiences in the industry and how they perceived blockchain as a transformative force in marketing strategies.

They highlighted the potential for enhanced data security and efficiency, emphasizing the advantages of blockchain in building consumer trust.Female respondents accounted for 44.8% of the sample, totaling 65 individuals. This group brought diverse insights and experiences, often highlighting different concerns and expectations regarding blockchain technology. Female respondents frequently underscored the importance of ethical considerations in digital marketing, particularly in relation to data privacy and security. Many expressed a desire for more inclusive discussions around blockchain applications, emphasizing the need for gender representation in the technology sector. They pointed out that while they recognized the potential benefits of blockchain, they also felt it was crucial to address the ethical implications and ensure that technological advancements served a broader audience. The gender distribution revealed valuable contrasts in perspectives, with male respondents leaning more towards the technical advantages of blockchain, while female respondents emphasized ethical considerations and inclusivity.

Table 1. Demographic information of the respondents

Demographic Variable	Category	Frequency	Percentage (%)
Age	18-24 years	20	13.8
	25-34 years	50	34.5
	35-44 years	35	24.1
	45 years and above	40	27.6
Gender	Male	80	55.2
	Female	65	44.8
Education Level	Advanced Level or Below	25	17.2
	Diploma/Certificate	35	24.1
	Bachelor's Degree	55	37.9
	Postgraduate Degree	30	20.7
Occupation	Marketing	40	27.6
	IT/Tech	35	24.1
	Finance	30	20.7
	Other	40	27.6
Industry/Sector	Government	35	24.2
	Academia	45	31.0
	Industry (Private Sector)	65	44.8

This gendered lens enriched the study, underscoring the importance of diverse viewpoints in understanding the multifaceted impact of blockchain and IT on digital marketing. The findings suggested that a more balanced representation of genders could lead to more comprehensive and effective marketing strategies in the evolving digital landscape.

3.1.3. Education Level of the Respondents

The educational background of the respondents provided a rich context for analyzing their perspectives on blockchain technology and its implications for digital marketing. According to table 1, among the participants, 25 individuals, accounting for 17.2%, had completed their education at the Advanced Level or below. This group often expressed a foundational understanding of technology but desired more information on advanced concepts like blockchain. Their feedback highlighted a knowledge gap that could hinder their engagement with digital marketing strategies leveraging blockchain technology.The next segment of respondents, comprising 35 individuals (24.1%), held a diploma or certificate.

This group demonstrated a moderate level of technical knowledge and practical skills related to marketing. They frequently discussed how their educational experiences had introduced them to various digital tools and platforms. However, many expressed uncertainty about blockchain's specific applications in marketing. They recognized its potential but were eager to learn how to integrate it into their existing marketing practices.The largest group in the study consisted of 55 respondents, representing 37.9%, who held a Bachelor's Degree. This cohort exhibited a higher level of familiarity with blockchain concepts and their implications for marketing.

Many respondents in this category articulated detailed insights about how blockchain could enhance data transparency and consumer trust in marketing initiatives. Their educational background equipped them with the analytical skills to assess blockchain adoption's benefits and challenges critically.Lastly, 30 respondents, or 20.7%, had obtained a Postgraduate Degree. This group displayed a sophisticated understanding of blockchain technology and its strategic applications in digital marketing. They often discussed complex ideas such as smart contracts and decentralized systems, emphasizing the transformative potential of blockchain in reshaping marketing strategies. Many respondents also highlighted the importance of aligning blockchain implementation with current regulatory frameworks to ensure compliance and build consumer confidence. The varied educational backgrounds of the respondents enriched the study by providing a spectrum of insights, illustrating how varying levels of education influenced their perceptions and understanding of blockchain technology in the context of digital marketing.

3.1.4. Occupation of the Respondents

The occupation of the respondents, as shown in Table 1, played a significant role in shaping their insights regarding blockchain technology and its impact on digital marketing strategies. Among the participants, 40 individuals identified as working in marketing, accounting for 27.6% of the sample. This group expressed a strong interest in understanding how blockchain could enhance marketing practices, particularly in improving data transparency and consumer trust. Many marketing professionals articulated the need for innovative solutions to combat data privacy concerns and fraud in digital advertising. Their discussions often revolved around the potential of blockchain to create more accountable and efficient marketing campaigns. In addition to the marketing professionals, 35 respondents, representing 24.1%, were employed in the IT or tech sector. This group brought a technical perspective to the discussions about blockchain, often highlighting its foundational principles, such as decentralization and immutability. Their familiarity with technological concepts allowed them to engage deeply with the potential applications of blockchain in marketing. Many IT professionals underlined the importance of interoperability between blockchain systems and existing marketing platforms, emphasizing that successful implementation would require collaboration between marketing and technology teams. Their insights indicated recognising the challenges and opportunities when integrating new technologies into established practices. Another significant segment of the respondents comprised 30 individuals from the finance sector, making up 20.7% of the sample.

These participants offered a unique viewpoint, often relating their experiences with blockchain in the context of financial transactions and regulatory compliance. Their concerns about the implications of blockchain for consumer data security and privacy were particularly pronounced. Many in this group expressed that a deeper understanding of blockchain's capabilities was fundamental for leveraging its advantages in finance-related marketing initiatives, such as targeted advertising and consumer engagement strategies. Finally, 40 respondents, or 27.6%, fell into the "other" category, which included various professions ranging from educators to entrepreneurs. This group provided varied perspectives on the intersection of blockchain technology and marketing, reflecting various experiences and insights. Some expressed skepticism about the practicality of blockchain in marketing, questioning whether the potential benefits outweighed the complexities involved in its implementation. Others viewed blockchain as a transformative technology that could disrupt traditional marketing models and enhance customer relationships. In general, the diverse occupational backgrounds of the respondents enriched the study by presenting a multifaceted view of how blockchain technology could reshape digital marketing practices across different sectors.

3.1.5. Industry/Sector of the Respondents

The study included respondents from various industries and sectors, highlighting the diverse perspectives within the framework of the triple helix model. As illustrated in Table 1, among the 145 participants, 65 respondents, accounting for 44.8%, identified themselves as working in the private sector. This substantial representation underscored the critical role of industry stakeholders in shaping and adopting blockchain and IT innovations in digital marketing. Participants from the private sector expressed strong interest in how these technologies could enhance operational efficiency and marketing strategies, reflecting a keen awareness of the potential competitive advantages offered by blockchain.

In contrast, the academic sector contributed 45 respondents, representing 31.0% of the sample. These participants were primarily engaged in research and educational roles, and their insights emphasized the importance of integrating emerging technologies into curricula and research initiatives. They articulated a vision for blockchain as a transformative force, particularly in data transparency and accountability within marketing practices. Their responses often highlighted the need for a collaborative approach between academia and industry to foster innovation and prepare future professionals for the evolving digital landscape. Lastly, 35 respondents, or 24.1%, represented government sectors.

Their perspectives were particularly focused on regulatory frameworks and policy implications surrounding the adoption of blockchain technologies. Government representatives expressed concerns about the necessity for clear regulations to protect consumer rights and encourage innovation.

They noted the importance of aligning public policy with technological advancements to create a supportive environment for blockchain initiatives. The varied sectoral representation in the study provided a well-rounded understanding of the challenges and opportunities that blockchain and IT present in reshaping digital marketing practices.

