Research Article

Technology and Innovation Systems and Performance of Microfinance Institutions in Kisii County, Kenya

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Abstract
Microfinance banks face numerous challenges, including fierce competition driven by regulatory changes, macroeconomic influences, and technological advancements, which had heightened competitive dynamics. It was from this background that the study explored the impact of competitive strategy on business performance, aiming to contribute to a deeper understanding of the intricate relationship between strategy and success. The study was sought to evaluate the effect of technology and innovation systems on performance of microfinance institutions in Kisii County. This method involved in-depth data collection and analysis to describe the characteristics of the given population. The target population consisted of all heads and employees of microfinance institutions, comprising 180 respondents. Since the study sample was small, a census sampling technique was used to include the entire population in the study. Questionnaires were used to collect data from staff below the rank of the head of department. Prior to the commencement of data collection, the researcher applied for an introduction letter from the School of Graduate Studies of Jomo Kenyatta University of Agriculture and Technology Ethics Review Committee to obtain a research permit from the National Commission for Science, Technology, and Innovation (NACOSTI). A multiple regression model was used to analyze the data. The study findings revealed that technology is significant positive predictors to performance of microfinance institutions in Kisii County, Kenya. The study concluded that strategic competitive advantage is a significant positive predictor of performance of micro finance institutions in Kisii County, Kenya. The study recommends that the financial institutions should invest in robust mobile banking infrastructure to ensure seamless, secure, and efficient services.
Keywords: Performance of Micro Finance Institutions, Technology and Innovation Systems, Challenges.

Introduction
On a global scale, microfinance banks encounter numerous challenges, including fierce competition driven by regulatory changes, macroeconomic influences, and technological advancements that have heightened competitive dynamics (Mbai *et al.,* 2018). Mustafa *et al.,* (2018) highlight that, the performance of microfinance banks suffered significantly during a period of heightened inflationary pressures in the South Asian economy. Microfinance banks faced an unexpected challenge in their financial statement as liabilities increased unexpectedly, and there was a sudden decline in liquidity on the assets side. Additionally, there was a noticeable rise in loan defaults and write-offs. Huayta *et al.,* (2018) noted that the period from 2002 to 2016 could be interpreted as a sign of an increasingly competitive environment for microfinance banks in Peru. During this time frame, the average interest rates charged by MFBs decreased from 38% to 24%, contributing to a reduction in market share and profits for these banks.

Akingbade (2015) examined how competitive strategies could be implemented for improved customer satisfaction, retention and loyalty. Three null hypotheses were postulated to test the relationship between lower prices and customer satisfaction, uninterrupted trunk services and customer loyalty, and customer complaint handling and retention. Only customers using telephone service were selected as respondents from Lagos State. From the study, findings revealed relationship between competitive strategies and customer satisfaction, retention and loyalty. The findings revealed that there is a relationship between competitive strategies, its constituents and performance of telecommunication companies. The study by Ebimobowei and Ekankumo (2012) discussed on customer services strategies and continued survival of banks in Nigeria in an era of post-merger. The study sought to find out if consumer service strategy is

applied on the survival of commercial banks in the post consolidation era in Nigeria. The data analysis provided a substantial relationship exists between performance and customer service strategies as well as between the government regulatory structure and customer service strategy in the Nigeria banking industry. In addition, doing both innovation differentiation and market differentiation simultaneously achieves greater competitive advantage that leads to best results in organizational performance.

According to the study findings by Mokua and Muturi (2015), organizations should contemplate on setting targets as strategic responses to make sure there is effective internal performance. This will enable the organization to form a comprehensive understanding that can be leveraged to bring impact on stakeholders and make better suppositions on the market. The study revealed that highly motivated employees serve as the competitive advantage of any organization because their performance leads an organization to achievement of its goals and in the current dynamic environment the highly motivated employees accomplish organization's business plans, goals, high efficiency, performance and growth in organizations.

