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Information and Communication Technology Adoption and Operational Efficiency of Co-operatives in Nigeria

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Abstract **Original Research Article**

The study examined the impact of Information and Communication Technology (ICT) adoption on operational efficiency of co-operatives in Anambra State, Nigeria. It also ascertained the extent to which the use of digital tools and platforms impact service delivery and determined the extent to which the level of ICT training and awareness impact administrative and financial performance of co-operatives. Descriptive survey research design was adopted. The population of the study comprised 14000 registered co-operatives, out of which 371 were sampled through a multistage sampling technique. A structure questionnaire, validated with its reliability coefficient ($\infty > 0.820$) through Cronbach's Alpha, was the instrument used. Data via SPSS 27 were analysed through a four point Likert Scale in frequency distributions, percentages, mean, and standard deviation, while hypotheses were tested via chi square ((χ^2) statistic. Results showed that the use of digital tools and platforms ($\chi^2 = 31.4356 > 21.0261$, $p < 0.05$) and level of ICT training and awareness ($\chi^2 = 36.3737 > 21.0261$, $p < 0.05$) had a significant positive impact on the service delivery performance and administrative and financial performance of co-operatives in Anambra State. It concluded that digital technologies and ICT training considerably enhance the service delivery, administrative capacity, and financial efficiency of co-operatives in Anambra State. The study recommended strengthening co-operative digital systems via affordable internet, mobile tools, and public–private platforms to enhance better service efficiency and continuous skill enhancement for members through workshops, peer mentoring, and community sessions to strengthen co-operatives' administrative and financial capacity.

Keywords: Co-operative Societies, ICT Adoption, Operational Efficiency, Digital Tools and Platforms, CT Training and Awareness, Nigeria.

1. INTRODUCTION

Over the past decade, Information and Communication Technology (ICT) has evolved into a cornerstone of efficiency, openness, and competitiveness within Nigeria's economic landscape. For co-operative societies, which play a vital role in fostering financial inclusion and empowering communities, embracing ICT

provides a strategic pathway to modernize their operations, enhance transparency, and strengthen financial and service performance. The deployment of digital tools such as accounting applications, member management systems, and mobile-based financial platforms has transformed how co-operatives communicate and manage information, cutting down the manual tasks that previously slowed administrative work and decision-making (Okafor *et al.*, 2025).

Empirical studies continue to confirm ICT's capacity to reshape organizational effectiveness and service quality. Karanja and Oloo (2022), for instance, found that adopting cloud-based accounting and communication tools improved accuracy and responsiveness among Kenyan savings and credit co-operatives. Similarly, Chirwa and Banda (2023) observed that digital banking and record systems accelerated transactions and enhanced reliability in Malawian microfinance co-operatives. Within Nigeria, Okafor *et al.* (2025) showed that ICT integration in agricultural co-operatives increased transparency and accountability, fostering greater trust and satisfaction among members. Collectively, these findings underline ICT's transformative potential in redefining co-operative governance, efficiency, and service delivery.

The success of these technological interventions, however, depends largely on users' competence and awareness. As Hayati and Wardhana (2025) demonstrate, consistent digital literacy programs and ICT capacity development significantly improve data handling, coordination, and financial reporting within co-operatives. Yet, many co-operatives, particularly in Nigeria, still encounter persistent barriers such as weak internet infrastructure, low technical proficiency, and insufficient awareness of emerging technologies. According to Akam *et al.* (2025), these limitations continue to prevent co-operatives from realizing the full benefits of digital transformation. Building ICT competence among members is, therefore, a critical prerequisite for sustaining operational efficiency, institutional accountability, and long-term growth (Ndaghu *et al.*, 2025).

Despite the growing awareness of ICT's benefits, numerous co-operative societies in Nigeria remain tied to outdated record-keeping systems, fragmented communication processes, and minimal digital skills. Eze and Ume (2022) report that such limited adoption undermines accuracy in documentation and transparency in financial management. Likewise, Obasi (2023) notes that insufficient digital infrastructure and poor ICT literacy weaken responsiveness and diminish member confidence, while Bello (2024) cautions that this slow digital transition threatens competitiveness and the sustainability of co-operatives nationwide.

