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Abstract:

Purpose of the Study: The purpose of the study was to examine the effect of investment in financial process automation on loan performance among deposit-taking Savings and Credit Cooperative Societies (SACCOs) in Nairobi City County, Kenya. Specifically, the study investigated whether investment in automated financial systems contributes to improved loan portfolio quality and reduced non-performing loans.

Methodology: The study adopted a causal research design and a census approach targeting 49 deposit-taking SACCOs, with two respondents selected from each institution. Of 98 questionnaires distributed, 89 were completed and analysed, yielding a response rate of 90.82%. Secondary loan performance data were obtained from financial statements and regulatory reports. Data were analysed using SPSS Version 28, descriptive statistics, Pearson correlation and multiple linear regression. Hypotheses were tested at the 5% significance level.

Findings: Respondents perceived investment in financial process automation positively, recording an overall mean of 4.11 (SD = 0.77). Cost savings scored highest (M = 4.18), followed by staff training (M = 4.12) and software, hardware, and infrastructure investment (M = 4.02). The average non-performing loans to total loans ratio was 8.62% between 2020 and 2024, exceeding the 5% benchmark. The regression model was statistically significant, $F(3, 45) = 17.189$, $p < .001$, explaining 53.4% of the variation in the ratio. Investment in automation had a negative, statistically significant coefficient ($\beta = -0.275$, $p = .022$), indicating an association with lower non-performing loan ratios.

Conclusion: The study concludes that investment in financial process automation is significantly associated with improved loan performance among deposit-taking SACCOs in Nairobi City County, Kenya. SACCO management should prioritise integrated automated systems, adequate infrastructure and continuous staff training. Regulators should encourage shared digital platforms to reduce implementation costs and strengthen loan portfolio management.

Keywords: *Financial process automation, Investment in automation, Loan performance, Deposit-taking SACCOs.*

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1.0 INTRODUCTION

1.1 Background of the Study

Financial process automation is the use of computer systems to carry out routine financial tasks, such as receiving loan applications, assessing a borrower's credit record, approving loans, tracking repayments and following up on late payments, with little manual effort. Its main purpose is to make these tasks faster, cheaper and more accurate. For a lender, these gains matter most in loan performance, which describes how well loans are repaid. When a large share of loans is not repaid on time, a lender loses income, has less money to lend and may become unstable. Investment in automation therefore covers more than buying software. It also includes the computers and networks that run the software, the training of staff who use it, and the savings the system delivers once it is running.

1.1.1 Global perspective

Evidence from Europe and Asia shows that technology investment does not always improve loan quality immediately. In Europe, Chhaidar *et al.* (2023) studied 23 European banks between 2010 and 2019 and examined how investment in financial technology relates to bank performance. The same study found that credit risk, measured by non-performing loans, lowers bank performance. Citterio et al. (2024) also examined whether digital transformation is profitable for banks in Europe, and Thornton and Di Tommaso (2021) showed that non-performing loans are closely tied to how much European banks are able to lend.

In Asia, Zhang (2026) analysed 116 commercial banks in China from 2011 to 2023. The study found that digital transformation did not improve profitability for most banks and that it raised the non-performing loan ratio, which the author linked to weak risk controls during the early stage of adoption. Zhang (2026) also noted that studies in Vietnam (Nguyen & Nguyen, 2024) and Europe (Citterio *et al.*, 2024) report higher credit risk during the early phase of digital change. Wang *et al.* (2023) examined whether financial technology inputs reduce non-performing loan risk and improve bank performance. These studies show that the effect of automation depends on how well it is managed and on how mature the institution is.

1.1.2 Regional perspective

In West Africa, Nigeria offers useful evidence on how lenders manage loan quality. Oladejo and Olorunsola (2023) surveyed microfinance banks in Lagos and Ogun States and found a favourable and statistically significant association between loan performance and the quality of internal controls over credit risk, credit administration, measurement and monitoring systems.

Msomi (2022) also examined the factors that affect non-performing loans in commercial banks in selected West African countries. These studies suggest that systems for assessing and monitoring borrowers are important for loan quality, which is the function that automation is meant to strengthen.

In Southern Africa, South Africa has one of the continent's most developed banking systems. Mhlongo *et al.* (2025) examined how financial technology innovations influence bank competition and performance in South Africa. Across the continent, Africa's lenders are adopting technology at different speeds, and this shapes how far automation can improve their loan portfolios. The experience of these countries shows that technology works best where the supporting systems, regulation and skills are in place. Kenya's deposit-taking SACCOs face a similar test, because they must invest in technology while keeping their loan portfolios healthy.

