



GLOBAL JOURNAL OF HUMAN-SOCIAL SCIENCE: A
ARTS & HUMANITIES - PSYCHOLOGY
Volume 24 Issue 1 Version 1.0 Year 2024
Type: Double Blind Peer Reviewed International Research Journal
Publisher: Global Journals
Online ISSN: 2249-460X & Print ISSN: 0975-587X

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GJHSS-A Classification: *LCC: HD9019.A352 - HD9019.A353*



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Agro Dealers and Information Communication Technology A Case of Selected Districts of Central Province of Zambia

Lloyd Mwanza ^α & Hanson Chishimba ^σ

Abstract- Over the years, the government of Zambia has recognized the pivotal role of Agro dealers in the distribution of farming inputs, positioning them at the core of the nation's agricultural landscape. In a concerted effort to enhance their efficiency and elevate food security by bolstering agricultural productivity, the government introduced the electronic voucher system. The implementation of this digital system aims to streamline the distribution of inputs and amplify the impact of agriculture in Zambia. The objective of this study was to analyze the barriers impeding the adoption of ICT among Agro dealers operating in selected districts within the central province of Zambia. Employing an explanatory mixed-method approach, the study population where Agro dealers. Data collection was done through a combination of questionnaires and interview guides. Quantitative data was analyzed using the Statistical Package for Social Sciences (SPSS) version 21.0, while qualitative data underwent a comprehensive thematic analysis. The study's findings underscore a significant dearth in ICT adoption among Agro dealers in the selected districts. It further elucidates the multifaceted barriers that hinder this adoption. Foremost among these challenges is the prohibitive cost associated with ICT equipment, which emerges as the predominant factor contributing to the prevailing low levels of ICT adoption within this sector. Remarkably, amidst these formidable obstacles, Agro dealers unequivocally acknowledged the substantial contributions of ICT to their operational efficiency, underlining its potential transformative power. The study recommends a revision of the national ICT policy to address the barriers unearthed by this research.

Keywords: information communication technology, agro dealers, efficiency.

I. INTRODUCTION

According to the World Economic Forum report, agriculture provides a living for approximately 70% of the African population. As a result, agriculture is a critical sector on the African continent. Nonetheless, agricultural productivity remains low, and food insecurity remains a problem. Information and Communication Technologies (ICTs) have been identified as a key driver that would exponentially push agriculture productivity and transform the economic fortunes of Zambia. To actualize this aspiration, the Zambian government has

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introduced numerous initiatives such as the Zambia Integrated Agriculture Management Information Systems (ZIAMIS) (Ayim *et al.*, 2022). These initiatives are intended to increase competitiveness in the agriculture sector among key players like Agro dealers while improving the welfare of farmers through the use of an electronic voucher farming inputs distribution platform (Ministry of Agriculture, 2009).

The foregoing has been a result of the economic reforms of the early 1990s which led to improvements in the Zambian business climate by encouraging private sector participation. Through the National Agriculture Policy (2004–2015), the Zambian government provided for the participation of the private sector in the distribution of farming inputs which over the years has placed Agro dealers at the center of the distribution chain. One way the Zambian government has put emphasis on agriculture is through improving the efficiency in the distribution of farming inputs by introducing Information and Communication Technologies (ICT) initiatives. Information and Communication Technologies play an important role in the sharing of agricultural input information to increase access to and use of agricultural input information among key players in the agriculture sector. Farmers in developing nations have been exposed to a variety of channels for accessing and using agricultural input information. This has resulted in several initiatives in recent years to use ICT to improve agricultural productivity (Ayim *et al.*, 2022).

To improve agriculture productivity and its contribution to the economy, the Zambian government introduced the Zambia integrated agriculture management information systems (ZIAMIS) Platform in the 2017/2018 Farming Season with technical support from Smart Zambia Institute (SZI) in selected districts. The initiative intended to increase competitiveness in the agriculture sector among key players like the Agro dealers while improving the welfare of farmers through the use of an electronic voucher farming inputs distribution platform (Bwalya, 2018).

The failure of the e-voucher FISP to meet its objectives led to the announcement of an introduction of an integrated comprehensive agriculture support program (CASP) by the government in the 2023 national budget. The CASP include components of infrastructure

development, irrigation development, livestock development, extension services support, farm block development and climate change adaptation with the key component being the e- voucher FISP initiative (National Assembly of Zambia, 2023).

