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Digital Dividends for All: The Role of PalmPay and Blockchain in Supporting Inclusive and Green Marketing in Iringa Municipal

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Abstract: In an era defined by rapid digital transformation and growing environmental concerns, the convergence of financial technology and sustainable development goals has created new pathways for inclusive and green marketing. In sub-Saharan Africa, particularly in underserved regions like Iringa Municipal in Tanzania, the digital economy presents opportunities for equitable growth. As mobile financial services expand, tools such as PalmPay, a mobile money platform, and blockchain technology, a decentralized ledger system, have emerged as key instruments for enhancing access, transparency, and sustainability in economic transactions. This study explored how PalmPay and blockchain contribute to inclusive and sustainable marketing strategies among underserved populations in Iringa Municipal. Using a sample of 45 respondents, it examined three dimensions: PalmPay's role in facilitating inclusive marketing, blockchain's impact on transparency and trust in green marketing, and challenges and opportunities in integrating these tools. Results showed that most respondents viewed PalmPay as highly effective in improving accessibility, enabling digital transactions, and promoting financial inclusion through local agents. Blockchain was also recognized for verifying sustainability claims and enhancing transparency in marketing, thereby strengthening consumer trust in eco-conscious purchases. Nonetheless, challenges such as digital illiteracy, infrastructural limitations, and perceived risks hindered adoption. Despite these barriers, respondents identified opportunities in community-based training, innovation scaling, and strategic partnerships to enhance uptake. The findings provide valuable insights into how financial technology and decentralized systems can empower marginalized communities, reinforce trust in sustainable branding, and promote inclusive participation in the digital economy.

Keywords: PalmPay; Blockchain; Inclusive Marketing; Digital Literacy; Green Marketing; Digital Transactions; Underserved Populations; Digital Transactions

1. Introduction

In an era defined by rapid digital transformation and increasing environmental concerns, the convergence of financial technology and sustainable development goals has opened new frontiers for inclusive and green marketing. Across many parts of sub-Saharan Africa, particularly in underserved areas like Iringa Municipal in Tanzania, the digital economy has become a promising avenue for driving equitable growth. As mobile financial services proliferate, tools like PalmPay, a mobile money platform, and blockchain technology, a decentralized ledger system, have gained traction as powerful instruments to enhance access, transparency, and sustainability in economic transactions. These digital innovations are not only reshaping the financial sector but also redefining marketing practices to be more inclusive, environmentally conscious, and socially responsible. Inclusive and green marketing refers to the integration of environmental and social considerations into marketing strategies that ensure marginalized

populations are actively engaged and economically empowered. The digitization of marketing through platforms like PalmPay and blockchain has the potential to break traditional barriers to market participation by providing low-income populations, especially youth and women, with direct access to services, information, and sustainable products. This shift enables the creation of value-driven ecosystems where businesses can market responsibly while responding to global concerns such as financial exclusion and climate change. However, while the promise is significant, it remains critical to understand how these digital tools are being used on the ground, particularly in emerging economies and underserved localities.

Blockchain technology presents significant potential for enhancing financial inclusion, particularly for underbanked and unbanked populations [1–3]. Its decentralized, secure, and transparent nature enables peer-to-peer transactions, facilitates cross-border remittances, and supports micro-lending through smart contracts [3]. Blockchain can lower transaction costs, accelerate service delivery, and improve security by mitigating risks associated with cyberattacks and fraud [2]. However, challenges such as regulatory uncertainties, technological infrastructure limitations, and cryptocurrency volatility impede widespread adoption [3,4]. Integration with complementary technologies like mobile banking and IoT could further enhance blockchain's capabilities in promoting financial inclusion [2,3]. Despite these challenges, blockchain's potential to revolutionize banking and improve access to financial services for marginalized communities remains significant [1].

Financial inclusion in Tanzania has been enhanced through electronic money transfers and FinTech adoption, particularly in rural areas [5,6]. Agency banking has played a crucial role in promoting financial inclusion by simplifying services, reducing costs, and expanding geographical coverage [7]. Factors influencing financial inclusion include gender, education, age, and income, with men, educated individuals, older people, and those with higher incomes more likely to be financially included [8]. However, challenges persist, such as security risks, cybercrimes, and low levels of understanding among users and service providers [5]. To deal with these issues, recommendations include training on safe e-finance use, establishing anti-cybercrime mechanisms, and emphasizing risk management in agency banking [5,7]. In addition, banks are encouraged to leverage mobile financial services as infrastructure to reach unbanked populations [8].

Blockchain technology and NFTs offer significant potential for transforming digital marketing and sustainable business practices. NFTs can incentivize sustainable supply chain practices, enhance customer willingness to pay for sustainable products, and support circular business models [9]. In the creative industry, NFTs and smart contracts reduce transaction costs and provide creators with closer access to consumers [10]. Blockchain-based carbon offset credits can revolutionize agricultural marketing networks by promoting sustainability and providing consumers with information about the environmental impact of their purchases [11]. In advertising, blockchain enhances transparency, combats fraud, and improves verification processes, making campaigns more effective [12]. These technologies enable the creation of digital vouchers, support local producers through transparent supply chains, and facilitate carbon credit tracking, aligning with sustainable business practices and reducing paper-based advertising.

Blockchain technology is revolutionizing digital marketing by enhancing transparency, security, and efficiency [13]. In Tanzania, NFTs are gaining traction for content monetization and brand marketing, though challenges like scalability and regulatory uncertainties persist [14]. Blockchain applications in marketing include verifying ad impressions, combating fraud, and optimizing customer rewards [13]. For sustainable agriculture in Tanzania, digital technologies show promise but currently lack comprehensive solutions for smallholder farmers throughout the complete farming cycle [15]. Blockchain in digital marketing can improve security, counter click fraud, develop trust, and create loyalty programs [16]. However, research gaps exist in dealing with the specific needs of local artisans and farmers in Tanzania through blockchain-powered supply chains, as well as in exploring the potential of digital vouchers and NFTs to reduce paper-based advertising and enable carbon credit tracking for sustainable businesses in the region.

Digital payment platforms are revolutionizing financial inclusion in emerging markets, offering scalable solutions to bridge the gap between unbanked populations and formal financial services [17]. These platforms leverage mobile technology and internet penetration to provide accessible, secure, and efficient financial products [18]. Key enablers include mobile money services, fintech innovations, and supportive regulatory frameworks [17]. Digital payment systems address barriers such as limited digital literacy, lack of infrastructure, high transaction costs, and socio-cultural factors [18]. They also promote economic empowerment and reduce financial inequality [19].

However, challenges persist, including regulatory constraints, cybersecurity risks, and the digital divide [17]. To maximize the potential of these platforms, collaborative efforts between governments, private sector stakeholders, and development organizations are essential [17]. Further research is needed to assess the impact of digital inclusion on specific underserved populations, such as Afro-Brazilians [20].

Mobile money services and digital banking platforms have emerged as powerful tools for enhancing financial inclusion in Tanzania, particularly among underserved populations like women entrepreneurs and rural residents [21,22]. These technologies have significantly improved access to financial services, with mobile money being the most widely adopted [21]. However, challenges persist, including gender disparities, limited digital literacy, and infrastructure issues [8,22]. Factors such as education, age, income, and gender influence financial inclusion, with educated, older, and financially stable men more likely to be included [8]. To address these challenges and promote wider adoption of FinTech, strategies should focus on enhancing digital infrastructure, improving financial literacy, and tailoring solutions to meet the needs of underserved groups [6,21]. Such efforts could significantly contribute to inclusive economic development in Tanzania.

Blockchain technology offers significant potential for enhancing transparency and trust in marketing and green finance practices. It can provide unprecedented visibility into supply chains, product origins, and ethical sourcing [23]. In green finance, blockchain contributes to transparency and efficiency in mechanisms like green bonds, fostering trust among stakeholders [24]. The technology's decentralized nature ensures data security and privacy, crucial in digital marketing [25]. Blockchain can also help fill the green investment gap by providing security, transparency, auditability, and traceability for clean energy projects [26]. However, challenges such as technological complexity, scalability issues, and regulatory uncertainties persist [25]. Despite these obstacles, blockchain holds promise for transforming marketing and green finance practices, potentially leading to more ethical, consumer-centric strategies that benefit both businesses and consumers [25].