1.1.3 Local Perspective of Digital Ecosystems

Kenya has an expanding digital financial ecosystem in which savings and credit cooperative societies (SACCOs) play an important role in mobilising savings and providing credit to members (Financial Sector Deepening Kenya [FSD Kenya], 2025). FSD Kenya (2025) reported that, by the end of 2023, Kenya had 357 regulated SACCOs, comprising 174 deposit-taking SACCOs and 183 non-withdrawable deposit-taking SACCOs. The growth of the sector highlights the importance of strengthening operational efficiency, financial management and loan portfolio quality as SACCOs respond to increasing competition and changing member expectations (FSD Kenya, 2025).

Research on Kenyan SACCOs indicates that technology adoption can improve organisational performance, although the findings differ according to the technology and outcome examined. Mugo (2022) found that mobile banking, internet banking and mobile communication services had statistically significant positive effects on the performance of deposit-taking SACCOs in Kenya. Similarly, Kamau et al. (2024) established that digital financial services improved financial inclusion among SACCO members and contributed to operational efficiency, transparency and accountability. However, these studies primarily examined digital service adoption and general organisational outcomes rather than the relationship between financial process automation investment and loan portfolio quality.

The financial and operational implications of automation are also evident in the challenges facing Kenya's SACCO sector. FSD Kenya (2025) identified high technology costs, fragmented systems, liquidity constraints and limited access to national payment infrastructure as challenges affecting SACCO operations. In a study of Mwalimu National Deposit-Taking

SACCO, Chamakany and Mbuva (2024) examined financial process automation in relation to profitability, illustrating the relevance of investigating automation within the SACCO sector. Nevertheless, profitability and loan performance are distinct outcomes, and evidence concerning one cannot automatically establish an effect on the other. Therefore, further investigation is necessary to establish whether investments in financial process automation are associated with improved loan performance among deposit-taking SACCOs in Nairobi City County, Kenya.

1.1.4 Deposit-Taking SACCOs in Nairobi City County, Kenya

Deposit-taking SACCOs are important participants in Kenya's financial system because they mobilise member deposits and provide loans to individuals and businesses. Their operations are subject to regulatory oversight by the Sacco Societies Regulatory Authority (SASRA), which publishes annual reports on the performance and financial condition of regulated SACCOs (SASRA, 2024). The study focuses on deposit-taking SACCOs in Nairobi City County, where the financial services environment provides a relevant setting for examining investment in financial process automation and loan performance.

Loan performance is important to the financial sustainability of deposit-taking SACCOs because repayment of principal and interest supports liquidity, income generation and the continued provision of credit. SASRA's supervision reports provide financial information on regulated SACCOs, including their loans, deposits and asset quality, which can be used to assess developments in the sector (SASRA, 2024). A deterioration in loan quality can constrain the availability of funds for lending and increase the resources required for monitoring, recovery and provisioning against potential losses.

Financial process automation may support loan performance by improving the speed and consistency of loan processing, strengthening the recording of transactions and facilitating the monitoring of repayment obligations. However, the actual benefits depend on the suitability of the systems adopted, their integration with existing operations and the ability of employees to use them effectively. Millan et al. (2023), in their study of deposit-taking SACCOs in Mombasa County, found that process digitalisation was associated with improved loan performance. Although this provides relevant Kenyan evidence, the findings arise from a different county and do not directly establish how financial process automation investment affects loan performance in Nairobi City County. Examining this relationship in Nairobi can therefore provide context-specific evidence to inform SACCO management decisions.

1.1.5 Investment in Financial Process Automation

Investment in financial process automation refers to the financial resources committed by an organisation to acquire, implement, maintain and effectively use technologies that automate financial activities. In the context of SACCOs, such activities may include loan application processing, borrower information management, loan disbursement, repayment tracking, financial reporting and arrears monitoring. Automation can reduce repetitive manual work and improve the consistency and timeliness of financial information, although the extent of these benefits depends on implementation and organisational capabilities (Chhaidar et al., 2023).

This study conceptualises investment in financial process automation through three dimensions: investment in software, hardware and infrastructure; investment in staff training; and cost-saving benefits associated with automation. Software, hardware and infrastructure investment covers expenditure on financial management applications, computers, networks, system integration and maintenance. Staff training investment concerns the resources allocated to developing employees' ability to operate automated systems accurately and efficiently. Cost-saving benefits relate to reductions in processing expenses, manual work, duplication and other operating costs that may arise when automated processes replace less efficient procedures.

These dimensions reflect different aspects of the resources committed to automation and the benefits expected from that expenditure. Chhaidar et al. (2023) found a positive relationship between financial technology investment and bank profitability in their study of European banks, suggesting that technology investment can have financial implications. However, profitability is not equivalent to loan performance, and findings from commercial banks cannot be assumed to apply directly to SACCOs. Consequently, the effect of these investment dimensions on SACCO loan performance requires empirical examination.

