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From Mining to Marketing: How Pi Currency Supports Sustainable Digital Advertising in Iringa Municipality

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ABSTRACT IN ENGLISH

The rapid growth of digital technology has revolutionized the way businesses market their products and services. However, traditional digital advertising models often face challenges such as ad blockers, intrusive ads, and lack of transparency. To address these issues, innovative solutions are emerging, including the use of cryptocurrencies like Pi Network. The aim of this study was to explore the role of Pi currency in advancing sustainable digital advertising in Iringa Municipal, focusing on its adoption, cost efficiency, and associated challenges. With a sample size of 60 participants, the research examined key indicators, including awareness and adoption, the impact on cost efficiency, and barriers to implementation. Findings revealed varying levels of awareness and adoption, with perceived benefits driving its gradual acceptance. The use of Pi currency demonstrated potential in reducing advertising transaction fees and enabling smaller businesses to access digital advertising platforms. However, challenges such as technical integration, regulatory concerns, and accessibility hindered its mainstream adoption. Insights from respondents underscored the need for strategic efforts to enhance the integration of Pi currency into existing digital marketing systems while addressing barriers to adoption. This study contributes to the discourse on integrating blockchain-based digital currencies into marketing practices, offering a foundation for future research on sustainable and innovative advertising solutions.

Keywords:
Pi Currency; Pi Network; Decentralized Cryptocurrency; Digital Advertising; Sustainable Digital Advertising; Ad-Blocking; Blockchain Technology; Cost Efficiency; Digital Marketing, Small Businesses

1. INTRODUCTION

The evolution of digital currencies has not only revolutionized financial systems but also opened up new frontiers for industries like marketing. Among these currencies, the Pi Network has emerged as a notable decentralized cryptocurrency, designed to be user-friendly, environmentally sustainable, and globally accessible. With the growing adoption of digital advertising as a key driver of business growth, especially in municipal settings like Iringa, integrating eco-friendly practices into marketing has become imperative. Digital marketing has seen an unprecedented rise in resource consumption, raising concerns about sustainability in a sector that depends on innovation and adaptability. Pi currency, with its energy-efficient mining model and unique value propositions, offers an opportunity to blend profitability with environmental consciousness. This study examines how adopting Pi currency can support sustainable digital advertising practices in Iringa Municipal, contributing to the broader discourse on eco-friendly marketing strategies in emerging economies.

Sustainable digital marketing is gaining traction as businesses seek to balance outreach and environmental responsibility. This approach aligns marketing strategies with sustainable development goals, emphasizing long-term growth while addressing social and environmental concerns [1, 2]. Digital platforms have revolutionized customer engagement, enabling companies to communicate their sustainability efforts and gather user insights [1]. The shift towards environmentally friendly products and socially responsible consumer behavior is driving the integration of sustainability into corporate digital strategies [3]. Effective sustainability advertising depends on factors such as ad context, source characteristics, and message design, with consumer drivers influencing its impact [4]. As businesses adapt to these trends, new sustainable business models and advertising campaigns are emerging, reflecting a growing emphasis on environmental and social responsibility in the digital marketing landscape [2, 3].

Cryptocurrencies, particularly Bitcoin and Ethereum, have faced criticism for their significant environmental impact stemming from energy-intensive mining. Studies show that Bitcoin's annual carbon emissions could exceed 90 $MtCO_2e$, surpassing the footprint of major cities [5]. The Proof-of-Work (PoW) consensus mechanism used by Bitcoin generates approximately 0.86 metric tons of carbon emissions per transaction, considerably higher than Proof-of-Stake (PoS) alternatives like Ethereum [6]. Bitcoin's energy consumption ranges from 26.41 TWh to 176.98 TWh, comparable to countries like Sweden and Thailand [7]. This high energy demand could potentially contribute to surpassing 2°C of global warming if adoption accelerates [8]. To address these concerns, researchers suggest exploring carbon offsets [5] and transitioning to more energy-efficient consensus mechanisms, such as PoS [6, 7]. Additionally, developing cryptocurrencies with reduced power demands is crucial for mitigating climate impact [8].

Pi Network is a cryptocurrency project launched in 2019 that aims to make mining accessible through mobile devices [9]. Unlike traditional cryptocurrencies, Pi Network doesn't require computational resources for mining; users can earn Pi coins by simply opening the app daily to confirm their identity [10]. The project utilizes the Stellar Consensus Protocol for its blockchain, emphasizing security, decentralization, and transaction speed [9, 11]. While still in development, Pi Network focuses on community engagement and may use NFTs to promote the platform and reward users [10]. The concept of low-cost, energy-efficient mining has been explored using hardware such as the Raspberry Pi [12, 13]. This approach could offer a more economical and sustainable method for cryptocurrency mining, potentially addressing the high costs of traditional mining setups [13]. Pi Network's future success depends on building a strong community and implementing strategies such as integrating with legal currencies and establishing a savings interest rate system [14]. The project also explores using NFTs to promote engagement and create value within its ecosystem [15]. Some researchers predict Pi's potential value based on Bitcoin's timeline, suggesting it could become a high-demand cryptocurrency [16]. However, users should remain informed about updates and consider associated risks in this evolving space.

Digital advertising has emerged as a powerful tool for promoting businesses and services, surpassing traditional media in effectiveness and spending [17]. It offers enhanced targeting capabilities, particularly for younger consumers, and has become increasingly important since the COVID-19 pandemic [18]. Despite its growing popularity and cost-efficiency, only a small portion of digital advertising spending yields desired outcomes [19]. However, research indicates that consumers find digital advertising helpful and interesting, and that it is effective in generating awareness, interest, and product preference [19]. The internet has revolutionized communication between customers and sellers, establishing itself as a potent advertising medium [19]. As businesses shift their focus from traditional to digital media, marketers are advised to increase their use of digital advertising to better target potential customers worldwide [17].