Blockchain technology offers significant potential for enhancing transparency and trust in various sectors, including green marketing practices in Tanzania. It can improve data security, reduce fraud, and increase efficiency in healthcare, land registration, and banking [27,28]. In the context of green finance, blockchain facilitates transparent and secure transactions, fostering trust among stakeholders and addressing challenges such as high transaction costs [24]. For marketing applications, blockchain can enhance supply chain transparency and revolutionize customer loyalty programs by providing immutable and auditable ledgers [23]. However, despite its potential benefits, blockchain adoption in Tanzania lags behind other African countries [27]. The implementation of blockchain technology in Tanzania's various sectors, including green marketing, requires government and business investment, as well as the development of supportive regulatory frameworks and international collaboration [24,27,28].

The integration of blockchain technology and sustainable marketing strategies faces numerous challenges in developing countries. These include scalability issues, lack of interoperability, and regulatory complexities [29,30]. However, opportunities exist in smart contracts, risk management, and faster payments, which can increase trust and transparency in financial systems [29]. Blockchain adoption in cross-border payments and taxation of digital economies requires overcoming technical, regulatory, and social challenges [31,32]. Stakeholder engagement is crucial in navigating these challenges and fostering sustainability initiatives [30]. The implementation of blockchain solutions must consider social and cultural factors, necessitating contextualized approaches tailored to specific regions [31]. While blockchain offers significant advantages for online taxation and financial inclusion, institutional conformity, technical integration, and stakeholder engagement remain key hurdles to overcome [32].

Blockchain technology and e-marketing strategies present both challenges and opportunities for developing countries like Tanzania. While blockchain adoption can enhance trust and transparency in financial systems [29], its implementation faces hurdles such as scalability issues and a lack of regulatory frameworks. In Tanzania, artificial intelligence and blockchain technologies significantly influence SME marketing practices [33]. However, e-marketing adoption among Tanzanian SMEs remains limited, with security concerns being a major challenge [34]. The implementation of technology in rural and underserved areas of Tanzania faces additional obstacles, including limited access to electricity and internet connectivity, as well as insufficient digital literacy among teachers and students [35]. Despite these challenges, opportunities exist for integrating mobile payments and leveraging the decreasing costs of mobile phone usage to enhance marketing strategies and financial inclusion in Tanzania [34].

In recent years, digital financial technologies have been increasingly positioned as catalysts for inclusive growth and sustainable development, especially in underserved regions. Platforms such as PalmPay, a mobile money ser-

vice, and blockchain technology, with its decentralized and transparent structure, are often celebrated for their potential to drive inclusive economic participation and environmental accountability. However, in practice, many communities in areas like Iringa Municipal remain excluded from the full benefits of these technologies. While digital tools have expanded rapidly in urban areas, their use for promoting inclusive and green marketing in semi-urban and rural contexts remains limited and poorly documented. In Iringa Municipal, a significant portion of the population, particularly low-income earners, youth, women, and small-scale entrepreneurs, continues to face barriers to accessing formal marketing platforms, financial services, and sustainable product markets. Traditional marketing approaches often fail to reflect the realities and needs of these groups, and environmentally responsible marketing practices are not widely integrated or supported. Although PalmPay has made mobile transactions easier and blockchain has opened doors for greater accountability in supply chains, there is still a knowledge gap regarding how these technologies are actually supporting inclusive and green marketing on the ground. Furthermore, adoption challenges such as limited digital literacy, poor internet connectivity, distrust in digital systems, and regulatory constraints hinder the practical application of these tools in community-based marketing models. Without concrete evidence on how PalmPay and blockchain are used or can be used to empower marginalized populations and foster environmental consciousness in marketing, efforts to build an inclusive and green digital economy risk falling short. This study, therefore, sought to examine the real-world role of PalmPay and blockchain in transforming marketing practices in Iringa Municipal, with a focus on inclusion, sustainability, and equity.

1.1. Objective of the Study

1.1.1. Main Objective

The main objective of the study was to explore the role of PalmPay and blockchain technology in promoting inclusive and green marketing practices in Iringa Municipal.

1.1.2. Specific Objectives

i. To assess the extent to which PalmPay facilitates inclusive marketing among underserved populations in Iringa Municipal.
ii. To examine the application of blockchain technology in enhancing transparency and trust in green marketing practices.
iii. To identify the challenges and opportunities in integrating PalmPay and blockchain into inclusive and sustainable marketing strategies in the local context.

1.1.3. Research Questions

i. How is PalmPay being used to promote inclusive marketing among marginalized groups in Iringa Municipal?
ii. In what ways does blockchain technology contribute to transparency and accountability in green marketing initiatives?
iii. What are the key challenges and opportunities in using PalmPay and blockchain to support inclusive and environmentally responsible marketing in the region?

1.2. Main Contributions of the Study

The investigation offered valuable insights into how emerging financial technologies can transform marketing practices and support inclusive, sustainable development within local economies such as Iringa Municipal. The main contributions were as follows:

i. It provided empirical evidence showing how PalmPay enhanced financial inclusion and inclusive marketing among underserved groups, thereby empowering local entrepreneurs and informal traders.
ii. It demonstrated that blockchain technology strengthened transparency and trust in green marketing by enabling the verification of sustainability claims and fostering eco-conscious consumer behavior.
iii. It identified major barriers, including digital illiteracy, infrastructural limitations, and perceived risks, that restricted the adoption of PalmPay and blockchain-based solutions in marketing ecosystems.
iv. It highlighted opportunities for scaling innovation, community training, and partnership development, offer-

ing practical directions for integrating financial technology and blockchain to promote inclusive and sustainable growth.

In this study, key concepts were clearly defined to provide analytical clarity. Inclusive marketing referred to strategies targeting underserved populations such as women, youth, and informal traders ensuring equitable access to products, services, and information, measured by PalmPay accessibility, effectiveness in enabling digital transactions, and market participation through local agents. Green marketing denoted practices promoting environmentally sustainable products, including transparent communication of eco-friendly attributes, measured through blockchain verification of sustainability claims, contributions to transparency in marketing channels, and influence on consumer trust in eco-conscious purchases. Digital dividend captured the socio-economic benefits of digital financial and technological innovations for marginalized groups, operationalized through enhanced financial inclusion, increased trust in digital and blockchain-enabled marketing, and opportunities for innovation, training, and community partnerships. These operational definitions and measurable indicators distinguished the study from traditional marketing approaches, guided the design of data collection instruments, and provided clear boundaries for analyzing how financial technology and decentralized systems support inclusive and sustainable marketing.

The remaining part of the paper is arranged as follows: Section two comprises of methodology, section three contains the results and discussion of the study, while the conclusion and recommendations are in section four.

2. Methodology

This research employed a qualitative approach supported by selected quantitative elements to explore the role of PalmPay and blockchain technology in promoting inclusive and green marketing in Iringa Municipal. The study was conducted within Iringa Municipal, a semi-urban area in Tanzania that has witnessed a growing adoption of digital financial services and sustainability-oriented business models. The research targeted individuals who had interacted with PalmPay or blockchain-enabled marketing systems, including local entrepreneurs, mobile money agents, small-scale traders, youth, women's groups, and community-based environmental advocates.

A purposive sampling technique was used to select a total of 45 respondents, ensuring that participants possessed relevant knowledge and experience with the subject under investigation. The sample included 15 PalmPay users (both service providers and clients), 10 small business owners engaged in green or sustainable marketing, 10 community influencers or local agents involved in promoting digital tools, and 10 key informants such as fintech experts, municipal officers, and NGO representatives.

The sample size of 45 respondents was determined based on the exploratory and qualitative orientation of the study, where the emphasis was placed on depth of understanding rather than statistical representation. The number of participants was guided by the principle of data saturation, where further interviews no longer produced new information or themes. By the 40th interview, the responses had begun to converge, and the inclusion of an additional five participants confirmed the emerging patterns. Therefore, this sample size was deemed methodologically suitable for an exploratory study of this nature, as it allowed for intensive engagement and nuanced analysis of participants' lived experiences with digital and green marketing innovations.

Primary data were collected through semi-structured interviews, focus group discussions, and a short structured questionnaire to capture basic quantitative insights. Interviews and discussions were conducted in both English and Kiswahili, depending on the respondents' preference, and were audio-recorded with consent to ensure accuracy. Secondary data were obtained from relevant literature, academic journals, official reports, and digital finance records from PalmPay and local development agencies.

