EFFECT OF ICT INNOVATION ON MICROFINANCE PERFORMANCE TO RWANDA: A CASE STUDY AB BANK RWANDA PLC (2018-2021)

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EFFECT OF ICT INNOVATION ON MICROFINANCE PERFORMANCE TO RWANDA: A CASE STUDY AB BANK RWANDA PLC (2018-2021)

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ABSTRACT

The study aimed to assess the effect of ICT innovation on the microfinance performance to Rwanda. Specifically, the study was to assess determinants of ICT innovation in AB Bank Rwanda Plc, to analyze the indicators of Microfinance performance in AB Bank Plc before and after ICT innovation, and to identify the relationship between ICT innovation and microfinance performance in AB Bank Rwanda Plc. The study adopted a descriptive research design. The study population was 19 AB Bank Rwanda Plc, Gisozi main branch staffs and 1740 customers; a sample of 84 respondents was selected from staff and clients using purposive sampling and simple random sampling. Both primary and secondary data was used. Data were gathered using questionnaires and documentary review. Data was analyzed using descriptive statistics and presented by frequency tables and percentage. Pearson coefficient correlation (R) was used in the study to establish relationship that exists between variables. Findings shows that software and computerized accounting system (98.8%) and branch networking (89.3%) are the most used determinants of ICT innovation within AB Bank Rwanda Plc. The others determinants such as internet banking (79.8%), digital financial services (86.9%) are simply used also within AB Bank Rwanda Plc. From findings it showed that 73.7% of staffs, 89.2% of staffs confirmed respectively that portfolio quality and financial efficiency and productivity, and 100% of staffs confirmed that financial profitability and sustainability are the microfinance performance indicators. Results also show that profitability of indicators of bank are: Net profit margin, Return on assets (ROA), and Return on equity (ROE). Findings showed that 100 % of staff's respondents consider strong positive relationship between ICT innovation and performance of AB Bank Plc. Results further showed that the coefficient of correlation (R=0.987) is greater than 0.5 and close to one. This indicates that there is a positive and strong relationship between ICT innovation and financial sustainability and profitability of AB Bank Plc. The study recommended that AB Bank PLC should upgrade technology to adjust to customer's requirements by investing in development and equipping current facilities and technology with various purposes to familiarize to customers' demands in its all clients are not satisfactorily informed about it.

Key words: *ICT Innovation and Microfinance Performance*

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INTRODUCTION

A microfinance that must participate in speedily developing markets with rapidly growing technology need to innovate. Lacking innovation, it turns the risk of being surpassed through competitors. Microfinance may irregularly underrate the problems modeled by that one of competitors. Competitors who reply to probable matters also have an important risk of this trendy(Abernathy & Utterback, 2005). Product innovation is more relevant in the contemporary global and dynamic competitive environment, mostly as a result of three fundamental trends: intense global competition, fragmented and demanding markets, and diversified and rapidly emerging technologies(Teece, 2003).

Microfinances are better positioned to create a sustained competitive advantage if they offer goods that are supplied to the requirements and expectations of the target market and companies sell those goods more rapidly and efficiently than their competitors(Calantone, 2005). Knowledge, technological competence, and experience are all essential sources of competitive advantage as new things are developed(Teece, 2003; Tidd , 2001). Microfinance institutions must function as an engine for an ICT-driven economy. The history of industrialized countries has sufficiently demonstrated the necessity for governments to move from drafting industrial strategies to those that are operated by ICT innovation. Evidently, effective industrial policy holds microfinance concerns about innovation efforts and encourages enterprises to establish a culture based on innovation(Goh, 2002).

The method by which technical improvements are made is referred to ICT innovation(Goh, 2002). The ability to produce unique products and services or use unique manufacturing techniques is increased by a number of processes that make up the innovation process. In this way, the concept of flow of technology discovery, application and distribution is connected to the concept of ICT innovation. In innovation process, the term "technical improvements" is frequently used interchangeably with phrases like "technological change," "technological progress," "technological development," and "innovation." Typically, industrial economists classify the three stages of technical innovation as invention, innovation, and diffusion.

