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Original Article

Does Technology Adoption Reforms Influence Securities Market Performance? Evidence from Kenya

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ABSTRACT

The Kenyan securities market has been undergoing significant transformation, driven by technological advancements and other structural reforms. The adoption of the automated trading system was aimed at improving market efficiency by speeding up transactions and increasing market liquidity. Regulatory efforts by the Capital Markets Authority, including stricter governance systems at the Nairobi Securities Exchange, have enhanced transparency and accountability. However, market performance remains subdued due to global economic conditions, inflation and currency fluctuations. The Exchange is diversifying its product offerings with derivatives and Reits to attract more domestic and foreign investors. Despite these positive efforts, challenges such as limited liquidity in some securities, high concentration in a few blue-chip stocks, and economic instability persist. This paper aimed to investigate the influence of technology adoption reforms on Kenya's securities market performance. The paper employed an exploratory research design, collecting primary data from 154 firms and 238 respondents from 333 managers participating in the Kenyan securities market. The study conducted data analysis using SPSS AMOS, employing principal component analysis and confirmatory factor analysis to evaluate the relationships between latent variables. The findings indicate that the measurement items' regression weights had t-calculated values exceeding the critical threshold of 1.96 and were statistically significant ($p < 0.05$). This suggests that technological reforms are associated with a cumulative increase in the number of shares traded, particularly following the introduction of mobile-share trading. Furthermore, there was a significant link between technology adoption reforms and the reduction of transaction costs, attributed to the elimination of paperwork and procedural inefficiencies. The paper concludes that there exists a significant positive influence of technological reforms on securities market performance in Kenya, highlighting the critical role these reforms play in enhancing market efficiency by reducing transaction costs. The practical implication of these findings is that the market regulator can leverage emerging technologies and popularize their adoption to enhance market remote market supervision, improve trading transparency, and boost investor

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confidence through real-time monitoring and access to accurate data. These reforms support financial inclusion by expanding online trading, simplifying regulatory compliance through automated reporting, and encouraging innovation with advanced products like derivatives. This will also align Kenya's securities market with global standards, increasing competitiveness and attracting foreign investment. Nevertheless, the CMA must address cybersecurity risks to ensure the market remains secure and resilient in the evolving digital landscape.

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INTRODUCTION

The securities market has undergone significant changes due to technology advancements and regulatory reforms. Automated Trading Systems have improved transaction speed and liquidity, while demutualization has increased transparency (Onyuma, 2023). Diverse financial products, foreign investor participation, stricter regulations, and digital platforms have expanded investment opportunities. However, challenges like economic instability and cybersecurity risks persist (Kosgei et al., 2014). The Kenyan government has implemented structural reforms to improve the performance of the securities market and its contribution to the economy's overall growth. Together with the NSE, the CMA initiated a market reform program to address the market's challenges (CMA, 2006). In 1994, the Nairobi Stock Exchange implemented trading modernization, facilitating online trading. In 1996, the Exchange further initiated the adoption of an automated depository and settlement system to reduce the time it would take to settle trades (NSE, 1996). The government also sought to increase foreign investor participation by doubling the limit of investment in local listed firms in 1995. Listed securities enjoyed tax exemptions on capital gains tax, value-added tax, and capital gains tax. In the same year, the government also made the costs of trading tax deductible. In 1998, they made the costs incurred to obtain credit internationally tax-allowable (Government of Kenya, 1996). In 2002, the Exchange significantly reduced commission rates, which were at an all-time high. There was also the segmentation of the market into four distinct parts to accommodate different classes of firms. In 2006, the Exchange also adopted an automated depository as well as an electronic trading platform to replace the older open-outcry system (Capital Markets Authority, 2012b).

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The manual systems are a deterrent to the flow of information that results in the observed securities market inefficiency. Initially, manual systems in Kenya had an enormous influence on the efficiency of the securities market. It would take roughly two weeks between an actual sale and trade approvals. The increase in technological use lowered registration times, made stock transfers quicker, increased market liquidity, and improved overall securities trading activities (Onyuma, 2012). In their study, Omuchesi et al. (2014) reported that market automation did not lead to greater efficiency in the securities market in Kenya. Okumu (2013) demonstrated that the adoption of an automated information technology system in the Kenyan securities market did not affect stock market volumes.