Unless these structural and capacity-related challenges are addressed, inefficiency, data inaccuracy, and financial mismanagement will persist, ultimately restricting the growth and resilience of co-operative enterprises. Guided by these concerns, this study examines the impact of Information and Communication Technology (ICT) adoption on operational efficiency of co-operatives in Nigeria. The specific objectives are to ascertain the extent to which the use of digital tools and platforms impact service delivery performance of co-operatives and determine the extent to which the level of ICT training and awareness impact administrative and financial performance of co-operatives.

2. LITERATURE REVIEW

2.1 Conceptual Review

Co-operative Societies

The origins of co-operative societies can be traced to early 19th-century Europe, particularly the formation of the Rochdale Society of Equitable Pioneers in 1844, which became the prototype for modern co-operative enterprise (Ostrom, 2021). Founded by a group of weavers seeking alternatives to exploitative trade practices, the movement embodied the spirit of collective self-help and mutual economic advancement. According to the International Co-operative Alliance (1995), a co-operative is a self-governing association of individuals who voluntarily collaborate to achieve shared social, cultural, and economic aspirations through a democratically managed organization. As emphasized by Onyeze *et al.* (2014) in Itodo *et al.* (2025), co-operatives thrive on unity, shared

responsibility, and joint economic participation to achieve group objectives. Across the globe, co-operatives promote equity, social justice, and sustainable livelihoods by empowering members, generating employment, and fostering inclusive community development (Okafor *et al.*, 2023).

ICT Adoption

Information and Communication Technology (ICT) adoption refers to the systematic integration of digital innovations within an organization's operational structure to enhance coordination, productivity, and transparency. In the context of co-operative societies, ICT adoption involves using management information systems, accounting software, data analytics tools, mobile financial services, and online communication platforms to strengthen accountability and accessibility. These tools simplify decision-making, streamline administrative procedures, and promote effective interaction between management and members. As observed by Okoro and Nwosu (2021), ICT adoption fosters innovation and heightens performance accuracy through improved service responsiveness. Similarly, Adebayo *et al.* (2023) note that digital transformation, through cloud computing, mobile technologies and e-payment systems, enhances competitiveness, accountability, and the long-term sustainability of co-operative organizations.

Operational Efficiency in Co-operatives

Operational efficiency in co-operatives reflects the ability to maximize productivity and minimize resource waste through the strategic deployment of technology and human capital. ICT enables faster communication, reliable documentation, and effective coordination among members, ultimately reducing costs while enhancing service quality. When properly implemented, digital systems reinforce accountability, improve internal control, and elevate overall organizational performance. According to Eze and Ume (2022), ICT applications significantly boost efficiency by streamlining workflows and minimizing redundancy. Likewise, Bello (2024) asserts that embracing technological innovation promotes sustainability, resilience, and growth within Nigerian co-operative enterprises.

Digital Tools and Platforms

Digital tools and platforms, including mobile applications, cloud-based accounting systems, and online databases, have become indispensable instruments for co-operatives seeking precision and operational transparency. These tools support record management, enable real-time communication between members and leadership, and ensure consistency in financial reporting. Through digital integration, co-operatives can quickly adapt to members' needs while maintaining clear and transparent operations. Ibrahim and Yusuf (2021) found that digital platforms enhance operational flexibility and productivity in developing economies. Furthermore, Obasi (2023) emphasizes that technology adoption strengthens accountability and transparency across sub-Saharan African co-operatives, fostering inclusive growth and institutional development.