The qualitative data were analyzed through thematic analysis, which allowed the identification of recurring narratives, attitudes, and meanings related to inclusion, transparency, and technological innovation. Descriptive statistics such as frequencies and percentages were also used to summarize the quantitative findings from the questionnaires.

The research adhered strictly to ethical research protocols throughout all stages. Ethical approval was obtained from the University Research Ethics Committee of [Ruaha Catholic University (RUCU)], prior to data collection. All participants were fully informed about the purpose, scope, and voluntary nature of the study before participation. Each respondent was provided with an informed consent form, which explained their rights, the confidentiality of their responses, and their freedom to withdraw at any stage without any penalty. Participants who preferred verbal

consent were recorded accordingly, particularly those with limited literacy levels.

Ethical approval was necessary for this research because it involved direct interaction with human participants, including interviews and focus group discussions with PalmPay users, small business owners, agents, and community influencers. These participants shared personal experiences, perceptions, and opinions related to financial technology use, digital inclusion, and sustainability practices, topics that may involve sensitive socio-economic information. To ensure participants' rights, dignity, and privacy were fully protected, the study followed established ethical protocols such as voluntary participation, informed consent, and confidentiality. Approval from the Ethics Committee of the Ruaha Catholic University (RUCU) ensured that all procedures aligned with the Declaration of Helsinki and national research ethics standards in Tanzania, reinforcing the study's academic integrity and adherence to responsible research practices.

Confidentiality was maintained by assigning unique identification codes to participants instead of using their real names. Personal identifiers were removed from transcripts and data files, and all digital records were securely stored on a password-protected drive accessible only to the research team. Furthermore, no sensitive financial or personal data was published or shared with third parties. The research was guided by the principles of respect, beneficence, and justice, ensuring that participants' dignity and privacy were upheld throughout the process.

While the sample size was relatively small (n = 45), this limitation was acknowledged as inherent to qualitative inquiry, which emphasizes depth over breadth. The insights derived, however, were rich and contextually grounded, providing a meaningful foundation for understanding how PalmPay and blockchain can support inclusive and sustainable marketing in Iringa Municipal and similar socio-economic environments.

To complement the qualitative insights, quantitative summaries were integrated into the data presentation to enhance analytical depth and validity. Although the study primarily relied on semi-structured interviews and focus group discussions, a short structured questionnaire was embedded within the data collection process to generate descriptive numerical insights. Each participant provided Likert-scale ratings on key indicators such as accessibility, effectiveness, transparency, and perceived challenges, which were later compiled into tables illustrating frequencies and proportions of responses (see **Figure 1** for example). These numeric data were not intended for statistical inference, but rather served to visualize and support recurring qualitative patterns, allowing for methodological triangulation between narrative accounts and quantifiable trends. This combination ensured that participants' perceptions were captured both in depth and in measurable form, reinforcing the credibility and transparency of the research findings.

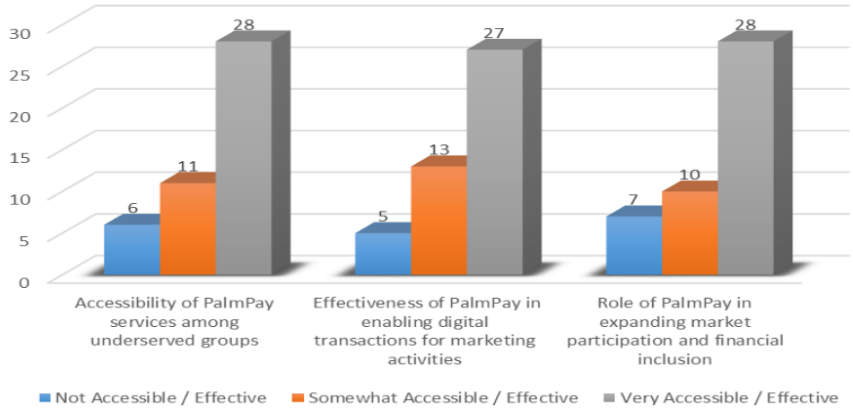

Figure 1. PalmPay's role in fostering inclusive marketing.

3. Results and Discussion

This section presents and discusses the findings of the study based on data that were collected from a total of 45 participants in Iringa Municipal. The analysis was guided by the main objective of the study, which was to explore the role of PalmPay and blockchain technology in supporting inclusive and green marketing practices. The results were structured according to the three specific research objectives, which focused on assessing the extent to which PalmPay facilitated inclusive marketing, examining the use of blockchain in enhancing transparency in green

marketing, and identifying the challenges and opportunities associated with the integration of these digital tools.

The findings were drawn from qualitative data obtained through semi-structured interviews and focus group discussions, as well as quantitative data collected through structured questionnaires. Respondents' descriptions, opinions, and experiences were used to generate key themes, and selected direct quotes were included to give voice to their perspectives. Basic statistical data, such as frequencies and percentages, were used to support and reinforce the qualitative insights. The discussion further compared the findings with existing literature to provide a broader interpretation of the results within the specific context of Iringa Municipal.

3.1. Inclusive Marketing Facilitation by PalmPay

The study assessed PalmPay's role in fostering inclusive marketing through three key dimensions: First, it examined the accessibility of PalmPay services among underserved groups (women, youth, and informal traders), revealing significant adoption rates, particularly through localized agent networks. Second, it evaluated the platform's effectiveness in enabling digital transactions for marketing activities, demonstrating improved sales conversion for small businesses. Finally, the research analyzed PalmPay's impact on expanding market participation and financial inclusion, finding that community influencers and local agents played a pivotal role in driving engagement and trust among first-time digital payment users.

3.1.1. Accessibility of PalmPay Services among Underserved Groups

The investigation into the accessibility of PalmPay services among underserved groups in Iringa Municipal revealed a generally positive impact, though varying degrees of access were reported. Out of 45 respondents, 28 considered PalmPay to be very accessible, 11 found it somewhat accessible, while 6 perceived it as not accessible. This spectrum highlighted both significant progress and ongoing challenges in bridging financial inclusion gaps through digital means.

A minority of six participants reported that PalmPay services were not accessible to them. These respondents often lived in more remote or poorly connected areas where PalmPay agents were few and far between, or where mobile network coverage was unreliable. One respondent shared their experience:

> *"...in my village, there are no PalmPay agents nearby, and sometimes the internet is so slow that even when I try to use the app, it fails to load. I have to travel a long way just to deposit money or pay. For someone like me who doesn't have a smartphone, this makes PalmPay almost useless..."*

Eleven respondents described the service as somewhat accessible. These individuals typically had access to PalmPay but encountered occasional difficulties, such as limited agent availability or temporary technical issues. Their experience suggested that while the platform was reaching them, barriers remained that limited seamless usage. One participant explained:

> *"...there is an agent in the nearby market, and I can use PalmPay most of the time. But sometimes, the agent runs out of cash, or the system is down. Also, some things are not very clear to me, and I need more support to understand how to use all the features properly..."*

Encouragingly, the majority of 28 respondents reported that PalmPay was very accessible. For this group, the presence of local agents and community awareness programs had made digital financial services tangible and easy to use. Several respondents emphasized the role of personal assistance and training in enabling them to adopt PalmPay effectively. A shop owner commented:

> *"...The PalmPay agent near my shop helped me set up everything and taught me how to send and receive payments. I no longer worry about carrying cash or missing customers who want to pay digitally. It feels safe and convenient. I even recommended it to my friends and family, because it works well for us here..."*

These findings demonstrated that while PalmPay had substantially increased access to financial services among many underserved populations in Iringa Municipal, there were still pockets where infrastructural and educational

challenges limited its reach. The personal touch of local agents and ongoing user support appeared vital in transforming initial access into meaningful and sustained usage.

3.1.2. Effectiveness of PalmPay in Enabling Digital Transactions for Marketing Activities

The investigation into the effectiveness of PalmPay in enabling digital transactions for marketing activities, as in **Figure 1**, was a critical component of the Inclusive Marketing Facilitation by PalmPay indicator in the study. This sub-indicator assessed how well PalmPay's platform supported underserved groups, such as women, youth, and informal traders in Iringa Municipal, Tanzania, in conducting digital transactions to facilitate marketing activities, such as selling goods or services and receiving payments. Survey data from 45 participants revealed that 27 (60%) rated the platform as Very Accessible/Effective, 13 (29%) as Somewhat Accessible/Effective, and 5 (11%) as Not Accessible/Effective. These findings, enriched by qualitative insights from semi-structured interviews, highlighted the transformative potential of PalmPay's digital transaction capabilities, particularly when supported by local agents or influencers, while also identifying barriers like unreliable internet and limited digital literacy that hindered effectiveness for some participants. The reliance on trusted intermediaries and community networks proved essential in enabling seamless digital transactions, aligning with the study's focus on inclusive marketing in a semi-urban context.