Despite the documented benefits that ICT offers, and deliberate government efforts to improve Agro dealers ICT adoption through platforms such as e- voucher FISP, the Farmer Input Support Program (FISP) in the selected districts has experienced low adoption rates of ICT within its framework. This is evidenced by Namooobe et al., (2021) who revealed that most Agro-dealers did not transact through the ZIAMIS system in these districts because they have not adopted ICTs in their business. Further Katambo (2020) the Minister of Agriculture then, in his Ministerial Statement to parliament stated that "Agro dealers faced challenges in the adoption of the FISP e-voucher system transactions as a result of failing to use ICTs". Additionally, the use of ICT remains significantly underutilized among Agro dealers participating in the FISP program. This low adoption of ICT has posed significant challenges to the program's objectives and hinders the realization of its full potential to improve agriculture services to farmers, improve farmer productivity, and foster sustainable agricultural development. The reasons behind this low adoption remain unclear and call for an in-depth analysis to identify the key barriers that deter Agro dealers from embracing ICT in their operations. Therefore, this study analyses ICT adoption barriers among Agro dealers in selected districts of the central province.

This research is organized into three segments. The first section provides a brief examination of the current body of literature related to agro dealers in Zambia. The second section provides the methodology used in the study. The last section delves into the research results and provides insights for improving the quality of life in rural areas of Zambia.

II. LITERATURE REVIEW

The role of Information and Communication Technology (ICT) in the operations of enterprises, especially small businesses cannot be over-emphasized and has been the subject of considerable research and analysis. Parida et al. (2009) investigated ICT use among enterprises and uncovered a notable challenge faced by small enterprises when it comes to embracing advanced ICT tools. These businesses often resort to informal ICT usage due to their perception of complexity. This observation indicates a crucial barrier to the full utilization of ICT's potential in enhancing the operational efficiency of small enterprises.

In the context of African agriculture enterprises, Martiz (2011) conducted a study that demonstrated the transformative power of ICT, particularly through the

widespread adoption of mobile phones. Mobile phones emerged as the dominant technology tool, revolutionizing the way farmers and stakeholders in the agricultural sector accessed information and conducted their activities. This emphasizes the significance of accessible and user-friendly ICT tools in driving positive change, even in resource-constrained environments.

Bhalerao and Patil (2021) shed light on barriers such as the high financial cost associated with acquiring ICT tools and the persistent concerns surrounding the risks and security implications of utilizing these tools. Similarly, Harindranath et al. (2008) emphasized the prohibitive cost of ICT equipment, uncertainties about the potential advantages of ICT, and the scarcity of internal ICT expertise as significant obstacles to widespread ICT adoption in businesses. William (2018) studied the diffusion of ICT in rural agricultural enterprises and revealed a set of challenges including a lack of familiarity with ICT, inadequate access to requisite tools and skilled personnel, limited governmental support, and the absence of reliable electricity sources, all acting as formidable barriers to technology adoption. Jayathilake et al. (2010) investigated the enterprises in the agriculture sector as well and identified primary impediments to ICT utilization that included the absence of proper training, skepticism towards the efficacy of ICT systems, a shortage of technological infrastructure, and a deficit in ICT proficiency. Moving beyond the agriculture sector, Jaime et al. (2016) examined enterprises with fewer than 10 employees and discovered that low levels of ICT knowledge among entrepreneurs, coupled with their lower educational backgrounds and deficiencies in ICT training, were major barriers undermining their capacity to incorporate ICT solutions into their businesses.

In recent times, entrepreneurs have come to recognize the advantages presented by information and communication technologies (ICTs), including tools like computers, phones, email, and the Internet, along with their practical applications, in enhancing their operational effectiveness (OECD, 2004). Studies by Barba-Sanchez et al. (2007) and Cardona et al. (2013) have revealed that the integration of ICTs into business operations leads to improved efficiency by boosting productivity. This increased productivity, in turn, opens up new avenues for business expansion. Shiels et al. (2003) demonstrated that aligning business strategies with ICT adoption propels enterprises towards growth, underscoring how the incorporation of relevant technologies amplifies overall productivity.