Securities markets are vital for economic development. In Kenya, the performance of the securities market has varied significantly over the two decades from 2000 to 2020. To improve performance, the Capital Markets Authority (CMA) has focused on creating a regulatory framework that ensures order, fairness, and efficiency in the securities market. The regulator initiated structural reforms focusing on mobilizing savings and investment to enhance the performance and its contribution to overall economic development. Some of the reforms undertaken in the securities markets were technology adoption reforms (Owade, 2023). The expectation was that these reforms to influence the securities market performance positively, but the market still faces a low level of participation, and performance has been fluctuating. This research area is still largely unexplored. Scant literature exists on the influence of technology adoption reforms and securities market performance in Kenya. The objective of this paper was to assess the influence of technology adoption reforms on securities market performance in Kenya.

LITERATURE REVIEW

Theoretical Literature.

Diffusion innovation theory, originally introduced by Everett Rogers in 1967, provides a framework for understanding how a new product or idea disseminates within a system or across a population over time. It outlines the mechanisms and stages through which innovations gain acceptance and adoption among different groups within a society. The theory notes that technology is a means through which innovation is passed to members of a social setup. Diffusion theory identifies the critical tenets that anchor its success. This includes awareness, evaluation, interest, trial and finally adoption. The theory encompasses several key components: the innovation itself, the communication channels utilized to disseminate information about the innovation, the social system surrounding the targeted group, and the distinction between adopters and non-adopters of the innovation. (Willet, 2020).

Additionally, it considers the time required for members of the social system to progress through the adoption process (Willet, 2020). The theory emphasizes that, over time, individuals within a social system tend to adopt new ideas, behaviours, or products as a result of the diffusion process. When an individual adopts a new idea, it signifies a shift from previous practices, leading to the acquisition and implementation of new behaviour. The likelihood of adoption depends on the individual's perception of the idea, action, or product as innovative or inventive (Willet, 2020). One of the limitations of this theory is that it does not consider the participatory approach in adoption. Technology adoption reforms require many stakeholders in the process for its success and also individual resources in the process of adoption, for example, time resources required and the cost incurred by individuals. The theory has been used as a benchmark in various disciplines, including commercial sector research, religion, governance and policy development as well as Information

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systems and security. (Sulaiman et al., 2007; Arvidsson, 2014; Stuart, 2010).

Technology adoption reforms are expected to enhance the securities market performance in Kenya if the reforms are implemented well. Ezirim et al. (2009) discovered that the adoption of technology-driven reforms played a significant role in fostering growth within the securities market. This growth was attributed to the increased availability of critical information to investors, coupled with a general enhancement in trading patterns. Bhunia (2011) established the availability of efficient information communication technology infrastructure and a well-digitized market increased the number of securities brokers and investors while access to information communication technology significantly contributed to the improvement of trading volumes. The diffusion theory highlights potential barriers to adoption, such as resistance to change, lack of awareness, or concerns about the innovation's compatibility with existing practices. In the context of technology adoption reforms, this theory helps policymakers identify and address resistance points within the system. For example, if stakeholders are resistant due to concerns about job displacement or loss of control, policymakers can implement strategies to address these concerns, such as reskilling programs or participatory decision-making processes. The theory provides a framework for understanding how technologies spread through societies, while technology adoption reform seeks to shape these dynamics through targeted policy interventions. By integrating insights from diffusion theory into reform initiatives, policymakers can enhance the effectiveness and efficiency of efforts to promote the adoption of new technologies for societal benefit. The technology adoption reform variable was supported by this theory in this study.

Empirical Literature

One of the notable contributions of technology is the improved market growth and the decrease in trade expenses. The general improvement in securities market liquidity has been attributed to technological advancements, which have reduced barriers to market entrance for financial services providers (Mohammed, 2020). Omuchesi et al. (2014) undertook a study to evaluate the effects of adopting Information and Communication Technology (ICT) on the efficiency of the securities market in processing and responding to new information covering a range of financial metrics such as market returns, the NSE-20 share index, and monthly closing prices spanning from 2002 to 2012. Through the examination of how the integration of ICT tools and systems influenced the market's ability to incorporate and act upon new information, thereby affecting its operational efficiency and overall performance. Their evidence provided insights into whether technological advancements have contributed to enhanced market efficiency and better information management within the securities market by comparing market efficiency before and after the implementation of automation. Results showed that the adoption of technology did not significantly improve market efficiency in the securities market as the use of automated trading systems did not improve efficiency in the securities market. This would imply that the technological reforms had not achieved the expected results. Stephen et al. (2013) investigated the impact of technology on market efficiency at the Kenyan Securities Market. The findings indicate that automation had a positive effect on market volume and market volatility. Furthermore, Onyuma (2020a) assessed market automation through technology and its effect on adaptive efficiency in the securities market. Using data on share prices for calculating an All-share index from 1994 to 2019. Non-parametric tests were used to determine the market efficiency before and after automation. The research’s findings revealed that market automation resulted in improved market efficiency since the market returns became more random after automation. Automation also influenced the price delivery process and higher volatility after automation.

