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TECHNOLOGY PERFORMANCE AND ADOPTION OF MIWA BORA MOBILE APPLICATION AMONG SMALL-SCALE SUGARCANE FARMERS IN KAKAMEGA COUNTY, KENYA

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ABSTRACT

We are in the era of emerging trends in technology which are being applied in many areas of life, and agricultural sector is taking forefront in realization of successful use of this trends and digital transformation at a snail's speed around the world. Improving agricultural technology is a global focus aimed at increasing agricultural productivity, profitability and safety for economic growth and improved livelihoods. Many agricultural technologies with potential benefits such as Blockchain, Drones and AI have been developed through research, but their adoption and use by the intended users is the main challenge worldwide. This requires the development of effective mechanisms to improve technology uptake and realize potential benefits among the users. Therefore, this study fills this research gap by analyzing the technology performance and adoption of the Miwa Bora mobile application among small-scale sugarcane farmers in Kakamega County, Kenya. The study was to achieve the following objectives (i) To assess the effect of Miwa Bora mobile application performance, including speed, reliability, and scalability on its adoption among small-scale sugarcane farmers in Kakamega County. To evaluate how facilitating conditions, such as network availability, smartphone accessibility, and technical support, affect the adoption and effective use of the Miwa Bora mobile application. The study employed a descriptive research design. The theoretical framework of the research was based on the Theory of reasoned action (TRA),

and Theory of Diffusion of Innovation (DOI) of adoption of new technologies among the intended users. This study used a drop-and-pick method in the data collection process. Quantitative data was collected using a survey questionnaire with a 1-5 Likert scale and analyzed with descriptive and inferential statistics using the statistical package for the social sciences (SPSS version 28) and presented in percentages, mean, standard deviation and frequency. Information was compiled and presented using tables and pros format on a word document.

Key Words: Technology Performance, Application Performance, Facilitating Conditions, Adoption, Miwa Bora Mobile Application, Small-Scale Sugarcane Farmers

Background of the Study

The agricultural sector is a vital sector of Kenya's economy, providing employment and income to a significant portion of the Kenyan population. Sugarcane farming is particularly important in regions such as Kakamega County, where small-scale farmers depend heavily on this crop for their livelihoods. However, the industry faces several obstacles, including fluctuating market prices, pest infections and unpredictable weather patterns, compounded by limited access to modern agricultural technologies and information, which hinders productivity and sustainability (Kenya National Bureau of Statistics, 2021). In response, digital innovations like the Miwa Bora app have been developed to offer real-time information and support, thereby improving farmers' decision-making and agricultural practices. This study aims to assess the adoption of the Miwa Bora app among small-scale sugarcane farmers in Kakamega County, examining the factors that influence its uptake and the potential benefits it offers to the farming community (Kenya National Bureau of Statistics, 2021).

Digital technology has the potential to transform agriculture by enhancing efficiency, reducing costs, and increasing yields. Mobile applications such as Miwa Bora provide a range of services tailored to the needs of small-scale farmers, including weather forecasts, pest and disease management advice, and market price information (Aker & Mbiti, 2010). These tools are particularly valuable in regions like Kakamega County, where traditional farming methods and limited access to information present significant barriers to agricultural productivity. The Miwa Bora app, developed in collaboration with agricultural experts and local stakeholders, aims to address these challenges by providing a user-friendly platform that delivers localized and relevant agricultural information (Njuguna & Munene, 2020). However, the adoption of such technologies among small-scale farmers is influenced by various factors, including digital literacy, socio-economic conditions, and the availability of supportive infrastructure.

Understanding the factors that influence the adoption of the Miwa Bora app is crucial for developing effective strategies to promote its use and maximize its benefits for small-scale sugarcane farmers. Previous studies have identified several barriers to the adoption of agricultural technologies, including lack of awareness, financial constraints, and resistance to change (Rogers, 2003; Mwangi & Kariuki, 2015). In Kakamega County, additional challenges such as poor internet connectivity and limited access to smartphones further impede the widespread adoption of the Miwa Bora app. To address these issues, this study employed a descriptive research design to gather comprehensive data on the adoption of the Miwa Bora app among small-scale sugarcane farmers in Kakamega County (Creswell & Plano Clark, 2017). The findings of the study provide valuable insights into the barriers and enablers of technology adoption, offering practical recommendations for policymakers, developers, and agricultural extension services to support the digital transformation of agriculture in the region.

This study is significant in its potential to contribute to the sustainable development of the agricultural sector in Kakamega County and beyond. By identifying the factors that influence the adoption of the Miwa Bora app, the research will inform the development of targeted interventions to enhance the uptake of digital technologies among small-scale farmers. This, in turn, can lead to improved farming practices, increased productivity, and greater economic resilience for farming communities. Additionally, the study will contribute to the broader body of knowledge on agricultural technology adoption, offering insights applicable to similar contexts in other regions. Ultimately, the successful adoption of the Miwa Bora app and other digital innovations can help address the challenges facing small-scale sugarcane farmers, supporting their efforts to achieve sustainable and profitable farming operations (Creswell & Plano Clark, 2017**.**

Statement of the problem

The adoption of digital agricultural solutions has been recognized as a key driver in improving productivity and efficiency among small-scale farmers (FAO, 2021). However, despite the potential benefits, the Miwa Bora mobile application has experienced low adoption rates among small-scale sugarcane farmers in Kakamega County, Kenya. Studies indicate that only 40% of small-scale farmers own smartphones, with over 60% relying on older models that may be incompatible with modern applications (Wachira & Otieno, 2022). Additionally, 65% of farmers lack sufficient digital literacy, limiting their ability to effectively use agricultural mobile applications (Mwangi & Karanja, 2021).