1.1.6 Loan Performance and Its Measurement

Loan performance refers to the extent to which borrowers meet their contractual repayment obligations and the quality of the institution's outstanding loan portfolio. One commonly used indicator is the non-performing loans to total loans ratio, which expresses non-performing loans as a proportion of the gross loan portfolio. This indicator is relevant because it captures the proportion of loans experiencing repayment difficulties and is used in financial-sector supervision and asset-quality assessment (SASRA, 2024).

For this study, loan performance is measured using the ratio of non-performing loans to total gross loans. The ratio is calculated by dividing the value of non-performing loans by total gross loans and multiplying the result by 100. A lower ratio generally indicates better loan portfolio quality, whereas a higher ratio suggests a greater proportion of loans are experiencing repayment difficulties. The measure is appropriate for examining whether investment in

financial process automation is associated with improvements in loan portfolio quality, provided that the data are defined consistently across the SACCOs studied.

1.2 Statement of the Problem

Deposit-taking SACCOs depend on effective loan administration and timely repayment to maintain liquidity, sustain lending activities and protect members' savings. The financial condition of regulated SACCOs is therefore closely linked to the quality of their loan portfolios, which SASRA monitors through its supervisory reporting framework (SASRA, 2024). Weak loan performance can increase credit losses, place pressure on available funds and constrain SACCOs' capacity to meet members' borrowing needs.

Financial process automation offers SACCOs opportunities to strengthen loan assessment, improve transaction processing, monitor repayment schedules and identify arrears more promptly. However, acquiring automated systems requires expenditure on software, hardware, infrastructure, maintenance and employee training. These costs may be substantial, particularly where systems are fragmented or require additional resources for integration and operation (FSD Kenya, 2025). Therefore, investment in automation should be assessed not only in terms of technological adoption but also in terms of its relationship with measurable financial outcomes.

Existing Kenyan research provides useful but incomplete evidence. Mugo (2022) examined mobile technology services and general SACCO performance, while Kamau et al. (2024) investigated digital financial services and financial inclusion among SACCO members. Millan et al. (2023) examined process digitalisation and loan performance among deposit-taking SACCOs in Mombasa County, while Chamakany and Mbuva (2024) investigated financial process automation in relation to the profitability of Mwalimu National Deposit-Taking SACCO. Although these studies establish the relevance of technology to SACCO operations, they do not collectively provide a direct assessment of how investment in software, hardware and infrastructure, staff training, and automation-related cost savings relates to loan performance among deposit-taking SACCOs in Nairobi City County.

Evidence from other financial institutions also suggests that the financial effects of technology investment depend on the outcome examined and the institutional context. Chhaidar et al. (2023), for example, reported a positive relationship between financial technology investment and bank profitability in Europe, but this finding does not directly establish an effect on non-performing loans or SACCO loan portfolio quality. Consequently, a specific empirical gap remains concerning the relationship between investment in financial process automation and loan performance among deposit-taking SACCOs in Nairobi City County, Kenya.

Without context-specific evidence, SACCO managers may find it difficult to determine whether expenditure on automation contributes to better loan portfolio quality or whether particular investment areas require greater attention. The study therefore examines the effect of investment in financial process automation on loan performance among deposit-taking SACCOs in Nairobi City County, Kenya.

1.3 Purpose of the Study

The purpose of the study was to determine the effect of investment in financial process automation on loan performance of deposit-taking SACCOs in Nairobi City County, Kenya.

1.4 Research Hypothesis

H_{01}: Investment in financial process automation has no significant effect on loan performance of deposit-taking SACCOs in Nairobi City County, Kenya.

2.0 LITERATURE REVIEW

2.1 Theoretical Review

2.1.1 Financial Intermediation Theory

Financial intermediation theory explains why financial institutions exist. It holds that they bring together people who have surplus funds and people who need funds, and that they do this at a lower cost than individuals could achieve on their own. Gurley and Shaw (1955, as cited in Konstantakopoulou, 2023) stressed that intermediaries share the fixed costs of assessing borrowers and can spread risk better than individual savers. Diamond (1984, as cited in Konstantakopoulou, 2023) added that intermediaries act as delegated monitors, who collect and study information about borrowers on behalf of savers. By doing so, they improve how funds are allocated, reduce monitoring costs and manage risk (Konstantakopoulou, 2023).

The theory assumes that intermediaries know more about borrowers than individual lenders do, and that this advantage reduces the risk of lending to borrowers who are likely to default. A related view is that credit can be rationed when lenders cannot distinguish good borrowers from bad ones (Stiglitz & Weiss, 1981, as cited in Konstantakopoulou, 2023). A limitation of the theory is that it does not say how new technology changes these functions, and intermediaries can fail when governance and regulation are weak.