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In addition, Okumu (2013) investigated the effects of technical reforms, with a particular focus on automation, on trade volume within the Kenyan securities market. The study compared trading volumes from two distinct periods 2002 to 2006 before the implementation of automation, and 2008 to 2012, following its adoption. Analyzing monthly trading volumes to assess the impact of automation on stock trading activities, the study revealed no significant relationship between the introduction of automation and changes in the volume of traded securities, suggesting that automation did not substantially affect trade volumes during the periods analyzed. However, some firms listed on the market reported changes in their stock volumes traded following automation. This may have been influenced by factors not accounted for in the study, such as organizational issues, macroeconomic conditions or microeconomic factors, which might not have been directly related to the ICT systems introduced.

Njoki (2019) conducted a study using a descriptive survey design to assess the impact of the automated trading system (ATS) on the efficiency of the Nairobi Securities Market. The research aimed to evaluate how the introduction of automated trading systems through ICT reforms affected the market's performance. The findings indicated that the implementation of these systems led to an increase in market participants and resulted in a slight improvement in the overall performance of the Nairobi Securities Market. The study relied on secondary data that was readily accessible, complemented by primary data collected through surveys. Descriptive and inferential statistical methods were employed to analyze and present the data. The respondents in the study included a diverse group of market stakeholders, such as representatives from listed firms, stockbrokers, investment banks, fund managers, investment advisors, REIT managers, and trustees. This broad range of participants provided a comprehensive perspective on the influence of the Automated Trading System on market efficiency.

Wong and Govindaraju (2012) assessed the influence of technological advancements on securities market performance in Malaysia and explored the broader implications of information and communication technology for the development of the securities market. Their research, which was based on existing literature, demonstrated a significant positive relationship between the adoption of ICT and overall market performance. Igwilo and Sibindi (2021) investigated the impact of ICT adoption on the development of securities markets across 11 African countries during the period from 2008 to 2017. They employed the panel ARDL bounds testing procedure to examine the potential causality between ICT adoption and securities market performance. The study used the securities market development index as the dependent variable and the ICT adoption index as the independent variable, with the financial freedom index included as a control variable. Their findings indicated a positive influence of ICT adoption on securities market performance. In contrast, the current research utilized primary data collected from market participants in Kenya and applied an explanatory research design. The primary objective of this paper was to assess the impact of technology adoption reforms on securities market performance in Kenya. The specific objectives were to examine the increase in the volume of shares traded following the introduction of technological reforms, to evaluate how the elimination of paperwork has reduced trading time in the market, and to analyze the significant reduction in the time taken by investors to purchase shares.

METHODOLOGY

The philosophy of positivist research was adopted in this study because it considers facts discovered through research and is based on rigorous observation and measurement of objective reality with the problem under analysis being seen as distinct and independent. Explanatory research designs are ideal for studies that seek to explore causal relationships between two quantitative

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variables. In this study, the unit of observation included 154 institutions actively participating in the securities market. The study employed a purposive sampling approach to determine an appropriate sample size. The target population, which consisted of key securities market participants, was categorized into subgroups based on their shared characteristics.

Primary data was collected through a questionnaire from not only the listed firms but also from other players in the securities market like stockbrokers, investment advisors, fund managers, REIT managers, and investment trustees to understand the current market status after reforms. The respondents comprised 238 from a target population of 333 managers working in the firms participating in the securities market. Data was analyzed using Structural Equation Modelling (SEM) via SPSS AMOS, employing principal component analysis and confirmatory factor analysis to evaluate the relationships between latent variables.