ICT innovation is commonly related to both pure and applied research as well as technological improvement because statistics on R&D investment are freely available(Roehm & Sternthal, 2001). In management literature, the technical innovation process has been discussed using the same language. However, in recent years, there has been a change in focus, and new words such "organizational learning" (Nelson&Winter, 1996),"knowledge making"(Nonaka & Takeuchi, 2005), and "routine making"(Nelson &Winter, 1996)are preliminary to be employed.

The growth of dynamic capability, core competency, and asset accumulation were all mentioned in 2001 (Teece *et al*., 2007) . Since they all describe the flow of new knowledge production within microfinance, these words all refer to phenomena that are related to the process of technical innovation. The words "learning" and "knowledge production" are normally used to refer to the innovation process. Microfinances develop new technological knowledge through a process of persistent learning (Rogers, 2005). Furthermore, it has been recognized that the innovation process in microfinances primarily comprises the development of new routines since the conversion of an organization's activity into routine provides the main form of packing of that organization's unique operational knowledge(Nelson&Winter, 2012).

Additionally, the process of innovation has been connected to the growth of both core competencies and dynamic capacity. ICT developments have reignited interest among academics studying the interest of consumer innovations(Moore, 2009). Robertson(2011) based on how they impact behavior and social organization, separates innovations into three

categories: continuous, dynamically continuous and discontinuous. Since ICT innovations are most likely to drop under the discontinuous innovation classification, they might be categorized as knowledge-intensive innovations(Moore, 2009). Technology considerations likely influence the knowledge needed to recognize ICT innovation.

According to Rogers(2005), Technology consists of both software component and hardware element. While the software component is the knowledge basis, the hardware component represents technology as a material or physical item. Even though it is frequently less evident than the hardware component of technology, the software component should however be considered when conducting technological research(Rogers, 2005). Consumers may need to combine their knowledge from multiple areas in order to fully understand the innovations given the hardware-software mix prominent in ICT innovations; in other words, both hardware and software knowledge would be necessary, in line with Rogers' distinction.

According to Schumpeter (2009), Technology pushes and demand pull or its combination, have been mentioned to as innovation's substances in the situation of ICT change. Theoretical inquiry has more newly in the 2000s, removed to the view of ICT innovation as an interface between a network of microfinances characterized by the systems combination and networking model(Argote, 2009). Microfinance institutions' performance has been compressed by ICT innovations made by those institutions. Online account opening, electronic money transfers, internet banking, ATM deposits and withdrawals and mobile banking technology are among the topics covered. All of these ICT innovations make important contributions to the increase of their client, capital and profitability, all which have an influence on financial performance(Argote, 2009).

Schumpeter (2009) explained that the ability of technological advancement to change an industry's competitive dynamics may limit the effectiveness of technology push. In other words, because of the quick bound of technological change, firms have a wide range of options from which to determine their technology strategy. Demand pull also falls short of providing a comprehensive explanation in cases where customers lack the necessary insight into potential future outcomes in a world with new items or systems. According to Hamel & Prahalad(2004), innovations result from collaboration for the integration of talents and competencies when fighting for the future market. Organizational learning is defined as the process through which an organization and its personnel build a knowledge base of action-outcome linkages relevant to its activities and technologies(Argote, 2009).

These information sources are denoted to as technological knowledge(Bohn, 2004). When ICT knowledge bases grow more comprehensive through learning, it is said to be mature knowledge(Bohn, 2004). Bohn(2004)when developing his concept of knowledge maturity, places a major accent on what he looks to as technological knowledge. ICT knowledge can improve from total illiteracy to mature knowledge when microfinance members discover, make errors, make conclusions and acquire (Bohn, 2004). There are several free learning alternatives with substantial recompenses available to those who lack ICT competence. Organizations with undeveloped technological knowledge pick up the low-hanging fruit quickly and experience significant productivity gains, whereas organizations with developed technological knowledge must search more carefully for learning opportunities, work harder to exploit them, and enjoy smaller returns to learning(Utterback, 2004).