Demographic factors such as age, sex, and education play a significant role in influencing the adoption of Information and Communication Technology (ICT) among Agro dealers and several scholars have contributed their findings. Maleka (2011) explored into an analysis of ICT adoption and determined that

technology exhibits a neutral stance towards gender, thereby indicating a lack of gender-based disparities in ICT adoption and utilization. Similarly, the investigation conducted by Anduwa-Ogiegbaen and Isah (2005) at the University of Benin, highlighted that there existed no significant discrepancy between male and female faculty members in their engagement with the internet and other ICTs. On the subject of genders role in the adoption of educational technology, Zhou and Xu (2007) revealed that genders influence on ICT perceptions and adoption was minimal. Conversely, research by Schumacher and Morahan-Martin (2001) and Spotts et al., (1997) suggested a contrasting trend, asserting that males generally exhibited more favorable attitudes towards the adoption of ICTs compared to females. Likewise, Markauskaite (2006) investigated genders impact on ICT adoption and showed noteworthy distinctions between males and females in terms of their technical ICT adoption behavior, indicating that males tended to adopt ICTs more frequently as compared to females.

On the aspect of age in relation to technology adoption, Morris et al. (2000) explored how differing age groups make decisions regarding technology adoption. Their study disclosed that older employees decisions were influenced by factors like attitude towards technology, subjective norm, and perceived behavioral control, while younger workers predominantly considered their attitude toward technology in short-term decisions. Zhou and Xu (2007) further investigated technology adoption among workers and identified age-based variations in individual adoption and usage behaviors. These discrepancies were more evident among older employees, while younger workers exhibited a more mixed pattern of technology adoption results.

Pillay (2016) probed the role of education in shaping ICT adoption among Small and Medium-sized Enterprises (SMEs) and established a noteworthy link between an individuals level of education and their propensity to adopt ICTs within their enterprises. Higher educational attainment correlated with a greater likelihood of ICT adoption. Similarly, Lleras-Muney and Lichtenberg (2002) investigated into the nexus between education and technology adoption, revealing that individuals with higher levels of education were more inclined to adopt new technologies at a faster pace than those with lesser education. However, the findings from Riddell and Song (2012) study revealed that positive associations between education level and technology adoption might be influenced by the endogeneity of education, implying that the true causal effects of education on technology use and adoption might differ from what is initially apparent.

According to Rogers (2003), compatibility is a crucial aspect of innovation adoption as adopters are keen to know how well an innovation aligns with their

existing values and past experiences. When ICTs are compatible with business requirements, their adoption tends to be higher, as noted by Hoerup (2001), who accent that meeting individual needs reduces uncertainty and increases adoption rates. This stresses the importance of compatibility in ICT adoption. Barba-Sanchez et al., (2007) examined ICT adoption by small and medium-sized enterprises, and found that ease of use and alignment with business needs significantly influences adoption decisions. This aligns with Azam and Quaddus (2009) assertion that compatibility plays a pivotal role in small enterprise adoption, particularly for businesses like Agro dealers. Kazembe (2021) studied the gap between technology awareness and adoption in Sub-Saharan Africa, and revealed that technology awareness has an impact on the adoption decision-making process. Similarly, Kyobe (2011) and Mustapha et al., (2022) identified awareness as a crucial factor affecting ICT adoption among small firm owners.

Bhalerao and Patil (2021), in their exploration of ICT adoption challenges and benefits among SMEs, noted that the adoption of ICT facilitates the creation of demand for products and services. Similarly, Jaas (2022) also highlighted that deploying diverse ICT tools empowers organizations to target specific customer segments. Furthermore, the adoption of ICT enhances the quality of interactions between businesses and their customers. Rothwell (1994) posits that ICT adoption serves to establish robust connections between internal business processes and external activities related to consumers and suppliers. Additionally, Hitt and Brynjolfsson (2000) conducted an investigation into the impact of ICT adoption on organizational transformation and business performance. Their findings emphasize that ICT adoption plays a pivotal role in various managerial functions, including cost reduction through streamlined coordination, efficient information processing, cost-effective service provision, and rapid, budget-friendly communication methods. Further, Nureni (2014) reinforces the importance of communication in businesses, emphasizing its role in maintaining connections among employees, suppliers, and consumers. The adoption of ICTs, including mediums like email, phones, radios, televisions, video chat rooms, and social networking platforms, significantly enhances communication mechanisms. The use of ICTs also extends to the domain of Agro dealers, who benefit from these technologies in tasks such as placing orders with suppliers and obtaining feedback from clients via phones and other ICT tools. Adeyemi (2010) makes evident the significance of effective inventory management in meeting customer demands, and Raitt and Okiy (2005) point out that investing in ICT-based inventory management systems helps in monitoring stock levels and item quantities held by enterprises.