ICT Training and Awareness

ICT training and awareness focus on equipping members and employees with the necessary digital skills and practical understanding required to effectively operate modern information systems. Training nurtures innovation, builds user confidence, and improves efficiency in data management and communication processes. Individuals with adequate digital competence are better positioned to leverage technological resources for organizational advancement. Onah and Eze (2022) report that ICT literacy contributes to workforce effectiveness and overall performance within Nigerian institutions. Similarly, Adetunji *et al.* (2024) emphasize that developing digital proficiency supports productivity, encourages innovation, and sustains competitiveness in an increasingly digitalized economy.

Service Delivery Performance

Service delivery performance denotes a co-operative's capacity to respond to members' needs promptly and efficiently. ICT plays a pivotal role in enhancing this performance by improving information flow, facilitating

transparency, and ensuring transaction accuracy. Such advancements build trust, reliability, and satisfaction among members while reinforcing engagement and loyalty. Ogunleye and Balogun (2020) observed that digital integration within co-operatives significantly improves service accessibility and operational precision, enabling faster, more dependable member-oriented services.

Financial Performance of Co-operatives

Financial performance represents the ability of co-operatives to maintain profitability, liquidity, and long-term viability. The use of ICT enhances financial administration by promoting accurate bookkeeping, minimizing errors, and ensuring timely financial reporting. Technology also reduces fraudulent practices, strengthens accountability, and increases confidence among stakeholders. Osei and Boateng (2021) confirm that digital financial systems have substantially improved transparency and resource utilization among co-operatives across Africa, contributing to sustainable institutional performance and financial resilience.

Study's Conceptual Framework

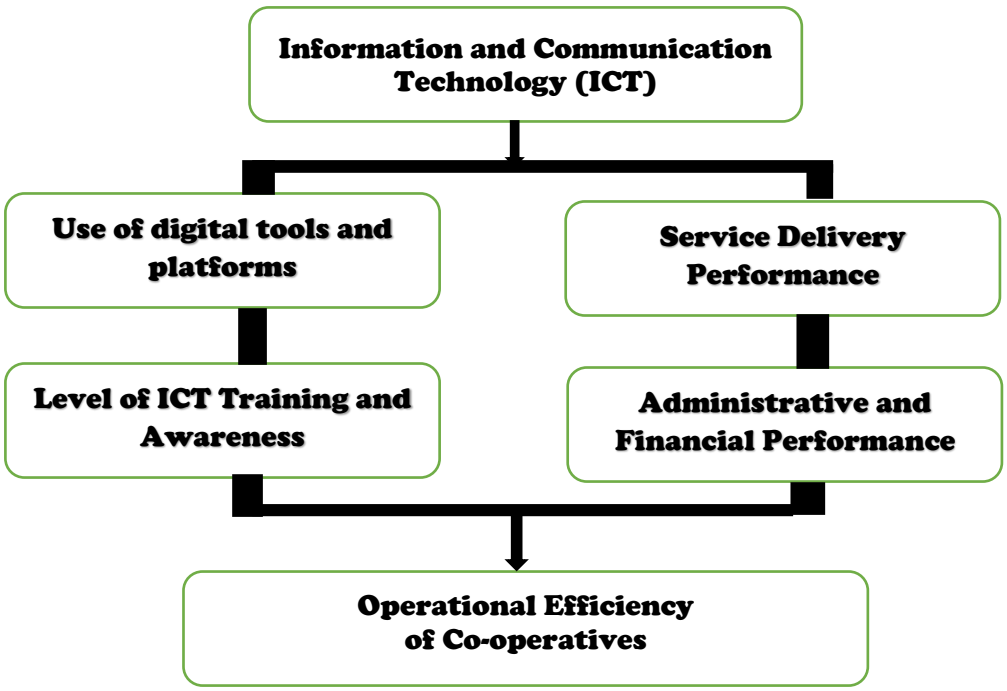

Fig 1 Researchers' Model, 2025.

The conceptual framework illustrates how Information and Communication Technology (ICT) adoption, serving as the independent variable, shapes the operational efficiency of co-operative organizations, which functions as the dependent variable. This relationship is reflected through two major indicators such as digital tools and platforms as well as ICT training and awareness. Digital technologies improve service delivery and coordination, while ICT competence enhances administrative and financial effectiveness. Together, these interactions promote efficiency, transparency,

accountability, and long-term sustainability within Nigerian co-operatives.