The digital advertising ecosystem faces challenges, including ad blocking, which undermines its effectiveness and sustainable development. Research indicates that excessive ad volume, invasiveness, and poor targeting are primary reasons for ad-blocking adoption [20]. To address these issues and build consumer trust, blockchain technology (BT) offers potential solutions for the digital advertising industry. BT can tackle privacy concerns, improve value for consumers, reduce tech companies' power, enhance personalization accuracy, and combat misinformation. Implementing

BT in digital advertising could lead to more socially beneficial practices and serve as a research environment for testing new approaches [21].

Blockchain technology is poised to revolutionize digital marketing by enhancing transparency, security, and efficiency [22]. It offers potential applications such as rewarding users for web interactions and content creation, ensuring data security, and mitigating fraud in advertising [22]. Pi Network, a cryptocurrency project, aims to create a decentralized network for digital transactions, allowing users to earn coins through energy-efficient mining and potentially leveraging NFTs for community engagement [23]. Blockchain in digital marketing can facilitate value exchange, protect data, eliminate intermediaries, and improve ad specificity [24]. It also has the potential to enhance the relationship between consumers and businesses by providing clarity, security, and streamlined revenue flow in digital advertising [25]. As blockchain technology continues to evolve, it is expected to significantly impact the future of digital marketing and consumer-business interactions.

While Pi Network offers the potential to democratize cryptocurrency participation, its use in digital advertising faces challenges. The digital advertising ecosystem is complex, involving programmatic processes and real-time bidding [26]. Key challenges include a lack of expertise, transparency, and concerns about brand safety. Pi Network's impact on advertising is still emerging, with potential applications in NFTs to promote engagement [27]. However, digital ads can consume significant bandwidth, affecting network performance [28]. As Pi Network is in early development stages, its effectiveness for digital advertising remains uncertain. Users should stay informed about updates and consider regulatory risks associated with emerging cryptocurrency projects [29].

Digital advertising in Tanzania faces several challenges and limitations. While linguistic innovations in multilingual digital ads show promise [30], small and medium enterprises struggle with e-marketing adoption due to limited understanding, high costs, and lack of internet access [31]. The adoption of cryptocurrencies, which could potentially facilitate digital transactions, is hindered by perceived risks and challenges, despite their potential usefulness [32]. In rural areas, ICT adoption in agriculture is particularly slow, with obstacles including lack of knowledge, poor infrastructure, insufficient government support, and language barriers [33]. These factors collectively impede the growth of digital advertising in Tanzania, especially in rural regions. While there is potential for advancement, significant improvements in infrastructure, education, and policy enforcement are necessary to overcome these challenges and foster a more robust digital advertising ecosystem in the country.

The rapid adoption of digital advertising in Iringa Municipal has highlighted significant challenges related to cost efficiency and environmental sustainability. Businesses, particularly small- and medium-sized enterprises (SMEs), faced increasing pressure to compete in a digital economy that often relied on costly platforms and resource-intensive technologies. While cryptocurrencies gained popularity as alternative payment systems, many, such as Bitcoin and Ethereum, were criticized for their high energy consumption, which posed environmental concerns. The emergence of Pi currency, with its energy-efficient mining model, offered a potential solution to these issues. However, the extent to which Pi currency could support sustainable digital advertising in the region remained largely unexplored. There was a lack of empirical evidence on its feasibility, integration into existing advertising frameworks, and effectiveness in reducing costs and environmental footprints. This knowledge gap limited businesses in Iringa Municipal's ability to fully embrace innovative, eco-friendly digital marketing approaches. Consequently, the study sought to investigate how Pi currency could be leveraged to support sustainable digital advertising practices, addressing the dual challenge of financial and environmental sustainability.

The main objective of this study was to explore the potential of Pi currency as a transformative tool in digital marketing. Specifically, the study aimed to assess awareness and adoption of Pi currency in digital advertising, examining factors including awareness levels, adoption rates, and perceived benefits for businesses. It also sought to evaluate the impact of Pi currency on cost efficiency in digital advertising, focusing on its ability to reduce transaction fees, optimize marketing budgets, and support smaller businesses. Furthermore, the study aimed to identify the challenges and barriers to implementing Pi currency, including technical, regulatory, and accessibility issues, and to analyze the factors hindering its mainstream adoption in the digital marketing ecosystem within Iringa Municipal.

The study primarily contributed to understanding how Pi currency could revolutionize digital advertising in Iringa Municipal by providing insights into its potential as a sustainable, cost-effective alternative to traditional digital marketing practices. It shed light on the levels of awareness and adoption of Pi currency among businesses, revealing varying degrees of familiarity and implementation. Additionally, the research highlighted the impact of Pi currency on reducing transaction costs and enabling smaller enterprises to access digital advertising opportunities, thus fostering inclusivity in the local advertising landscape. The study also identified significant challenges, including technical integration issues, regulatory hurdles, and limited accessibility, offering a comprehensive view of the barriers businesses face. By addressing these aspects, the study bridged gaps in existing knowledge and provided a foundation for future

exploration of blockchain-based currencies in digital marketing. The rest of the paper is arranged as follows: Methodology is presented in section two, results and discussion in section three, and section four contains the conclusion and recommendations of the study.

2. METHOD

The study employed a mixed-methods research design, combining both qualitative and quantitative approaches to provide a comprehensive understanding of how Pi currency supports sustainable digital advertising in Iringa Municipality. A sample size of 60 participants was selected, including business owners, marketing professionals, and other stakeholders involved in digital advertising within the municipality. The sample was selected purposively to ensure respondents had relevant experience or knowledge of digital marketing practices and cryptocurrencies.

Quantitative data were collected via structured questionnaires designed to capture awareness, adoption, perceived benefits, and challenges associated with the use of Pi currency in digital advertising. The questionnaires included both closed-ended and Likert-scale questions to facilitate statistical analysis of responses. Qualitative data were gathered through in-depth interviews with participants in the sample, enabling a deeper exploration of attitudes, perceptions, and barriers to implementation. The data analysis involved descriptive statistics to summarize quantitative findings and thematic analysis for qualitative responses. Ethical considerations were upheld throughout the study, including obtaining informed consent from participants, ensuring confidentiality, and providing the option to withdraw at any point. This methodology ensured a robust and comprehensive assessment of the research objectives.