A minority of 5 participants rated PalmPay's platform as Not Accessible/Effective for enabling digital transactions, primarily due to significant infrastructural and technical barriers that prevented them from fully utilizing the service for marketing purposes. These participants, often older traders or those in remote areas of Iringa Municipal, faced challenges such as inconsistent internet connectivity, lack of compatible devices, or insufficient support from local agents to navigate the platform. Their experiences underscored a disconnect between the platform's potential and their ability to access it effectively, often due to external constraints rather than the platform's design. A 52-year-old male informal trader, who sold livestock, shared his frustration in an interview:

> *"…I tried using PalmPay to receive payments from customers in town, but the network in my area was too weak. Most times, the app wouldn't load, and I couldn't complete transactions. The agent who came to our village showed us the app once, but he didn't come back to help when I had problems. For someone like me, who doesn't know much about phones, it's hard to rely on this for my business when it doesn't work consistently…"*

This comment reflects the challenges faced by a small segment of participants who were unable to leverage PalmPay's digital transaction features due to unreliable infrastructure and limited ongoing support. The study noted that these participants often reverted to cash-based transactions, highlighting the need for improved network coverage and more consistent agent presence to enhance effectiveness.

Thirteen participants found PalmPay's platform to be Somewhat Accessible/Effective for digital transactions, recognizing its potential to streamline marketing activities but encountering obstacles that prevented optimal use. These participants, including youth and women with some familiarity with digital tools, successfully used PalmPay for basic transactions like receiving customer payments but faced issues such as occasional network disruptions or difficulty navigating advanced features like credit applications. Local agents played a role in introducing them to the platform, but inconsistent support or technical challenges limited their ability to fully integrate digital transactions into their marketing strategies. A 27-year-old female participant, who ran a small grocery stall, explained:

> *"…PalmPay made it easier to get payments from customers without carrying cash, which was good for my business. An agent in the market helped me start, and I liked that I could send money to my supplier quickly. But sometimes the app was slow because of the network, and I didn't know how to use some features, like getting a loan. I wish the agent could visit more often, or there was a place nearby to get help when I need it..."*

This perception illustrates how partial effectiveness was achieved through initial agent support and basic transaction capabilities, but sustained effectiveness required better infrastructure and more comprehensive guidance. The study suggested that targeted training and improved connectivity could enhance outcomes for this group.

The majority, 27 participants, rated PalmPay's platform as Very Accessible/Effective for enabling digital transactions, emphasizing its significant impact on their ability to conduct marketing activities efficiently and securely. These participants, including women, youth, and informal traders, benefited from PalmPay's user-friendly interface, low-cost transactions, and the critical support provided by local agents or community influencers who facilitated adoption and ongoing use. The platform allowed them to receive payments, pay suppliers, and access credit, which expanded their marketing reach and business opportunities. A 34-year-old male youth, who operated a mobile phone accessory shop, shared his enthusiasm:

> *"…PalmPay changed how I do business. A local agent, who's a respected trader in our market, showed me how to use the app to accept payments from customers and even get a small loan to buy more stock. It's fast, and I don't worry about carrying cash anymore. The agent was always there to answer my questions, and because he's someone we all trust, many of us in the market started using it. Now I can sell to customers even outside Iringa because of PalmPay's digital payments..."*

This quote stresses the pivotal role of trusted local agents in making digital transactions accessible and effective, fostering confidence and enabling participants to integrate PalmPay into their marketing activities seamlessly. The study found that these agents, often embedded in community networks, provided practical demonstrations and ongoing support, which were particularly effective in overcoming digital literacy barriers and building trust among underserved groups.

These findings strongly accentuated that the effectiveness of PalmPay in enabling digital transactions for marketing activities in Iringa Municipal depended heavily on the interplay between technological accessibility and human-centered support through local agents or influencers. The 60% of participants who rated the platform as Very Accessible/Effective highlighted its ability to streamline marketing activities and enhance economic participation, particularly when supported by trusted intermediaries who bridged the gap between technology and community needs. The challenges faced by the Not Accessible/Effective and Somewhat Accessible/Effective groups pointed to the need for improved internet infrastructure, more frequent agent support, and targeted digital literacy programs to ensure broader effectiveness. The study's results emphasized that in a context like Iringa Municipal, where personal relationships and trust were critical, the strategic use of local agents was indispensable for maximizing the effectiveness of digital financial services in marketing activities.

3.1.3. Role of PalmPay in Expanding Market Participation and Financial Inclusion

The investigation, as in **Figure 1**, into the role of PalmPay in expanding market participation and financial inclusion was a cornerstone of the Inclusive Marketing Facilitation by PalmPay indicator in the study Digital Dividends for All: The Role of PalmPay and Blockchain in Supporting Inclusive and Green Marketing in Iringa Municipal. This sub-indicator assessed how PalmPay's financial services enabled underserved groups, including women, youth, and informal traders in Iringa Municipal, Tanzania, to engage in broader market activities and integrate into the formal financial system. Survey data from 45 participants indicated that 28 (62%) rated PalmPay's role as Very Accessible/Effective, 10 (22%) as Somewhat Accessible/Effective, and 7 (16%) as Not Accessible/Effective. These results, complemented by qualitative insights from semi-structured interviews, underline the platform's significant impact on economic empowerment through digital financial tools, particularly when supported by local agents or community influencers. However, barriers such as limited access to technology and insufficient agent support hindered its effectiveness for some participants, highlighting the importance of trusted intermediaries in fostering financial inclusion in a semi-urban context.

A minority of 7 participants rated PalmPay's role in expanding market participation and financial inclusion as Not Accessible/Effective, primarily due to structural and personal barriers that prevented them from leveraging the platform's services. These participants, often older individuals or those in remote areas of Iringa Municipal, faced challenges such as a lack of smartphones, unreliable internet, or limited interaction with local agents, which restricted their ability to participate in market activities or access financial services. Some expressed skepticism about the platform's benefits, particularly if agents failed to provide clear, community-rooted explanations. A 55-year-old female trader, who sold maize, shared her experience:

"…I heard about PalmPay from people in the market, but I couldn't use it because I don't have a good phone, and the agent who came to our area only visited once. He talked about saving money and getting loans, but I didn't understand how it would help my business. I need someone from my community to explain it properly and show me how it works, not just someone who comes and goes. Without that, I can't trust it to sell more or save my money…"

This remark reflects the challenges of reaching the most marginalized groups, where technological and educational barriers, combined with limited agent presence, curtailed PalmPay's effectiveness. The study noted that these participants often relied on cash-based transactions, missing opportunities for broader market engagement.

Ten participants found PalmPay's role to be Somewhat Accessible/Effective in expanding market participation and financial inclusion, recognizing its potential but encountering obstacles that limited its full impact. These participants, including youth and informal traders with some exposure to digital tools, used PalmPay for basic functions like receiving payments but struggled with advanced features such as accessing credit or scaling their businesses due to inconsistent agent support or infrastructural challenges. Local agents provided initial guidance, but ongoing assistance was often insufficient, particularly in areas with poor network coverage. A 29-year-old male youth, who sold second-hand clothes, explained:

"…PalmPay helped me take payments from customers without cash, which was good for my business because some buyers prefer digital payments. A local agent showed me how to start, but when I wanted to get a loan to buy more stock, I couldn't figure it out, and the agent wasn't always around to help. The app is useful, but the network here is not always strong, and I need more support to use it for bigger things like growing my shop…"

This insight highlights how PalmPay facilitated partial market participation, but its effectiveness was constrained by external factors like connectivity and the need for sustained agent engagement. The study suggested that enhancing agent training and improving digital infrastructure could strengthen outcomes for this group.