Benchmarking, financial ratio analysis, performance review against budget, or any combination of these methods are frequently used to assess the performance of microfinances and other financial institutions (Barley, 2000). Most performance research and discussion is based on the widely-held assumption that improving performance will improve an organization's operations and activities.

The research on performance and techniques for measuring it in the fields of finance and management has greatly advanced. It may be said that the three primary factors to improve performance for microfinance institutions are the institution's size, asset management, and operational effectiveness(Bijker, 2007). Chien *et al*. (2004) shown that most past research on assessing corporate performance has primarily examined operational effectiveness and efficiency, which could have a direct attitude on a firm's survival.

Their study's empirical conclusion is that a company' s efficiency is not always a good indicator of its effectiveness. It does this by using a revolutionary two-stage data envelopment analysis technique. In a newspaper titled "Efficiency, Customer Service and Financing Performance between Australian Financial Institutions". Jolly(2007) showed a strong link between all financial performance measures, including as interest margin, return on assets, capital adequacy, and customer satisfaction scores. Additionally, microfinance recognized the social trend toward environmental realization as an opportunity for microfinance. Later, they created certain credit products, mortgages, and green or socially responsible funds that invest in companies that support the environment or sustainability(Jolly, 2007).

ICT developments have been incorporated by microfinance organizations to enhance service, effectiveness and product quality. ICT developments continue to give to budgeting, risk management and credit management(Nystrom, 2009). Commercial banks and other financial institutions offer corporate and retail banking services, but very few of them, usually the larger banks, also offer other services like investment banking. The important seeming growth of ICT driven banking services is one of the significant trends. Banking is shifting away from an over-reliance on traditional banking rooms and toward diverse platforms made possible by ICT, especially telecommunications. This is beginning to posture a danger to banks because it has allowed non-bank competitors to evade them by providing cheap money transfer services(The Kenyan Banking Sector Report, 2007).

Banks are now pursuing a new approach that involves investigating underdeveloped yet lucrative markets including mortgage lending and SME banking, among others. The gap between historically large banks and smaller banks is significantly eroding in terms of product offers. In an effort to keep up with global development, enhance the spreading of customer service and lower transaction costs, banks deeply invest in ICT and widely build ICT networks for delivery a wide variety of value-added goods and services. With AB Bank Rwanda Plc as case study, this study's core objective is to assess the Effect of ICT innovation on microfinance performance in Rwanda.

Statement of the Problem

ICT innovation has a straight influence on microfinance performance, which has been a crucial opinion of much modern research in operations development and operations learning(Upton&Kim, 2009). Microfinance need to have strong processes in place to deal with unexpected situations in order to keep microfinance operations and decrease risks, rendering to strategic management in the banking industry. ICT innovation is one of the main causes of change that has meaningfully compressed how good microfinance is performing.

Although these improvements, there are quiet several difficulties to ICT innovation in microfinance institutions. They regularly fight to familiarize new technologies for innovation since they lack the essential human capital, scientific information and technical abilities, normally makes it tough for Microfinance institutions to involve in innovation progress through research and development as the financial benefits of their innovation hard work are rapidly lost. Since there hasn't been much study done in this field, this study looked on how Rwanda's microfinance institutions had performed since the outline of ICT innovation.

Objectives of the Study

The general objective of this study was to establish the effect of ICT innovation on microfinance performance to Rwanda period of 2018-2021, a case study of AB BANK RWANDA Plc. Specifically the study aimed at the following objective:

- To assess determinants of ICT innovation in AB Bank Rwanda Plc.
- To analyse the indicators of Microfinance performance in AB Bank Plc before and after ICT innovation.
- To identify the relationship between ICT innovation and microfinance performance in AB Bank Rwanda plc.