A regression model was fitted to assist in the testing of the hypothesis, as follows:

$$Y = \beta_{0+} \beta_i X_i + \boldsymbol{\varepsilon} \quad (1)$$

Where; **Y=** Dependent variable; $\boldsymbol{\beta_0}$ **=** Y-intercept; $\boldsymbol{\beta_i}$**=** Coefficients to be estimated; $\mathbf{X_i}$**=** Independent variables; $\boldsymbol{\varepsilon}$ **=** Stochastic error term.

RESULTS

The component matrix for factor loadings related to technology adoption reforms was extracted, with factor loadings ranging from 0.846 to 0.880. Three measurement items exceeded the 0.7 threshold. This criterion was met in the paper, and therefore, the items were retained for SEM analysis. The tabulated findings are shown in Table 1.

Table 1: Component Matrix for Technology Adoption Reforms

	Component 1
TAR10-The number of shares traded is cumulatively increasing every month following the introduction of m-share trading.	.846
TAR12-The transaction cost has significantly reduced due to the elimination of paperwork and a lot of procedures	.880
TAR14-Days taken by an investor to buy company shares have significantly reduced	.870
Extraction Method: Principal Component Analysis.	
a. 1 Components extracted.	

The component matrix in Table 2 displays the factor loadings for the variables associated with securities market performance, with values ranging from 0.827 to 0.931. According to Ndung'u & Onyuma (2022), these loadings indicate the strength of the relationship between each variable and the underlying factor being measured. According to the results, four specific items met the minimum threshold for factor loading in exploratory factor analysis to ensure that only variables with a strong correlation to the factor are retained for further analysis. This criterion helps improve the robustness of the model by filtering out weaker items that do not contribute significantly to explaining the variance in securities market performance. Therefore, these four items, with loadings exceeding 0.7, were considered valid and reliable indicators and were retained for the next stage of the analysis.

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Table 2: Component Matrix for Securities Market Performance

	Component 1
ML5-Investors have significantly improved since savers have been attracted by market liquidity.	.827
SPV5-Market patterns have become predictable over time.	.844
SMT1- The company shares sold have significantly increased cumulatively over time.	.862
SMT2- The number of shares bought has significantly increased over the years.	.931

Extraction Method: Principal Component Analysis.
a. 1 components extracted.

Structural Equation Modelling and Hypotheses Testing

The paper then fitted the latent variable structural model and tested the hypothesis. In examining the contribution of each of the measurement items to the latent construct, regression weights were used, following Ndung'u & Onyuma (2024). Additionally, the model output value (t-calculated) was compared with the t-critical value of -1.96 or +1.96, to determine whether the structural models were significant at a 95% confidence level (Ndung'u, 2022).

Influence of Technology Adoption Reforms on Securities Market Performance

In examining how technology adoption reforms affect securities market performance in Kenya, the paper selected measurement items with factor loadings of 0.7 or greater, which were retained for the structural model analysis. The results are presented in Table 3 and Figure 1**.**

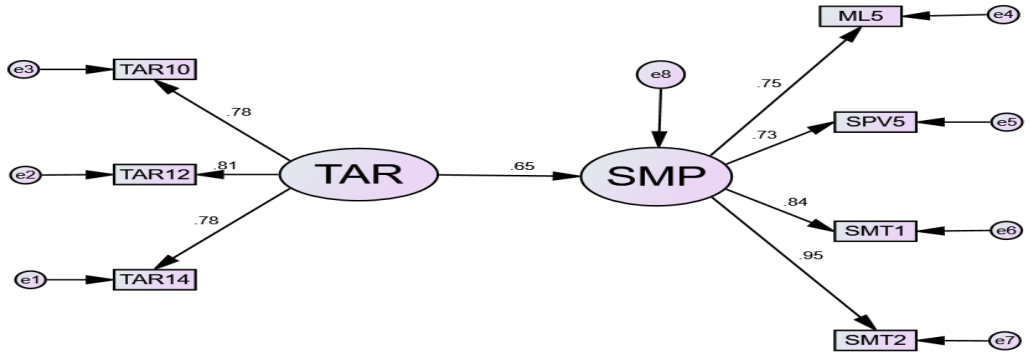
Table 3: Standardized Regression Weights and Critical Values (C.V)

Item		Construct	Estimate	S. E	C.R	P
SMP	<---	TAR	.650	.061	8.092	***
TAR14	<---	TAR	.776			
TAR12	<---	TAR	.811	108	11.772	***
TAR10	<---	TAR	.782	108	11.772	***

Source: Field Survey (2024)

Below is the path coefficient for standardized regression weights and critical values.