According to the study by Ouma *et al.,* (2022), investment on product innovation and market intelligence is essential to enable microfinance banks to achieve long-term competitive advantage within the dynamic environment. This will embrace development of appropriate strategic responses for competitive advantage. Microfinance banks need to broaden their strategic responses so that they can continuously scan the external environment and respond to changes in time.

Objective of the Study
The study sought to evaluate the effect of technology and innovation systems on performance of microfinance institutions in Kisii County, Kenya.

Theoretical Framework
The study was based on strategic management theory was developed in the mid-1960s at the general electric company and is a broad body of research aimed at measuring the relationship between business activities and business results in an organization. According to Gupta (2003), profit impact of market strategies (PIMS) consists of a database of trading strategies that is used to generate metrics and identify winning strategies. A collection of data derived from business strategy principles to guide strategic thinking and strategic measurement. PIMS has methodologies for identifying business problems and opportunities and measuring potential business benefits. The purpose of resource-based competitive advantage theory is to identify and classify a company's resources, evaluate their strengths and weaknesses compared to competitors, and identify opportunities for better use. This theory considers a company's capabilities, what it can do more effectively than its competitors, and rents resources and capabilities in terms of the potential for sustainable competitive advantage and the adequacy of returns, evaluating the potential for revenue generation.

This matrix helps companies understand what actions they need to take given their current business performance, and this theory suggests that companies need strategic changes to sustain growth. Strategic choice refers to the process of selecting an option for implementation. This means that in relation to Ansoff's product/market matrix, a company must make decisions at some point in its growth stage, such as: What products and services to offer in which markets? The matrix attempts to identify where the company is today, where it wants to be, where it will be if it does not change its strategy, and bridges the gap between the two.

Empirical Literature
The competitive advantage of an organisation is an essential instrument for businesses in market competition and the fundamental technological competencies of entities are believed to be significant tools for institutional development (Feng *et al.,* 2020). In recent times, more innovation accomplishments and advanced innovation capability have enabled organisations to gather more specialists and innovative ideas, which are new catalysts for economic growth and development path for any organisation. The proposed study will endeavour to unearth the competitive strategies that would be employed by microfinance organisations in the study area in a bid to enhance their performance.

Owing to technical advancement and transformation in various business sectors, the idea of competitive advantage has evolved over time (Feng *et al.,* 2020). Organisation management and the potential for enough services can be achieved by developments in an effortless and viable manner. The use of technology and innovation will help the organisation adapt to the dynamic condition and improve its competitive position.

Furthermore, it enables the organisation to make business esteem; it would be less demanding for them to offer quality merchandise and enterprises, increment efficiency and amplify benefits (Wei *et al.,* 2017).

Although technology advancement is a phase, the redesign of innovation capacities is an ongoing task for the enterprise. This requires a complex strategy and analysis development of capacity-enhancing or capacity growing services. The emphasis is on the use and improvement of technology, product, process, expertise, practice and organisation. Eventually, these considerations will decide whether clients/customers are happy with the services rendered by the firms (Satalkina and Steiner, 2020; Van der Loos *et al.,* 2020; Yu *et al.,* 2017). Competition in the commercial world is inevitable, for that each exertion is essential to dependably recognise, comprehend what is going on in the marketplace and what client needs and comprehend the adjustments in the business condition to rival others (Fagerberg 2018; Yu *et al.,* 2019).

Therefore, an attempt should be made on a consistent basis to understand when and how to deal with issues of asset acquisition, which attracts the competition and creates a competitive advantage. One solution to winning competition by using product creativity is the preparation of new products along with competition from rivals (Fukuda, 2020). Competition involves identifying markets to find and serve clients by offering new products or services (Hinings *et al.,* 2018). However, it is paramount to holding competition in mind and the overall aim of acquiring a core market position and winning competitors' fights for the primary objective of fulfilling consumer requirements (Rachinger *et al.,* 2019). Subsequently, it tends to be utilised as a competitive advantage for a business.