3.2. Awareness and Understanding of Blockchain and IT in Marketing

The study assessed respondents' awareness and understanding of blockchain and its marketing through three key sub-indicators: familiarity with blockchain concepts, understanding of its applications in marketing, and knowledge of blockchain's marketing use cases. Respondents were asked about their familiarity with foundational blockchain concepts such as decentralization and smart contracts, their understanding of how it is applied in marketing, and their awareness of specific blockchain use cases. This evaluation provided valuable insights into the participants' overall knowledge.
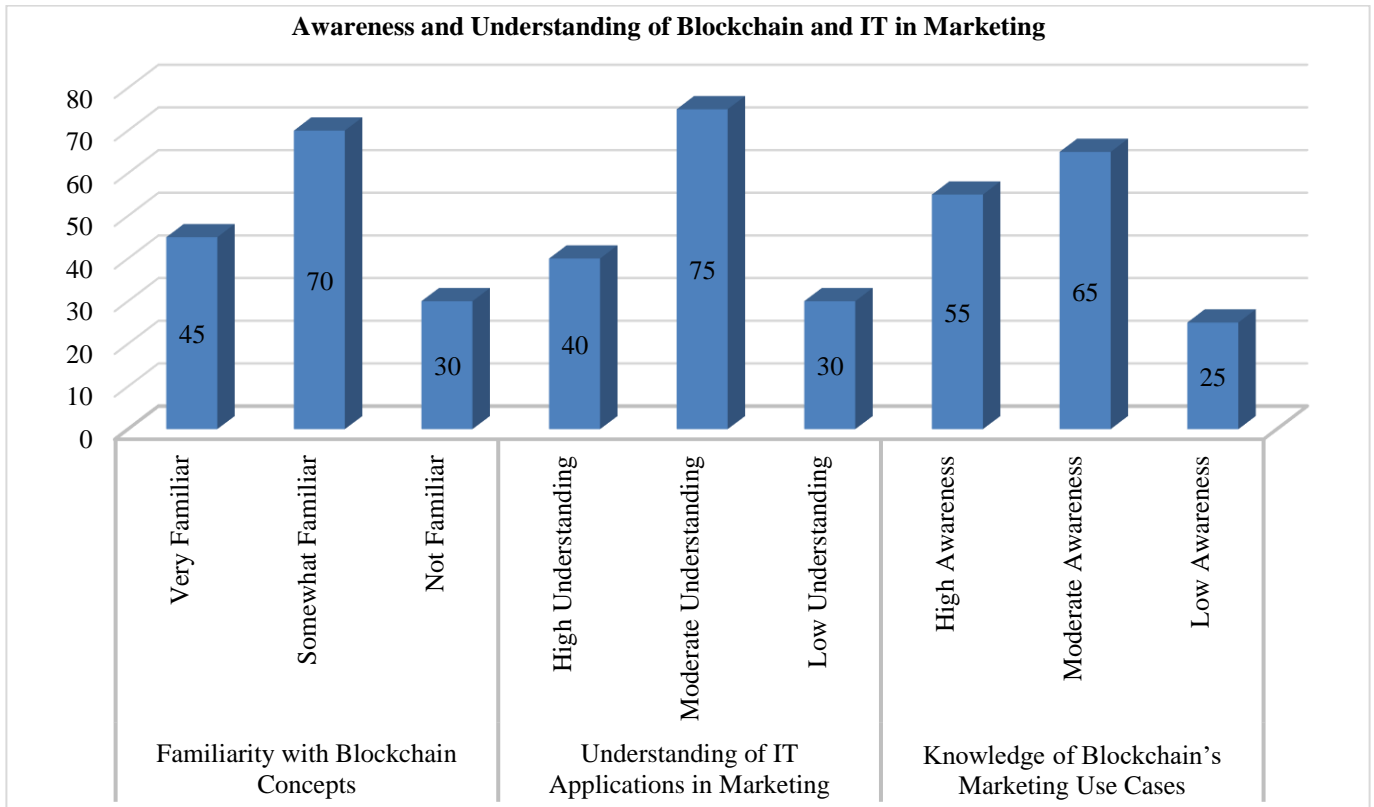

Fig. 1 The awareness and understanding of blockchain and IT in marketing sub-indicators

3.2.1. Familiarity with Blockchain Concepts

In the study, according to Figure 1, participants were asked about their Familiarity with Blockchain Concepts, and the responses varied significantly across different levels of understanding. A substantial portion of respondents, 45 participants (31%), indicated they were very familiar with blockchain principles such as decentralization, immutability, and smart contracts.

These individuals demonstrated a high level of comfort with the technology, often mentioning how they had been exposed to blockchain through academic research or professional applications. One respondent explained:

"...I have been involved in projects where we explored blockchain for secure data management, which gave me a deep understanding of how decentralized systems work..."

The largest group, comprising 70 respondents (48%), were somewhat familiar with blockchain concepts. These participants were generally aware of the technology, particularly its potential applications, but acknowledged that they lacked a deep, technical understanding. Many in this group stated that they had encountered blockchain in discussions related to IT or finance but had not worked with it directly. One participant noted:

"... I have read about blockchain and understand its basics, but I have not had hands-on experience using it. I know about decentralization and smart contracts, but I do not fully grasp how they work in practice..."

Finally, 30 respondents (21%) reported being unfamiliar with blockchain. These participants often cited that they had heard the term "blockchain" in passing but did not fully understand its meaning or potential applications. Several of them expressed a desire to learn more but felt that blockchain's technical jargon made it difficult for non-specialists to engage. One respondent shared:

"... I have seen blockchain mentioned in articles, but honestly, I do not know much about it. It seems too complex, and I have not found a straightforward explanation that makes sense to me..."

The varying levels of familiarity across the sample reflected the broader state of blockchain awareness in the industry, highlighting both the progress made in understanding and the significant knowledge gaps that still exist.

3.2.2. Understanding of IT Applications in Marketing

In the study, respondents shared diverse perspectives regarding their Understanding of IT Applications in Marketing, revealing different levels of familiarity and expertise. As per Figure 1, 40 participants (27.6%) demonstrated a high understanding of how IT solutions, such as data analytics and artificial intelligence, are leveraged in digital marketing. These respondents deeply understood how technology could be integrated into marketing strategies to enhance customer engagement, optimize ad targeting, and improve overall campaign effectiveness. Many of them had firsthand experience working with IT systems in marketing, with one respondent explaining:

"... We have been using AI-driven tools for years to analyze customer behavior and personalize ads. It has been a game-changer for how we approach our campaigns..."

A majority of the respondents, 75 participants (51.7%), reported having a moderate understanding of IT applications in marketing. These individuals understood the essential functions of IT tools in the marketing landscape, such as using customer data to improve targeting or employing analytics for performance measurement. However, their knowledge was not as advanced or detailed. They were familiar with the potential of these technologies but had less practical experience implementing them. As one respondent remarked:

"... I am aware of how IT tools like CRM systems or data analytics platforms can improve our marketing efforts, but I have mostly been exposed to them through workshops or industry events rather than using them directly..."

On the other hand, 30 respondents (20.7%) reported having a low understanding of IT applications in marketing. These participants struggled to grasp the full scope of how technology could be utilized in modern marketing practices. Many admitted that while they had heard of terms like AI or data analytics, they did not fully understand how these tools worked or how they could be applied to enhance marketing strategies. One respondent reflected:

"... I have heard a lot about AI and data being used in marketing, but I have not had the chance to explore it much. There is a big gap between what is possible and what I know..."

The differences in understanding revealed a broader trend in the industry where, despite growing exposure to advanced IT tools, significant disparities still existed in terms of how well individuals and organizations could apply these technologies to marketing. The study highlighted the need for further education and training to bridge these knowledge gaps, particularly as IT reshapes the digital marketing landscape.