The study was guided by the following research hypotheses

- Internet banking, branch networking, digital financial services, computerized accounting system and clients satisfaction are determinants of ICT innovation of AB Bank Rwanda Plc.
- Portfolio quality, financial effectiveness and productivity, financial sustainability and profitability are Indicators of microfinance performance of AB Bank Rwanda Plc.
- There is a positive relationship between ICT innovation and microfinance performance in AB Bank Rwanda plc.

LITERATURE REVIEW

This section presents literature review linked to influence of ICT innovation on Microfinance performance. In this chapter, the study reveals the work done in the preceding researches, scholars and authors basing on the precise subject in study. You may discover these in books, journals, online literature, and other published resources that are related to the variables being studied.

Definition of Key Terms

ICT Innovation

Roger(2009) defined ICT innovation as a company that employs technology in unique ways to create even more effective organizations and to better connect technology initiatives with microfinance objectives. ICT innovation can take a variety of forms. For instance, enhancing software to reach a wider audience or utilizing desktop virtualization to enhance manageability and save system expenses. Additionally, it can convert company procedures into computerized ICT operations. Many microfinances create innovation teams from several business areas in an effort to institutionalize the innovation process. Usually, this is referred to as revolution management. It encourages the steady, long-term growth of inventive proficiency. Other firms rely on individuals to function in an environment where innovation is strengthened. Many claim that innovation has become a buzzword that no longer has any actual meaning. Since ICT innovation can be challenging to quantify, many organizations associate ICT innovation with the return on investment of ICT expenditure.

Determinants of ICT Innovation

The process of ICT innovation at the firm level depends upon a number of inter-related determinants which vary across all sections of a firm and is strongly influenced by the relationship of many components in the firm's external environment. This section presents the following ICT innovation determinants: Internet banking, branch networking, digital financial services, computerized accounting system and clients' satisfaction(DeYoung, 2005; Dang, 2011).

Internet Banking

According to DeYoung(2005), internet banking is to provide customers access to their bank accounts via a web site and to allow them to pass certain transactions on their account, given agreement with tough security authorizations. Internet Banking is described as the delivery of banking services over the internet according to the Federal Reserve Board of Chicago's Office of the Comptroller of the Currency Internet Banking Handbook. Internet banking by its environment offers more accessibility and suppleness to customers coupled with effectively total control over their banking services. Service distribution is informational like notifying

customers on bank's products, and transactional which is conducting marketing banking services.

Branch Networking

Dang(2011) describe branch networking as the computerization and inter-connecting of geographically dispersed separate bank branches, into one combined system in the form of a Wide Area Network or Enterprise Network; for the creating and sharing of associated customer information. It offers faster rate of inter-branch relations as the result of distance and time are removed. Therefore, there is further efficiency per time period. Similarly, with the some networked branches helping customer masses as one scheme, there is replicated separation of labor between bank branches with its related positive impact on efficiency between the branches. Moreover, as it restricts customer travel distance to bank branches it offers added time for customers' prolific activities.

Digital Financial Services

Electronic payments through electronic channels including in electronic banking products and services. Keivin *et al.* (2011) explained that it is an umbrella term for the procedure by which a customer may achieve banking transactions electronically without visiting any banking institution. According to Aragba-Akpore(2008),digital financial services refers to several types of services through which a bank's customers can demand information and carry out greatest retail banking services through computers or mobile phones. Berger &Wharton(2007) describe digital financial services as an electronic connection among the bank and customer in order to formulate, accomplish and control financial transactions.

Computerized Accounting System

A computer based system which associates with accounting principles and concepts as well as the perception of information system to record, process, analyses and provide financial information to its users for creation economic decisions is known as Computerized Accounting Systems(Gelinas *et al.,* 2005). According to Bernd (2007), the utilization of computers is time-saving for microfinances and all financial information for the microfinance is well prepared so that the Computerized Accounting Systems are significant to microfinances in several ways such as time and cost minimization, organization and precision, storing and speediness and easy delivery of financial information. According to Otero & Rhyne (2009), microfinance is the delivery of financial services to low income poor and very poor entrepreneurial people.