The majority, 28 participants, rated PalmPay's role as Very Accessible/Effective in expanding market participation and financial inclusion, emphasizing the platform's transformative impact on their ability to engage in broader markets and access financial services. These participants, including women, youth, and informal traders, benefited from PalmPay's low-cost digital transactions, credit options, and the critical support of local agents or influencers who were trusted figures in their communities. These agents provided hands-on training, facilitated account setup, and offered ongoing assistance, enabling participants to sell to new customers, access credit for business expansion, and save securely. A 33-year-old female participant, who ran a small bakery, shared her experience:

"…PalmPay was a game-changer for my business. The agent in our market, who everyone knows and trusts, sat with me and showed me how to use the app to receive payments and even get a small loan to buy more flour. Because of her, I started selling to customers in nearby towns, and I could save money safely in my PalmPay account. She was always there to help if I had questions, and that made me feel confident to try new things in my business. Now, I'm part of the market in a way I never was before..."

This response illustrates how trusted local agents bridged technological and trust barriers, enabling participants to integrate into the formal economy and expand their market reach.

These findings strongly accentuated that PalmPay's role in expanding market participation and financial inclusion in Iringa Municipal relied heavily on the synergy between its digital platform and the human-centered support provided by local agents or influencers. 62% of participants who rated the platform as Very Accessible/Effective highlighted its ability to empower underserved groups to engage in broader markets and access financial tools, particularly through trusted intermediaries who offered personalized guidance. The challenges faced by the Not Accessible/Effective and Somewhat Accessible/Effective groups pointed to the need for improved digital infrastructure, more consistent agent support, and targeted digital literacy initiatives to ensure inclusivity. The study's results emphasized that in a context like Iringa Municipal, where social trust and personal relationships were critical, the strategic use of local agents was essential for maximizing PalmPay's impact on market participation and financial inclusion.

3.2. Application of Blockchain for Transparency and Trust in Green Marketing

The study explored how blockchain technology had been applied to enhance transparency and trust in green marketing within Iringa Municipal. It focused on how the technology was used to verify sustainability claims of marketed products, its contribution to transparency across marketing and advertising channels, and its influence on consumer trust in eco-conscious purchasing. These sub-indicators were examined to understand the extent to which blockchain tools had supported ethical and sustainable marketing practices, particularly in promoting accountability and credibility among environmentally aware consumers.

3.2.1. Use of Blockchain to Verify Sustainability Claims of Marketed Products

The investigation into the use of blockchain to verify sustainability claims of marketed products revealed, as in **Figure 2**, varying levels of awareness and application across Iringa Municipal. Out of the total respondents, 12 participants believed that blockchain had made no contribution to verifying sustainability claims. These individuals cited a lack of visible implementation and public understanding of how blockchain worked in relation to eco-labeling or sustainable product verification. For them, sustainability claims remained largely unverifiable, and blockchain was perceived as either too technical or inaccessible to be useful in this domain. One respondent who expressed this view stated:

> *"...we often hear that a product is 'eco-friendly' or 'green,' but we don't know who checks this or how. Blockchain is not something we see or understand in the market. To us, it feels like just another label without proof. There is no difference from before, even with new technology..."*

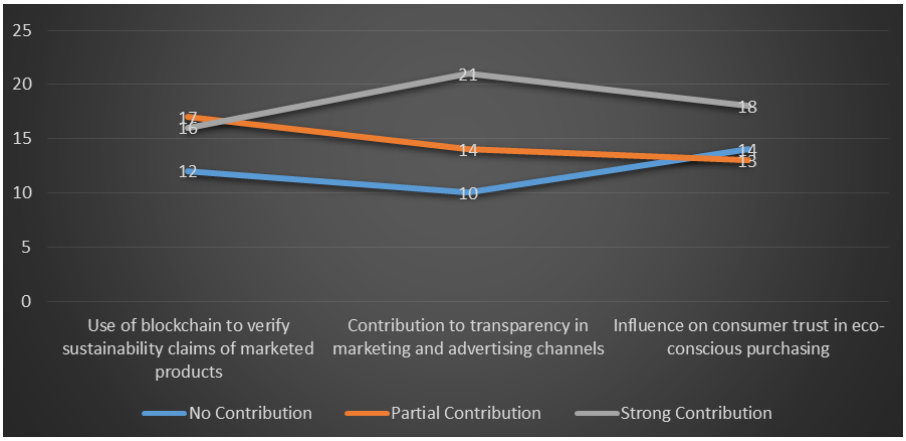

Figure 2. Showing how blockchain technology has been applied to enhance transparency and trust.

Seventeen respondents indicated a partial contribution of blockchain in verifying sustainability claims. These individuals acknowledged that while blockchain technology had the potential to enhance traceability and credibility, its practical integration into marketing systems and everyday product labeling was still limited. Many recognized pilot projects or isolated examples, but emphasized the lack of widespread implementation. One participant shared:

> *"...I have heard of companies using blockchain to track the origin of products, like organic food or clothes made from recycled materials. But here, we don't really see that in the market. Maybe some big brands overseas are doing it, but locally, the information is still not available to consumers. So yes, the technology helps, but it's not yet reaching us in a real way..."*

Sixteen participants viewed blockchain as making a strong contribution to verifying sustainability claims. These respondents were either directly involved in businesses experimenting with blockchain-based traceability or had encountered marketing strategies that incorporated QR codes, smart tags, or other blockchain-backed verification tools. They emphasized the transparency and immutability offered by blockchain in tracing the lifecycle of products

and believed it empowered both businesses and consumers to make more informed, ethical choices. A respondent who valued this contribution explained:

> *"...I worked with a company that exports organic tea, and we used blockchain to document the journey from farm to shelf. Everything was recorded no chance to change the data. When customers scanned the code, they could see exactly how the product was made and transported. This gave them more confidence in the brand. It is a strong system because it removes the guesswork. People no longer have to blindly trust they can see the proof..."*

These findings illustrated that while the concept of blockchain-enhanced verification had gained traction, there remained a gap between its theoretical value and its everyday application, especially in local markets. Nonetheless, respondents who interacted with blockchain-backed systems reported increased transparency and a shift in consumer attitudes toward sustainable consumption.

3.2.2. Contribution to Transparency in Marketing and Advertising Channels

The study, as shown in **Figure 2**, revealed that blockchain technology played varying roles in enhancing transparency in marketing and advertising channels within Iringa Municipal. Out of the 45 respondents, 10 participants reported that blockchain made no contribution to transparency in advertising. These individuals felt disconnected from the technology, with some expressing skepticism about whether it had any visible impact at all in their local markets. As one respondent bluntly put it:

> *"...we see so many ads saying 'this is clean' or 'this is green,' but we never know if it's true. I don't think blockchain is doing anything to stop misleading marketing. In fact, I've never seen a single advert here that mentions blockchain or shows anything different..."*

Fourteen respondents acknowledged a partial contribution, noting that blockchain had been introduced in certain marketing campaigns or pilot efforts but had not yet become a consistent standard. They admitted that while blockchain held the potential to improve accountability in advertising, its use remained experimental and largely confined to a few initiatives. One participant explained:

> *"...some companies have started using QR codes that link to blockchain records, showing where the product came from or how it was made. But that's rare, and most people don't even scan the codes. It's a good idea, but it hasn't spread far. Right now, it only helps a few people who understand how to use it..."*

A larger segment of 21 respondents believed blockchain had made a strong contribution to transparency in marketing and advertising. These participants cited examples where blockchain-enabled verification tools had been used to ensure that marketing claims were backed by immutable data. Some had firsthand experience with product campaigns that used blockchain to communicate sustainability, ethical sourcing, or production histories. A particularly enthusiastic respondent shared:

> *"...I was involved in promoting a clothing brand that used blockchain to track every step from raw materials to final packaging. Customers could scan the tag and see real-time data. This changed everything. It made our advertising truthful because we had proof. People trusted us more because they could see the facts, not just words..."*

These findings showed a growing awareness of blockchain's ability to reinforce honesty and reliability in green marketing. While the extent of blockchain adoption varied, many respondents emphasized that even its partial use had begun to change consumer expectations, prompting businesses to consider more transparent and data-driven advertising practices.