3.2.3. Knowledge of Blockchain's Marketing Use Cases

In the study, respondents, according to Figure 1, expressed varying levels of Knowledge of Blockchain's Marketing Use Cases, reflecting a spectrum of awareness

regarding how blockchain technology could be applied to marketing practices. 55 participants (37.9%) demonstrated high awareness and deep understanding of specific use cases, such as smart contracts for ad buys, supply chain transparency, and consumer data privacy.

These respondents were well-versed in blockchain's potential to revolutionize marketing, particularly in providing transparency and accountability. One respondent noted:

"... We have started using blockchain to track our advertising spend, drastically improving our transparency with clients. Now, they can see exactly where every dollar goes in real-time..."

The largest group, 65 respondents (44.8%), indicated moderate awareness of blockchain's applications in marketing. These participants understood some aspects of how blockchain could be integrated into marketing strategies, but their knowledge was more surface-level and less detailed than those with high awareness. They were familiar with the technology but had limited direct experience or involvement. As one respondent shared:

"... I have heard about blockchain's use in loyalty programs and data protection, but we have not fully implemented it in our marketing strategies yet. It sounds promising, but it is still somewhat theoretical for us at this stage..."

In contrast, 25 respondents (17.2%) were unaware of blockchain's marketing use cases. These individuals had minimal exposure to how blockchain could enhance marketing efforts, and many were unfamiliar with the specific applications discussed by other participants. Some struggled to see how blockchain could play a significant role in marketing, with one respondent admitting:

"...honestly, I do not know much about blockchain. I have heard about it in finance but did not realize it could be useful for marketing. It still feels like something out of reach for us..."

The results highlighted a clear divide in the knowledge base regarding blockchain's potential in marketing, with a significant portion of respondents still grappling with understanding its full implications.

The study suggested that while interest in blockchain technology was growing, practical awareness and implementation in marketing remained limited, particularly for smaller businesses or those without the resources to explore emerging technologies fully. These findings underscored the importance of continued education and demonstration of blockchain's tangible benefits to bridge the awareness gap.

3.3. Perceptions of Blockchain's Impact on Marketing Efficiency

The study assessed respondents' Perceptions of Blockchain's Impact on Marketing Efficiency, focusing on Perceived Efficiency Gains, Perceived Challenges in Adoption, and the Impact on Marketing Campaigns.

Participants shared their views on how blockchain technology had streamlined marketing processes, improved campaign outcomes, and highlighted the challenges they encountered during implementation. The responses provided insight into the benefits and barriers of integrating blockchain into marketing strategies.

3.3.1. Perceived Efficiency Gains

As per Figure 2, the respondents overwhelmingly expressed a positive view regarding the Perceived Efficiency Gains associated with blockchain technology in marketing. A significant portion of the participants, specifically 55, strongly agreed that blockchain could enhance operational efficiency. They noted that its capabilities in automating processes and improving data management could lead to substantial time and cost savings. One respondent emphasized this point by stating:

"...Blockchain offers a way to streamline our operations. The ability to automate contracts through smart contracts means we spend less time on manual tasks and can focus on strategic initiatives..."

In addition to those who strongly agreed, 65 participants somewhat agreed that blockchain could drive efficiency within their marketing strategies. Many acknowledged the technology's potential to reduce redundancies and eliminate intermediaries in advertising processes. A respondent reflected on this, saying:

"...By using blockchain, we could eliminate many middlemen involved in ad buying. This not only saves money but also speeds up the entire process. We can allocate resources more effectively..."

However, a group of 25 respondents remained neutral or disagreed with the efficiency gains of blockchain. Their skepticism often stemmed from concerns about the initial implementation challenges and the learning curve of adopting new technologies. One individual shared:

"...While I see the potential in theory, the reality of integrating blockchain into our existing systems seems daunting. We are still figuring out our current processes, so I am unsure if this will make things easier..."

This mixture of enthusiasm and caution highlighted the diverse perceptions surrounding blockchain's efficiency in marketing.
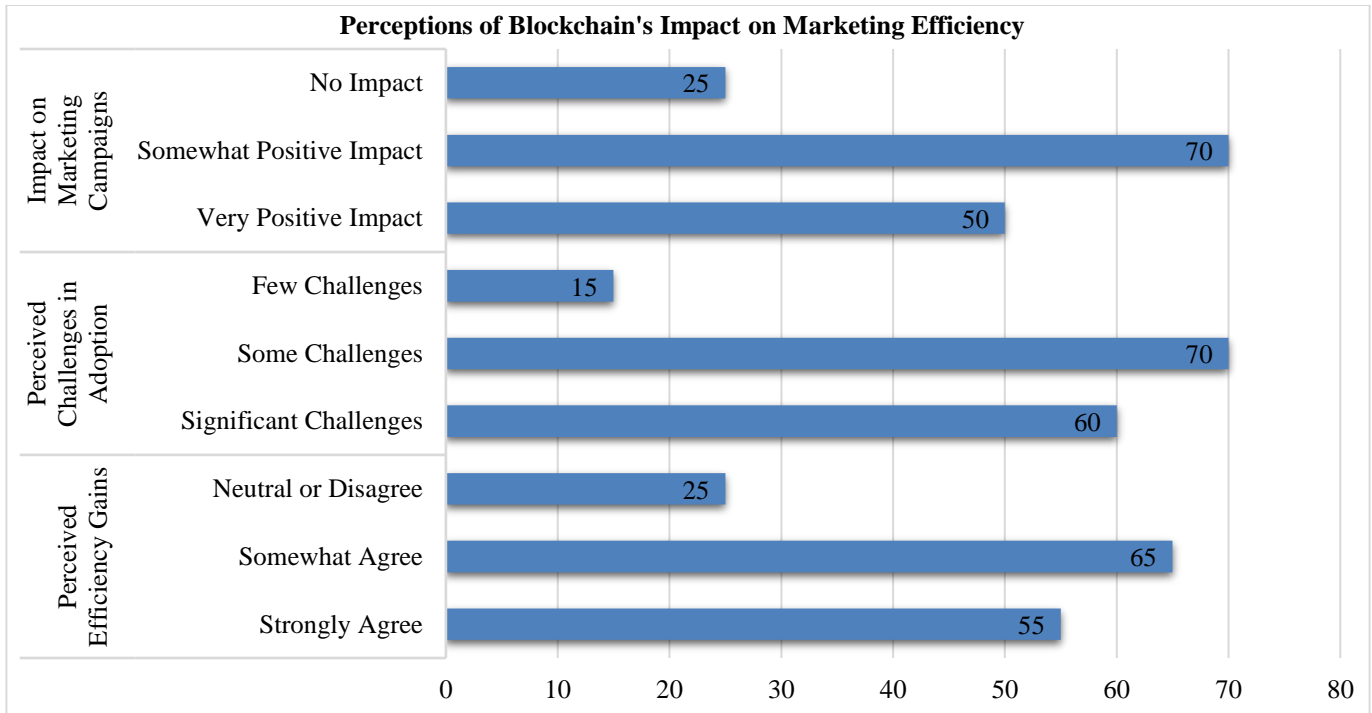
Fig. 2 The perceptions of Blockchain's impact on marketing efficiency sub-indicators

3.3.2. Perceived Challenges in Adoption

The study revealed that respondents' perceived challenges in adopting blockchain technology in marketing were a major concern. According to figure 2, a significant portion, comprising 60 participants, identified substantial barriers that hindered their organizations from fully embracing blockchain solutions. Many articulated that these challenges encompassed technological hurdles and organizational inertia. One respondent explained:

"...the technical aspects of blockchain can be overwhelming. For instance, the need for interoperability with existing systems is a significant hurdle. If we cannot integrate it smoothly, it becomes more of a burden than a benefit..."