2.2 Theoretical Review

This study draws on foundational theories that explain how Information and Communication Technology (ICT) adoption impact operational efficiency of co-operatives in Nigeria. It is grounded in two interrelated perspectives - Technology Acceptance Model (TAM), and The Socio-Technical Systems (STS) Theory

The Technology Acceptance Model (TAM), introduced by Fred Davis (1986), provides the foundational basis for this study. It proposes that users' acceptance of technology is primarily determined by their perceptions of its usefulness and ease of use. In essence, it explains how individuals adopt digital innovations to enhance productivity, efficiency, and informed decision-making. Although Bagozzi (2007) criticized the model for overlooking contextual and organizational influences, Venkatesh and Bala (2008) reaffirmed its robustness in predicting user behavior toward ICT utilization. Within this research, TAM elucidates how co-operative members in Anambra State embrace ICT tools to streamline operations, enhance service delivery, and strengthen administrative efficiency.

Complementing this, the Socio-Technical Systems (STS) Theory by Trist and Emery (1951) emphasizes the interdependence between the social subsystem (people, culture, and collaboration) and the technical subsystem (technology and processes). The theory asserts that optimal performance emerges when both dimensions' function harmoniously. Applied here, STS underscores that ICT adoption enhances operational efficiency only when co-operative members' skills, communication, and teamwork align with technological systems, illustrating that human adaptability is as vital as technological advancement.

The Technology Acceptance Model (TAM) provides the most appropriate theoretical foundation for this research. It explains how individuals' perceptions of a system's usefulness and ease of use influence their willingness to adopt and apply technology. This makes it particularly relevant for understanding ICT adoption among co-operative members. The model aligns with the study's emphasis on behavioral intention and practical application, linking technology acceptance to enhanced operational efficiency, service quality, and administrative effectiveness within Nigerian co-operatives.

2.3 Empirical Review

Omife *et al.* (2025) in their study, Artificial Intelligence (AI) Integration and Business Sustainability in Enugu State: Implications for Co-operative Enterprises, using simple linear regression analysis revealed that integration of artificial intelligence significantly boosts co-operative business sustainability and consequently driven by the challenges these enterprises face.

In Indonesia, Hayati and Wardhana (2025) analyzed the effects of digital financial literacy programs in student co-operatives in Yogyakarta. Pre- and post-training results showed substantial improvements in accounting accuracy, transparency, and data management, underscoring the value of ICT education in enhancing administrative efficiency.

Chauhan *et al.* (2025) investigated ICT capacity building in co-operatives across Uttar Pradesh, India, using structural equation modeling. Results demonstrated that digital proficiency among employees fostered innovation, productivity, and financial growth, highlighting the importance of continuous digital skill enhancement.

Bui (2025) focused on ICT governance and training practices within Vietnamese agricultural co-operatives, revealing that consistent technology-based training improved financial tracking, reporting accuracy, and long-term resilience, positioning governance-led learning as critical for sustainability.

Similarly, Golestaneh and Sadeghi Naeini (2024) explored the impact of digital integration on service transformation in Tehran's community co-operatives. Using mixed methods, they found that mobile applications and e-governance tools strengthened openness, communication, and institutional responsiveness, framing digital inclusion as a driver of innovation and improved outcomes.

Karanja and Oloo (2022) examined how adopting digital management systems influences service quality among Kenyan savings and credit co-operatives. Their regression analysis revealed that cloud-based accounting, electronic data tools, and member communication platforms improved decision-making speed, record precision, and service responsiveness.

In Malawi, Chirwa and Banda (2023) assessed ICT-enabled platforms within microfinance co-operatives, drawing data from 220 participants. Findings indicated that mobile loan applications and digital customer portals shortened processing times, promoted transparency, and enhanced overall service reliability.