The theory suits this study because a SACCO is a financial intermediary: it collects members' savings and lends them to other members. Loan performance shows how well the SACCO

performs the monitoring function. Automated systems store borrower records, check them quickly and track repayments, so they should lower the cost of assessing and monitoring borrowers. Investment in software, infrastructure and staff training is the means by which a SACCO acquires this capacity. The theory therefore leads to the expectation that SACCOs that invest more in automation will monitor loans better and record a smaller share of non-performing loans.

2.2 Empirical Review

This review examines what earlier studies found about automation, technology investment and loan quality. It identifies where the findings agree, where they differ and what remains unstudied.

2.2.1 Investment in Automation and Loan Performance

Studies of banks outside Africa show that the effect of technology investment on loan quality varies. Chhaidar et al. (2023) used data from 23 European banks for 2010 to 2019 and tested how investment in financial technology relates to bank performance. They found that non-performing loans lower bank performance, which shows why loan quality matters. Zhang (2026) used data from 116 Chinese commercial banks for 2011 to 2023. The study reported that digital transformation did not improve profitability for most banks and that it raised the non-performing loan ratio in the early stage, because risk controls were not yet strong. In contrast, Wang et al. (2023) examined whether financial technology inputs reduce non-performing loan risk and improve bank performance. Zhang (2026) further reported that studies in Vietnam (Nguyen & Nguyen, 2024) and Europe (Citterio et al., 2024) link the early phase of digital change to higher credit risk. Taken together, these studies indicate that the effect depends on how mature the systems are and how well they are managed.

African studies are fewer. Oladejo and Olorunsola (2023) found that loan performance among Nigerian microfinance banks was significantly associated with strong credit administration and monitoring systems. This supports the idea that systems for tracking borrowers improve repayment. Mhlongo et al. (2025) studied financial technology innovations and bank performance in South Africa.

In Kenya, studies of SACCOs show mostly favourable results. Mugo (2022) used a sample of 86 deposit-taking SACCOs and found that mobile banking, internet banking and mobile communication services had a significant positive effect on SACCO performance, and recommended more investment in these services. Kamau et al. (2024) found that digital

financial services improved efficiency, transparency and accountability. The closest studies to this one were carried out in one SACCO. Chamakany and Mbuva (2024a) examined financial process automation and profitability at Mwalimu National Deposit-Taking SACCO. They found that investment advisory automation had a significant direct effect on profitability, while payment automation and lending automation had adverse effects that were not significant. In a related analysis of the same SACCO, Chamakany and Mbuva (2024b) reported that payment automation influenced profitability adversely and significantly.

The review shows three gaps. First, most studies measure overall performance or profitability, not loan performance. Second, studies of investment in automation, including the cost of software, hardware and training, are scarce. Third, the Kenyan evidence comes mostly from single institutions or from studies that did not use the non-performing loan ratio. This study addresses these gaps by measuring investment in automation and testing its effect on the non-performing loan ratio across the deposit-taking SACCOs of Nairobi City County.

2.2.2 Loan Performance

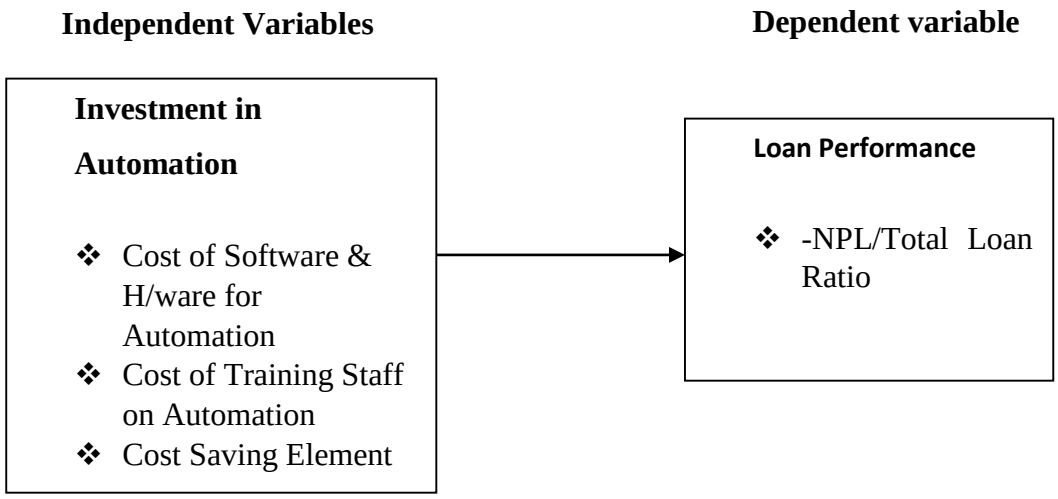
Loan performance is commonly measured with the ratio of non-performing loans to total loans. Zhang (2026) measured the non-performing loan ratio as non-performing loans divided by credit and treated it as a channel through which digital change affects bank results. Thornton and Di Tommaso (2021) studied how non-performing loans affect credit expansion in European banks, and Chhaidar et al. (2023) found that a higher non-performing loan ratio lowers bank performance. In Africa, Oladejo and Olorunsola (2023) treated loan performance as the outcome of credit control, administration and monitoring systems, and Msomi (2022) examined the factors behind non-performing loans in West African commercial banks. These studies agree that the ratio is a sound and widely used measure, and that it depends on how well lenders assess, monitor and recover loans. This study therefore used the ratio as the measure of loan performance.