3. RESULT AND DISCUSSION

The results and discussion of this study provided a comprehensive analysis of how Pi currency contributed to sustainable digital advertising in Iringa Municipality. Based on responses from 60 participants, the findings were organized around key indicators, including awareness and adoption, cost efficiency, and challenges encountered in implementing Pi currency for digital marketing. The data, collected through surveys and interviews, were analyzed to understand the perceived benefits and barriers to integrating Pi currency. These insights were then compared with existing literature, offering a detailed perspective on how Pi currency impacted digital advertising practices in the region and outlining its potential for future growth.

3.1 Awareness and Adoption of Pi Currency in Digital Advertising

The study revealed varying levels of awareness and adoption of Pi currency in digital advertising, with respondents reflecting different experiences and perceptions. In terms of awareness, some participants were familiar with Pi currency as a digital advertising asset, while others had limited knowledge. The adoption rate of Pi currency in digital campaigns varied, with many businesses exploring its potential, though full integration was still in the early stages for many. Additionally, several respondents recognized the perceived benefits of using Pi currency in digital marketing, especially in terms of cost-efficiency and targeting niche markets, yet challenges in understanding its full scope persisted for others.

3.1.1 Awareness of Pi currency as a digital asset for advertising

The study on awareness of Pi currency as a digital asset for advertising, shown in Figure 1, revealed varying levels of understanding among respondents. A substantial portion, 25 out of 60, considered Pi currency an effective digital asset for advertising, acknowledging its potential to disrupt traditional advertising models. These respondents viewed Pi currency as a viable tool that could offer cost-effective and innovative solutions for digital marketing. One respondent shared:

"...Pi currency presents a fresh opportunity. It's a low-cost option, especially for small businesses like ours, to engage with a wider audience without paying high transaction fees..."

Another participant added:

"...I believe it has great potential, especially in reducing advertising costs and reaching a more targeted audience..."

These positive views were rooted in the belief that Pi currency could enhance the efficiency and reach of digital advertising campaigns, making it a favorable option for those seeking alternatives to traditional payment methods.

However, 10 respondents categorized their awareness as "Not Effective," showing a lack of confidence in Pi currency's current capabilities for digital advertising. These participants expressed uncertainty about its applicability in the advertising domain, highlighting concerns over its limited use in mainstream advertising strategies. One respondent noted:

"...I've heard about Pi, but honestly, I don't see how it could be used in our advertising campaigns. It's still very niche and not widely accepted..."

Another shared:

"...we're not convinced it will make a difference yet. We would need more evidence that it works before adopting it for anything serious..."
Their disbelief highlighted a lack of understanding and underscored the need for more concrete information and real-world examples to demonstrate Pi Currency's effectiveness in digital marketing.
The remaining 25 respondents, categorized as "Somewhat Effective," reported moderate awareness of Pi currency's potential in digital advertising. While they saw some benefits, they were cautious about fully adopting it until more clarity was provided on its practical application. One participant explained:
"...I think it could work, but we're not sure how to integrate it into our existing marketing strategies. It seems promising, but we need to see more case studies and examples of success..."
Another added:
"...Pi could be a good option, but we are still figuring out how to incorporate it into our campaigns in a way that feels right for our audience..."

Their responses reflected openness to the idea but a need for more information and support to fully embrace Pi currency as a digital advertising asset. The findings indicated a wide range of awareness and understanding of Pi currency's potential in digital advertising, with a need for more education and practical examples to increase its adoption.

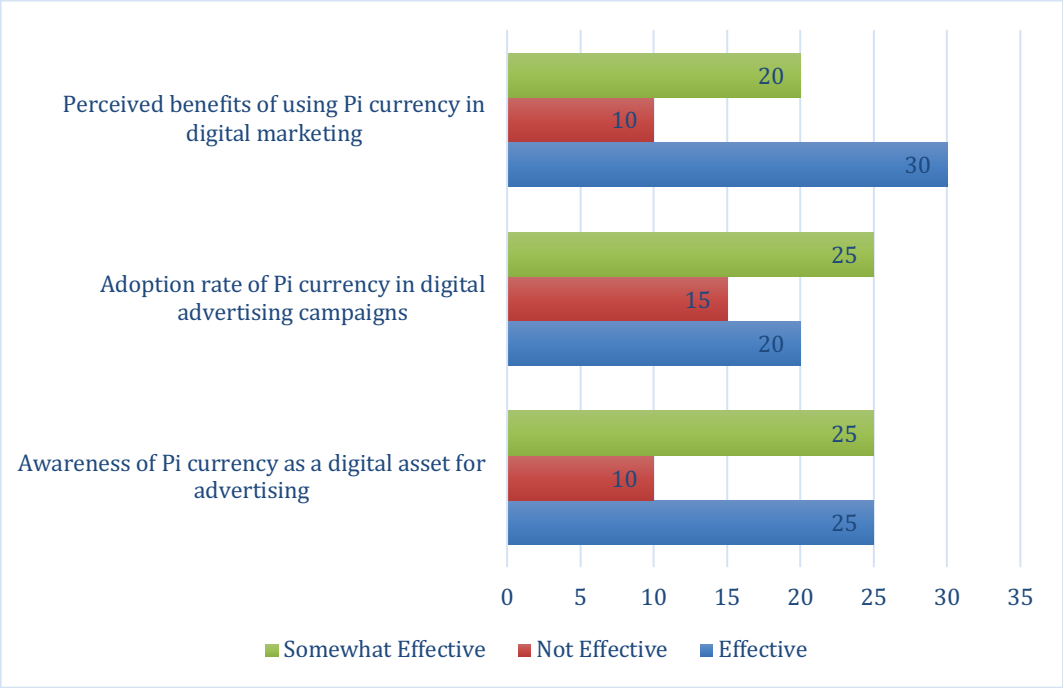

Figure 1 - Showing the Awareness and Adoption of Pi Currency in Digital Advertising