In addition to those who saw significant challenges, 70 respondents noted that they encountered some challenges in the adoption process. They often cited issues related to their teams' lack of understanding and expertise as critical obstacles. A participant remarked:

"...while we recognize the potential benefits, the knowledge gap is a major issue. Our team needs training to understand how blockchain works and how to implement it effectively. Without that, we cannot make informed decisions..."

Several others echoed this sentiment and stressed the importance of education and skill development as prerequisites for adoption. Conversely, a smaller group of 15 respondents expressed that they faced few challenges regarding blockchain adoption. They generally belonged to organizations that had already invested in training or had prior experience with emerging technologies. One of these respondents shared:

"...our company is quite tech-savvy and has a culture of innovation. We have already started experimenting with blockchain in some projects, and while there are challenges, they feel manageable because we have the right resources and support..."

This division in opinions highlighted the complexity of blockchain adoption and the varying degrees of readiness among organizations in the marketing sector.

3.3.3. Impact on Marketing Campaigns

The study found that the Impact on Marketing Campaigns through the implementation of blockchain and IT was perceived as largely beneficial by the respondents. As per Figure 2, of the participants, 50 expressed that they experienced a very positive impact from using these technologies in their marketing efforts. Many highlighted how blockchain enabled greater transparency and trust in their campaigns. One respondent articulated:

"...when we integrated blockchain into our marketing strategy, we could track every interaction and transaction. This level of transparency built trust with our customers and allowed us to optimize our campaigns in real-time. It changed the way we approached marketing altogether..."
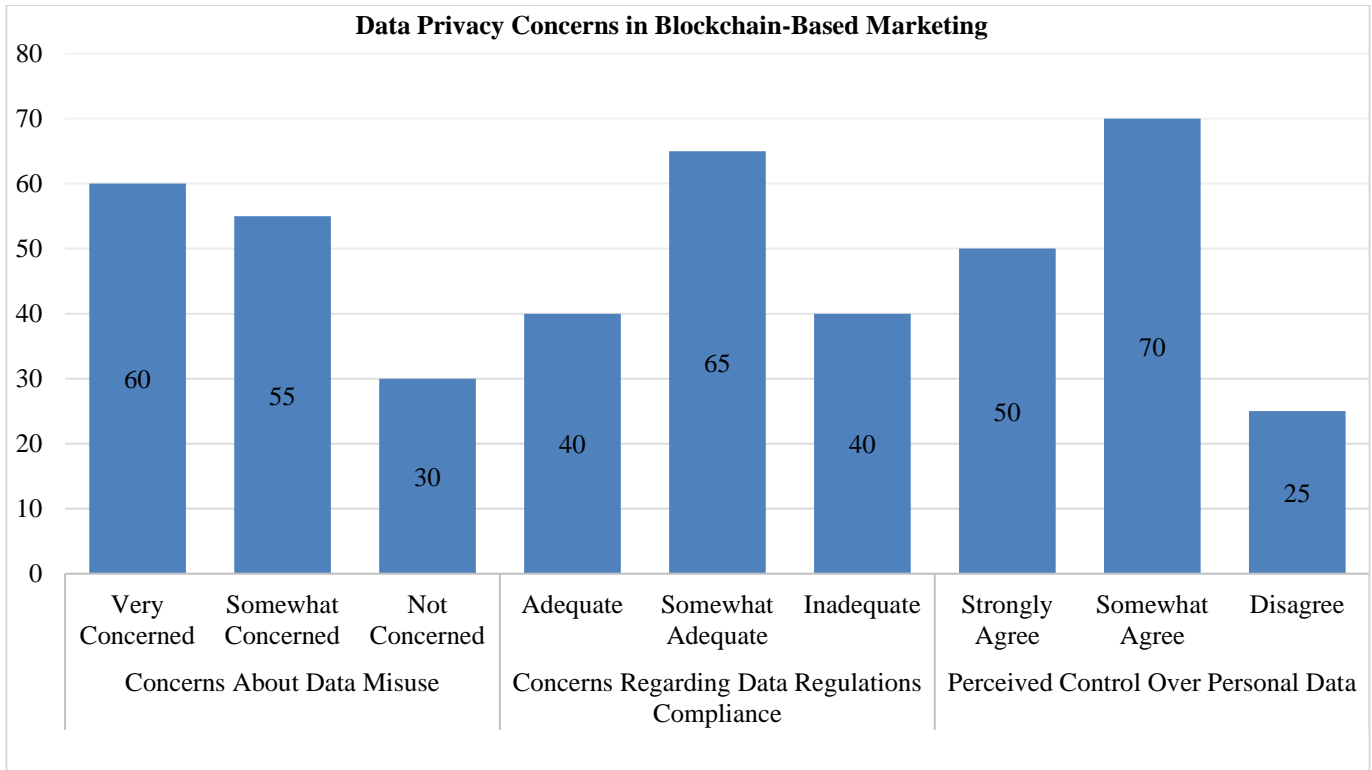
Fig. 3 The data privacy concerns in blockchain-based marketing sub-indicators

In addition to those who reported a positive impact, 70 respondents noted that they felt the impact was somewhat positive. These participants acknowledged the benefits but pointed out that challenges remained in fully realizing the potential of blockchain. A marketer stated:

"...while we saw improvements in customer engagement and targeting, it was not without hiccups. There were technical difficulties in implementation, and we had to navigate regulatory considerations. Still, the overall direction felt promising, and we could see tangible benefits in campaign effectiveness..."

On the other hand, 25 respondents indicated that they observed no significant impact on their marketing campaigns. Many of these individuals were from organizations without fully adopted blockchain solutions or were still in the exploratory phase. One of these respondents shared:

"...we are still trying to figure out how blockchain fits into our strategy. As of now, it has not made any noticeable difference in our campaigns. We are aware of its potential, but we are not there yet..."

This range of perceptions illustrated the varied stages of blockchain integration in marketing and organisations' differing experiences as they navigated this transformative landscape.

3.4. Data Privacy Concerns in Blockchain-Based Marketing

The Data Privacy Concerns in Blockchain-Based Marketing indicator provided critical insights into respondents' apprehensions regarding using blockchain technology in marketing practices. The analysis focused on three sub-indicators: Concerns about data misuse, concerns Regarding data regulations compliance, and perceived control over personal data. Respondents expressed significant worries about the potential for unauthorized access and misuse of their personal data, even with blockchain's touted security features.

3.4.1. Concerns About Data Misuse

In exploring the Concerns About Data Misuse, the study, according to figure 3, revealed that a significant majority of respondents expressed serious apprehensions regarding handling their personal data within blockchain-based marketing frameworks. Specifically, 60 respondents, or about 41.4%, indicated they were very concerned about the potential for data misuse. Many emphasized their fears about how their information might be exploited, with one respondent stating:

"...even though blockchain is supposed to be secure, I worry about who has access to my data and how they might use it against me..."

This sentiment was echoed by another participant who noted:

"...the idea of companies using my data without my explicit consent is terrifying; I want to feel safe knowing my personal information is protected..."