Clients Satisfaction

A term normally used in marketing is client's satisfaction. It is a degree of how products and services provided by a company encounter or exceed customer expectancy. According to Gustafsson *et al.* (2006), customer satisfaction is explained as a customer's general assessment of the performance of a contribution to date. This general satisfaction has a strong positive effect on customer trustworthiness intentions through a wide range of product and service classes.

Microfinance Performance

The return on assets (ROA) and operational self-sufficiency ratios are the two accounting metrics that are specifically used to measure performance(Yaron, 2002, Yaron 2004). The subject is whether or not microfinance can use its earning income to pay for operating expenses. Performance in the microfinance sector serves as an objective measure of how efficiently the sector can use resources to achieve its goals. It is a complex perception for which there is no solid definition. Effectiveness and efficiency are components of performance as a whole. The ability to accomplish organizational goals at the lowest feasible cost is measured by the latter, whereas this ability is measured by the former. The microfinance discussion states that the industry's dual objectives are to serve as many low-income individuals as possible while continuing to be profitable.

Non-financial constraints are frequently utilized to assess performance because microfinance is primarily considered as a tool for social transformation. The financial position of these initiatives has seemed to be dominated by the concept of social performance. However, in microfinance studies, outreach and financial success have typically been attached(Ledgerwood, 2009; Yaron *et al*., 2008).

Indicators of Microfinance Performance

Capital Adequacy

Capital is one internal factor that impacts the microfinance's financial success. Capital is the steady supply of the bank's own funds needed to maintain operations and act as a safety net in trying situations(Athanasoglou *et al.,* 2005). The capital of the microfinance provides liquidity for the microfinance due to the sensitivity of deposits and the possibility of microfinance runs. Due to the microfinance's increased capital resources, the likelihood of misery is decreased(Azam &Siddiqoui, 2012).

Asset Quality

The third element that influences financial performance in a microfinance bank context is asset quality. The bank's assets consist of current assets, credit portfolios, fixed assets, and other investments. The bank's growth is influenced by its age(Athanasoglou *et al.,* 2005). Loans from the bank are a key asset that generates the majority of its income. Loan portfolios are the primary source of revenue for commercial banks. The capacity of the bank's loan portfolio determines its financial performance. The greatest risk for banks is losses from lending(Dang, 2011). Various financial ratios are used by many academics to evaluate the performance of banks. For all commercial banks, maintaining reasonable levels of non-performing loans is a major concern. This is so because a high percentage of non-performing loans negatively impacts the health of the banks' finances. For banks, a low rate of non-performing loans is a trustworthy indicator of the portfolio's soundness. Dang (2011) stressed that the bank's performance improves when the ratio decreases.

Management Efficiency

Management effectiveness is one of the primary internal factors that affect bank profitability. As indicators, many financial metrics like total asset growth, loan growth rate, and earnings growth rate are used. According to Dang (2011),an additional aspect of management quality is operational effectiveness in managing operating expenses. The subjective evaluation of the company's management techniques, organizational structure, control mechanisms, staff quality, and other elements is widely used to qualitatively communicate the success of the company. Financial ratios can be used to evaluate a company's effectiveness at allocating resources, maximizing revenue, and cutting operational costs. The statistic employed to evaluate the efficiency of management is the operational profit to income ratio(Athanasoglou *et al.,* 2005).

Liquidity Management

Liquidity is another factor that impacts a bank's performance. Liquidity is the ability of the bank to fulfill its obligations, mostly to depositors. The profitability of banks is positively correlated with adequate liquidity(Dang, 2011). The two financial ratios that are most typically used to assess a bank's liquidity situation are the ratio of customer deposits to total assets and the ratio of total loans to customer deposits. Other scholars have used different financial ratios to evaluate the liquidity situation of the bank. Ilhomovich*(*2009) analyzed the cash to deposit ratio to determine how liquid Malaysian banks were. However, a research conducted in China and Malaysia found no link between bank performance and levels of liquidity(Said &Tumin, 2011).