3.1.2 Adoption rate of Pi currency in digital advertising campaigns
The study on the adoption rate of Pi currency in digital advertising campaigns revealed, as in Figure 1, varying levels of adoption among respondents, reflecting a mix of enthusiasm and cautiousness toward integrating Pi currency into digital marketing strategies. A group of 20 respondents categorized Pi currency as **"Effective"** in terms of adoption. These participants had either successfully integrated Pi currency into their digital advertising efforts or were planning to do so in the near future. One respondent shared:
"...we've already begun experimenting with Pi in our campaigns. It's been a great way to attract tech-savvy customers and reduce advertising costs. We're seeing positive engagement and are planning to expand its use in the coming months..."
Another participant stated:
"...we've adopted Pi for some of our campaigns and have seen a reduction in transaction fees, which makes our advertising budget go further. The response from our target audience, particularly younger consumers, has been encouraging..."

These responses indicated that, for some, Pi currency represented a promising tool that provided not only cost savings but also an innovative way to engage with a specific demographic.

However, 15 respondents categorized the adoption rate of Pi currency as **"Not Effective,"** highlighting challenges in fully integrating it into their advertising strategies. These participants had either not adopted Pi currency at all or had abandoned plans to use it after testing its potential. One respondent explained:
"...we tried to use Pi for a few campaigns, but it didn't yield the results we were expecting. The audience wasn't familiar with it, and we had to shift back to traditional methods…"
Another respondent added:
"...It's still a very niche market. Our brand's target audience is not ready for Pi, and we haven't seen enough evidence to make it worth the investment..."

Their experiences pointed to a gap between the theoretical benefits of Pi currency and its practical application in mainstream digital advertising. This group stressed the importance of education and broader adoption before they would consider it a viable option for future campaigns. The remaining 25 respondents viewed the adoption of Pi currency in digital advertising as **"Somewhat Effective,"** expressing a mixed but generally positive stance on its potential. These participants had experimented with Pi currency in small-scale campaigns or were considering its use but had not fully committed to its widespread implementation. One participant shared:
"...we've done a pilot with Pi currency in one of our recent campaigns, and while the results were modest, we see its potential. We're still evaluating if we should scale it…"
Another respondent remarked:
"...It looks promising, especially as an alternative to traditional payment systems, but we're not fully convinced yet. We need more data and case studies before taking it to the next level..."

Their responses reflected cautious optimism, indicating that while they recognized Pi currency's potential, they needed further evidence and experience to make a more significant investment in its adoption.
In general, the findings revealed a varied approach to adopting Pi currency in digital advertising: a small but committed group of respondents had successfully integrated it into their campaigns, while others were more hesitant due to a lack of familiarity and tangible results. The mixed responses underlined the need for further exploration, education, and evidence to encourage broader adoption of Pi currency in digital advertising.

3.1.3 Perceived benefits of using Pi currency in digital marketing
The study on the perceived benefits of using Pi currency in digital marketing revealed varying levels of recognition and acknowledgment of its advantages among respondents. A group of 30 participants rated Pi currency as **"Effective"** in digital marketing, emphasizing its potential to improve various aspects of their advertising strategies. These respondents noted multiple benefits of incorporating Pi into their campaigns, particularly cost reduction and increased audience engagement. One respondent shared:
"...we've seen clear financial benefits. Pi currency allowed us to reduce transaction fees, and we've noticed that customers are more likely to engage with our campaigns when they can participate using Pi. It's given us a competitive edge in the digital marketing space…"
Another participant added:
"...the use of Pi has enabled us to provide an innovative experience for our customers. It's particularly appealing to the younger, tech-savvy demographic, which aligns with our target market…"

These responses reflected a strong belief in Pi currency's ability to enhance the effectiveness and reach of digital advertising campaigns by reducing financial barriers and engaging a niche audience that values digital assets.
In contrast, 10 respondents rated the perceived benefits of Pi currency as **"Not Effective,"** expressing skepticism about the digital asset's ability to deliver tangible benefits to their marketing efforts. These participants either did not see the value in adopting Pi currency or had negative experiences that led them to abandon its use in advertising campaigns. One respondent noted:
"...we tried Pi for a brief period, but we didn't see any noticeable difference in customer engagement or ROI. It's just not worth the effort for us right now…"
Another participant explained:
"...we've tried multiple platforms, and Pi currency just didn't offer the benefits we were expecting. Many other advertising strategies deliver results more reliably..."

These participants' experiences highlighted the challenges of integrating a new, unfamiliar digital asset into established marketing practices, with many feeling that Pi did not yet offer sufficient advantages to justify the transition.
The remaining 20 respondents viewed the perceived benefits of Pi currency in digital marketing as **"Somewhat Effective,"** indicating a neutral stance on its utility. While they acknowledged that Pi currency had potential advantages, they were uncertain about its long-term value and effectiveness compared to other tools in digital marketing. One respondent shared:

"...Pi has shown some benefits in our test campaigns, particularly in lowering costs, but the jury is still out on whether it can deliver sustained engagement. It's too early to tell for us..."
Another participant remarked:
"...we've seen some positive feedback from customers, but we're not sure if the benefits are enough to make a significant impact on our overall strategy..."

This group's responses suggested that while Pi currency had potential, more data and experience were necessary to fully assess its role in driving marketing success. The study's findings from this indicator demonstrated a range of perceptions regarding the benefits of Pi currency in digital marketing. A significant portion of respondents believed in its effectiveness, particularly in reducing costs and increasing customer engagement, while a smaller group found its benefits negligible. The moderate group displayed cautious optimism, indicating that while they saw some value, further evidence and experience were required to make definitive conclusions. These results highlighted the ongoing exploration of Pi currency's role in digital marketing, with both promise and challenges identified by businesses in the region.