Additionally, 55 respondents, accounting for 37.9%, reported being somewhat concerned about data misuse. These respondents often cited specific instances in the past where their data had been mishandled or where they had encountered privacy breaches in other platforms. One individual remarked:

"... I have heard stories of data leaks from reputable companies, so how can I trust that blockchain will be different? I still have my doubts..."

In contrast, only 30 respondents, or 20.7%, indicated that they were not concerned about data misuse, suggesting a relatively small portion of the sample felt assured about the privacy protections offered by blockchain technology.
The findings highlighted a pervasive anxiety regarding data misuse that could significantly impact consumer trust in blockchain applications for marketing.

3.4.2. Concerns Regarding Data Regulations Compliance
In the study shown in Figure 3, respondents conveyed mixed perceptions regarding the adequacy of data regulation compliance in blockchain-based marketing. Out of the total participants, 40 considered current regulations adequate. These respondents expressed a sense of reassurance that existing frameworks, such as the General Data Protection Regulation (GDPR), offered sufficient protection for consumers. One participant remarked:

"...I believe that the regulations in place are quite strong. They help ensure that companies handle personal data responsibly. If they fail to comply, there are consequences, which I think is a good deterrent..."

On the other hand, a significant group of 65 respondents viewed the compliance measures as somewhat adequate. While they recognized the efforts made by regulators, they felt that gaps still needed to be addressed. One respondent articulated this sentiment by stating:

"...the regulations are a step in the right direction, but I think they often lag behind technological advancements. Blockchain is so new, and while the intent is there, I worry that enforcement is not keeping up with the pace of innovation..."

This opinion highlighted a prevalent concern about the dynamic nature of technology and the need for regulations to evolve correspondingly. In contrast, 40 respondents felt that the existing compliance frameworks were inadequate. They raised alarms about the potential for companies to exploit loopholes or inadequacies in current regulations. One

participant asserted:

"...the regulations seem outdated to me. Blockchain technology is complicated, and I fear many marketers will find ways around the rules, leaving consumers unprotected..."

This concern accentuated a broader skepticism about the effectiveness of regulatory measures in safeguarding consumer interests in an increasingly complex digital landscape. The findings revealed a range of opinions on regulatory adequacy, reflecting a collective desire for more robust and adaptive frameworks to govern data use in blockchain marketing.

3.4.3. Perceived Control over Personal Data
In the study, respondents exhibited varying degrees of perception regarding their control over personal data within blockchain-based marketing frameworks. As shown in Figure 3, a notable segment of 50 participants strongly agreed that blockchain technology provided them with enhanced control over their personal information. These respondents emphasized that the decentralized nature of blockchain offered a sense of empowerment. One participant stated:

"...I truly feel like blockchain gives me the reins over my data. With the ability to manage permissions and see who accesses my information, I am more aware and in control than ever before..."

This reaction highlighted the optimism that many felt about the potential for blockchain to change the dynamics of data ownership. Conversely, a larger group of 70 respondents expressed a somewhat favorable view, agreeing that blockchain could facilitate control over personal data but with reservations. Many in this category acknowledged the advantages of blockchain, yet they raised concerns about practical implementation. One individual noted:

"...while I understand that blockchain is designed to give us more control, I still worry about how user-friendly these systems are. It is one thing to say we can control our data, but if the tools are too complex, many people will be unable to utilize them effectively..."

This insight revealed a nuanced understanding that usability remained a critical factor in realizing these benefits despite the promise of increased control.
A smaller group of 25 respondents disagreed that blockchain significantly enhances personal data control. These individuals voiced skepticism about the actual effectiveness of blockchain in providing genuine control. One participant remarked:

"...I think it is a great concept, but I do not believe it

fully delivers. Just because I can see where my data is going does not mean I have real control over it. Companies can still find ways to use my data without my explicit consent..."

This viewpoint accentuated a broader apprehension that, despite the technological advancements, the foundational issues related to data privacy and consent remained unresolved. Generally, the responses highlighted a range of beliefs about personal data control in the blockchain context, emphasising optimism and skepticism regarding the technology's potential to empower users.

3.5. *Trust and Transparency in Blockchain-Based Marketing*
The study examined the indicators of trust and transparency in blockchain-based marketing, focusing on how respondents perceived blockchain's role in consumer data protection, its transparency levels, and the trustworthiness of IT security measures supporting these technologies. Participants reflected on their experiences and attitudes, revealing a complex landscape of trust influenced by their understanding of blockchain's capabilities.

This exploration illuminated the varying degrees of confidence among respondents regarding the efficacy of blockchain in safeguarding consumer data, the transparency of marketing practices, and the reliability of associated IT security protocols.

3.5.1. *Trust in Blockchain for Consumer Data Protection*
The study, as per Figure 4, revealed varying levels of trust in blockchain technology for consumer data protection among respondents. A significant portion of participants, numbering 65, expressed high trust in blockchain's ability to

safeguard personal information, citing its decentralized nature as a key factor. Many noted that the transparency inherent in blockchain technology offered reassurance, with one respondent mentioning:

"...the fact that transactions are recorded on a public ledger means there is less room for manipulation, which boosts my confidence in how my data is handled…"

In contrast, 55 respondents conveyed moderate trust, indicating that while they recognized the potential benefits of blockchain, they remained cautious. They often highlighted concerns regarding the maturity of the technology and its practical implementation. One interviewee remarked:

"...I see the promise of blockchain for data protection, but I also worry about how it is implemented in real-world scenarios. There are still many unknowns..."

Lastly, a smaller group of 25 respondents reported low trust in blockchain for consumer data protection. This skepticism was often rooted in their experiences with existing data breaches and a general wariness of new technologies. One participant articulated this apprehension, stating:

"...just because a technology is new and innovative does not mean it is secure. We have seen too many cases where companies promise security but fail to deliver..."

These insights painted a slightly different picture of trust in blockchain, revealing that while many recognized its potential, there remained significant reservations among others.
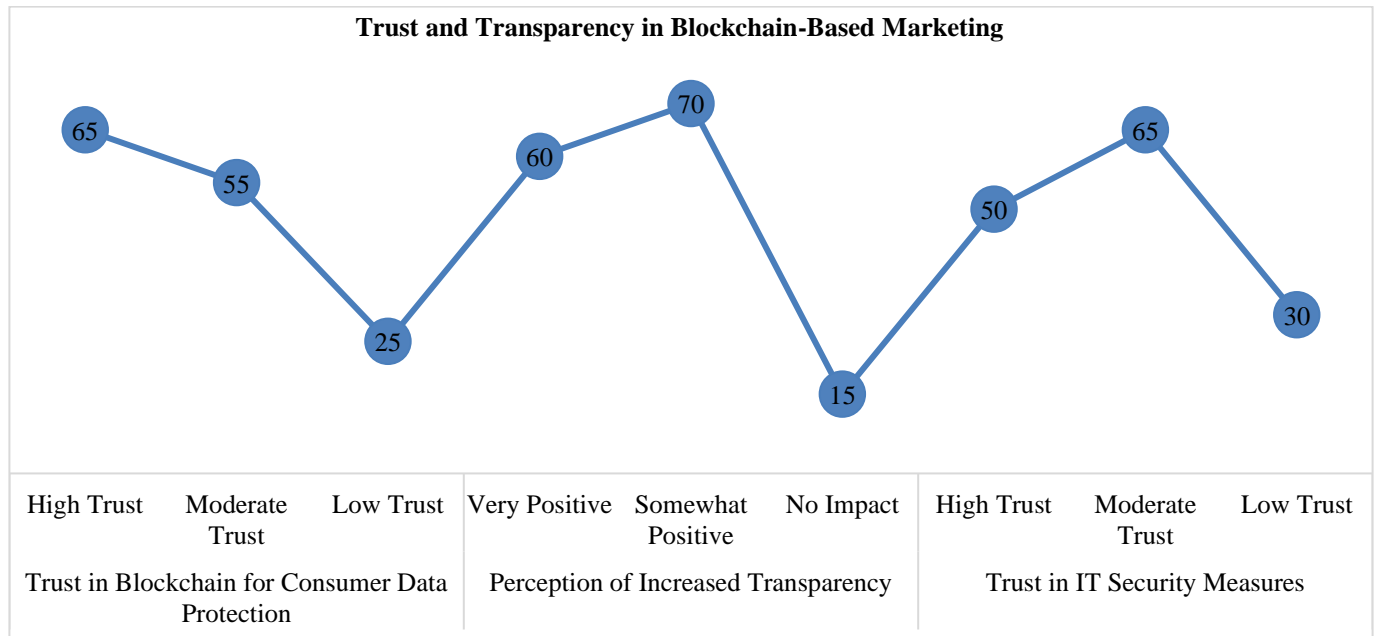