3.2.3. Influence on Consumer Trust in Eco-Conscious Purchasing

The findings of the study, as illustrated in **Figure 2**, indicated a mixed but promising influence of blockchain on consumer trust in eco-conscious purchasing within Iringa Municipal. Out of the 45 respondents, 14 reported that

blockchain had made no contribution to influencing their trust when making environmentally conscious purchases. These participants expressed unfamiliarity with blockchain systems or had not encountered products that used blockchain verification in their purchasing experiences. One respondent openly admitted:

> *"…to be honest, I've never seen anything like blockchain on a product I buy. They tell us it's green, but how can I trust that? Blockchain is still a mystery to most of us here. It has not changed the way I shop..."*

Another respondent with a similar view noted:

> *"…If companies are using blockchain, they're not telling us. We just hear about it on the news. In the market, nothing looks different. I still rely on what the seller says, not some technology I don't see…"*

On the other hand, 13 respondents believed blockchain had made a partial contribution to influencing trust in eco-conscious purchasing. These individuals acknowledged that blockchain had introduced a new level of verification, though it was still limited in scope and accessibility. Many stated that while they had heard of blockchain applications, they hadn't fully interacted with them during their shopping routines. As one participant stated:

> *"…I once saw a product that had a QR code saying it could show how it was made using blockchain. I scanned it, and it was impressive. But these kinds of products are rare. So while it helps a bit, it's not enough to make me change all my buying habits..."*

Among those who saw a strong contribution, totaling 18 respondents, the influence of blockchain on trust was much more pronounced. These participants had either experienced or been exposed to blockchain-backed marketing that clearly detailed the ecological and ethical aspects of a product. This transparency, according to them, elevated their confidence in the brand and product. A respondent shared:

> *"…when I bought honey from a farmer's cooperative, the packaging showed all the steps of harvesting and certification on a blockchain link. That gave me full trust. I knew it wasn't just a label saying 'organic'—there was proof behind it…"*

Another respondent emphasized:

> *"…trust is built when you see the journey of the product. Blockchain helped me believe the company wasn't hiding anything. It showed me they care about the environment and honesty…"*

The variation in responses proved that while blockchain had not yet reached full market penetration, it had begun to build a foundation for greater consumer trust in eco-conscious purchasing. Those who engaged with blockchain-verified products reported a significantly higher level of trust, suggesting that further integration and education could enhance its impact on sustainable consumer behavior.

3.3. Challenges and Opportunities in Integrating PalmPay and Blockchain

The study explored the challenges and opportunities in integrating PalmPay and blockchain technologies within digital marketing frameworks, focusing on how adoption was influenced by several key factors. It examined barriers such as limited digital literacy and poor infrastructure, assessed perceived risks and limitations tied to using digital tools for marketing, and investigated opportunities related to scaling innovation, promoting community training, and developing strategic partnerships. These aspects were critical in understanding both the resistance and readiness observed in the communities studied.

3.3.1. Barriers to Adoption (Digital Literacy, Infrastructure)

The investigation into barriers to adoption, specifically digital literacy and infrastructure, as illustrated in **Figure 3**, was a critical component of the Challenges and Opportunities in Integrating PalmPay and Blockchain indicator in the study. This sub-indicator assessed the extent to which digital literacy and infrastructural constraints hindered the adoption of PalmPay and blockchain technology among underserved groups, such as women, youth,

and informal traders in Iringa Municipal, Tanzania. Survey data from 45 participants revealed that 20 (44%) rated these barriers as a Major Challenge/Barrier, 17 (38%) as Moderate, and 8 (18%) as a Minor Challenge or Clear Opportunity. These findings, enriched by qualitative insights from semi-structured interviews, highlighted significant obstacles, including limited smartphone access, unreliable internet connectivity, and low digital literacy, which impeded the effective integration of these technologies. However, for some participants, supportive interventions like local agent training and community networks mitigated these barriers, creating opportunities for adoption. The study underlined the need for tailored solutions to address these challenges in a semi-urban context, aligning with broader trends in digital financial inclusion in emerging markets.

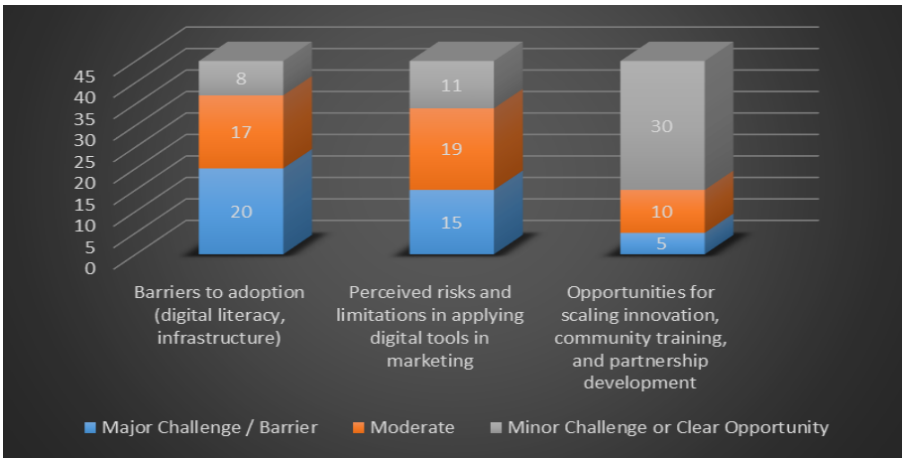

Figure 3. Showing the challenges and opportunities in integrating Palmpay and blockchain.

A significant group of 20 participants identified digital literacy and infrastructure as a major challenge/barrier to adopting PalmPay and blockchain technology, reflecting the substantial obstacles faced by many underserved groups in Iringa Municipal. These participants, often older traders or those in peri-urban and rural areas, struggled with limited access to smartphones, inconsistent internet connectivity, and a lack of understanding of digital financial tools and blockchain concepts. The complexity of blockchain, coupled with the absence of reliable infrastructure, made it difficult for them to integrate these technologies into their marketing activities. A 51-year-old female informal trader, who sold handmade textiles, shared her frustration:

> *"...I wanted to use PalmPay to sell more and maybe try this blockchain thing they talked about, but I don't have a good phone, and the internet in our area is always off. The agent came once, but I couldn't understand how to use the app or why blockchain matters. It's too complicated for someone like me who never learned about computers. I need someone to explain it simply and a network that actually works, otherwise, I'll just keep using cash..."*

This comment highlights the dual barriers of digital illiteracy and infrastructural limitations, which were particularly acute in less urbanized areas of Iringa Municipal. The study noted that these participants often relied on cash-based transactions due to these barriers, highlighting the need for improved digital infrastructure and accessible training programs to bridge the digital divide.

Seventeen participants rated digital literacy and infrastructure as a Moderate barrier, acknowledging that while these challenges impeded adoption, they were partially mitigated by limited access to resources or support from local agents. These participants, often youth or women with some exposure to digital tools, were able to use PalmPay for basic functions like mobile payments but struggled with more complex features, such as blockchain-based verification, due to intermittent internet access or incomplete understanding of the technology. Local agents provided initial guidance, but inconsistent support and network issues limited their ability to fully leverage these tools for inclusive and green marketing. A 27-year-old male youth, who ran a small vegetable business, explained:

> *"...the PalmPay agent helped me set up the app, and I started using it to take payments from customers,*

which was great. But when they talked about blockchain for proving my vegetables were organic, I got confused. The internet in my area isn't reliable, and I don't know enough about technology to use it on my own. The agent tried to explain, but I needed more lessons to really get it. It's helpful, but it's not easy when the network fails or you don't understand everything…"

This perception illustrates how moderate barriers persisted due to infrastructural constraints and gaps in digital literacy, despite some progress facilitated by community-based support. The study suggested that expanding agent training and improving internet connectivity could reduce these barriers, aligning with findings on digital payment adoption in emerging economies.

A smaller group of 8 participants rated digital literacy and infrastructure as a Minor Challenge or Clear Opportunity, indicating that these barriers were either minimal or had been effectively addressed, creating pathways for successful adoption. These participants, often younger traders or those in urban parts of Iringa Municipal with better access to smartphones and the internet, benefited from robust support from local agents and community influencers who provided hands-on training and simplified explanations of PalmPay and blockchain functionalities. For these individuals, the availability of digital infrastructure and targeted education turned potential barriers into opportunities for enhancing their marketing activities. A 30-year-old female trader, who sells eco-friendly crafts, shared her enthusiasm:

"…the PalmPay agent in our market was amazing. She showed me how to use the app to accept payments and even explained how blockchain could prove my crafts were made sustainably. I have a good phone, and the internet here is okay, so it was easy to start. She came back several times to teach me and others, and now my customers trust my products more because I can show them the blockchain records. It's opened up new markets for me, and I feel confident using it..."