Technological performance is a critical determinant of mobile application adoption. Research has shown that 45% of farmers experience frequent system glitches and slow response times, reducing their willingness to use the application (Omondi et al., 2021). Furthermore, poor interoperability and compatibility with different operating systems and device specifications limit accessibility, affecting the user experience (Kimani & Maina, 2020). Despite these barriers, there is limited empirical research assessing the effect of performance factors such as speed, reliability, and scalability on adoption in the agricultural technology space.

Contextually, most studies on digital agriculture in Kenya focus on broad technological challenges without specifically addressing how technology performance influences adoption among small-scale sugarcane farmers (Wachira & Otieno, 2022; Mutuku & Wanyama, 2019). Moreover, research on mobile applications for agriculture in Kakamega County remains scarce, creating a gap in understanding localized adoption behavior.

Conceptually, prior studies have primarily examined either adoption determinants or application usability separately but fail to integrate key factors such as ease of use, interoperability, and facilitating conditions in a single model (Kimani & Maina, 2020; Omondi et al., 2021). The interplay between these variables remains underexplored, necessitating a comprehensive analysis to establish how technological performance affects adoption and sustained utilization.

Methodologically, existing research largely relies on general survey methods, lacking a mixed-methods approach that combines quantitative adoption metrics with qualitative insights on user experiences (Mwangi & Karanja, 2021). A more robust analytical framework is required to capture the multifaceted barriers affecting adoption and to offer evidence-based recommendations for improving the Miwa Bora mobile application's effectiveness among small-scale farmers.

This study seeks to bridge these gaps by examining the relationship between technological performance and the adoption of the Miwa Bora mobile application among small-scale sugarcane farmers in Kakamega County. By integrating application performance, ease of use, interoperability, and facilitating conditions, this research will provide actionable insights to enhance digital agricultural transformation

General objective

To analyze the adoption and technological performance of the Miwa Bora mobile application among small-scale sugarcane farmers in Kakamega County, Kenya.

Specific objectives

i. To assess the effect of Miwa Bora mobile application performance, including speed, reliability, and scalability on its adoption among small-scale sugarcane farmers in Kakamega County.
ii. To evaluate how facilitating conditions, such as network availability, smartphone accessibility, and technical support, affect the adoption and effective use of the Miwa Bora mobile application.

LITERATURE REVIEW

Theoretical Review

Theory of Reasoned Action (TRA)

Fishbein and Ajzen (2000) developed the Theory of Reasoned Action (TRA) to explain factors influencing an individual's behavioral intention. According to this theory, attitude refers to an individual's evaluation of a specific technology, while belief and outcome evaluation represent the links between the technology and its characteristics. Subjective norms pertain to how the opinions of those in the individual's social environment affect their perception and behavior toward the technology. TRA is frequently used to explain behavioral changes in various fields, including health, education, agriculture, and consumption.

In this study, TRA is crucial for understanding the relationship between attitudes and behaviors in farmers' actions toward technology adoption. The theory is employed to predict how individual farmers' pre-existing attitudes and behavioral intentions influence their adoption of the Miwa Bora mobile application.

Innovation of diffusion Theory

Rogers (2010) developed the Diffusion of Innovations Theory, which explains how new technologies and ideas are adopted over time within a society. This theory outlines a process consisting of five stages: understanding, convincing, deciding, acting, and confirming. Rogers also introduced an S-shaped curve to illustrate the adoption process and categorized adopters into five groups: innovators, early adopters, early majority, late majority, and laggards.

Innovations, according to Rogers, are new ideas, practices, or objects perceived as novel by individuals or organizations (Rogers, 2010). Innovators are risk-takers who eagerly experiment with new technologies and often lead the way in adoption. Early adopters, while also open to new technologies, carefully evaluate them before publicly supporting them. They prefer to gain personal experience and information before recommending technologies to others. The early majority seeks evidence of an innovation's effectiveness through reviews and case studies before adoption. The late majority, similar to the early majority, requires strong proof of an innovation’s value and tends to adopt only after observing its success. Laggards are the most resistant to change, needing substantial evidence of an innovation’s benefits before considering adoption.

Rogers identified five key characteristics that influence adoption rates: relative advantage, compatibility, complexity, trialability, and observability. Relative advantage assesses whether an innovation is perceived as better than existing alternatives. Compatibility measures how well an innovation aligns with current values and practices. Complexity evaluates the perceived difficulty of using the innovation. Trialability refers to the ability to test the innovation on a limited basis, while observability pertains to how visible the innovation's results are to others. Innovations with high relative advantage, compatibility, trialability, and observability are adopted more quickly, while complexity negatively impacts adoption rates (Rogers, 2010).