2.3 Conceptual Framework

The conceptual framework shows the expected relationship between the study variables. The independent variable is investment in automation, which has three parts: investment in software, hardware and infrastructure; investment in staff training; and the cost-saving element of automation. The dependent variable is loan performance, measured by the NPL/Total Loans ratio. The framework expects that higher investment in automation improves the accuracy of credit assessment, loan monitoring and repayment tracking, and so lowers the share of non-performing loans.

Figure 1

Conceptual Framework



Note. Source: Researcher (2025)

3.0 RESEARCH METHODOLOGY

The study adopted a causal research design to examine the effect of financial process automation on loan performance. The target population comprised 49 deposit-taking SACCOs, with a census approach involving 98 respondents: loan/credit managers and ICT/operations officers from each SACCO. Primary data were collected using structured questionnaires, while secondary data on loan performance, measured by the non-performing loans (NPL) to total loans ratio, were obtained from SASRA reports covering 2020–2025. Content and construct validity were assessed through supervisory review, while reliability was evaluated using Cronbach's alpha, with 0.70 as the minimum acceptable threshold. A pilot study involving five SACCOs and ten respondents in Thika Town was conducted to refine the research instrument. Data were coded, cleaned, and analysed using SPSS Version 28. Descriptive statistics, Pearson correlation, and multiple linear regression were used to examine the relationships between investment in automation and loan performance. Normality, linearity, multicollinearity, and homoscedasticity tests were conducted to assess regression assumptions. Hypotheses were tested at a 5% significance level. Ethical requirements included informed consent, confidentiality, voluntary participation, institutional authorization, and NACOSTI approval.

4.0 RESEARCH FINDINGS AND DISCUSSION

4.1 Response Rate

The study adopted a census approach targeting the 49 deposit-taking SACCOs domiciled in Nairobi City County. Two respondents were targeted from each SACCO, comprising one loan/credit manager and one ICT/operations officer. Consequently, a total of 98 questionnaires were issued. Of the 98 questionnaires issued, 89 were returned, duly completed and found suitable for analysis, representing an overall response rate of 90.82%.

Table 1
Response Rate

Response status	Frequency	Percentage (%)
Questionnaires issued	98	100.00
Questionnaires returned and usable	89	90.82
Questionnaires not returned	9	9.18
Total	98	100.00

Note. Source: Field Data, 2026

According to Mugenda and Mugenda (2009), a response rate of 50% is adequate for analysis and reporting, 60% is good, while 70% and above is very good. Therefore, the overall response rate of 90.82% achieved in the study was very good and provided sufficient data for subsequent statistical analysis. The high response rate was also considered an indication of adequate participation by officers involved in loan management, ICT and financial operations within the deposit-taking SACCOs.

Although 89 questionnaires constituted the usable respondent-level data, the SACCO remained the unit of analysis. Responses from the two officers within each SACCO were therefore consolidated to generate SACCO-level measures of automated loan processing, automated credit assessment, automated loan monitoring and automated loan repayment processing. The resulting SACCO-level measures were then matched with the corresponding loan-performance data for purposes of correlation and regression analysis.

4.2 Descriptive analysis

Investment in Automation and Loan Performance

The second dimension of financial process automation examined was investment in automation and its relationship with loan performance among deposit-taking SACCOs in Nairobi City

County. Investment in automation was assessed through three sub-constructs, namely investment in software, hardware and infrastructure; investment in staff training; and the cost-saving element of automation. The assessment sought to establish whether the resources committed to automation were perceived to generate sufficient operational and financial benefits. The results are presented in Table 2.