Theoretical Framework

Technology Acceptance Model (TAM)

The information systems technology acceptance model includes the network of all statement channels within the institution. According to the

hypothesis, a number of factors affect users' decisions over how and when to use new software when it is introduced to them. The model describes how people utilize and hold a technology (Davis, 2006). Davis (2006) came up with the idea to explain proper computer usage behavior and how IT impacts how employees cooperate at work. According to TAM theory, perceived utility and perceived affluence of use are the key factors that determine how someone intends to use a system and whether or not they will really use it.

The system's perception by adjacent users and observers also influences how aware they are of it(Nida, 2006). The demand for ICT in MFIs depends on how user-friendly and effective it is, both of which will eventually lead to an increase in ICT use in terms of behavior. In order to explain why users choose to use an information system, the concept acknowledges factors that influence users' decisions to accept or reject data.

Technology Adoption and Diffusion of Innovations Theory (TADIT)

The "diffusion of innovations" theory aims to provide light on how, why, and how quickly novel ideas and scientific advancements spread among civilizations(Rogers, 2009). Diffusion is the process through which a new idea spreads over time through certain channels among the members of a social organization (Rogers, 2009). According to the model, innovation is any novel concept, behavior, or object that a person finds novel. Inventions are spread through routes of figure and interactive(Rogers, 2009).

Diffusion of Innovation Theory

A common method used in information systems research to describe how well new technologies are received by users is Rogers'(2009) Diffusion of Innovation theory. According to Rogers(2005), the process of "conveying an innovation over time among members of a social society through certain routes" is called diffusion (Rogers, 2005). A fresh idea or creation is referred to as an innovation (Rogers, 2005).

The relative advantage, compatibility, complexity, trial ability of an innovation all has an effect on its rate of spread. According to Rogers(2005),the degree to which an innovation is judged to be superior than its predecessor is known as relative advantage. According to TAM's perceived ease of use definition, complexity is the extent to which a potential user perceives an invention as being relatively difficult to use and understand. Compatibility is the extent to which an invention is regarded as being consistent with the adopters' pre-existing values, beliefs, experiences, and requirements. Trial ability is the extent to which a concept may be investigated on a restricted basis(Rogers, 2005).

Empirical Review

ICT is quickly taking over as the backbone of the nation's new banking industry, according to Aragba-Akpore, who wrote on its use in Nigerian banks in a 2008 essay. He noted initiatives by All States Bank Limited and Diamond Bank Limited that strive to modernize the banking sector, such as the Electronic Smart Card Account (ESCA) and Diamond Integrated Banking Services (DIBS). Ovia (2000) discovered that the importance of using information technology in the Nigerian banking sector has increased, and that the sector's ICT expenditure is significantly higher than that of any other industry. He claimed that the development of websites by some of them demonstrated how Nigerian Internet banking had become simpler thanks to online platforms. He also learned that banks now allow customers to handle their accounts at any location, regardless of where the account is registered.

It is feasible to conduct transactions in the modern world without using currency. According to a study conducted in Nigeria by Irechukwu (2000), the usage of ICT has revolutionized some banking tasks such as account creation, client account mandates, transaction processing and recordkeeping. Nantel (2000) given attention to the demand-side of electronic/online bill paying. Research on consumer demographics objectively as opposed to the studies

listed above. The author finds that, among other features, electronic bill payers are often older, female, higher-income, and homeowners. Agboola*(*2001) Researchers looked at how computer automation affects banking services in Lagos and discovered that Electronic Banking significantly improved how some banks there provided for their customers.