3.2 Impact of Pi Currency on Cost Efficiency in Digital Advertising

The impact of Pi currency on cost efficiency in digital advertising was a critical area of focus in understanding how Pi currency influenced marketing strategies. Respondents reflected on various aspects of cost efficiency, such as the reduction in advertising transaction fees, the effects on overall marketing budget allocation, and the accessibility of digital advertising for smaller businesses. Many respondents acknowledged that Pi currency led to noticeable reductions in transaction fees, enabling greater flexibility in their advertising budgets. Additionally, smaller businesses highlighted the ease with which they could now access and participate in digital advertising, thanks to Pi currency's cost-effectiveness. However, opinions varied, with some businesses still uncertain about the full impact of Pi on their financial strategies.

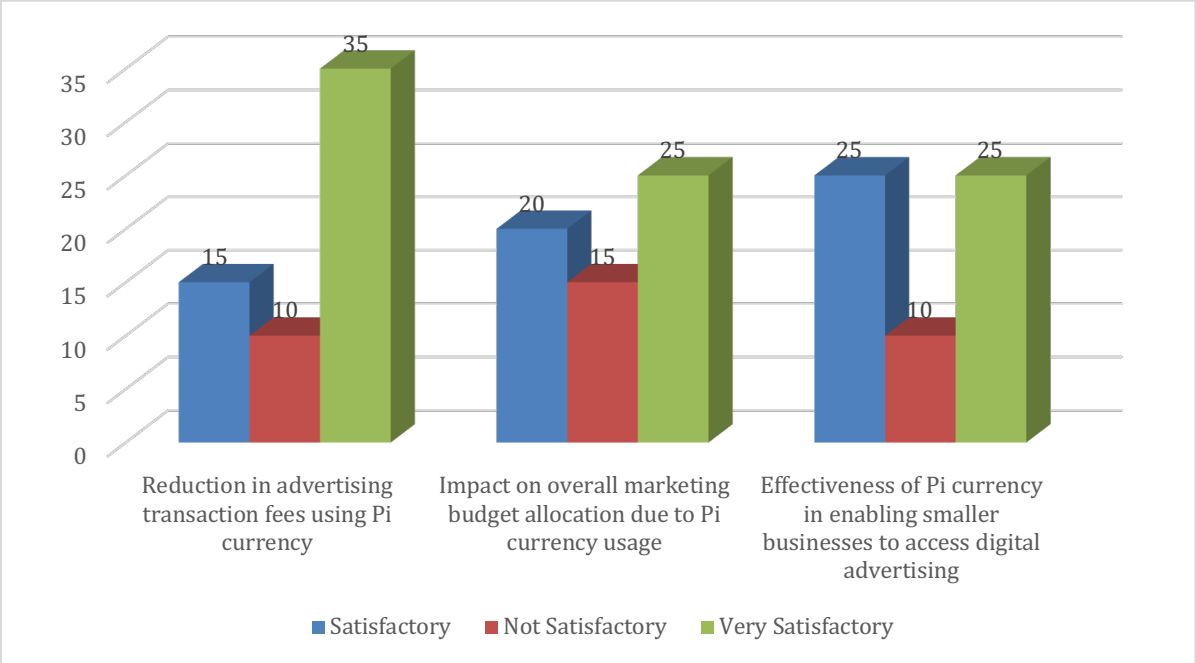

Figure 2 - Showing the impact of Pi currency on cost efficiency in digital advertising

3.2.1 Reduction in advertising transaction fees using Pi currency

The reduction in advertising transaction fees using Pi currency was one of the most widely discussed aspects of cost efficiency in digital advertising. According to the data in Figure 2, 15 respondents found the reduction **satisfactory**, 10 found it **not satisfactory**, and 35 rated it **very satisfactory**. The majority of respondents, particularly those in the **very satisfactory and satisfactory** categories, praised Pi currency for significantly lowering transaction fees compared to traditional payment methods. As one respondent mentioned:
"...The ability to use Pi for transactions has been a game-changer for our business. We've seen a clear reduction in the fees that we used to pay for ads. This has allowed us to stretch our budget further and reach more potential customers. It's definitely been very beneficial for us..."

Another respondent elaborated:

"…I'm very pleased with how Pi has worked for our advertising. The transaction fees were significantly lower, allowing us to allocate more funds to other aspects of our marketing campaigns. This has allowed us to diversify our ad placements without breaking the bank…"

However, a few respondents in the **not satisfactory** category expressed reservations about Pi's overall impact on reducing transaction fees, particularly given the cryptocurrency's fluctuating value. One participant shared:
"…While Pi definitely lowered transaction fees initially, we've noticed some instability in its value, which makes it harder to plan our advertising spend effectively. We've had a few instances where the fees, when converted back to fiat, weren't as low as expected…"

Despite these concerns, the overall sentiment was overwhelmingly positive, especially in the **very satisfactory** group, which noted tangible savings that directly contributed to better budget management and more flexible marketing strategies. The findings indicated that Pi currency, for the majority of respondents, was a highly effective tool for reducing advertising transaction fees and enhancing the cost efficiency of digital marketing campaigns.