Different types of innovation decisions affect adoption rates: selective decisions are made by individuals, collective decisions are made by groups, regulatory decisions are made by a few with authority or expertise, and conditional decisions follow previous innovation experiences (Rogers, 2003). Communication channels, through which information about innovations is disseminated, play a crucial role in adoption. Individuals often rely on the opinions of peers rather than expert reviews when evaluating new technologies (Fuentevilla, 2018).

The social structure and norms within a community also impact innovation adoption. Opinion leaders who adhere closely to social norms can influence the spread of innovations (Rogers, 2010). Change agents, who aim to promote adoption, perform several functions including creating a need for change, developing information exchange relationships, and helping clients implement and stabilize new innovations. Effective change agents tailor their communication strategies to the needs of target groups to facilitate adoption (Green & Parcel, 2005).

The Diffusion of Innovations Theory is particularly relevant to this study, which examines the dissemination and adoption of new technologies among small-scale sugarcane farmers in Kakamega County. The theory provides insights into how new technologies are introduced, accepted, and integrated into existing practices. It suggests that adoption rates can be accelerated through targeted communication and outreach strategies, addressing personal uncertainty and responding to social pressures (Green & Parcel, 2005).

Conceptual Framework

Sekaran and Bougie (2016) defines conceptual framework as a diagrammatical representation that shows the relationship between the independent variables and the dependent variables as shown in the figure 2.1 below.

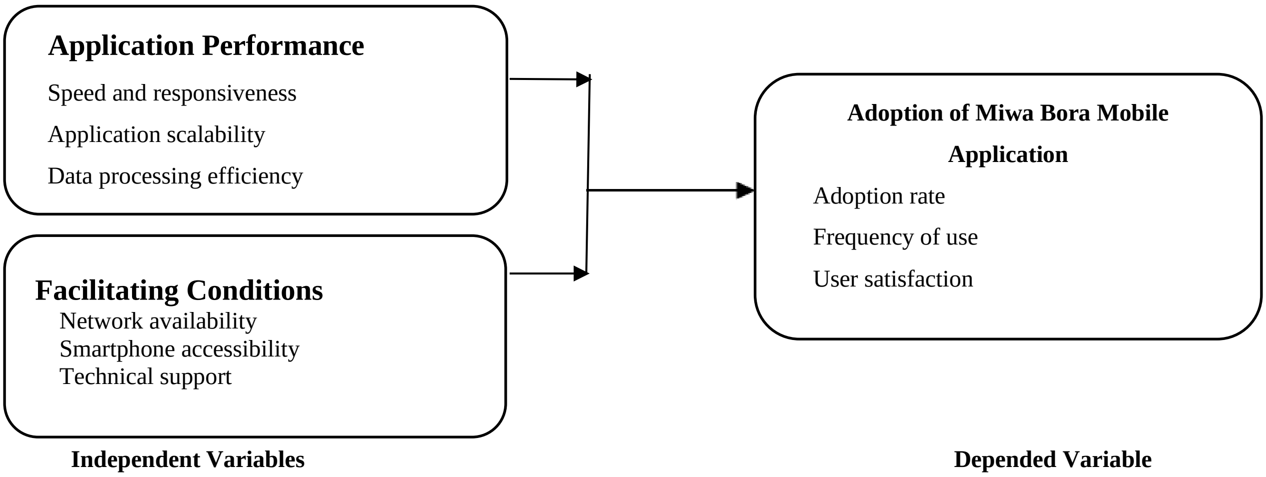

Figure 2. 1: Conceptual framework

Application performance

According to Fuentevilla et al. (2015), application performance refers to the efficiency and effectiveness with which a technology meets user needs. Speed and Responsiveness: This involves how quickly an application loads and responds to user inputs. Delays or sluggish responses can lead to user frustration, decreased satisfaction, and lower adoption rates. In agriculture, where timely decision-making is critical, responsive applications can significantly enhance productivity by supporting quicker task completion (Fuentevilla et al., 2015).

Scalability: Scalability is the capacity of an application to handle increased workloads, users, or data without degrading performance. It is essential for ensuring that a technology can adapt to growing demands and evolving user requirements (Fuentevilla et al., 2015). Data Processing Efficiency: This refers to how effectively and swiftly an application processes, manages, and utilizes data. Key components include speed, accuracy, and resource efficiency. Effective data processing is vital for meeting user needs and managing larger data volumes as the application becomes more widely adopted (Fuentevilla et al., 2015).

Facilitating Conditions

The adoption and effective use of mobile applications in agriculture depend not only on user-related factors but also on facilitating conditions, which include external resources that support technology use. Facilitating conditions refer to the environmental, infrastructural, and technical factors that influence an individual's ability to adopt and use a technological system effectively (Venkatesh et al., 2003). For small-scale sugarcane farmers in Kakamega County, key facilitating conditions such as network availability, smartphone accessibility, and technical support play a crucial role in determining the successful adoption of the Miwa Bora mobile application.

Reliable network connectivity is a critical requirement for mobile applications, particularly in rural areas where infrastructure challenges are prevalent. Many mobile applications rely on internet access for real-time data retrieval, cloud-based updates, and interactive functionalities (Aker & Mbiti, 2019). However, studies indicate that rural areas in Kenya, including Kakamega County, experience inconsistent mobile network coverage, which limits internet access and, consequently, the usability of digital agricultural tools (Mwangi & Karanja, 2021).