Materials and Methods
A descriptive survey research design was adopted. This method involved in-depth data collection and analysis to describe the characteristics of the given population. The target population consisted of all heads and employees of microfinance institutions, comprising 180 respondents. Since the study sample was small, a census sampling technique was used to include the entire population in the study. Questionnaires were used to collect data from staff below the rank of the head of department, while an interview schedule was used for heads of departments. Prior to the commencement of data collection, ethical issues and procedure were handled. Appointments with various heads of departments were made to enable data collection from them. The collected data was described or summarized using descriptive statistics, such as means and frequencies, to provide insights into the distribution of responses. Various factor analysis techniques were employed to infer population characteristics from the sample. A multiple regression model was used to analyze the data. Qualitative data collected were analyzed through content analysis and descriptively alongside the respective quantitative data analysis.

Descriptive Analysis
The descriptive data presented in Table 1 offer insights into the perceptions regarding the impact of digital technologies on microfinance services. Here is an interpretation of the data based on the mean scores and standard deviations for each statement.

Table 1. Technology and innovation systems on the performance.

Statements	N	Min	Max	Mean	SD
Mobile banking has improved the accessibility of microfinance services.	166	1.00	5.00	4.2590	1.10058
Online platforms have enhanced the efficiency of microfinance operations.	166	1.00	5.00	3.5000	1.54430
Digital payment systems have facilitated faster and more secure transactions within microfinance institutions.	166	1.00	5.00	3.8253	1.65865
The integration of mobile banking has increased the outreach of microfinance services to remote areas.	166	1.00	5.00	3.8313	1.60921
Digital payment systems have reduced the operational costs of microfinance institutions.	166	1.00	5.00	4.2169	1.95234
Digital payment systems have encouraged financial inclusion by reaching underserved populations.	166	1.00	5.00	4.0000	1.11736

Table 1 revealed that the mobile banking has improved the accessibility of microfinance services with the mean score of 4.2590, with a standard deviation of 1.10058, suggests a generally positive perception among respondents. This high mean indicates that most individuals agree that mobile banking has significantly

enhanced access to microfinance services. The relatively low standard deviation reflects a consensus among respondents, signaling a strong agreement on the positive impact of mobile banking on accessibility.

Online platforms have enhanced the efficiency of microfinance operations with a mean score of 3.5000 and a standard deviation of 1.54430, this statement reflects a more moderate view. The mean score suggests a neutral to positive perception of online platforms' role in improving operational efficiency. However, the higher standard deviation indicates varied opinions among respondents, pointing to some disagreement or uncertainty about the effectiveness of online platforms in enhancing operational efficiency. Digital payment systems have facilitated faster and more secure transactions within microfinance institutions with the mean score of 3.8253 and a standard deviation of 1.65865 indicate a relatively positive view on the role of digital payment systems in improving transaction speed and security. While the mean suggests that respondents generally perceive digital payment systems as beneficial, the large standard deviation highlights considerable variation in responses, implying that experiences with the speed and security of transactions can differ widely among users.

The study also revealed that the integration of mobile banking has increased the outreach of microfinance services to remote areas mean score of 3.8313 and a standard deviation of 1.60921 reveal a positive yet varied perception regarding the outreach capabilities of mobile banking. The mean suggests a belief that mobile banking has broadened the reach of microfinance services to more remote locations. However, the high standard deviation indicates diverse opinions on the extent and effectiveness of this outreach.