In a study conducted by Mweshi et al. in 2022, a contextual analysis of the agriculture sector in Zambia revealed significant and positive outcomes. This analysis highlighted how ICT played a pivotal role in optimizing the distribution of farming inputs by Agro dealers, ultimately leading to substantial improvements in various aspects of the agricultural sector. One of the notable effects observed was the enhancement of beneficiary targeting. ICT mechanisms enabled Agro dealers to precisely identify and reach out to the farmers who needed their services the most. This precision in targeting not only streamlined the distribution process but also ensured that resources were directed to those who could benefit most from them. Additionally, the study underscored how ICT facilitated timely access to agricultural inputs. This aspect was critical for smallholder farmers as it empowered them to procure a diverse range of recommended inputs quickly. These inputs encompassed an array of essentials, including veterinary drugs, agricultural equipment, livestock, poultry, and fingerlings. Such accessibility to a wide variety of inputs can significantly accelerate the diversification of the smallholder sector, bolstering its productivity and resilience. Furthermore, the study highlighted the practical benefits of ICT by reducing the necessity for costly and time-intensive travel associated with marketing agricultural produce. Agro dealers no longer had to travel to access markets or gather information about pricing and demand. This reduction in travel not only saved resources but also improved the overall efficiency of agricultural operations.

III. METHODOLOGY

a) Ethics Statement

A stringent code of conduct was established and adhered to, prioritizing the protection of individuals who willingly contributed information to this research. The researchers sought and obtained ethical clearance from the University of Zambia's ethics committee, as confirmed by clearance number HSSREC-2022-JUL.014. Moreover, a commitment was made to ensure that all participants engaged in the research voluntarily, free from any form of coercion or unfulfilled promises of incentives. Participants received information about the study's purpose, its potential advantages for both them and society, and they were afforded ample opportunities to seek clarification through questions. Importantly, participants were made fully aware of their right to withdraw from the research at any point. Confidentiality was maintained by safeguarding the identities of all participants, with real names remaining undisclosed throughout the study.

b) Study Design

This study adopted an explanatory mixed-method approach, incorporating both quantitative and qualitative data, collected between October and

December 2022. The data collection process encompassed three phases. The first phase involved the administration of questionnaires to an exhaustive sample of 130 Agro-dealers, distributed across four selected districts. Subsequently, the second phase involved the collection of qualitative data from a stratified sample of 30 Agro-dealers who had previously participated in the initial data collection, aiming to provide valuable insights that complemented the quantitative data. In the third phase, in-depth interviews were conducted with seven key informants, purposively selected to offer comprehensive insights for the study. In terms of data analysis, quantitative data were processed using IBM SPSS version 21, while the qualitative data from the in-depth interviews underwent analysis through qualitative methods, particularly employing thematic analysis. In addition to primary data, secondary data were collected from diverse sources, including the Ministry of Agriculture and Livestock, policy documents, national development plans, scholarly books, articles, and research papers.

IV. RESULTS

a) Demographic Characteristics of Respondents

To establish the correlation between education levels and the propensity to embrace ICT among the Agro dealers, the study results revealed that 71% of the respondents were male, while 29% were female. A closer look at age distribution revealed that the majority of Agro dealers fell within the 41 to 50 years age bracket, comprising 49.5% of the respondents. The age group above 50 accounted for 29.7% of participants, while those in the 31 to 40 years age range represented 14.8%. Notably, the age group below 30 years was the smallest, with a representation of 6%.

Regarding education, the research findings indicated a diverse educational background among the Agro dealers. A small percentage (5%) had not acquired any formal education, while 11.9% had completed primary education. The majority of Agro dealers (58.4%) had achieved a secondary school education, while 24.4% had attained tertiary education levels.

Unveiling the impact of education levels on ICT adoption, the results paint a revealing picture. Agro dealers with higher educational attainment were more inclined to integrate ICTs into their businesses. This is substantiated by the average scores, where individuals with tertiary education achieved a higher Mean of 5.0, outperforming those with secondary education (Mean 4.7). Moreover, participants with secondary education demonstrated greater ICT adoption compared to those with only primary education (Mean 3.8) or no formal education (Mean 2.4).

b) Extent of ICT adoption by Agro dealers

In examining the extent to which Agro dealers have embraced ICT, the research found that several

technologies were commonly utilized. These technologies included mobile phones, social media, email, radio, television, photocopiers/scanners, and printers. According to the findings, most Agro dealers possessed mobile phones, and a large portion of them could access the internet on their phones. It is evident that all Agro dealers had embraced phone usage, while 65.3% were using social media, 56.4% preferred radio,

and 53% opted for email. However, the adoption rates for other ICTs remained below 50%, indicating a relatively limited integration of these technologies into their businesses. This is further supported by the average ICT adoption Mean of 2.66, suggesting a low level of overall ICT adoption among Agro dealers as seen in Table 1 below.