3. METHODOLOGY

3.1 Research Design

The study adopted a descriptive survey research design method in other to examine the impact of ICT adoption on operational efficiency of co-operatives in Nigeria by eliciting first-hand data from the field.

3.2 Population and Sample Size Determination

The population of the study comprised 14000 registered co-operatives in Anambra State (Anambra State Ministry of Commerce and Industry) To determine the adequate sample size, the study used Freund and William's statistic formula as shown below:

$$n = \frac{Z^2 N(pq)}{N(e)^2 + Z^2(pq)}$$

Where n = Sample Size
N = the population
p = Probability of success/proportion
q = Probability of failure/proportion
Z = Standard error of the mean
e = Limit of tolerable error of 0.05
N = 14000
p = .5
q = (1 – .5) = .5
Z = 95 percent = 1.96
e = 0.05 percent

$$= \frac{(1.96)^2 \; X \; 14000 \; X \; .5 \; X \; 5}{14000(0.05)^2 + (1.96)^2 \; X \; .5 \; X \; 5}$$

$$= \frac{3.8416 \; X 14000 \; X \; .25}{35 + 3.8416 \; X \; .25}$$

$$\frac{13356}{3.5 + .9604} = \frac{13356}{35.9604} = 371.4085494$$

$$\simeq 371$$

3.3 Sampling Technique

The study adopted a multistage sampling technique to ensure equity and practicality in participant selection across Anambra State. In the first stage, the State was systematically divided into three senatorial districts to achieve balanced geographical and administrative representation. This division is justified since the districts, recognized by INEC and NPC, represent administrative boundaries encompassing roughly one-third of the State's land and population, ensuring generalization of findings. At the second stage, one Local Government Area (LGA) was randomly selected from each district. This randomization minimized bias, enhanced fairness, and ensured equal inclusion chances, thereby improving the sample's representativeness. (See Table 1)

Table 1 Sampling Procedure

S/N	Senatorial District	LGA	Sample
1	Anambra Central	Idemili North	88
2	Anambra North	Onitsha North	158
3	Anambra South	Aguata	125
Total			**371**

Source: Fieldwork, 2025.

3.4 Instrument for Data Collection and Method of Data Analysis

A structure questionnaire, validated with its reliability coefficient ($\infty > 0.820$) through Cronbach's Alpha, was the instrument used. From distributed copies, 371(100%) were distributed, 364(98.11%) returned. Thus given 98.11% response rate, and deemed sufficient and reliable for meaningful analysis. Data via SPSS 27 were analyzed through a four point Likert Scale in frequency distributions, percentages, mean, and standard deviation, while hypotheses were tested via chi square ((χ^2) statistic.

Likert Scale Interpretation
Very High Extent (VHE) = 4; High Extent (HE) = 3; Low Extent (LE) = 2; Very Low Extent (VLE) = 1

Chi-Square

$\chi^2 = \sum \frac{(o-e)^2}{e}$

Where: $\chi 2 = \text{chi} - \text{square}$
$o = \text{observed frequency}$
$e = \text{expected frequency}$
$\Sigma = \text{summation sign}$
Level of significance 5% = 0.05
Degree of freedom (df) = (r – 1) (c – 1)
Where: $r = \text{Number of rows};\ c = \text{Number of columns}$
= (5-1) x (4-1) = 4 x 3 = 12
Critical value or table value = 21.0261
Decision Rule: If mean ≥ 2.5, the respondents agree. If mean < 2.5, the respondents disagree
Reject the H_0 if χ^2 calculated is > critical or table value, otherwise do not reject H_0

4. RESULTS AND DISCUSSION

Table 2 Extent to which the use of digital tools and platforms impact service delivery performance of co-operatives