Digital payment systems have reduced the operational costs of microfinance institutions has the highest mean score of 4.2169, accompanied by a substantial standard deviation of 1.95234. The mean indicates a strong perception that digital payment systems have significantly lowered operational costs. The very high standard deviation suggests a broad range of responses, with some respondents possibly experiencing considerable cost reductions and others less so, reflecting significant variability in the impact of digital payment systems on operational expenses. Digital payment systems have encouraged financial inclusion by reaching underserved populations with a mean score of 4.0000 and a standard deviation of 1.11736, this statement reflects a generally positive view on the role of digital payment systems in promoting financial inclusion. The mean score indicates a consensus that digital payments systems have helped extend financial services to underserved groups. The relatively low standard deviation signifies agreement among respondents regarding the impact of these systems on financial inclusion.

Regression Statistics

The ordinal regression was used in explaining the relationships between and among the study variables. Test of ordinal regression was made as shown in Tables 2, 3, 4 and 5.

Table 2. Model fitting information.

Model	-2 log-likelihood	Chi-square	df	Significance
Intercept only	627.382	-	-	-
Final	.000	627.382	1	.000
Link function: Logit.				

The interpretation of these results suggests that the predictors included in the final model are crucial in explaining the variation in the outcome variable. The significant drop in -2 log-likelihood and the corresponding p-value indicate that the final model is a better fit for the data compared to the simpler intercept-only model. This suggests that the predictors in the final model have a meaningful impact on the outcome, as reflected by the statistically significant improvement in model fit.

Table 3. Goodness of fit.

	Chi-square	df	Significance
Pearson	35.175	439	1.000
Deviance	55.116	439	1.000
Link function: Logit.			

Table 3 revealed that both the Pearson and Deviance chi-square statistics, coupled with their high p-values, suggest that the logistic regression model fits the data very well. There is no significant evidence of misfit, indicating that the model is a robust representation of the observed data.

Table 4. Pseudo R-square.

Cox and Snell	.977
Nagelkerke	.981
McFadden	.679
Link function: Logit.	

The Nagelkerke pseudo R-square adjusts the Cox and Snell measure to account for the fact that it cannot reach the value of 1. This adjustment scales the Cox and Snell value to a range from 0 to 1, providing a more interpretable measure of model fit. With a Nagelkerke value of .981, this suggests that the model explains approximately 98.1% of the variance in the dependent variable, indicating an excellent fit. This metric is particularly useful as it allows for a clearer comparison of model fit across different datasets and models.

Table 5. Test of parallel lines.

Model	-2 log-likelihood	Chi-square	df	Significance
Null hypothesis	.000	-	-	-
General	.000b	.000	21	1.000
The null hypothesis states that the location parameters (slope coefficients) are the same across response categories.				
a. Link function: Logit.				
b. The log-likelihood value is practically zero. There may be a complete separation in the data. The maximum likelihood estimates do not exist.				

Table 5 reveals that the test of parallel lines indicates that the slopes of the predictors are consistent across different response categories under normal circumstances. However, the zero log-likelihood values suggest that there might be an issue with the data, such as complete separation, which renders the likelihood estimates non-existent and may impact the validity of the test results. This necessitated the analysis of the parameter estimates as shown in Table 6.

Table 6. Parameter estimates.