A study by Mutuku and Wanyama (2019) found that 65% of smallholder farmers in rural Kenya experience frequent internet disruptions, leading to poor app performance and dissatisfaction. If the Miwa Bora application requires high-speed internet for essential functions such as accessing market prices, weather updates, or agronomic advice, farmers in low-network areas may be unable to use it effectively. Wachira and Otieno (2022) further emphasize that mobile applications designed for rural farmers should incorporate offline functionality to ensure accessibility even in areas with weak network signals. By optimizing Miwa Bora to function efficiently with low-bandwidth connections, its adoption rate among sugarcane farmers can improve significantly.

The adoption of mobile applications in agriculture is also influenced by smartphone ownership and device capability. While smartphone penetration in Kenya has grown over the years, a large proportion of small-scale farmers still use basic feature phones or older smartphones that may not support modern applications (Kimani & Maina, 2020). Research by Omondi et al. (2021) found that only 40% of smallholder farmers own smartphones, with many relying on second-hand or outdated models that struggle with storage space, processing power, and software compatibility.

If Miwa Bora is designed primarily for high-end smartphones, it risks excluding a significant portion of its target users who cannot afford such devices. Compatibility issues can arise when applications require frequent updates, large storage space, or high processing power (Alam & Khan, 2021). To enhance adoption, the Miwa Bora application should be optimized for low-resource environments, ensuring that it functions smoothly on lower-end devices with minimal technical requirements (Chung et al., 2019).

Moreover, affordability remains a key barrier to smartphone adoption in rural Kenya. The World Bank (2021) highlights that the high cost of smartphones limits access to digital tools, particularly among small-scale farmers with limited financial resources. Subsidized smartphone programs, partnerships with mobile manufacturers, or government-led digital inclusion initiatives could help bridge this gap, making mobile applications like Miwa Bora more accessible to farmers.

Even when farmers have access to smartphones and network coverage, a lack of technical support can hinder adoption and effective use of mobile applications. Digital literacy levels among small-scale farmers remain relatively low, making it difficult for them to navigate complex applications without proper guidance (Mwangi & Karanja, 2021). A study by Park et al. (2018) found that users are more likely to abandon mobile applications if they do not receive adequate support when encountering challenges such as app crashes, registration issues, or difficulty understanding functionalities.

Kimani and Maina (2020) suggest that mobile application developers should integrate comprehensive user support systems, such as help centers, chatbots, or localized customer service teams, to assist users in troubleshooting issues. Additionally, training programs and community-based digital literacy initiatives can play a significant role in enhancing farmers' confidence and competence in using mobile technology (Dimitrov, 2016).

Further, localized language support can improve the usability of agricultural applications among farmers with varying literacy levels. Studies indicate that many smallholder farmers prefer applications available in their native language, as this enhances comprehension and ease of use (Aker & Mbiti, 2019). If Miwa Bora lacks translation features for local dialects, some farmers may struggle to understand instructions, limiting their ability to fully utilize the application.

Adoption of Miwa Bora Mobile Application

This study aimed to evaluate the impact, limitations, and potential of the Miwa Bora mobile application adoption for improving sugar output among small-scale commercial sugarcane farmers in Kakamega County. Adoption Rate: The adoption rate measures the extent to which the Miwa Bora mobile application has been taken up by the target population of small-scale sugarcane farmers (Davis, 2000).

Number of Registered Users: Track the total number of farmers who have registered on the app. This provides a basic measure of adoption (Venkatesh, Morris, Davis, & Davis, 2003).

Percentage of Target Population: Compare the number of registered users to the total number of small-scale sugarcane farmers in Kakamega County. This percentage shows the proportion of the target population that has adopted the app (Rogers, 2003). This metric helps gauge how widespread the app has become among the intended user base and provides a baseline for evaluating further adoption efforts (Davis, 2000). Frequency of Use: Frequency of use measures how often users interact with the Miwa Bora application. It provides insight into how regularly and consistently the app is being utilized (Venkatesh et al., 2003).

Daily, Weekly, and Monthly Usage: Track how often users log into or use the app. Categorizing usage into daily, weekly, and monthly helps understand the regularity of engagement (Rogers, 2003). Session Count: Record the number of sessions each user initiates over a specific period (e.g., weekly or monthly) (Venkatesh et al., 2003). Session Duration: Measure the average length of time users spend on the app during each session. This indicates how engaged users are when they access the app (Davis, 2000). Understanding how frequently users interact with the app helps assess whether it is becoming an integral part of their farming practices and identify opportunities for increasing engagement (Rogers, 2003). User Satisfaction: Collect qualitative data from users about how the app has influenced their day-to-day farming activities. This can include changes in decision-making processes, time management, or overall satisfaction with their farming outcomes (Munyua, 2018).