Table 1: Extent of ICT tools adoption.

ICT ADOPTION Frequencies				
		Responses		Rate of Adoption
		N	Percent	
ICT tools	Phone	101	26.6%	100.0%
	Laptop	15	3.9%	14.9%
	Desktop	13	3.4%	12.9%
	Email	54	14.2%	53.5%
	Social media	66	17.4%	65.3%
	Printer	14	3.7%	13.9%
	Scanner/ photocopier	14	3.7%	13.9%
	Point of sale system	26	6.8%	25.7%
	Radio	57	15.0%	56.4%
	Television set	20	5.3%	19.8%
Total		380	100.0%	376.2%
Overall ICT Adoption Mean =			2.66	

Source: Fieldwork survey 2022.

In light of the foregoing, the varying adoption rates of different ICTs among Agro dealers in Central Province reflect the diverse communication needs and preferences within the community. While phones have achieved universal adoption due to their practicality, social media, email, and radio offer complementary avenues for communication and information dissemination. These adoption rates show the importance of a multi-faceted approach to ICT integration, catering to the preferences and requirements of Agro dealers across different platforms and technologies. This is reflected in the words of one participant

"In our agro dealership, I've noticed that the extent of ICT adoption is quite low. We primarily rely on traditional methods for managing our inventory, sales, and customer records. Our transactions are mostly carried out manually, and we maintain handwritten records. There's no integrated system

for tracking product availability or customer preferences. This lack of technological integration has made our operations slower and less efficient compared to businesses in other sectors that have embraced ICT tools."

c) *Barriers to ICT adoption*

The study examined various factors that represent both internal and external barriers to ICT adoption in the selected districts among Agro-dealers. Internal barriers are presented first followed by external barriers.



i. *Internal Barriers*

The study found a lack of knowledge and skills in ICT as the only significant barrier as shown in table 2 below.

Table 2: Internal Barriers to ICT adoption

	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Mean
Lack of awareness about the benefits of ICT	5.0%	20.0%	36.7%	25.0%	13.3%	3.22
Time constraints	20.7%	41.4%	27.6%	5.2%	5.2%	2.33
Lack of resources to access ICT.	18.0%	42.6%	24.6%	11.5%	3.3%	2.39
Employee satisfaction with traditional technologies	14.8%	48.1%	24.1%	9.3%	3.7%	2.39
Resistance to change within the enterprise	6.7%	42.2%	33.3%	8.9%	8.9%	2.71
Lack of knowledge and skills	1.1%	13.0%	25.0%	54.3%	6.5%	3.52

Source: *Fieldwork survey 2022.*

▪ *Lack of Knowledge and Skills*

The research discovered that one significant internal barrier preventing Agro dealers in the chosen districts of the central province from adopting information and communication technology (ICT) is their lack of knowledge and skills. Many of these Agro dealers are facing difficulties because they do not possess enough understanding or abilities related to using ICT tools and systems. This is reflected in the words of one participant

"Most Agro dealers have not received skills training on how to operate electronic devices which have contributed to them not embracing them into their businesses."

ii. *External Barriers*

The research found several external barriers to ICT adoption among Agro dealers that included; the cost of ICT equipment, Cost of bundles, Poor network, and electricity power problem.

Table 3: External Barriers to ICT adoption

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree	Mean
The cost of ICT equipment is too expensive	0.0%	4.0%	6.0%	42.0%	48.0%	4.34
Cost of bundles	1.1%	0.0%	16.3%	30.4%	52.2%	4.33
Lack of government support	10.3%	42.6%	22.1%	16.2%	8.8%	2.71
Unreliable service e.g. Poor network	1.5%	12.1%	10.6%	56.1%	19.7%	3.80
Electricity power problem	3.2%	19.4%	19.4%	50.0%	8.1%	3.51
Business partners, suppliers, and customers do not make use of ICT	2.5%	55.0%	35.0%	7.5%	0.0%	2.48

Source: *Fieldwork survey 2022.*

The study found that there were more external barriers than internal barriers to ICT adoption among Agro dealers as shown in table 2 on the previous page and in table 3 above. The research discovered that one of the main reasons why Agro dealers in the selected districts of the central province are not embracing ICT (Information and Communication

Technology) is because of the high expenses associated with ICT equipment.