		Estimate	SE	Wald	df	Significance	95% confidence interval	
							Lower bound	Upper bound
Threshold	[OP = 1.00]	14.800	1.830	65.390	1	.000	11.213	18.388
	[OP = 1.33]	23.289	2.819	68.236	1	.000	17.764	28.815
	[OP = 1.50]	28.770	3.699	60.497	1	.000	21.520	36.019
	[OP = 1.67]	50.001	5.951	70.596	1	.000	38.337	61.665
	[OP = 1.83]	51.592	6.124	70.981	1	.000	39.590	63.594
	[OP = 2.00]	51.975	6.152	71.386	1	.000	39.918	64.032
	[OP = 2.17]	52.334	6.174	71.860	1	.000	40.234	64.434
	[OP = 2.33]	58.886	7.277	65.486	1	.000	44.624	73.148
	[OP = 2.50]	60.829	7.318	69.098	1	.000	46.487	75.172
	[OP = 2.67]	61.119	7.333	69.463	1	.000	46.746	75.492
	[OP = 2.83]	62.465	7.458	70.145	1	.000	47.847	77.082
	[OP = 3.00]	63.051	7.514	70.418	1	.000	48.325	77.778
	[OP = 3.17]	63.154	7.522	70.488	1	.000	48.411	77.897
	[OP = 3.33]	63.348	7.537	70.640	1	.000	48.575	78.120
	[OP = 3.50]	63.777	7.565	71.075	1	.000	48.950	78.604
	[OP = 3.67]	64.007	7.577	71.367	1	.000	49.157	78.857
	[OP = 3.83]	64.566	7.598	72.213	1	.000	49.674	79.458
	[OP = 4.00]	64.898	7.607	72.792	1	.000	49.989	79.807
	[OP = 4.33]	65.306	7.614	73.559	1	.000	50.382	80.230
	[OP = 4.50]	65.679	7.620	74.296	1	.000	50.745	80.614
	[OP = 4.67]	66.023	7.624	74.996	1	.000	51.080	80.965
	[OP = 4.83]	66.328	7.627	75.627	1	.000	51.379	81.277
Location	TI	11.793	1.391	71.873	1	.000	9.067	14.519
Link function: Logit.								

Table 6 observes that the regression analysis reveals that all threshold parameters are statistically significant and increase with higher OP values, reflecting a positive association. This is evident as the study shows that technology innovation strategy is a significant positive predicator of project performance with a p-value <0.05. This was evident since the estimates reveals that for every one unit increase in the technology innovation there is an insignificant predicated increase in the independent variable of 11.793 in the log-odds of being at a higher level of the micro finance performance.

Technology innovation and microfinance performance in Kisii County was found to be positively significant p<0.05(B=11.793). Since the p-value <0.05 at 5% level of significance, the study concludes that technology innovation has a significant positive effect on performance. Hence, the null hypothesis, there is no significant effect between the technology innovation and microfinance performance in Kisii County, was rejected since p<0.05 and adopted the alternative hypothesis, technology innovation has a significant effect on performance adopted.

Conclusion
From the study findings, the study concludes that technology and innovation systems are a significant positive predictor of performance of micro finance institutions in Kisii County, Kenya.

Recommendations
To enhance mobile banking infrastructure, the study recommends that the financial institutions should invest in robust mobile banking infrastructure to ensure seamless, secure, and efficient services. This includes upgrading network capacities and implementing advanced encryption technologies to protect user data. Improved infrastructure will reduce downtime, enhance user experience, and increase customer trust, thereby driving higher adoption rates of mobile banking services.

Online platforms offer a unique opportunity for MFIs to deepen client engagement and improve service delivery. The MFIs should therefore develop user-friendly, multilingual online platforms, institutions can provide clients with easy access to financial products, educational resources, and customer support. Additionally, these platforms can serve as a channel for collecting feedback and data, which can be used to tailor products to better meet the needs of diverse client segments, ultimately driving customer satisfaction and retention.

To maximize the impact of digital payment systems, MFIs should focus on integrating these systems with the local economic ecosystem, including local businesses, government services, and other financial institutions. This integration can facilitate seamless transactions, reduce cash-handling risks, and enhance the efficiency of financial operations. Furthermore, by promoting the adoption of digital payment systems among their clients, MFIs can foster greater financial inclusion, particularly for underserved populations. This adoption not only improves access to financial services but also empowers clients to build credit histories, enabling them to secure larger loans in the future.

Additionally, offering training on digital literacy and ensuring that the technology is user-friendly can help overcome barriers to usage. By creating a supportive environment for digital payments, MFIs can improve customer experience, reduce operational costs, and contribute to the broader development of a more resilient and inclusive financial infrastructure.

Institutional Review Board Statement: The proposal for the study was approved by the Institutional Review Board of the Jomo Kenyatta University of Agriculture and Technology, Kenya.
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