Empirical Review

Application Performance and Mobile Technology Adoption

Several studies have examined the role of application performance in mobile technology adoption, particularly in the agricultural sector. Poor app performance, characterized by slow loading times, frequent crashes, and high data consumption, has been found to discourage users from sustained engagement (Kimani & Maina, 2020). A study by Omondi et al. (2021) found that 45% of Miwa Bora users reported experiencing technical glitches, leading to frustration and eventual discontinuation of use. Similarly, Alam and Khan (2021) noted that mobile agricultural applications with high processing demands tend to have lower adoption rates in rural settings, where most farmers use low-end smartphones with limited processing power. However, studies rarely explore optimization strategies such as lightweight versions or offline functionality, which could improve usability in resource-constrained environments.

Facilitating Conditions and Infrastructure Challenges

Research has established that network availability, smartphone accessibility, and technical support are key determinants of mobile technology adoption (Venkatesh et al., 2003). According to Mutuku and Wanyama (2019), poor network connectivity in rural areas is a major barrier to the use of mobile agricultural applications. Similarly, a study by Omondi et al. (2021) found that only 40% of small-scale sugarcane farmers in Kakamega County own smartphones compatible with the Miwa Bora app, limiting access to digital farming solutions. While existing research acknowledges these infrastructural challenges, few studies explore potential interventions such as subsidized smartphone financing, community-based digital literacy programs, or offline app functionalities to bridge the accessibility gap.

RESEARCH METHODOLOGY

For this study, the target population comprises 7,600 registered small-scale sugarcane farmers in Kakamega County, as reported by the local agricultural office and the county government of Kakamega (Kakamega County Government, 2010). Kakamega County is divided into three major sugar zones: Mumias Sugar Zone, which includes 3,200 sugarcane farmers; West Kenya Sugar Zone, with 2,600 sugarcane farmers; and Butali Sugar Zone, which has 1,800 sugarcane farmers (Kakamega County Government, 2010). The study employed a descriptive research design, which is aimed at systematically detailing the characteristics of a specific population, phenomenon, or situation. This design focuses on providing an in-depth account of occurrences within a particular context without intervening or manipulating variables (Creswell, 2014). The sample size for this study will be 380 registered small-scale sugarcane farmers, determined by Slovin's Formula.

The study used stratified sampling, a method that involves dividing the population into distinct subgroups, or strata, and drawing samples from each subgroup. This approach ensures that various subgroups within the population are proportionately represented in the sample, thereby enhancing the accuracy and representativeness of the results (Creswell, 2014; Teddlie & Tashakkori, 2009). For this research, Kakamega County will be divided into three primary sugar zones Mumias, West Kenya, and Butali each serving as a stratum. The sample proportions for each stratum will be calculated based on their sizes to ensure

comprehensive representation across these zones (Sekaran & Bougie, 2016).

The researcher selected a total of 160 individuals from the Mumias Sugar Zone, 130 from the West Kenya Sugar Zone, and 90 from the Butali Sugar Zone each serving as a stratum, simple random sampling was used to choose the required number of participants from each stratum, Stratified sampling ensured representation from each of the three subgroups, capturing regional variations and improving the accuracy of the results (Cochran, 2022). Simple random sampling was used within each stratum to ensure that every individual has an equal chance of being selected, thereby reducing selection bias and enhancing the reliability and validity of the data (Cochran, 2022; Sekaran & Bougie, 2016).

The quantitative data collected from the questionnaire was analyzed through descriptive statistics and inferential statistics. Descriptive statistics involved frequencies, percentages, mean and standard deviation. Descriptive statistics was used because it provides a description of the phenomenon of the study. Multiple regression analysis was applied to test the viability of a dependent variable from multiple independent variables

ANALYSIS AND DISCUSSIONS

The researcher distributed 380 questionnaires to registered small scale sugarcane farmers all drawn from the three sugar zones of Kakamega County. The researcher collected 290 complete questionnaires filled. This accounted for 76.3% response rate. According to Mugenda & Mugenda (2008) a response rate of 50% is adequate for data analysis and reporting, 60% is good and above 70% is excellent. Since the response rate was above 70%, the study regarded the questionnaire to be acceptable for data collection.

Descriptive statistics for the Independent variable against the Dependent variable.

Application Performance and Miwa Bora Mobile Application adoption

The first objective of the study was to assess the effect of Miwa Bora mobile application performance, including speed, reliability, and scalability on its adoption among small-scale sugarcane farmers in Kakamega County. The descriptive statistics results are shown in Table 1.

Table 1: Application Performance and Miwa Bora Mobile Application.

Statement	N	Mean	Std. Deviation
I rarely experience crashes or technical glitches when using the Miwa Bora mobile application	290	3.88	1.332
The loading speed of the Miwa Bora mobile application positively influences my willingness to continue using it for sugarcane farming activities	290	4.28	.579
The features of the Miwa Bora mobile application (e.g., input submission, data retrieval, and real-time updates) respond quickly and efficiently to my commands.	290	3.91	1.268
The Miwa Bora mobile application maintains good performance even when many users are actively using it at the same time.	290	4.02	1.388
The Miwa Bora mobile application consumes minimal internet data, making it affordable and accessible for regular use.	290	4.03	1.193
Overall Mean Score	**290**	**4.02**	**1.152**

Scale: 1=strongly disagree, 2=disagree, 3=Uncertain, 4=Agree, and 5=Strongly Agree.