3.2.2 Impact on overall marketing budget allocation due to Pi currency usage
The impact on overall marketing budget allocation due to the use of Pi currency, as per Figure 2, was another key aspect that was thoroughly discussed by the respondents in the study. Of the 60 respondents, 20 rated the impact as **satisfactory**, 15 as **not satisfactory**, and 25 as **very satisfactory**. The majority of respondents in the **very satisfactory** and **satisfactory** groups observed that adopting Pi currency enabled more efficient allocation of their marketing budgets, particularly by reducing overall costs in other areas. One respondent shared:
"…Using Pi currency has allowed us to reallocate a significant portion of our marketing budget to other activities. The reduction in transaction fees and lower costs meant that we had extra funds to invest in more innovative and impactful marketing strategies. It's been a real advantage…"
Similarly, another respondent expressed:
"…We had more flexibility in our budget since Pi currency provided savings on transaction fees. This allowed us to allocate more resources to targeted campaigns and social media promotions, resulting in higher engagement and better performance. It's been an unexpected benefit…"

However, some respondents in the **not satisfactory** category noted that while Pi currency reduced some costs, they did not observe a significant impact on their overall budget. One participant remarked:
"…It's nice that Pi currency helps with transaction fees, but the savings didn't make a huge difference to our overall marketing budget. We're a large company with a complex marketing strategy, so these small savings don't move the needle much for us."
Another respondent added:
"…Although Pi helps with some transaction fees, the costs in other areas of digital marketing remain high. The overall effect on our budget allocation hasn't been as transformative as I had hoped…"

Despite these concerns, the predominant view among respondents was that Pi currency had a positive effect on marketing budget allocation. The **very satisfactory** responses were particularly notable, with participants emphasizing how the additional funds saved through Pi currency usage allowed them to diversify their marketing efforts, resulting in more successful campaigns. This response highlighted the tangible financial benefits for businesses, especially small- and medium-sized enterprises, from improving their cost efficiency in digital marketing.

3.2.3 Effectiveness of Pi currency in enabling smaller businesses to access digital advertising
The effectiveness of Pi currency in enabling smaller businesses to access digital advertising, as illustrated in Figure 2, was a key concern explored in the study. Among the 60 respondents, 25 rated this aspect as **satisfactory**, 10 as **not satisfactory**, and 25 as **very satisfactory**.
Respondents in the **very satisfactory** category generally agreed that Pi currency lowered barriers to entry for small businesses, enabling them to access digital advertising that would have been too costly otherwise. One respondent explained:
"…for smaller businesses like ours, traditional advertising costs are often prohibitive. But with Pi currency, savings on transaction fees and reduced digital ad costs enabled us to enter the digital space and compete more effectively. This has been a game-changer for us..."
Another participant added:
"…we've always wanted to invest in digital advertising, but the cost of running campaigns on established platforms was just too high. With Pi currency, we've seen a noticeable reduction in our expenses, and we've been able to scale our advertising efforts without stretching our budget..."

Similarly, a respondent from the **satisfactory** category highlighted the positive influence Pi currency had on their marketing strategies:
"...Pi currency has helped us save on some of the fees, but it's not a massive difference yet. For smaller businesses, every little bit counts, but we're still figuring out the best way to integrate it effectively into our advertising plans. It's been good, though..."
In contrast, a few respondents in the **not satisfactory** class expressed that while Pi currency helped reduce certain costs, it had not provided the level of access they expected. One participant shared:
"...we've tried using Pi currency for a few campaigns, but it hasn't made a huge difference for us. The savings aren't enough to overcome the other challenges of digital advertising, like ad targeting and analytics. We're still struggling to see the full benefits..."
Another respondent noted:
"...while Pi currency lowered transaction fees, we still face challenges accessing the right platforms and reaching our target audience effectively. For us, the effect has been marginal, and we're not sure if it's worth the effort just yet..."

Despite these concerns, the overall reaction indicated that Pi currency had been highly effective in enabling small businesses to enter the digital advertising space with greater confidence and lower financial risk. The **very satisfactory** responses, particularly, highlighted how Pi currency had democratized digital advertising for smaller businesses, enabling them to compete with larger players without being hindered by high costs. However, the feedback from those who were less satisfied indicated that while Pi currency opened doors, its full potential was still evolving for many businesses.

3.3 Challenges and Barriers in Implementing Pi Currency for Digital Marketing

The study explored several challenges and barriers that businesses encountered when implementing Pi currency for digital marketing in Iringa Municipality. Respondents discussed technical challenges in integrating Pi currency into existing advertising platforms, concerns over regulatory and legal issues related to its use, and the accessibility of Pi currency for businesses in the region. Additionally, the study addressed barriers to mainstream adoption, including reluctance from traditional businesses and a lack of awareness or trust in the new digital asset. These challenges presented significant obstacles to the widespread use and acceptance of Pi currency in local digital marketing campaigns.