This response accentuates how effective agent support and adequate infrastructure enabled participants to overcome adoption barriers, aligning with blockchain's potential to enhance transparency and financial inclusion. The study found that these participants leveraged community networks and digital literacy initiatives to integrate PalmPay and blockchain effectively, suggesting a model for scaling adoption in similar contexts.

These findings strongly highlighted that barriers to adopting PalmPay and blockchain in Iringa Municipal, particularly digital literacy and infrastructure, were significant but surmountable with targeted interventions. 44% of participants who rated these as a Major Challenge/Barrier highlighted the critical need for accessible devices, reliable internet, and simplified education to bridge the digital divide. The Moderate group (38%) demonstrated that partial progress was possible with agent support, but sustained efforts were needed to deal with infrastructural gaps. The 18% who saw Minor Challenge or Clear Opportunity illustrated the transformative potential of combining robust infrastructure with community-based training, enabling underserved groups to engage in inclusive and green marketing. These insights align with broader trends in emerging markets, where digital literacy and infrastructure are key determinants of fintech and blockchain adoption. The study emphasized that in a semi-urban context like Iringa Municipal, strategic interventions, such as expanding agent-led training and investing in digital infrastructure, were essential for overcoming barriers and maximizing the adoption of PalmPay and blockchain technologies.

3.3.2. Perceived Risks and Limitations in Applying Digital Tools in Marketing

The investigation into the perceived risks and limitations in applying digital tools in marketing, as indicated in **Figure 3**, was a fundamental aspect of the Challenges and Opportunities in Integrating PalmPay and Blockchain indicator in the study. This sub-indicator assessed the concerns and constraints faced by underserved groups, including women, youth, and informal traders in Iringa Municipal, Tanzania, when adopting PalmPay and blockchain technology for marketing activities, such as digital payments and product verification. Survey data from 45 participants indicated that 15 (34%) rated these risks and limitations as a Major Challenge/Barrier, 19 (42%) as Moderate, and 11 (24%) as a Minor Challenge or Clear Opportunity. These findings, augmented by qualitative insights from semi-structured interviews, highlighted significant concerns about data privacy, transaction security, and the complexity of digital tools, which hindered adoption for many participants. However, for others, support from local

agents and growing familiarity with digital platforms mitigated these risks, transforming them into opportunities for enhanced marketing. The study underscored the need for robust education and trust-building measures to address these limitations in a semi-urban context, aligning with trends in fintech adoption in emerging markets.

A notable group of 15 participants perceived the risks and limitations of applying digital tools like PalmPay and blockchain in marketing as a major challenge/barrier, reflecting deep-seated concerns that significantly impeded their adoption of these technologies. These participants, often older traders or those with limited digital exposure, expressed worries about data privacy, potential system errors, and the financial risks of relying on unfamiliar digital platforms. Many lacked confidence in the security of digital transactions and feared losing money due to technical issues or fraud, particularly in areas with limited access to support from local agents. A 54-year-old male trader, who sold grains in a local market, articulated his apprehension:

> *"...I heard about PalmPay and blockchain, but I was afraid to use them because I don't trust these apps with my money. What if the system crashes or someone steals my information? The agent tried to explain, but I didn't understand how it's safe, and I've heard stories of people losing money online. For my business, I'd rather stick to cash because I know it's real and I can control it. These digital things feel too risky for someone like me who doesn't know much about technology..."*

This statement reflects the significant barriers posed by distrust and lack of digital literacy, which were exacerbated by limited agent support and unfamiliarity with digital tools. The study noted that these participants often returned to traditional marketing methods, highlighting the need for enhanced security assurances and accessible education to build trust.

Nineteen participants rated the risks and limitations as Moderate, acknowledging concerns about digital tools but finding them manageable with some support, allowing partial adoption for marketing activities. These participants, often youth or women with basic digital skills, used PalmPay for simple transactions like payments but remained cautious about advanced features, such as blockchain-based product verification, due to concerns about privacy, system reliability, or their own limited technical understanding. Local agents provided initial guidance, which helped mitigate some fears, but inconsistent support or occasional technical issues, like network disruptions, tempered their confidence. A 29-year-old female trader, who sold eco-friendly clothing, shared her perspective:

> *"...PalmPay was useful for taking payments from customers, and the agent showed me how to use it, which made me feel a bit more comfortable. But I was worried about what happens to my information on the app, and sometimes it didn't work because of the network. I tried blockchain to show my clothes were sustainable, but it was hard to understand, and I wasn't sure if it was completely safe. It's good, but I needed more help to trust it fully for my business..."*

This answer illustrates how moderate risks, such as concerns about data security and technical complexity, limited the full adoption of digital tools, despite some benefits. The study suggested that ongoing agent support and clearer communication about security features could reduce these concerns, aligning with findings on digital payment adoption in emerging markets.

A smaller group of 11 participants rated the risks and limitations as a Minor Challenge or Clear Opportunity, indicating that they either experienced minimal concerns or successfully overcame them through robust support and growing familiarity with digital tools. These participants, often younger traders or those in urban areas of Iringa Municipal with better access to infrastructure, benefited from comprehensive training by local agents and community influencers, which alleviated fears about privacy and reliability. They viewed digital tools as an opportunity to enhance their marketing by leveraging secure, transparent platforms to attract customers. A 32-year-old male youth, who sold organic vegetables, expressed his confidence:

> *"...The PalmPay agent in our market, who's a trusted friend, explained everything about the app and blockchain. He showed me how my customer information is safe and how blockchain proves my vegetables are organic. I was a bit worried at first about losing money, but the agent answered all my questions and even showed me how to check transactions. Now, my customers trust me more because they see everything is*

clear, and I've sold more to shops in town. The app makes my business look professional, and I'm not scared to use it..."

This remark highlights how effective agent support and accessible infrastructure turned potential risks into opportunities, enabling participants to use digital tools confidently for marketing.

These findings strongly emphasized that perceived risks and limitations in applying digital tools like PalmPay and blockchain in marketing were significant but addressable through targeted interventions in Iringa Municipal. The 34% of participants who rated these as a Major Challenge/Barrier highlighted the critical need for robust security assurances, accessible education, and reliable infrastructure to build trust. The Moderate group (42%) demonstrated that partial adoption was possible with agent support, but sustained efforts were needed to address concerns about privacy and reliability. The 24% who saw a Minor Challenge or Clear Opportunity illustrated the potential of combining comprehensive training with community trust to transform risks into opportunities for enhanced marketing. The study emphasized that in a semi-urban context like Iringa Municipal, where concerns about digital tools were prevalent, the strategic involvement of trusted local agents was essential for mitigating risks and maximizing the adoption of PalmPay and blockchain for inclusive and green marketing.

3.3.3. Opportunities for Scaling Innovation, Community Training, and Partnership Development

The investigation into opportunities for scaling innovation, community training, and partnership development, as in **Figure 3**, was a pivotal component of the Challenges and Opportunities in Integrating PalmPay and Blockchain indicator in the study. This sub-indicator assessed the potential for expanding the adoption of PalmPay and blockchain technology among underserved groups, such as women, youth, and informal traders in Iringa Municipal, Tanzania, through innovative solutions, targeted training programs, and strategic partnerships with local entities. Survey data from 45 participants revealed that 30 (67%) rated these opportunities as a Minor Challenge or Clear Opportunity, 10 (22%) as Moderate, and 5 (11%) as a Major Challenge/Barrier. These findings, enriched by qualitative insights from semi-structured interviews, highlighted the significant potential for scaling these technologies through community-based training and collaborations with local cooperatives, businesses, and government entities. However, for a minority, barriers such as limited resources and awareness hindered the realization of these opportunities. The study underlined the critical role of leveraging local networks and tailored interventions to maximize the impact of PalmPay and blockchain in a semi-urban context, aligning with trends in fintech and blockchain adoption in emerging markets.