Table 1 provides a comprehensive overview of the respondents' evaluation of the application's performance across various key dimensions, offering valuable insights into the perceived functionalities and benefits associated with the Miwa Bora Mobile Application. The findings indicate that the respondents rated the Miwa Bora Mobile Application favorably across multiple dimensions. Specifically, the application was highly regarded for good loading speed that positively influences the willingness of the farmers to continue using it for sugarcane farming activities (mean score: 4.28). It also received positive evaluations for consuming minimal internet data, making it affordable and accessible for regular use: 4.03) and maintains good performance even when many users are actively using it at the same time (mean score: 4.02). Furthermore, the application was perceived to be experiencing crashes or technical glitches when using the Miwa Bora mobile application (mean score: 3.88) and responding quickly and efficiently to commands. (mean score: 3.91). The overall mean score of 4.02, with a standard deviation of 1.152, suggests a generally positive perception of the Miwa Bora Mobile Application's performance and utility among the small-scale sugarcane farmers in Kakamega county.

The findings of the study concurred with Davis (1989) and Gupta & Pal (2020) who established that key factors influencing technology performance and adoption include speed, reliability, feature responsiveness, scalability, and data efficiency. Davis (1989) and Gupta & Pal (2020) highlight speed as crucial for user satisfaction, while DeLone & McLean (2003) emphasize system stability's role in technology success. Venkatesh et al. (2003) and Park & Kim (2013) identify feature responsiveness as critical for adoption. Scalability and performance under heavy usage are supported by Wang & Liao (2008) and Kim et al. (2007), while data efficiency and minimal connectivity needs are key in low-resource settings, as shown by Chatterjee et al.

(2018) and Tarhini et al. (2019).4.2.11 Application Ease of use and Miwa Bora mobile application adoption.

Facilitating Conditions and Miwa Bora mobile application adoption

The fourth objective of the study to evaluate how facilitating conditions, such as network availability, smartphone accessibility, and technical support, affect the adoption and effective use of the Miwa Bora mobile application. The descriptive statistics results were summarized in Table 2.

Table 2: Facilitating Conditions and Miwa Bora mobile application adoption

Statement	N	Mean	Std. Deviation
Reliable internet connectivity in my area enables me to effectively use the Miwa Bora mobile application.	290	3.67	.471
I have access to a smartphone that is capable of running the Miwa Bora mobile application without issues.	290	3.43	.496
I can easily access technical support when I experience difficulties using the Miwa Bora mobile application.	290	4.10	.296
The cost of mobile data or internet access does not prevent me from using the Miwa Bora mobile application regularly.	290	3.49	.501
I have received or can easily access training and guidance on how to use the Miwa Bora mobile application effectively.	290	4.00	.000
Overall Mean Score	**290**	**3.74**	**0.353**

Table 2 provides an insightful analysis of the respondents' perspectives on the facilitating conditions associated with the adoption of the application, shedding light on the role of Network availability, smartphone accessibility, technical support availability, affordability of internet and data, costs and availability of user training and assistance in influencing the adoption of the Miwa Bora Mobile Application. The findings indicate that the respondents valued reliable internet connectivity in their area that enables them to effectively use the Miwa Bora mobile application. (mean score: 3.67) and acknowledged that they can easily access training and guidance on how to use the Miwa Bora mobile application effectively 4.00). Moreover, the respondents recognized the importance of easy access to technical support when they experience difficulties in using the Miwa Bora mobile application (mean score: 4.10). However, the respondents expressed some reservations regarding the accessibility to a smartphone that is capable of running the Miwa Bora mobile application without issues. (mean score: 3.43) and the necessity of cost of mobile data or internet access does not prevent them from using the Miwa Bora mobile application regularly (mean score: 3.49). The overall mean score of 3.74, with a standard deviation of 0.353, reflects a generally positive perception of the facilitating conditions influencing the adoption of the Miwa Bora Mobile Application among the surveyed population.

The finding of the study was in support to Rahim study (2012) which highlights that network availability, smartphone accessibility, technical support, affordability of internet, and user training significantly influence technology performance and adoption. Venkatesh et al. (2003) in the UTAUT model emphasize infrastructure availability, including network accessibility, as key to technology adoption. Kim et al. (2007) found that smartphone accessibility directly affects mobile internet adoption. DeLone & McLean (2003) stress that system success depends on adequate technical support. Chatterjee et al. (2018) show that affordability of internet and data costs impact digital service adoption, especially in developing regions. Tarhini et al. (2019) further highlight that user training and assistance improve confidence, leading to sustained technology use.