Item	Variables	VHE	HE	LE	VLE	Mean	S. Dev.
1	**Through digital platforms we deliver services faster, accurately**	**128 (35.2%)**	**122 (33.5%)**	**70 (19.2%)**	**44 (12.1%)**	**2.918**	**1.0117**
2	**Online meeting tools strengthened communication and collaboration greatly**	**130 (35.7%)**	**118 (32.4%)**	**68 (18.7%)**	**48 (13.2%)**	**2.907**	**1.0323**
3	**Digital record systems reduced errors, enhanced financial transparency**	**104 (28.6%)**	**132 (36.3%)**	**60 (16.5%)**	**68 (18.7%)**	**2.747**	**1.0663**
4	**Social media platforms expanded my access to customers**	**96 (26.4%)**	**128 (35.2%)**	**62 (17.0%)**	**78 (21.4%)**	**2.665**	**1.0873**
5	**Electronic payment channels simplified members' contributions and repayments**	**134 (36.8%)**	**100 (27.5%)**	**76 (20.9%)**	**54 (14.8%)**	**2.863**	**1.0745**
	AGGREGATE					**2.82**	**1.054**

Source: Researchers' Computation (2025) via SPSS 27

Table 2 shows the responses of the respondents on the extent to which the use of digital tools and platforms impact service delivery performance of co-operatives, with a mean value of 2.82 and standard deviation of 1.054, indicating that the respondents were in agreement with all the items.

Table 4.3 Extent to which the level of ICT training and awareness impact administrative and financial performance of co-operatives

Item	Variables	VHE	HE	LE	VLE	Mean	S. Dev.
6	ICT training enhanced record management and financial reporting	126 (34.6%)	118 (32.4%)	72 (19.8%)	48 (13.2%)	2.885	1.0301
7	Improved ICT awareness aids administrative duties efficiently	130 (35.7%)	117 (32.1%)	69 (19.0%)	48 (13.2%)	2.904	1.0334
8	Applying ICT skills strengthened budgeting, auditing and financial planning	100 (27.5%)	131 (36.0%)	65 (17.9%)	68 (18.7%)	2.722	1.0614
9	Familiarity with ICT tools increased financial management confidence	97 (26.6%)	127 (34.9%)	66 (18.1%)	74 (20.3%)	2.679	1.0774
10	Ongoing ICT capacity building improved co-operative financial growth	132 (36.3%)	98 (26.9%)	78 (21.4%)	56 (15.4%)	2.841	1.0817
	AGGREGATE					2.81	1.057

Source: Researchers' Computation (2025) via SPSS 27

Table 4.3 shows respondents' responses on the extent to which the level of ICT training and awareness impact administrative and financial performance of co-operatives, with a mean value of 2.81 and standard deviation of 1.057, indicating that the respondents were in agreement with all the items.

Test of Hypotheses

Hypothesis I: Use of digital tools and platforms have no significant impact on the service delivery performance of co-operatives

Data from table 2 was used for testing this hypothesis which are presented as observed frequencies below:

Table 4 Chi-square Table

Items	responses	o	e	x^2
1	VHE	128	118.4	0.7784
	HE	122	120	0.0333
	LE	70	67.2	0.1167
	VLE	44	58.4	3.5507
2	VHE	130	118.4	1.1365
	HE	118	120	0.0333
	LE	68	67.2	0.0095
	VLE	48	58.4	1.8521
3	VHE	104	118.4	1.7514
	HE	132	120	1.2000
	LE	60	67.2	0.7714
	VLE	68	58.4	1.5781
4	VHE	96	118.4	4.2378
	HE	128	120	0.5333
	LE	62	67.2	0.4024
	VLE	78	58.4	6.5781
5	VHE	134	118.4	2.0554

	HE	100	120	3.3333
	LE	76	67.2	1.1524
	VLE	54	58.4	0.3315
			Σ=	**31.4356**

Source: Researchers' Computation (2025), as generated from χ^2 output

Since the calculated value (31.4356) is greater than the table value (21.0261), the Ho (null hypothesis) should be rejected. This implies that use of digital tools and platforms have significant positive impact on the service delivery performance of co-operatives.