The price of internet bundles serves as another external obstacle to the adoption of Information and Communication Technology (ICT) among Agro dealers. This shows that the expense associated with purchasing internet packages is making it difficult for agricultural

dealers in the chosen districts of the central province to use modern technology like computers, smartphones, and online services. Further, the research discovered inadequate or poor network service contributes to barriers affecting Agro dealers in the adoption of these ICT tools. Additionally, erratic electricity supply was identified as a barrier affecting ICT adoption by discouraging the implementation of ICT solutions in Agro dealer's businesses. One agro dealer lamented that

"The electrical supply in this area is poor, especially during this period of the year undermining the point of using electronic devices like computers".

d) *Effects of ICT Adoption on Agro-dealer's Efficiency*

Some aspects that represent efficiency as a result of using ICT in an enterprise were explored in the study. The study found that the key effects of efficiency experienced by Agro dealers are increased task completion, enhanced communication internally, improved advertising, improved relationship with suppliers, customer satisfaction increased, and improved service delivery. This is shown in Table 4 on the next page.

Table 4: Effects of ICT adoption on Efficiency.

Question	Strongly disagree	Disagree	Not sure	Agree	Strongly agree	Mean
The business experienced increased task completion since ICT adoption	1.0%	1.0%	10.2%	43.9%	43.9%	4.29
Advertising has become easy	1.4%	5.6%	26.4%	44.4%	22.2%	3.81
Customer satisfaction has increased	0.0%	8.9%	35.6%	42.2%	13.3%	3.60
We have improved service delivery due to ICT adoption	4.4%	13.2%	32.4%	30.9%	19.1%	3.47
The business has become more effective since the adoption of ICT	0.0%	15.6%	44.4%	28.9%	11.1%	3.36
Relationships with suppliers have been improved	0.0%	14.6%	16.7%	54.2%	14.6%	3.69
Management of inventory has improved	4.0%	24.0%	38.0%	26.0%	8.0%	3.10
We have experienced enhanced Communication	1.2%	7.1%	10.7%	51.2%	29.8%	4.01
Employees can work remotely	4.1%	40.8%	24.5%	30.6%	0.0%	2.82

Source: Fieldwork survey 2022.

V. DISCUSSION

a) *Theme 1: Extent of ICT adoption*

The research findings shed light on the prevailing low adoption rates of Information and Communication Technology (ICT) tools among Agro dealers, with a noteworthy majority of these tools being utilized by less than 50% of the dealers. Among these findings, a remarkable and crucial revelation is the near-ubiquitous adoption of mobile phones, with a staggering 100% adoption rate. This observation underscores the pervasive role of mobile phones as a primary communication tool within the Agro dealer community, transcending other ICT tools in terms of acceptance and usage. Notably, the dominant ICT tool embraced by Agro dealers is the mobile phone, aligning with the research conducted by Martiz (2011). Martiz's work highlights the pivotal role of mobile phones as the most widely used and rapidly adopted ICT tool across various sectors. This comprehensive insight into the ICT

landscape among Agro dealers underscores the critical importance of recognizing the nuanced challenges and opportunities that accompany ICT adoption in this specific context, highlighting the preeminent position of mobile phones within this ecosystem.

The research indicates that 65.3% of Agro dealers have ventured into the realm of social media, while 53.5% utilize email for their communication needs. Additionally, 56.4% of Agro dealers have incorporated radio communication into their business advertising and information access strategies. This diverse pattern of ICT tool adoption among Agro dealers corresponds with the findings of Parida et al. (2009). Parida et al. emphasize that small businesses, including Agro dealers, often encounter challenges when integrating ICT into their operations, which can be attributed to the existence of informal communication structures and the pressing operational demands that are inherent in their businesses.