The study, however, was restricted to Nigeria's commercial center and only examined six banks. He compared banks from the old and new generations and discovered differences in the adoption of automated technology. The primary goal of online banking research has been to comprehend the factors that affect bank adoption and how technology has affected bank performance. The ability of a microfinance to foster organizational innovation depends on its ability to thrive in the knowledge-based economy. Technology innovation serves as the primary criterion and technique of comparison amongst logistics service providers. Commercial banks' operations will improve thanks to the use of current technology. They should utilize cutting-edge information technology in the age of e-commerce to increase their capacity for service(Agboola*,* 2001).

According to Furst *et al (*2002), If a U.S. national bank was larger, younger, affiliated with a holding company, situated in an urban area, had higher fixed expenses, and generated more non-interest income, then it was more probable that it would offer transactional websites. Many emerging and developed countries use ICT tools in the banking sector, including automated teller machines, smart cards, telephone banking, MICR, e-funds transfers, e-data sharing, and electronic home and office banking (Agboola, 2002). Furst *et al. (*2002) claims that the use of information technology and social networking has transformed how banks and other financial companies operate. Some assert that the financial services industry will undergo significant structural changes as a result of the Internet revolution, while others believe that current trends will persist.

Information and communication technology has enabled self-service facilities (automated customer service devices) so that potential customers can complete their account opening papers online. It assists customers with account number verification and provides details on how and when to receive their checkbooks, credit cards, and debit cards (Agboola*,* 2002). The use of ideas, methods, guidelines, and implementation strategies from information and communication technology to banking services, has grown to be a subject that affects all banks on a fundamental level, is essential for maintaining local and global competitiveness (Agboola*,* 2002).ICT directly affects how the banking business makes decisions, plans, and provides products and services.

It has continued to change how banks and their business relationships are organized globally, as well as the variety of cutting-edge solutions available to boost service delivery quality and efficiency(Agboola*,* 2002). Despite recent increases in attention to innovation in the service sector, the majority of studies on innovation focused on the manufacturing sector(Agboola*,* 2002). Sebastian&Lawrence(2004) emphasized that Customer focus in banking services is their study's definition of customer relationship management. The objective of banks should be to draw in new clients while keeping their existing ones. If the banking industry is to increase the value of the services it provides, it must employ technology effectively and efficiently while keeping an eye on both the cost of the product and the services offered.

Modern banking should use marketing strategies and technical advancements that enable banks to maximize revenues through satisfied customers in order to draw customers. Offering clients value is the only way to achieve complete, long-lasting customer happiness in a market with fierce competition. DeYoung *et al. (*2007) show that internet use enhanced the profitability of U.S. community banks, primarily through deposit-related costs. This brings up how well internet

banks perform. According to Hernando & Nieto(2007), online banking has historically been associated with lower costs and greater profitability. Both evaluations come to the same conclusion: the internet channel complements existing bank branches rather than displaces them.

The empirical research on SBCs has focused on the effects of SBCS on credit availability as well as the factors that affect bank acceptance and spread of this technology. Two studies have statistically assessed the variables that influence the likelihood and timing of large banks adopting SBCs. Frame *et al*. *(*2001) and Akhavein *et al*. *(*2005) determine that the choice to adopt is significantly influenced by organizational structure. Banking organizations adopted more frequently and did so early if they had fewer bank charters and more bank branches. This demonstrates that large banks used SBCs more frequently if their organizational structure was more "centralized."

The majority of SBC's technology users continue to be large banking organizations. However, a recent study found that local banks are increasingly using the principal owner's consumer credit score(Berger *et al.,* 2007). The significant increase in personal Internet use in the 1990s opened the door to the possibility of a new organizational structure in banking: the Internet-only bank. As of the middle of 2002, there were roughly 35 Internet-only banks operating in Europe, and another 20 in the United States(Delgado *et al.,* 2007). However, practically all of these banks in Europe were affiliated with already-established institutions, but in the US, they were typically new companies. This may be the reason why the majority or all of the U.S. banks that solely operate online either closed their doors or went out of business (via acquisition, liquidation, or closure).