Hypothesis II: Level of ICT training and awareness have no significant impact on the administrative and financial performance of co-operatives

Data from table 4.3 was used for testing this hypothesis as presented below:

Table 5 Chi-square Table

Items	responses	o	e	x^2
6	VHE	138	117	3.7692
	HE	129	118.2	0.9868
	LE	50	70	5.7143
	VLE	47	58.8	2.3680
7	VHE	132	117	1.9231
	HE	122	118.2	0.7934
	LE	60	70	1.4286
	VLE	50	58.8	1.3170
8	VHE	134	117	3.4188
	HE	106	118.2	1.2592
	LE	68	70	0.0571
	VLE	56	58.8	0.1333
9	VHE	131	117	1.6752
	HE	127	118.2	0.6552
	LE	57	70	2.4143
	VLE	49	58.8	1.6333
10	VHE	134	117	3.4188
	HE	100	118.2	2.8024
	LE	75	70	0.3571
	VLE	55	58.8	0.2456
			Σ=	**36.3707**

Source: Researchers' Computation (2025), as generated from χ^2 output

Since the calculated value (36.3737) is greater than the table value (21.0261), the Ho (null hypothesis) should be rejected. This implies that level of ICT training and awareness have no significant impact on the administrative and financial performance of co-operatives.

Discussion of Findings

The results showed that use of digital tools and platforms have significant positive impact on the service delivery performance of co-operatives in Anambra State ($\chi^2 = 31.4356 > 21.0261$, $p < 0.05$). This outcome aligns with the findings of Karanja and Oloo (2022), Chirwa and Banda (2023), and Golestaneh and Sadeghi Naeini (2024), who established that innovations such as mobile apps, cloud-based systems, and digital

governance tools enhance transparency, accuracy, and responsiveness in organizational service delivery. The consistency among these studies confirms that technology adoption leads to faster communication, improved accountability, and better overall performance in co-operative management. Unlike previous research that concentrated on SACCOs and microfinance co-operatives across East Africa and Asia, this study broadens understanding by situating the analysis within the Nigerian context, specifically among co-operatives that face digital literacy and inclusion challenges. The positive outcomes observed could be linked to the growing use of smartphones and social media, which facilitates information sharing, record updates, and member interaction. Consequently, digital platforms serve as vehicles of empowerment, promoting inclusivity, participatory management, and improved service satisfaction within co-operatives in Anambra State.

The findings further revealed that level of ICT training and awareness have no significant impact on the administrative and financial performance of co-operatives in Anambra State ($\chi^2 = 36.3737 > 21.0261$, $p < 0.05$). These findings are consistent with Hayati and Wardhana (2025), Chauhan *et al.* (2025) and Bui (2025), who observed that digital literacy improves data accuracy, transparency, and financial adaptability among co-operatives in Indonesia, India, and Vietnam. Similarly, this study confirms that continuous ICT training builds members' confidence in financial reporting, enhances operational discipline, and minimizes accounting errors. However, the present research moves beyond prior works by offering empirical evidence from grassroots co-operatives in Nigeria. It highlights that peer learning and community-driven knowledge exchange play essential roles in promoting digital proficiency among female co-operators. The improvements in performance can be attributed to greater familiarity with financial software and electronic documentation, which have improved accountability and efficiency. Thus, regular ICT sensitization programs strengthen internal management systems, ensuring better financial oversight and long-term sustainability for co-operatives operating in a digital economy.

5. CONLUSION AND RECOMMENDATIONS

Digital technologies and ICT training considerably enhance the service delivery, administrative capacity, and financial efficiency of co-operatives in Anambra State by fostering transparency, accountability, improved coordination, and digital inclusion through practical learning and technological empowerment. Based on the outcomes and conclusion of this research, the study recommends strengthening co-operative digital systems via affordable internet, mobile tools, and public–private platforms to enhance better service efficiency and continuous skill enhancement for members through workshops, peer mentoring, and community sessions to strengthen co-operatives' administrative and financial capacity. The study contributed to knowledge by empirically showing how ICT usage and training enhance co-operatives' performance in Nigeria, an area rarely explored in prior African co-operative development studies

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