b) *Theme 2: Barriers to ICT adoption*

The study found several barriers to ICT adoption among Agro dealers in the selected districts. One such barrier is the lack of knowledge and skills in ICT use. Essentially, many Agro dealers do not fully understand how various ICTs can be effectively used to improve their operations and overall business performance. This gap in understanding has hindered the uptake of ICT solutions in their businesses. This conclusion is consistent with previous research conducted by Esselaar et al. (2007), where they surveyed across 13 African countries. Their study also identified the deficiency in skills and knowledge regarding ICTs as a primary obstacle to their adoption by enterprises in Africa. However, it's essential to note a divergence in the findings of this current study compared to the conclusions drawn by Jaganathan (2018). Jaganathan's research found that the lack of knowledge was not statistically significant when considering its relationship with ICT adoption among enterprises. This discrepancy could be due to variations in research methods, sample sizes, or the specific context of the enterprises studied.

Another barrier this study identified is the substantial cost associated with ICT equipment. This financial burden has prevented many Agro-dealers from effectively adopting and utilizing technological solutions in their daily operations. The research findings emphasize that the expenses associated with procuring and maintaining ICT tools have acted as a significant deterrent for Agro-dealers. The findings of this research support observations made by Onyedimekwu et al. (2022), whose research findings similarly underscored the critical role of the cost factor in the decision-making process of business owners considering the adoption of ICT tools.

Further, the study found that high rates of data charges act as a significant restriction on their internet usage among Agro dealers. Agro dealers are involved in the agricultural supply chain, and their ability to access timely information and communicate efficiently is crucial and dependent on internet accessibility. If this internet accessibility is inhibited by the high cost of internet bundles, it eventually results in a challenge of adopting ICT in their businesses. This study's findings align with the observations made by Molla and Licker, (2005), who noted the adverse impact of expensive internet services on accessibility, particularly hindering the widespread adoption of information and communication technology (ICT) in enterprises within developing countries.

Additionally, the research reveals that inadequate network connectivity continues to pose a significant obstacle for Agro dealers, greatly impeding their effective integration of ICT tools. One of the key issues is unreliable voice calls, making it difficult for them to communicate with clients, suppliers, and other stakeholders. Further, the unavailability of internet services adds to their impediments, limiting access to

online resources, market information, and digital tools that could enhance their efficiency. Persistent network problems, such as frequent disconnections and slow connections, present a formidable challenge to the successful adoption of ICT practices among Agro dealers. These challenges echo the conclusions drawn by the Ministry of Communication and Transport and Information (2006), which report that poor network especially in rural areas remain a challenge to technology adoption.

Furthermore, the study's findings show that the irregular availability of electrical power serves as a hindrance for Agro dealers as they endeavor to incorporate and utilize ICT tools within their business framework. These observations are closely aligned with the conclusions drawn from ZICTA's 2015 ICT Survey report, which highlighted that a mere 33.1 of households in the country are connected to the national power grid. Moreover, the ongoing deficit in power supply has resulted in certain regions of the nation grappling with a lack of cellular network coverage, thereby restricting the scope of potential ICT advancements that could be created and utilized.

c) *Theme 3: Effects of ICT Adoption on Efficiency*

The research examined the multifaceted effect of Information and Communication Technology (ICT) adoption among Agro-dealers, aligning itself with the perspective championed by Barba-Sanchez et al. (2007). This perspective underscores the pivotal role of ICT in enterprise success, emphasizing its capacity to create new business opportunities and enhance overall operational efficiency. In concurrence with this perspective, the study unearthed compelling evidence of the transformation brought about by ICT adoption.

A noteworthy finding of this research is the significant improvement in task completion rates attributed to the integration of ICT. This discovery resonates with the observations made by Cardona et al. (2013), who also emphasized the instrumental role of ICT in expediting task fulfillment, thereby bolstering overall productivity. An illustrative example of this phenomenon is the streamlining of advertising processes, a key aspect that aligns closely with the research findings by Jaas (2022). Jaas's work not only underscores the role of ICT in creating demand for goods and services but also highlights its facilitative impact on the distribution and sale of these offerings to end customers.

Moreover, this research contributes to the growing body of knowledge by substantiating the positive correlation between ICT adoption and heightened customer satisfaction. This alignment with prior research conducted by Jaas (2022) and Tetey (2013) emphasizes the role of strategic ICT implementation in elevating customer interactions and overall organizational performance. Additionally, the

study unveils the enhancement in service delivery practices brought about by the integration of ICT tools, a finding that resonates with the research conducted by Mwila and Ngoyi (2019). Mwila and Ngoyi's work similarly established a positive link between investments in ICTs and the augmentation of service delivery. Notably, the study also sheds light on the improved relationships with suppliers arising from ICT adoption, a phenomenon in accordance with the research conducted by Bhalerao and Patil (2021) and Rothwell (1994). These studies also recognize ICT as a catalyst for fostering robust connections between internal business processes and suppliers within an organization, underscoring the overarching role of ICT in enhancing business relationships and performance.