Adoption of Miwa Bora mobile application

The general objective was to analyze the adoption and technological performance of the Miwa Bora mobile application among small-scale sugarcane farmers in Kakamega County, Kenya. The descriptive statistics results were recorded in Table 3

Table 3: Adoption of Miwa Bora mobile application

Statement	N	Mean	Std. Deviation
I actively use the Miwa Bora mobile application to support my sugarcane farming activities	290	4.02	1.388
The Miwa Bora mobile application meets my expectations in terms of speed, reliability, and overall performance.	290	4.84	.440
Using the Miwa Bora mobile application has improved my farming practices and productivity.	290	3.78	.855
I would recommend the Miwa Bora mobile application to other small-scale sugarcane farmers	290	4.02	1.388
I intend to continue using the Miwa Bora mobile application in the future due to its usefulness and performance.	290	4.33	.471
Overall Mean Score	**290**	**4.2**	**0.908**

Table 3 provides a comprehensive analysis of the respondents' perspectives on the adoption of the application, shedding light on user satisfaction, experience, and the fulfillment of needs through the use of the Miwa Bora Mobile Application. The findings indicate that the respondents expressed overall high levels of satisfaction with the application's performance and utility in enhancing sugarcane planting and production activities. Specifically, the Miwa Bora mobile application meets my expectations in terms of speed, reliability, and overall performance was highly regarded as very satisfying (mean score: 4.84), most of the respondents agreed to continue using the Miwa Bora mobile application in the future due to its usefulness and performance (mean score: 4.33). Furthermore, the respondents reported that they would recommend the Miwa Bora mobile application to other small-scale sugarcane farmers (mean score: 4.02) and that they would actively use the Miwa Bora mobile application to support their sugarcane farming activities (mean score: 4.02). The overall mean score of 4.2, with a standard deviation of 0.908, reflects a significantly positive perception of the adoption and user satisfaction with the Miwa Bora Mobile Application among the surveyed population.

Regression Analysis

The study carried out regression analysis to determine the level of significance between the factors and adoption of Miwa Bora mobile application among small scale commercial sugarcane farmers in Kakamega County, Kenya.

Table 4: Coefficients of Factors and adoption of the Miwa Bora Mobile Application

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	-2.214	.463		-4.784	.000
Application Performance	.614	.021	.893	28.816	.000
Facilitating Conditions	.715	.114	.168	6.277	.000

a. Dependent Variable: Adoption of Miwa Bora Mobile Application

Table 4 displays the coefficients of the factors influencing the adoption of the Miwa Bora Mobile Application within the context of the study. The table provides crucial information regarding the standardized and unstandardized coefficients, t-values, and significance levels, shedding light on the strength and direction of the relationships between each predictor and the adoption of the mobile application. The 'Unstandardized Coefficients' column presents the raw coefficients for each predictor. It illustrates the magnitude of the change in the dependent variable (adoption of the mobile application) associated with a one-unit change in the respective predictor. In this case, the table shows that coefficient for application performance is 0.614, indicating that a one-unit increase in application performance is associated with a 0.614 increase in the adoption of the Miwa Bora Mobile Application. Finally, one-unit increase in Facilitating Conditions is associated with a 0.715 increase in the adoption of the Miwa Bora Mobile Application.

The 'Standardized Coefficients' column, also known as the Beta coefficients, represents the standardized values of the coefficients. It demonstrates the relative importance of each predictor in explaining the variation in the dependent variable. For instance, the standardized coefficient for application performance is 0.893, suggesting that application performance has a strong positive influence on the adoption of the mobile application compared to the other predictors.

The study findings are shown in the regression model below:

Adoption of Miwa Mobile Application = -2.214+0.614 Application performance +0.715 Facilitating Conditions

Conclusions

This study concluded that the technology performance of the Miwa Bora mobile application significantly influences its adoption among small-scale sugarcane farmers in Kakamega County, Kenya. Specifically, application performance (speed, reliability, and scalability) directly affects user engagement, as farmers prefer a stable and responsive application for their agricultural needs. Ease of use, including intuitive interface design and simplified navigation, was also found to be a key determinant, as usability challenges discourage continued usage. Additionally, application interoperability and compatibility with various mobile devices and operating systems were identified as critical factors, as farmers often rely on older or low-spec smartphones. Lastly, facilitating conditions, such as network availability, smartphone accessibility, and technical support, were found to significantly impact adoption, given the infrastructural challenges in rural areas.

Overall, the study concludes that enhancing the Miwa Bora application’s performance, usability, compatibility, and supporting infrastructure is essential for driving higher adoption rates. Addressing these aspects will improve farmers' access to digital agricultural resources, ultimately fostering efficiency, productivity, and sustainability in sugarcane farming.

Recommendations

Application Performance

The performance of the Miwa Bora mobile application plays a crucial role in ensuring its adoption and sustained usage among small-scale sugarcane farmers in Kakamega County, Kenya. Poor application performance, including slow response times, frequent crashes, and unreliable connectivity, significantly discourages users from engaging with the technology. To enhance performance and drive adoption, the following measures should be implemented

Optimize Application Speed by Reducing Load Times and Improving Backend Processing Efficiency

Application speed is a critical determinant of user experience. Slow-loading applications discourage users and reduce adoption rates, particularly in agricultural settings where farmers need quick access to essential farming information. Optimizing speed involves: Reducing unnecessary background processes that slow down response time. Minimizing app size to allow for faster installation and smoother performance on low-end devices. Enhancing database query efficiency to ensure quick retrieval of stored data. Implementing caching mechanisms to store frequently accessed data locally, reducing server requests. Faster load times ensure that farmers can efficiently use the app without frustration, improving its overall adoption.