Figure 1: Path Coefficient for Standardized Regression Weights and Critical Values



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The regression weights, as presented in Table 3 and illustrated in Figure 1, indicate that an increase in technology adoption reforms by one unit is associated with an increase in TAR10 – the number of shares traded is cumulatively increasing every period following the introduction of m-share trading by 0.782 units. This means that the number of shares traded is cumulatively increasing every period following the introduction of m-share trading. Since the calculated t-value of 11.772 was more than 1.96, it implies that there was a positive association between TAR10. The results agree with Igwilo and Sibindi (2022), who examined the impact of the use of trading technologies on the development of the African stock exchange and reported a positive relationship between technology adoption and securities market development across African countries. Similar to Onyuma (2020b), existing evidence further shows that the volume of stock traded in the market exhibited a significant positive correlation with the number of mobile telephone users, thus suggesting that increased mobile phone usage facilitates greater participation in the securities market, potentially enhancing trading activities and market liquidity.

Results for TAR12 show that the transaction cost has significantly reduced due to the elimination of paperwork and tedious procedures following the reforms. A unit increase in technology adoption reforms was linked to a 0.811 unit reduction in the transaction cost, given that the t-calculated of 11.772 was greater than 1.96. Additionally, the results show that a unit increase in technology adoption reforms was linked to the 0.776-unit increase in TAR14 – the number of days taken by an investor to buy listed shares has significantly reduced.

These results show that the measurement items had regression weights with t-calculated values that were greater than 1.96 and also statistically significant ($P<0.05$). This implies that the measurement items were perfectly related to technology adoption reforms, ascertaining their convergence validity. According to the findings, there exists a significant relationship between technology adoption reforms and securities market performance, as seen in Figure 1 and Table 3.

Technology adoption reforms influence on securities market performance was statistically significant ($\beta = 0.650$, calculated t-value = 8.092, $P<0.05$). At a 95 % confidence level, the calculated t-value of 8.092 was greater than 1.96, implying that for every unit increase in technology adoption reforms, there was a 0.650 increase in securities market performance. Accordingly, the paper rejected the null hypothesis, concluding that technology adoption reforms have a statistically significant influence on securities market performance in Kenya. The results agree with the findings of Olagundoye et al. (2023) who assessed the impact of technology adoption reforms and financial market performance in Nigeria and South Africa and found that, in country-specific analyses, technology adoption had a strong and direct impact on financial market performance in Nigeria, whereas in South Africa, it had a negative and significant impact on financial market performance.

CONCLUSION AND RECOMMENDATION

The research concluded that the regression weights indicated that, increasing technology adoption reforms was related to an increase in the number of shares traded cumulatively monthly. Also, the increase in technology adoption reforms as indicated by t- values led to the introduction of m-share trading. Also, technological reforms lead to a significant reduction in the transaction cost in the market as well as the elimination of paperwork and unnecessary procedures. Also, it can be concluded that the introduction of technology adoption reform has reduced the number of days taken by investors to buy company shares. Technology adoption reforms have a positive significant influence on the securities market performance; through the adoption of technological reforms, the market has been robust in terms of performance and the participation of the investors.

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Based on the findings, the market regulatory body should consistently monitor technological advancements in the capital markets to effectively track the increasing investor participation driven by the implemented reforms. Such continuous oversight will enable the regulator to assess how these technological changes are influencing market dynamics, investor behaviour, and overall market performance. By staying proactive in remote monitoring, the regulator can also ensure that the technology adoption remains aligned with the market's growth objectives and addresses any emerging risks or challenges.

Secondly, the paper recommends that the securities market regulator should embrace continuous product innovation in conjunction with the Exchange to enhance market efficiency and meet the investor's needs and expectations. The market's uptake of securities could improve through innovations such as robo-advisors, blockchain technology, algorithm trading, and data analytics, resulting in improved overall market performance.

The findings of this paper, therefore, suggest that technology adoption reforms significantly improve the performance of securities markets by boosting efficiency, upscaling liquidity, cutting transaction costs, and boosting investor confidence. However, the success of these reforms depends on the market's ability to implement the technology effectively and adapt to the resulting changes in trading dynamics. The regulator, as well as the Exchange, should continue to drive the automation agenda to improve the overall market outlook, as they also ponder over the potential of market trading system hackers and other cybersecurity risks due to the use of emerging technologies and related financial innovations.

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