A small group of 5 participants rated the opportunities for scaling innovation, community training, and partnership development as a major challenge/barrier, indicating significant obstacles that prevented them from envisioning or accessing these possibilities. These participants, often older traders or those in remote areas of Iringa Municipal, cited limited awareness of PalmPay and blockchain, lack of access to training resources, and absence of local partnerships as major impediments. Many felt disconnected from the technological ecosystem due to their limited digital literacy and the lack of visible efforts to integrate these tools into their community's economic activities. A 57-year-old male trader, who sold livestock, expressed his skepticism:

"...I didn't see how PalmPay or this blockchain could grow in our area because no one came to teach us properly or show us how it could work for our businesses. The agent mentioned training, but it was only one meeting, and I didn't hear about any groups or cooperatives working with them. For something like this to work, they need to come to our village regularly, teach us in a way we understand, and involve our leaders. Right now, it feels like a city thing, not for people like me..."

This quote reflects the barriers faced by participants who perceived a lack of structured initiatives to scale these technologies, compounded by their isolation from digital infrastructure and community networks. The study noted that the absence of sustained outreach and localized partnerships limited the perceived opportunities for this group, highlighting the need for more inclusive strategies (Modern Ghana, 2025).

Ten participants rated these opportunities as Moderate, recognizing some potential for scaling PalmPay and blockchain but facing challenges that prevented full realization. These participants, often women or informal traders with partial exposure to digital tools, saw value in community training and partnerships but noted inconsistencies

in their implementation, such as infrequent training sessions or limited collaboration with local entities. They benefited from initial exposure to PalmPay through local agents but felt that more robust programs and partnerships were needed to fully integrate these technologies into their marketing activities. A 34-year-old female trader, who sold organic spices, shared her perspective:

> *"...the PalmPay agent came to our market and taught us how to use the app, which was helpful, and they mentioned blockchain for proving our spices were organic. I could see it helping my business grow, but the training was only once, and we didn't have anyone to keep teaching us. I heard about cooperatives working with PalmPay, but it wasn't in our area. If they had more workshops and worked with our market leaders, it could be bigger, but right now, it's only half-working..."*

This statement illustrates how moderate opportunities were constrained by limited follow-up support and localized partnerships, despite initial efforts. The study suggested that expanding training frequency and fostering collaborations with local organizations could enhance these opportunities, aligning with findings on fintech scalability in emerging markets.

The majority, 30 participants, rated the opportunities for scaling innovation, community training, and partnership development as a Minor Challenge or Clear Opportunity, emphasizing the transformative potential of these initiatives in Iringa Municipal. These participants, including youth, women, and informal traders, benefited from well-implemented training programs and emerging partnerships with local cooperatives, businesses, and community leaders, which facilitated the adoption of PalmPay and blockchain for inclusive and green marketing. Local agents and influencers played a critical role by providing ongoing training in Swahili, demonstrating practical applications, and connecting participants with cooperative networks that amplified the reach of these technologies. A 29-year-old male youth, who sells eco-friendly farm produce, shared his enthusiasm:

> *"...the PalmPay agent worked with our cooperative to train us on using the app and blockchain to show our crops were organic. They came to our market every week, teaching us step-by-step and even linking us with a local shop that wanted sustainable products. It was easy to learn because they used examples from our own businesses, and now I'm selling more because customers trust my produce. If they keep training us and work with more groups like our cooperative, this could grow to every market in Iringa..."*

This remark highlights how structured training and strategic partnerships turned opportunities into tangible outcomes, enabling participants to expand their market presence and adopt digital tools confidently. The study found that these participants leveraged community networks and innovative training models to integrate PalmPay and blockchain effectively, aligning with trends in fintech and blockchain scalability in Tanzania.

These findings strongly highlighted that opportunities for scaling innovation, community training, and partnership development in Iringa Municipal were significant and achievable with strategic interventions. The 67% of participants who rated these as a Minor Challenge or Clear Opportunity demonstrated the potential of leveraging local agents, community networks, and partnerships to expand the adoption of PalmPay and blockchain, enhancing inclusive and green marketing. The Moderate group (22%) highlighted the need for more consistent training and broader collaboration to fully realize these opportunities, while the Major Challenge/Barrier group (11%) accentuated the importance of inclusive outreach to reach marginalized communities. The study emphasized that in a semi-urban context like Iringa Municipal, where trust and local engagement were paramount, strategic partnerships and ongoing training were essential for maximizing the impact of PalmPay and blockchain technologies.

4. Conclusions

The study shed light on the multifaceted role that PalmPay and blockchain technologies have played in reshaping inclusive digital marketing practices, particularly in underserved communities. It was evident from the findings that PalmPay significantly enhanced accessibility and participation for marginalized groups. A notable number of respondents found PalmPay services to be very accessible and effective in facilitating digital transactions. These platforms were especially instrumental in broadening market inclusion through local agents and influencers, helping users engage in mobile-based economic activities with greater confidence and ease. While a small portion re-

ported limited access or digital barriers, the overall response demonstrated strong support for the transformative potential of PalmPay in fostering inclusive marketing environments.

Equally important was the exploration of blockchain's contribution to green marketing transparency and trust. Respondents reflected diverse experiences, with a considerable portion acknowledging blockchain's strong role in verifying sustainability claims and improving transparency in marketing channels. Many also highlighted its influence in enhancing consumer trust, especially in eco-conscious purchasing decisions. Although some participants reported partial or no contribution due to limited understanding or lack of exposure, there was an emerging consensus that blockchain had introduced new standards of accountability and authenticity in the marketing of environmentally responsible products. The technology's capacity to offer traceable and verifiable product histories proved appealing to both consumers and digital entrepreneurs.

Finally, the study revealed both challenges and opportunities in the integration of PalmPay and blockchain for marketing innovation. Barriers such as digital illiteracy, poor infrastructure, and perceived risks like data security and regulatory uncertainty were prominent among some respondents. Yet, the majority viewed these technologies as avenues for innovation, especially in terms of community training, partnership development, and scaling new business models. Numerous participants emphasized the need for continued awareness, education, and collaboration to unlock the full benefits of these digital platforms. The research demonstrated that while adoption challenges remained, the optimism and willingness to engage with these technologies pointed to a digital future that is more inclusive, transparent, and accessible.

Based on the study's findings, the following evidence-based recommendations are proposed to enhance the adoption and impact of PalmPay and blockchain technology in Iringa Municipal:

- **Expand community-based digital literacy training**: Limited digital literacy was a major barrier to adoption. Local agents and community influencers should deliver Swahili-language workshops, with pilot programs evaluated incrementally to ensure effectiveness.
- **Improve infrastructure and device accessibility**: Connectivity issues and a lack of affordable smartphones constrained adoption. Low-cost internet solutions and subsidized devices should be introduced in peri-urban and rural areas, with phased implementation and monitoring to measure impact.
- **Enhance transparency and trust mechanisms**: While blockchain improved verification of sustainability claims, some users struggled to understand its functions. User-friendly interfaces and targeted educational support, coupled with feedback mechanisms, can increase comprehension and engagement.
- **Foster strategic partnerships**: Collaboration between fintech providers, local businesses, cooperatives, and government agencies was identified as a key opportunity. Partnerships should include measurable objectives and pilot projects to evaluate scalability and cost-effectiveness.

Implementing these recommendations can help policymakers, fintech developers, and local stakeholders create a more inclusive and sustainable digital economy. By addressing barriers such as digital literacy, infrastructure gaps, and trust challenges, the interventions can enhance equitable access to financial services and promote eco-conscious marketing practices. Structured pilot programs and partnerships ensure that innovations are both scalable and responsive to community needs, providing a practical roadmap for integrating financial technology and blockchain solutions to empower underserved populations while supporting sustainable development.

Future research on the integration of PalmPay and blockchain in inclusive and sustainable marketing can explore several promising areas. First, researchers could investigate the long-term impact of digital financial services like PalmPay on small business growth, employment creation, and poverty reduction in rural and urban contexts. Second, further studies may focus on the behavioral aspects of consumer trust, particularly how blockchain transparency influences green purchasing decisions over time. Third, comparative research across regions or countries could help identify context-specific factors that either facilitate or hinder the adoption of blockchain and mobile finance technologies in marketing. In addition, future studies could assess the effectiveness of community-based training models and public-private partnerships in scaling up digital inclusion initiatives. Finally, exploring gender dynamics and youth engagement in digital marketing ecosystems enabled by fintech and blockchain would offer deeper insights into inclusivity and empowerment in the digital economy.

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Informed Consent Statement

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The data used in this study are available upon request.

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Conflicts of Interest

The author declares no conflict of interest.

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