Fig. 4 The trust and transparency in blockchain-based marketing sub indicators

3.5.2. Perception of Increased Transparency

As indicated in Figure 4, the study uncovered a range of perceptions regarding the increased transparency associated with blockchain technology in marketing. A substantial segment of respondents, comprising 60 individuals, expressed a very positive outlook on how blockchain could enhance transparency in marketing practices. Many participants emphasized that the immutable nature of blockchain records played a critical role in fostering trust among consumers and businesses alike. One respondent remarked:

"...with blockchain, every transaction is traceable and verifiable. This level of transparency allows consumers to see exactly how their data is being used, which is incredibly reassuring in today's digital landscape..."

In contrast, 70 respondents conveyed a somewhat positive perception, acknowledging blockchain's potential benefits while highlighting its limitations. These respondents recognized that while blockchain could improve transparency, its effectiveness largely depended on the willingness of companies to adopt and implement the technology transparently. As one participant noted:

"...I appreciate the concept of blockchain and see how it can potentially enhance transparency. However, the reality is that not all companies are committed to utilizing it effectively. It really depends on their willingness to change..."

Finally, 15 respondents indicated that they perceived no impact on transparency from blockchain technology. This group often expressed skepticism about the practical implementation of blockchain and questioned whether it would genuinely lead to increased transparency in marketing. One interviewee stated:

"...I do not see how just using blockchain will change anything. Companies can still find ways to hide information, and I am not convinced that just having a new technology will solve the existing transparency problems..."

These varying perceptions stressed the complex relationship between blockchain and marketing transparency, highlighting the respondents' optimism and scepticism.

3.5.3. Trust in IT Security Measures

As indicated in Figure 4, the respondents exhibited a range of trust levels in IT security measures supporting blockchain technology within marketing. A noteworthy portion of the participants, specifically 50 individuals, indicated high trust in these measures. Many of these respondents articulated a strong belief in the robustness of IT security protocols associated with blockchain. One participant expressed:

"...I have great confidence in the security features of blockchain technology. The encryption and secure data exchange processes give me a sense of safety when interacting with brands that utilize it. It feels like a significant step up from traditional marketing methods..."

In contrast, 65 respondents reported a moderate level of trust. These individuals acknowledged the potential of IT security measures to enhance data protection but expressed reservations about their effectiveness in practice. One respondent highlighted this ambivalence, stating:

"...while I appreciate blockchain's technological advancements and security features, I think there are still vulnerabilities. I have moderate trust because I have seen how quickly technology can evolve and the methods that hackers use to exploit systems. It is a constant battle..."

This insight reflected a cautious optimism, suggesting that while the security measures were commendable, they were not infallible. On the other hand, 30 respondents conveyed low trust in IT security measures related to blockchain. This group often cited concerns about the evolving nature of cyber threats and the possibility of inadequate security protocols. A respondent noted:

"...honestly, I do not feel completely secure with IT security measures in blockchain marketing. There have been too many data breaches in recent years, and just because a company claims to use blockchain does not mean they are immune to attacks. I need more assurance before I can trust it fully..."

This skepticism highlighted a broader anxiety regarding data security in the digital age, highlighting the need for continual advancements in IT security measures to build consumer trust.

3.6. Challenges and Opportunities in Implementing Blockchain in Marketing

The study revealed significant insights into the challenges and opportunities of implementing blockchain in marketing. Participants discussed various technical challenges, including scalability and interoperability issues, as well as regulatory and legal hurdles that could hinder adoption. Despite these obstacles, many respondents also highlighted the innovation potential that blockchain technology could bring to the marketing landscape.

3.6.1. Technical Challenges

In exploring the technical challenges associated with implementing blockchain in marketing, respondents, as per figure 5, shared a range of concerns that illuminated the complexities involved. A notable number of participants, approximately 55, expressed significant challenges, emphasizing issues related to scalability and interoperability.

One respondent articulated:

"...the scalability of blockchain is a major hurdle. As more users engage with the system, maintaining performance and speed becomes increasingly difficult..."

This response resonated with others, who noted that existing infrastructures often struggled to integrate with new blockchain solutions. Additionally, about 70 respondents indicated they faced challenges, particularly concerning the technical skills required for effective implementation. A participant remarked:

"...the technical expertise needed to manage blockchain projects is not always available in-house, complicating the adoption process. Companies must either invest heavily in training or seek external consultants..."

This lack of skilled personnel was seen as a barrier to leveraging blockchain's full potential in marketing strategies.Despite these significant concerns, there were also voices among the 20 respondents who indicated few challenges. These individuals highlighted instances where organizations had successfully navigated technical barriers. One respondent pointed out:

"...some companies have implemented blockchain effectively by collaborating with tech partners specialising in these solutions. Their experiences suggest that with the right partnerships, the technical challenges can be managed more effectively..."

This blend of perspectives provided a nuanced view of the landscape, illustrating the formidable obstacles and the pathways to overcoming them.

3.6.2. Regulatory and Legal Challenges

When examining the regulatory and legal challenges associated with blockchain in marketing, the insights gathered from respondents, as per Figure 5, revealed a landscape fraught with complexities and uncertainties. A substantial portion of the participants, numbering 60, identified significant challenges, particularly regarding compliance with existing regulations. One respondent expressed frustration, stating:

"...navigating the regulatory environment is like walking through a minefield. Each country has different laws, and marketing teams struggle to ensure compliance while trying to innovate..."