Table 2
Investment in Automation

Statement	Mean	Std. Dev.
Investment in software, hardware and infrastructure		
Investment in software licensing, infrastructure and maintenance is less than the benefits the SACCO is reaping	4.02	0.81
Investment in automation has not interrupted the SACCO's long-term cost plans	3.96	0.84
Return on investment in automation is worth it because financial benefits exceed those of the earlier manual system	4.08	0.78
Sub-construct mean	*4.02*	*0.81*
Investment in staff training		
Staff training on the automated system has improved the use of automation tools for better returns	4.15	0.73
Training has improved staff efficiency and reduced human error when processing credit facilities	4.18	0.71
There has been little staff resistance to training, which has produced cost-effective outcomes	4.03	0.82
Sub-construct mean	*4.12*	*0.75*
Cost-saving element of automation		
Investment in automation is cost saving compared with the old manual systems	4.16	0.76
In the long run, automation has saved the SACCO operational costs	4.20	0.72
The cost of loan processing, application and approval has become cheaper, attracting more clients	4.18	0.74
Sub-construct mean	*4.18*	*0.74*
Overall mean	**4.11**	**0.77**

Note. Source: Field Data, 2026

Respondents generally agreed that investment in financial process automation was beneficial to their SACCOs. The overall mean of 4.11 (SD = 0.77) shows a high level of agreement, which suggests that the resources committed to automation were seen to produce benefits that justified their cost. The cost-saving element recorded the highest sub-construct mean (4.18, SD = 0.74), followed by staff training (4.12, SD = 0.75) and software, hardware and infrastructure (4.02,

SD = 0.81). The small standard deviations, all below 0.85, show that respondents held similar views.

On software, hardware and infrastructure, respondents agreed that the return on investment was worthwhile (M = 4.08, SD = 0.78) and that the cost of licences, infrastructure and maintenance was less than the benefits received (M = 4.02, SD = 0.81). The lowest mean in the table, 3.96 (SD = 0.84), was for the statement that automation had not interrupted long-term cost plans. This suggests that some SACCOs found the up-front spending a strain on their budgets. This pattern agrees with FSD Kenya (2025), which noted that high technology costs and fragmented systems are among the challenges facing SACCOs, and with Zhang (2026), who found that large up-front technology spending can reduce returns before its benefits appear. Even so, the favourable scores show that Nairobi's SACCOs saw the spending as justified. Chamakany and Mbuva (2024a) reached a similar conclusion for one SACCO: automation can pay off, but not for every kind of system.

Staff training scored higher, which shows that respondents valued the people who operate the systems. Training was said to have improved staff efficiency and reduced human error in processing credit (M = 4.18, SD = 0.71) and to have improved the use of the automated tools (M = 4.15, SD = 0.73). Resistance to training was the weakest item (M = 4.03, SD = 0.82), yet it still showed agreement. This matters for loan performance because a system that is used wrongly can produce errors in credit assessment and follow-up. Kamau et al. (2024) similarly found that digital financial services improved efficiency, transparency and accountability among Kenyan SACCOs, which depends on staff who can use them well.

The cost-saving element had the strongest scores, led by the statement that automation had saved operating costs in the long run (M = 4.20, SD = 0.72). Respondents also agreed that loan processing, application and approval had become cheaper (M = 4.18, SD = 0.74). Lower processing costs free resources for credit monitoring and recovery, and faster approvals can attract more members. This view matches financial intermediation theory, in which intermediaries add value by lowering the cost of assessing and monitoring borrowers (Konstantakopoulou, 2023). Mugo (2022) likewise found that technology services improved the performance of deposit-taking SACCOs.

Overall, the findings show that SACCOs saw automation as a combination of technology spending, staff capacity and long-term savings, and not as technology spending alone. However, these are opinions, and they do not show whether investment in automation lowered the share of non-performing loans. That question is answered in Section 4.7.

Loan Performance

Loan performance was measured using the Non-Performing Loans to Total Loans (NPL/Total Loan) Ratio. The ratio was computed by dividing total non-performing loans by total gross loans and multiplying the result by 100. A lower NPL/Total Loan Ratio indicates better loan performance because it implies that a smaller proportion of the loan portfolio was non-performing. Conversely, a higher ratio indicates weaker loan performance because a larger proportion of loans had fallen into non-performing status. The ratio was calculated for each of the 49 deposit-taking SACCOs for the period 2020 to 2024 using information obtained from SACCO financial statements and SASRA reports. Table 4.7 presents the descriptive statistics of the NPL/Total Loan Ratio for the five-year period.