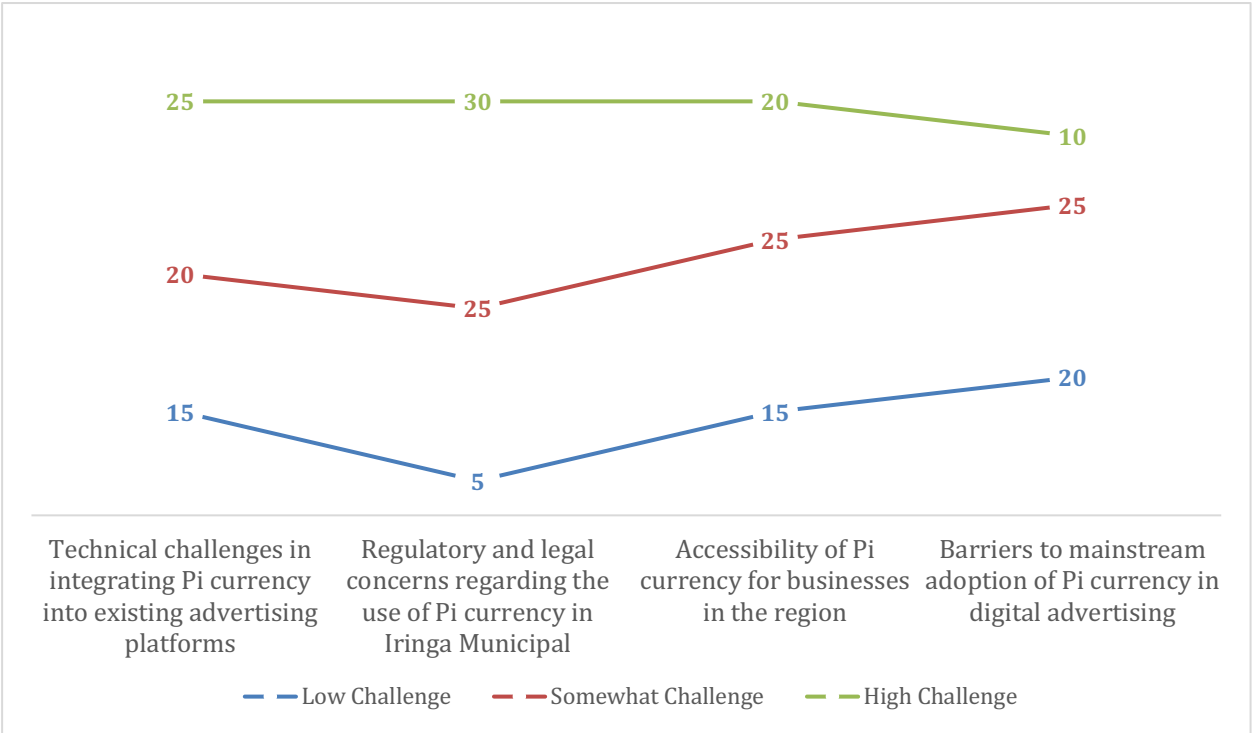

Figure 3 - Showing the challenges and barriers that businesses encountered when implementing Pi currency for digital marketing

3.3.1 Technical challenges in integrating Pi currency into existing advertising platforms

The study revealed that technical challenges in integrating Pi currency into existing advertising platforms, as shown in Figure 3, were a significant barrier for many businesses, with respondents reporting varying levels of difficulty. Among the participants, 15 perceived these challenges as low barriers, 20 as somewhat challenging, and 25 as high challenges. These findings highlighted the complexities involved in adapting traditional advertising platforms to accommodate this

innovative digital currency. Respondents who viewed the integration process as low-**challenge** often had prior experience with digital currencies or robust technical support teams to navigate the transition. One participant noted:
"…we were fortunate to have a tech-savvy team that could handle the integration seamlessly. For us, the process was more about adapting than completely overhauling our systems…"
In contrast, those who rated the challenge as **somewhat significant** described encountering hurdles but expressed optimism about overcoming them with time and resources. A respondent in this group remarked:
"…the integration wasn't entirely smooth, but we managed to work through the glitches. Having access to reliable documentation and technical support would have made things a lot easier…"
For the 25 respondents who viewed technical integration as a **high challenge**, the process was often described as frustrating and resource-intensive. Many struggled with compatibility issues and with a lack of clear implementation guidelines. One frustrated participant explained:
"…we had no prior knowledge of how Pi currency worked, and our existing platform simply wasn't designed for it. The technical modifications were overwhelming and costly, leaving us hesitant to proceed further…"
Another respondent from this group added:
"…Integrating Pi currency felt like entering uncharted territory. Without specialized expertise or comprehensive support, we were left grappling with issues we didn't anticipate…"

The varying degrees of difficulty in integrating Pi currency highlighted the need for more user-friendly solutions, enhanced documentation, and technical support to facilitate smoother adoption for businesses. While some organizations navigated the transition with ease, others encountered significant barriers that hindered their ability to fully leverage Pi currency in digital marketing.

3.3.2 Regulatory and legal concerns regarding the use of Pi currency in Iringa Municipal
The study found that regulatory and legal concerns regarding the use of Pi currency in Iringa Municipal, as shown in Figure 3, posed a substantial challenge for businesses. Among the respondents, only 5 described these concerns as low challenges, 25 as somewhat challenging, and a notable 30 as high challenges. These results emphasized the significant impact of regulatory uncertainties and legal complexities on the adoption and implementation of Pi currency in digital marketing.

5 respondents who perceived regulatory issues as a **low challenge** often belonged to businesses with prior experience in navigating compliance frameworks. One participant in this category stated:
"…we already had a legal team well-versed in cryptocurrency regulations, which made it easier for us to adopt Pi currency. The concerns were minimal for us because we knew what to expect…"
On the other hand, 25 participants who rated the challenge as **somewhat significant** highlighted the existence of regulatory grey areas that created hesitation but did not entirely discourage adoption. A respondent explained:
"…the regulations were unclear, especially when it came to taxes and cross-border transactions. It wasn't impossible to address these issues, but it required additional effort and consultation…"
Those who found regulatory concerns to be a **high challenge** expressed frustration with the lack of clear guidelines and perceived risks of non-compliance. This group often described the uncertainty as a major hindrance to their ability to confidently integrate Pi currency into their digital marketing strategies. One participant remarked:
"…the biggest problem is that there's no official policy on how cryptocurrencies should be used for advertising. We felt like we were walking a tightrope, unsure if we'd face penalties or restrictions down the line..."
Another respondent added:
"…we spent weeks trying to understand the legal implications of using Pi currency. The lack of clarity from local authorities made it feel like a gamble, and that discouraged us from moving forward…"

These findings highlighted a pressing need for regulatory frameworks that provide businesses with clear and actionable guidance on using Pi currency. Addressing these concerns could not only alleviate apprehensions but also encourage wider adoption, fostering innovation in digital marketing across Iringa Municipal.