This confusion was echoed by others who noted that the evolving nature of regulations made it difficult to establish a clear operational framework.Moreover, 70 respondents reported some challenges, highlighting the need for clarity and consistency in regulatory guidance. One participant remarked:

"...It feels like we are constantly adapting to new rules, but the framework for blockchain is still in its infancy. There is a lack of clear directives from regulatory bodies, which creates a cautious atmosphere where companies are hesitant to invest in blockchain technologies fully..."
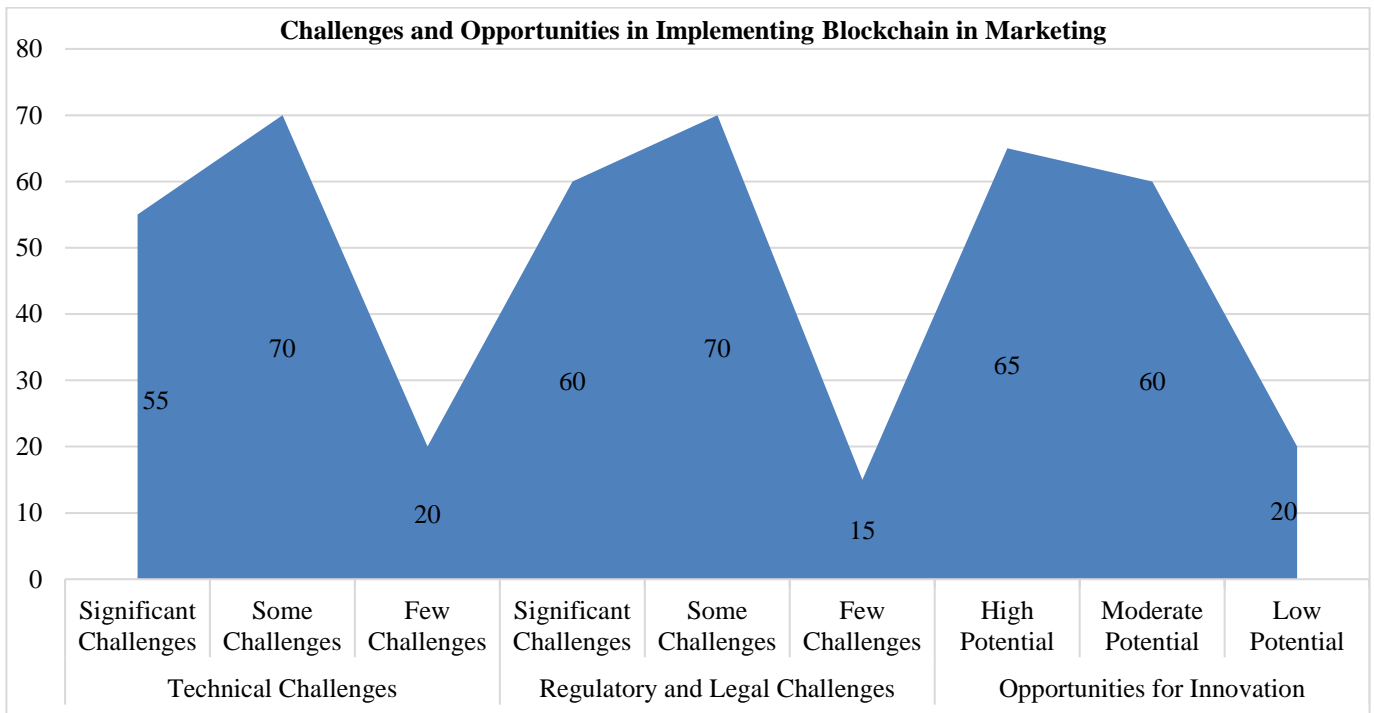

Fig. 5 The challenges and opportunities in implementing blockchain in marketing

This hesitation to fully embrace blockchain innovations stemmed from fears of potential legal repercussions, leading to slower adoption rates in marketing practices. Conversely, a small group of 15 respondents noted that they faced few challenges regarding regulation. These individuals highlighted instances of proactive engagement with regulators and suggested that early adopters had found ways to navigate the legal landscape effectively. One respondent commented:

"...we took the initiative to consult with legal experts and even engaged with regulators early on. This approach helped us understand what was needed to comply and ultimately facilitated smoother implementation..."

This mix of views illustrated a complex regulatory environment where proactive strategies could mitigate challenges, but significant hurdles remained for many organizations seeking to harness blockchain's capabilities in marketing.

3.6.3. Opportunities for Innovation

In exploring the opportunities for innovation presented by blockchain in marketing, respondents, according to Figure 5, shared a range of insights that highlighted a dynamic landscape brimming with potential. A significant number of participants, totaling 65, firmly believed in blockchain technology's high innovation potential. One respondent articulated this sentiment, stating:

"...blockchain has the power to transform how we approach marketing completely. Its ability to enhance transparency and streamline transactions opens up avenues for new business models that were previously unimaginable..."

This enthusiasm was prevalent among those who recognized the technology's capacity to foster more direct relationships between brands and consumers. Additionally, 60 respondents acknowledged a moderate potential for innovation, indicating a cautious yet optimistic outlook. These participants noted that while the possibilities were promising, challenges remained. One interviewee pointed out:

"...yes, there are innovative applications out there, but they require a significant shift in mindset and infrastructure. Companies need to be willing to invest in new technologies and rethink their marketing strategies..."

This perspective emphasized that innovation was not solely a function of technology; it also hinged on organizational readiness and adaptability. In contrast, a smaller group of 20 respondents indicated low potential for blockchain innovation. Their skepticism stemmed from concerns about the practicality and scalability of implementing blockchain solutions in marketing. One respondent reflected on this hesitance, saying:

"...I just do not see how this will work on a large scale. The technology is still maturing, and many companies struggle to grasp its benefits. Until more evidence of success, I am not convinced it will be a game-changer..."

This diversity of opinions illustrated the varying levels of optimism regarding blockchain's role in driving innovation within the marketing landscape, revealing both the excitement and the apprehension that characterized this emerging field.

3.7. Collaboration within the Triple Helix Model

The study examined the collaboration within the Triple Helix Model, focusing on the interplay between academia, industry, and government in fostering innovation through blockchain technology in marketing. Respondents discussed the effectiveness of partnerships that bridged theoretical knowledge and practical application, emphasizing the importance of collaboration between academia and industry. They also highlighted the government's role in regulating and promoting blockchain initiatives and the significance of joint efforts aimed at driving innovation. This comprehensive exploration provided insights into how these sectors worked together to navigate challenges and leverage opportunities within the evolving marketing landscape.

3.7.1. Collaboration between Academia and Industry

As per Figure 6, the respondents reflected on the nature of collaboration between academia and industry in the context of blockchain and IT in marketing, providing a nuanced understanding of their interactions. A significant portion of participants, representing 55 individuals, noted strong collaboration between the two sectors. They highlighted various initiatives where academic institutions partnered with industry players to develop practical solutions. One respondent remarked:

"...the partnership between universities and businesses has been instrumental in creating projects that advance academic research and address real-world marketing challenges. This synergy fosters innovation that benefits both sectors..."

However, 70 respondents acknowledged that while some collaboration existed, it often lacked depth and consistency. They pointed out that not all academic insights translated effectively into industry practices. As one participant explained:

"...while there are instances of collaboration, it tends to be sporadic and often focuses on specific projects rather than a sustained partnership. This limits the potential for long-term innovation..."
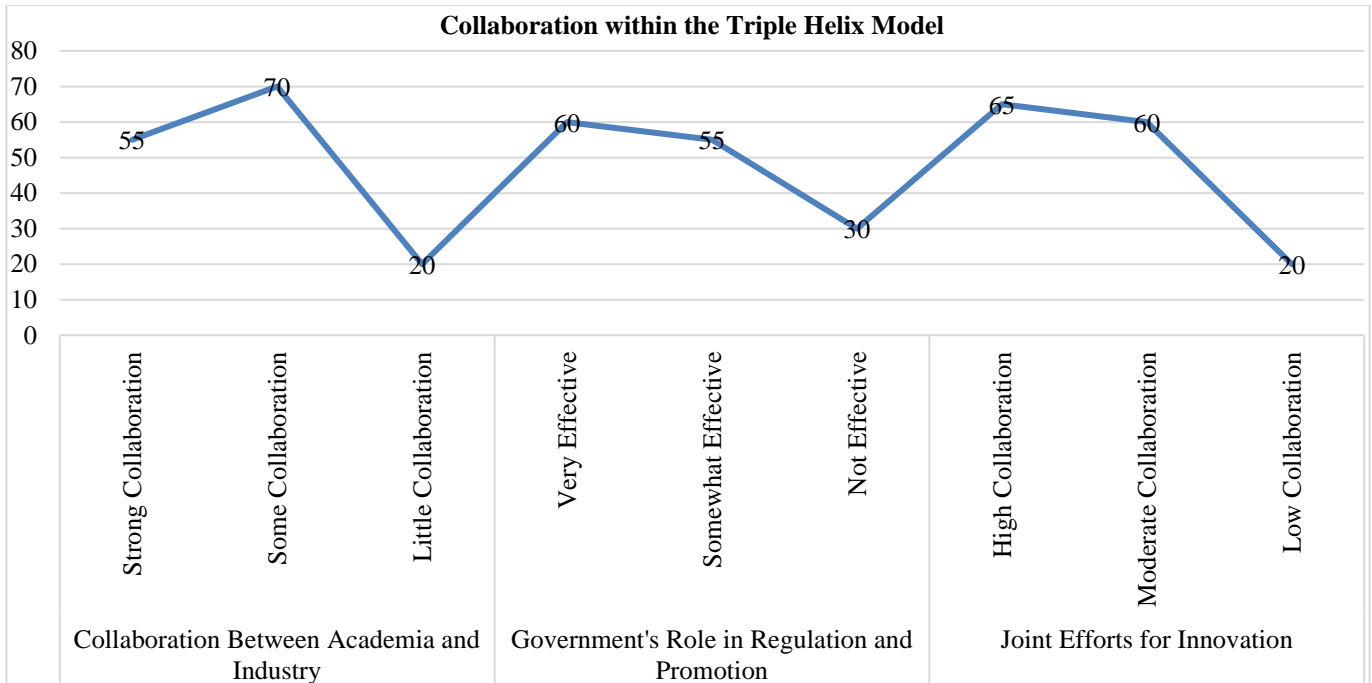
Fig. 6 The Collaboration within the Triple Helix Model sub indicators

Additionally, 20 individuals expressed concerns about the little collaboration, suggesting that the disconnect between theory and practice could hinder advancements in blockchain applications for marketing. A respondent articulated this concern, stating:

"... there is a noticeable gap; many academics are focused on theoretical frameworks while industry professionals need practical, actionable insights. Bridging this gap is crucial for realizing the full potential of blockchain in marketing..."

The insights gathered from respondents painted a complex picture of the current state of collaboration between academia and industry, revealing both promising partnerships and significant opportunities for improvement.

3.7.2. Government's Role in Regulation and Promotion

The respondents provided varied perspectives on the government's role in regulating and promoting blockchain and IT within the marketing sector. According to Figure 6, a substantial number of participants, totaling 60 individuals, characterized government efforts as very effective. They highlighted specific initiatives that showcased the government's commitment to fostering innovation and creating a conducive environment for blockchain adoption. One respondent remarked:

"...the government has actively engaged with stakeholders to establish frameworks that encourage investment and ensure that regulations keep pace with technological advancements. This proactive approach has

been crucial in building trust within the industry..."

Conversely, 55 respondents expressed that while government efforts were somewhat effective, areas still need improvement. They acknowledged initiatives promoting blockchain but noted inconsistencies in enforcement and regulatory clarity. A participant noted:

"...while the policies have good intentions, the lack of clear guidelines often creates confusion among businesses. Companies want to comply, but the regulatory landscape is sometimes ambiguous, leading to uncertainty in their operations..."

Additionally, 30 respondents felt the government's role was ineffective, citing a lack of engagement and support.

These participants expressed frustration over what they perceived as slow responses to the evolving needs of the industry. One individual articulated this sentiment by stating:

"...there seems to be a disconnect between the government and the tech sector. Without timely and relevant regulations, it becomes challenging for businesses to navigate the complexities of implementing blockchain effectively..."

In general, the insights from the respondents highlighted a range of views on the government's regulatory and promotional efforts, illustrating both recognition of positive actions and critical gaps that need to be addressed to enhance the blockchain landscape in marketing.

3.7.3. Joint Efforts for Innovation

The analysis of joint efforts for innovation within the framework of the Triple Helix model, as per Figure 6, revealed a range of collaboration experiences among the respondents. A notable 65 participants reported high levels of collaboration, expressing enthusiasm about the synergies formed between academia, industry, and government. Many of these respondents emphasized the value of such partnerships in driving innovation. One respondent stated:

"...the collaboration between universities and businesses has been a game-changer. We have seen projects that leverage academic research and industry needs, resulting in real-world applications that benefit everyone involved..."

This sentiment highlighted the belief that such alliances foster an environment conducive to innovation and problem-solving. Conversely, 60 respondents indicated moderate collaboration, recognizing existing partnerships but highlighting areas where improvements could be made. These individuals acknowledged the potential of joint efforts but often noted that more structured frameworks could enhance the effectiveness of these collaborations. One participant remarked:

"...while we have made progress in partnering with local universities, there are still many silos. It often feels like we are not fully utilizing the resources and expertise. More strategic alignment could lead to even better outcomes..."

This perception reflected a desire for deeper integration and more consistent stakeholder communication.In contrast, 20 respondents reported low levels of collaboration, expressing concerns about the lack of engagement across the three sectors. These individuals felt that opportunities for innovation were being missed due to insufficient dialogue and cooperation. A participant lamented:

"... It is frustrating to see so much potential left untapped. Innovative ideas are circulating, but without a cohesive effort among government, academia, and industry, they often remain just that ideas..."

This comment highlighted the critical need for fostering a culture of collaboration to ensure that innovative concepts could be translated into practical applications. Generally, the insights gathered from the interviews illustrated the varying degrees of collaboration experienced by participants, with many recognizing the benefits of strong partnerships and calling for enhanced efforts to facilitate joint innovation initiatives.

4. Conclusion and Recommendations

The study demonstrated that blockchain and information technology (IT) are significantly reshaping digital marketing practices within the framework of the Triple Helix model. The findings highlighted a growing awareness among participants regarding the potential benefits of blockchain, such as increased efficiency, enhanced data security, and greater transparency. Many respondents expressed a positive outlook on how these technologies could improve marketing strategies and consumer engagement.

However, the study also revealed substantial concerns, particularly regarding data privacy and the regulatory landscape, indicating that while there is optimism about innovation, critical challenges must be addressed to harness the potential of blockchain fully and IT in marketing. Moreover, the collaborative dynamics among academia, industry, and government emerged as a key factor influencing the success of blockchain adoption in marketing. Respondents' varying levels of collaboration emphasized the need for stronger partnerships to foster innovation. Participants highlighted that effective communication and joint efforts could lead to more successful implementation of blockchain solutions.

The study underlined the importance of addressing both the opportunities and challenges presented by blockchain and IT in digital marketing, advocating for a coordinated approach among stakeholders to navigate the complexities of this evolving landscape. Based on the study's findings, it is recommended that stakeholders in the marketing sector actively engage in collaborative initiatives involving academia, industry, and government to facilitate the adoption of blockchain and IT solutions. Additionally, efforts should be made to enhance education and training programs focused on blockchain technologies, ensuring that marketing professionals are well-equipped to leverage these tools effectively. Addressing data privacy concerns through clear regulatory frameworks and transparent communication will also be crucial in building consumer trust and maximizing the potential of blockchain in marketing strategies.

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