Table 3
NPL/Total Loan Ratio of DT-SACCOs, 2020–2024 (%)

Year	N	Minimum	Maximum	Mean	Std. Dev.
2020	49	1.42	22.87	8.39	4.21
2021	49	1.58	23.64	8.57	4.36
2022	49	1.71	24.31	8.86	4.48
2023	49	1.63	23.76	8.72	4.39
2024	49	1.51	22.95	8.54	4.27
Five-year average	49	1.61	23.46	8.62	4.32

Note. Source: SACCO Financial Statements and SASRA Reports, 2020–2024

The average NPL/Total Loan Ratio across the 49 deposit-taking SACCOs was 8.62% over the five years. The annual mean rose from 8.39% in 2020 to 8.57% in 2021 and peaked at 8.86% in 2022. It then fell to 8.72% in 2023 and 8.54% in 2024. Loan quality therefore weakened between 2020 and 2022 and improved gradually afterwards. The mean rose by 0.18 percentage points between 2020 and 2021 and by a further 0.29 points between 2021 and 2022. Despite the later improvement, the 2024 mean was still slightly above the 2020 level, so portfolio quality had not fully recovered. The decline after 2022 may reflect better credit management, stronger loan monitoring and recovery, or better conditions for borrowers.

The five-year mean of 8.62% is above the 5% benchmark associated with World Council of Credit Unions guidance, by about 3.62 percentage points. On average, therefore, the proportion of non-performing loans was higher than is considered healthy for a loan portfolio. This is a concern because SASRA (2024) reported that SACCO lending was growing faster than

deposits, so the cushion for loan losses is thin. It also gives a reason to examine whether automation of credit assessment, monitoring and repayment tracking is associated with lower ratios.

The minimum and maximum values show wide differences among SACCOs. The yearly minimum ranged from 1.42% in 2020 to 1.71% in 2022, and the yearly maximum from 22.87% in 2020 to 24.31% in 2022. In 2022, the gap between the best and worst SACCO was about 22.60 percentage points. Some SACCOs therefore kept very healthy portfolios, while others carried a large share of non-performing loans. The standard deviation moved from 4.21% in 2020 to 4.48% in 2022 and then to 4.27% in 2024. The five-year value of 4.32% is large compared with the mean of 8.62%, so a sector-wide average hides large differences between individual SACCOs.

These differences suggest that loan performance is not explained by the economy alone. Differences in credit practices, internal controls, staff capacity and technology may explain why SACCOs in the same county perform differently. Oladejo and Olorunsola (2023) found that credit administration and monitoring systems were significantly related to loan performance among Nigerian microfinance banks, and Chhaidar et al. (2023) found that a higher non-performing loan ratio lowers bank performance. Because the variation among SACCOs is large, it provides a sound basis for testing, in Section 4.7, whether investment in automation explains part of it.

4.3 Inferential Statistics

The Pearson correlation coefficient (r) can only vary between −1 and +1. If the coefficient is positive, then the variables have a positive relationship; if the coefficient is negative, then the variables have an inverse relationship. The absolute value of the coefficient is a measure of the strength of the relationship; the closer the coefficient is to ±1, the stronger the relationship. The significance value was calculated to determine if the relationships observed were statistically significant.

Table 4

Pearson Correlation Matrix between Investment in Automation and Loan Performance

	Investment in automation	**NPL/Total Loan ratio**
Investment in automation	1	0.645
NPL/Total Loan ratio	0.645	1

Note. Source: Field Data (2026)

The correlation coefficient of (r = 0.645) indicates a moderately strong positive relationship between investment in automation and the NPL-to-total-loans ratio. However, because a higher

NPL ratio indicates poorer loan performance, this relationship suggests that greater automation investment was associated with poorer loan portfolio quality, not improved performance. Statistical significance must be confirmed using the SPSS p-value. Millan et al. (2023) similarly found that digital financial innovations significantly influenced loan performance among Kenyan deposit-taking SACCOs. However, the positive correlation observed here suggests higher NPL ratios alongside greater automation investment, warranting cautious interpretation. Report the SPSS p-value before concluding statistical significance; correlation alone does not establish causation.

4.4 Model Summary

Table 5 shows how much of the variation in the NPL/Total Loan ratio is explained by the three dimensions of financial process automation, of which investment in automation is the dimension under study.

Table 5
Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	0.731	0.534	0.503	3.05

Note. Predictors: (Constant), Level of automation, Investment in automation, Adoption and utilisation of automation

Dependent variable: NPL/Total Loan ratio (%), Source: Field Data (2026)

The R value of 0.731 shows a strong relationship between the three dimensions of automation and the NPL/Total Loan ratio. The coefficient of determination (R^2) of 0.534 shows that the model explains 53.4% of the variation in the ratio, and the adjusted R^2 of 0.503 shows that the result holds after allowing for the number of predictors. The standard error of the estimate (3.05 percentage points) is smaller than the standard deviation of the ratio (4.32), which shows that the model improves on using the average alone. About 46.6% of the variation is explained by other factors, such as credit policies, the economy and borrower characteristics.