Enhance System Reliability Through Regular Software Updates and Bug Fixes

Application reliability ensures continuous usability without frequent crashes or errors. Farmers require a stable and dependable system that consistently delivers accurate information. Enhancing reliability can be achieved by: Rolling out periodic software updates to fix bugs and optimize features. Conducting regular system audits to detect vulnerabilities and improve stability. Creating an error-logging system that automatically detects and reports issues for immediate resolution. Implementing a rollback mechanism to revert to previous versions in case of unexpected failures. By ensuring system reliability, trust and confidence in the application increase, encouraging widespread adoption.

Implement Cloud-Based Solutions to Improve Scalability Under Increased User Traffic

As more farmers adopt the Miwa Bora mobile application, the system must be able to handle increased user traffic efficiently. Scalability ensures that the app remains functional even during peak usage periods. Cloud-based solutions support: Auto-scaling capabilities, allowing the system to adjust its resources based on real-time demand. Load balancing to distribute traffic evenly across multiple servers, preventing overloads. Cloud storage for agricultural data, ensuring real-time accessibility from different locations. By utilizing cloud infrastructure, the application remains responsive and reliable, even as the number of users grows.

Introduce Offline Functionality to Reduce Dependence on Constant Internet Connectivity

Rural farmers often struggle with unstable internet connections, making offline accessibility a critical feature. Offline functionality allows users to: Access previously downloaded content, such as farming tips and market prices, without an internet connection. Input farming data offline, which synchronizes automatically once connectivity is restored. Use core features like farm record-keeping and weather forecasts in an offline mode. This approach ensures continuous usability even in low-network areas, increasing the app's adoption.

Optimize Data Compression Techniques to Minimize Bandwidth Usage

Many small-scale farmers in rural areas face high mobile data costs and poor internet speeds. Optimizing data compression techniques can help by Reducing image and video file sizes without compromising quality. Compressing text-based content for quicker downloads and reduced data consumption. Using adaptive streaming for video content, ensuring that it adjusts to available bandwidth. This will make the app more accessible and cost-effective, reducing barriers to adoption. Enhancing the technology performance of the Miwa Bora mobile application requires a multi-faceted approach, addressing speed, reliability, scalability, data efficiency, and real-time synchronization. Implementing these recommendations will ensure that small-scale sugarcane farmers in Kakamega County experience a seamless, efficient, and responsive digital farming tool, ultimately increasing adoption and sustained usage.

Facilitating conditions

Facilitating conditions refer to the external factors that support or hinder the adoption and effective use of technology. For the Miwa Bora mobile application, these conditions include network availability, smartphone accessibility, and technical support, all of which significantly impact adoption among small-scale sugarcane farmers in Kakamega County, Kenya. Addressing these challenges will improve technology performance and usability, ensuring that more farmers benefit from digital agricultural solutions. Below are ten key recommendations for enhancing facilitating conditions:

Improve Network Infrastructure and Internet Accessibility

A major challenge affecting the adoption of the Miwa Bora mobile application is poor network coverage and unreliable internet connectivity in rural areas. To address this: Collaborate with mobile network providers to improve 3G, 4G, and emerging 5G network coverage in farming communities. Introduce an offline mode within the app, allowing users to access key functions without an internet connection and sync data once reconnected. Encourage community-based Wi-Fi initiatives, such as setting up Wi-Fi hotspots in cooperative offices or local agricultural centers for free or subsidized access. Expanding network access ensures that more farmers can consistently use the application without experiencing disruptions.

Increase Smartphone Accessibility Through Affordable Devices

A significant portion of small-scale farmers in Kakamega County still use feature phones, which limits their ability to access the Miwa Bora mobile application. To promote smartphone adoption: Partner with mobile phone companies to provide subsidized smartphones for farmers at affordable prices. Encourage government or NGO programs that distribute entry-level smartphones to farmers. Develop a lightweight version of the application that can run efficiently on low-cost smartphones with limited storage and processing power. By making smartphones more accessible, more farmers will be able to adopt digital solutions, enhancing agricultural efficiency.

Establish Localized Technical Support Centers

Many farmers lack digital literacy and may struggle with using the application effectively. To provide hands-on assistance: Set up support centers in farming cooperatives where trained personnel can guide farmers on how to use the app. Deploy mobile support teams that visit farming communities to provide training and troubleshooting services. Develop a farmer-friendly help desk, accessible via call, SMS, or WhatsApp, to assist users facing technical issues. Providing direct technical support reduces frustration and improves overall user experience, leading to higher adoption rates.

Improve User Support Through AI Chatbots and Helplines

To provide real-time assistance, the Miwa Bora application should integrate automated and human support systems. This includes: AI-powered chatbots within the application to answer frequently asked questions and guide users through basic troubleshooting. A toll-free call center or SMS support system, allowing farmers to seek help without worrying about airtime costs. Dedicated WhatsApp and Telegram support groups, where farmers can ask questions and receive peer-to-peer assistance. For the Miwa Bora mobile application to achieve widespread adoption among small-scale sugarcane farmers, improving facilitating conditions is essential. By addressing network accessibility, smartphone affordability, digital literacy, technical support, and policy integration, the application can become a valuable tool for enhancing agricultural productivity. Implementing these recommendations will ensure that more farmers can access, use, and benefit from Miwa Bora, ultimately leading to greater technological empowerment and improved farming outcomes.

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