3.3.3 Accessibility of Pi currency for businesses in the region
The study, as shown in Figure 3, found that the accessibility of Pi currency for businesses in the region posed varying degrees of challenge to adoption and implementation in digital marketing. Among the respondents, 15 described accessibility as a low challenge, 25 as somewhat challenging, and 20 as a high challenge. These findings underscored how infrastructure limitations, awareness gaps, and varying levels of technological readiness influenced the accessibility of Pi currency in Iringa Municipal. 15 respondents who rated accessibility as a **low challenge** tended to be businesses with established digital systems or prior experience in cryptocurrency adoption. One participant in this group shared:
"…we already had the necessary infrastructure in place, including digital wallets and knowledgeable staff, which made it easier to access and integrate Pi currency. For us, it wasn't a significant barrier…"

Conversely, 25 respondents who perceived accessibility as a **somewhat significant challenge** often cited the limited availability of reliable support networks and educational resources. A respondent in this category explained:
"…we faced some difficulties initially because there weren't enough local experts to guide us. We had to rely on online tutorials and trial-and-error to understand how Pi currency works for marketing..."
Respondents who rated accessibility as a **high challenge** frequently pointed to inadequate internet infrastructure, lack of digital literacy, and a perceived exclusivity of Pi currency platforms. One participant remarked:
"…many small businesses in the area don't have the digital tools needed to access Pi currency. The process of setting up wallets and learning how to use them felt overwhelming, especially for those without technical expertise..."
Another respondent highlighted the socio-economic barriers, stating:
"…It's not just about having access to the technology; it's also about affordability. For some businesses, investing in the necessary systems to adopt Pi currency is simply not feasible…"

These responses emphasized a critical disparity in the region regarding accessibility to Pi currency for marketing purposes. While larger or more digitally savvy businesses found it relatively manageable, smaller enterprises faced significant hurdles. Addressing these barriers through improved infrastructure, targeted training programs, and simplified access mechanisms could enhance the inclusivity and adoption of Pi currency in the region's digital marketing landscape.

3.3.4 Barriers to mainstream adoption of Pi currency in digital advertising

The study also highlighted that barriers to the mainstream adoption of Pi currency in digital advertising varied across respondents, reflecting differing levels of preparedness and perception regarding its integration. According to the data in Figure 3, 20 participants categorized it as a low challenge, 25 as somewhat challenging, and 10 as a high challenge. These findings demonstrated the existence of mixed experiences and attitudes, influenced by factors such as existing infrastructure, market readiness, and awareness of Pi currency's potential. 20 respondents who experienced **low challenges** often attributed their success to proactive adaptation and robust technological infrastructure. One business owner remarked:
"…for us, adopting Pi currency wasn't a problem because we already had the necessary systems and personnel in place. Our team was eager to explore this new digital trend, and the transition felt natural…"
This group mainly included businesses that had previously engaged with cryptocurrencies or had digitally mature operations. Their familiarity with blockchain technology allowed them to bypass many of the initial hurdles.
25 respondents who rated this barrier as a **somewhat significant challenge** identified knowledge gaps and market skepticism as the primary obstacles. A participant in this category shared:
"…the main problem was convincing our clients and partners to accept Pi currency. While we understood its potential benefits, many people didn't trust it or lacked enough knowledge to see its value in advertising…"
This response was echoed by several respondents, who noted the absence of educational campaigns to raise awareness of Pi currency among both businesses and consumers.
10 respondents who identified **high challenges** often cited systemic issues such as regulatory uncertainty and a lack of incentives for adoption. One participant expressed frustration, stating:
"...we wanted to try Pi currency for our campaigns, but there's too much confusion about its legality and no clear guidelines. Without government backing or regulatory clarity, it feels risky to fully commit to it…"
Another respondent highlighted the inertia within traditional advertising markets, saying:
"...mainstream adoption will take time because the industry is set in its ways. People are hesitant to move away from established payment systems, especially when Pi currency is still relatively new and untested…"

The responses illuminated a landscape where eagerness for innovation clashed with practical challenges. While some businesses embraced Pi currency with minimal resistance, others struggled to overcome barriers rooted in trust, education, and systemic constraints. These findings emphasized the need for collaborative efforts among stakeholders, including policymakers, industry leaders, and teachers, to address these barriers and foster greater acceptance of Pi currency in digital advertising.

4. CONCLUSION

According to a study, integrating Pi currency into digital marketing presents a promising yet complex landscape for businesses in Iringa Municipal. Findings demonstrated growing awareness and adoption of Pi currency as an innovative digital asset, with many respondents highlighting its perceived benefits, including reduced advertising costs and broader access to marketing platforms, particularly for smaller businesses. Despite these advantages, adoption levels varied, and Pi currency's effectiveness in enhancing marketing strategies remained contingent on factors such as technological readiness, market education, and trust in its systems. Respondents expressed mixed responses, with some emphasizing its transformative potential and others pointing to the need for further exploration and understanding of its practical applications. Challenges and barriers also emerged as critical factors in the implementation of Pi currency in digital advertising. Technical hurdles, accessibility issues, and regulatory concerns were cited by many respondents as

significant obstacles, underscoring the need for targeted efforts to address these limitations. The study revealed that while some businesses navigated these challenges with relative ease due to prior experience with blockchain technology, others struggled to align their operations with Pi currency requirements. This complexity highlighted the dual nature of Pi currency as both a catalyst for innovation and a subject of ongoing debate regarding its feasibility and sustainability in digital marketing ecosystems.

Based on the findings, the study recommends enhancing awareness campaigns and educational initiatives to promote a deeper understanding of Pi currency and its applications in digital marketing. Efforts should focus on addressing technical challenges by providing businesses with training and resources to seamlessly integrate Pi currency into their advertising strategies. Furthermore, policymakers and industry stakeholders in Iringa Municipal should collaborate to establish clear regulatory frameworks that reduce legal uncertainties and foster trust in the use of Pi currency. Accessibility improvements, such as simplifying platforms and ensuring broader availability of Pi currency, are crucial for encouraging adoption among smaller businesses. Finally, partnerships between technology providers and local enterprises can drive innovation, making Pi currency a more practical and sustainable tool for digital marketing.
In the future, research must be carried out:

Exploring how Pi currency influences consumer engagement, brand loyalty, and campaign outcomes over time.

- Analyzing how Pi currency adoption affects small and medium-sized enterprises, focusing on cost savings and reduced barriers to entry in digital advertising.
- Investigating the applicability and effectiveness of Pi currency solutions in various industries and regions, identifying key success factors for integration.
- Examining the potential of Pi currency to drive environmentally sustainable marketing through blockchain efficiencies and reduced carbon footprints.

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