ANOVA of the Regression Model

Table 6 tests whether the regression model as a whole is statistically significant.

Table 6
ANOVA

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	479.698	3	159.899	17.189	< 0.001
Residual	418.612	45	9.302		
Total	898.310	48			

Note. Dependent variable: NPL/Total Loan ratio (%)

Note. Predictors: (Constant), Level of automation, Investment in automation, Adoption and utilisation of automation

Note. Source: Field Data (2026)

The model was statistically significant, $F(3, 45) = 17.189$, $p < 0.001$. This means that the three dimensions of automation together explain variation in the NPL/Total Loan ratio better than would be expected by chance.

Regression Coefficients

Table 7 presents the coefficient for investment in automation, which is the variable examined in this study.

Table 7
Regression Coefficients

Predictor	B	Std. Error	Beta (β)	t	Sig.
(Constant)	28.50	5.72		4.983	< 0.001
Investment in automation (X_2)	−1.54	0.65	−0.275	−2.372	0.022

Note. Dependent variable: NPL/Total Loan ratio (%)

Note. Source: Field Data (2026)

Investment in automation had a negative and statistically significant relationship with the NPL ratio ($B = -1.54$, $\beta = -0.275$, $p = 0.022$), indicating that higher automation investment was associated with improved loan performance. This finding aligns with Millan et al. (2023), who examined process digitalisation and loan performance among Kenyan deposit-taking SACCOs. However, the cross-sectional findings establish association, not causation.

5.0 SUMMARY OF THE STUDY

The study examined the effect of investment in financial process automation on loan performance of deposit-taking SACCOs in Nairobi City County. Of 98 questionnaires issued, 89 were usable, a response rate of 90.82%. Respondents agreed that investment in automation was worthwhile, with an overall mean of 4.11 (SD = 0.77). The cost-saving element scored highest (M = 4.18), followed by staff training (M = 4.12) and software, hardware and infrastructure (M = 4.02). The average NPL/Total Loan ratio over 2020 to 2024 was 8.62%, above the 5% benchmark. It rose from 8.39% in 2020 to 8.86% in 2022 and then fell to 8.54% in 2024, and it varied widely among SACCOs. The regression model was significant, $F(3, 45) = 17.189$, $p < 0.001$, and explained 53.4% of the variation in the ratio (adjusted $R^2 = 0.503$).

Investment in automation had a negative and significant coefficient ($\beta = -0.275$, $p = 0.022$), so the null hypothesis was rejected.

6.0 CONCLUSION

The study concludes that investment in financial process automation is significantly associated with better loan performance among deposit-taking SACCOs in Nairobi City County. SACCOs that committed more to software, infrastructure, staff training and cost-saving systems tended to have lower non-performing loan ratios. Respondents also saw automation as a long-term source of savings and not merely as a cost. The study further concludes that technology spending works best when it is combined with staff capacity. The high scores for training and the earlier evidence that automation results differ by type of system (Chamakany & Mbuva, 2024a) show that how the money is spent matters as much as the amount. Because the average non-performing loan ratio remained above 5%, automation should be treated as one tool among others for protecting loan portfolios, and not as a complete solution.

7.0 RECOMMENDATIONS

Based on the findings, the following recommendations are proposed.

The management of deposit-taking SACCOs should continue to invest in automated systems for credit assessment, loan monitoring and repayment tracking, because higher investment was associated with lower non-performing loan ratios. Investment should be planned so that software, hardware and infrastructure are funded together, and so that the cost of licences and maintenance is included in long-term budgets.

SACCOs should invest in staff training at the same time as they invest in systems. Training should be repeated whenever systems are updated, so that credit officers use the tools correctly and errors in loan processing are reduced. This is important because staff training recorded one of the highest scores in the study.

SACCOs whose ratios are above 5% should use automated reports to identify late-paying borrowers early, and should link these reports to follow-up and recovery procedures. Management should also review the cost savings from automation regularly and direct part of them to credit monitoring.

SASRA and the Ministry in charge of cooperatives should encourage shared digital platforms, so that smaller SACCOs can obtain automation at a lower cost. This responds to the high technology costs and fragmented systems noted by FSD Kenya (2025). SASRA should also continue to publish loan-quality data by SACCO to support benchmarking.

8.0 AREAS FOR FURTHER RESEARCH

Future research should repeat this study in other counties and in SACCOs outside Nairobi to test whether the results hold more widely. Studies that follow the same SACCOs over several years would give stronger evidence on whether investment in automation changes loan performance over time. Further work could examine other factors, such as credit policies, borrower characteristics and governance, that may explain the part of the variation in non-performing loans that the model did not explain. Researchers could also compare the effects of different types of automation, such as credit scoring, loan monitoring and repayment tracking, on loan performance.

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