VI. CONCLUSION

This research analyzed the barriers hampering the adoption of Information Communication Technology (ICT) among Agro dealers in selected districts within Zambia's Central Province. The study was operationalized by establishing the extent of ICT adoption, identifying barriers to its uptake, and exploring the effect of ICT integration on the operational efficiency of Agro dealers. The study employed an explanatory mixed-method approach and used structured questionnaires and interviews for data collection.

Through an in-depth analysis of the factors at play, five primary barriers emerged as significant obstacles to the widespread adoption of ICT by Agro dealers in the selected districts. Firstly, the substantial cost associated with acquiring necessary equipment was identified as a critical impediment. The financial burden of procuring ICT devices and infrastructure poses a substantial challenge, particularly for small-scale Agro dealers who often operate on limited budgets. Secondly, the cost of internet bundles was identified as another key barrier. The reliance on affordable and reliable internet connectivity is pivotal for the effective use of ICT tools. The high costs of data packages deter Agro dealers from fully engaging with digital platforms and services, limiting their potential to access market information, engage with customers, and manage their businesses more efficiently. A third barrier is the issue of poor network coverage. Inadequate or inconsistent network connectivity restricts Agro dealers from utilizing ICT tools seamlessly. This limitation not only hampers real-time communication but also inhibits the adoption of digital platforms that rely on stable and high-speed connections for effective operation.

Collectively, the findings underscore the transformative power of ICT adoption in Agro-dealer operations, pointing toward a more efficient way of conducting their businesses. Through the use of technology and leveraging on its potential, Agro-dealers in the selected districts can position themselves for

sustained growth, improved competitiveness, and enhanced contributions to the agricultural value chain. However, it is important to recognize that successful ICT adoption requires careful planning, training, and ongoing support to fully harness its benefits. This study serves as a valuable foundation for future research and policy considerations aimed at optimizing the integration of ICT in the agricultural sector and beyond.

VII. RECOMMENDATIONS

Based on the insights and conclusions drawn from the study, several key barriers to the adoption of Information and Communication Technology (ICT) among Agro dealers have been identified. To foster the integration of ICT tools among the operations of Agro dealers, the following recommendations are proposed:

- *Revise the National ICT Policy:* In light of the barriers uncovered by this study, it is recommended that the national ICT policy be revised to effectively address the high cost of ICT equipment identified as a significant barrier. Among the policy's outlined objectives and strategies for enhancing ICT integration in the agriculture sector, it is evident that the challenge of high ICT equipment costs remains unaddressed, despite its recognition in this study as a major barrier to ICT adoption among Agro dealers. By proactively addressing this challenge within the policy framework, it has the potential to serve as a powerful catalyst for encouraging Agro dealers to embrace ICT solutions.
- *Tailored ICT Solutions:* ICT service providers should develop customized ICT applications and packages tailored to the unique characteristics and needs of Agro dealers. These solutions should be cost-effective, streamlined to support daily operations, and user-friendly. Additionally, a focus on creating mobile-based applications is crucial, considering their widespread usage and convenience among enterprises.

Disclosure of interest

The authors declare that there are no conflicts of interest pertaining to the research, authorship, or publication of this article. We affirm that the research conducted and the findings presented in this manuscript are devoid of any financial, personal, or professional relationships or affiliations that could potentially bias or influence our objectivity in the research process, data analysis, or the presentation of results.

Declaration of funding

The authors wish to declare that no external funding, grants, or financial support were received for the design, execution, or analysis of the study presented in this article. The research was solely conducted with internal resources, and the authors have not received any financial contributions or incentives from any

external entities that could potentially influence the research process or outcomes.

Data availability statement

The data supporting the findings of this study is publicly available and can be accessed at the University of Zambia library. Additionally, datasets pertaining to the institutions that were investigated in this research are also accessible through the respective institutions' data repositories or archives. Researchers interested in accessing and utilizing this data for further analysis or validation are encouraged to refer to the University of Zambia library's data repository or contact the relevant institutions directly.

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