DeYoung(2005) indicates that internet de novo banks are less profitable than traditional de novo banks because of low business volumes (fewer deposits and smaller non-interest income) and high labor costs. This indicates that click and mortar technology is the dominant one. The author does point out, though, that due to scale effects, the differences in financial performance quickly close over time. Delgado *et al.(*2007) also found that scale economies based on technology are displayed by European Internet banks. Berger *et al.(*2007) they found that these innovations have a moderate influence in their assessment of the effect of bank innovations on Kenyan commercial banks' income.

The authors suggested that the government implement a strategy that would provide incentives for technology transfer from more developed economies in order to promote the adoption of cutting-edge products. The adoption of innovations boosts bank profits, which creates more jobs and raises the country's GDP, promoting the general macroeconomic goals of the government(Delgado *et al.,* 2007). Concerning how innovations affect bank performance, Delgado *et al. (*2007) despite having discovered contradictory information, they came to the conclusion that financial innovation had a major impact on bank performance.

Cooper & Schindler *(*2001) in their research to determine whether bank innovations have an impact on Kenyan commercial banks' profitability and found that they did. The entire impact of the bank innovations in this research must be statistically significant in order to statistically explain the profitability of commercial banks in Kenya. Banks in Kenya have enhanced their capacity to earn money and control costs for more than ten years with the introduction of technology like mobile banking, online banking, and most recently agency banking.

Research Gap

This chapter has reviews of numerous studies, papers, books, journals, and newspapers. When all of the previously mentioned factors are taken into consideration, it becomes clear that the effects of technical improvements on income have a minimal impact on microfinance's income. Because technological innovation is actively and continuously acknowledged, more incentives should be provided for research and development

to motivate academics to keep committing their time and talents to uncovering new technological improvements. Policies that provide incentives for technology transfer from more developed economies should be implemented in order to promote the adoption of excellent ideas. The adoption of innovations boosts bank profits, which creates more jobs and raises the country's GDP, promoting the general macroeconomic goals of the government. Technology developments have an impact on bank profitability, and these advancements statistically had a big impact on profitability.

This demonstrates that the researches statistically significant study of the overall effect of technological developments in explaining bank earnings. For more than ten years, banks have incorporated technologies like mobile banking, internet banking, and most recently agency banking to boost their earning potential and reduce costs. Banking has a far greater budget than any other industry, and its usage of ICT has become more and more reliant on it. Online systems have simplified Internet banking, as evidenced by the fact that some of them have created websites. Customers now have the option to manage their accounts in any location, regardless of the account's domicile, thanks to banks.

It is feasible to conduct transactions in the modern world without using currency. Because of people's drastically expanded usage of the Internet, the possibility of a new organizational structure in banking, the internet only bank has emerged. Online banks are less profitable as a result of low business volumes and high employee costs. However, due to scale effects, the performance gaps quickly disappear over time. This showed the information gap that this study was trying to fill. In order to assess the impact of ICT innovation on microfinance performance, this study was really applied in AB Bank Rwanda on the basis mentioned previously.

METHODOLOGY

Research Design

According to Adèr *et al. (*2008), a structure developed to support the achievement of research objectives is known as a research design. Sekaran & Bougie *(*2009), outlined research design as the overarching plan for answering the study questions. The goals of this study were met by using a descriptive research approach. Doyle*(*2004)stated that a collection of techniques for obtaining data and soliciting responses from respondents to a preset set of questions is what is meant by a descriptive study investigation. A descriptive research design was used since the study was more interested in understanding the problem in depth than in generalizing the findings to the community. The detailed investigation in this instance aimed to find or contradict an established theory. In order to fully explore the study's variables and meet its objectives, a correlational research design also was used to measure the relationship between variables.

Quantitative methodologies were used to quantify the problem and understand how it might be projected for a larger population because they are definitive in nature. According to Creswell & Plano-Clark *(*2007), the quantitative approach to data analysis uses a variety of mathematical and statistical tools. Quantitative approaches concentrate on precise and clearly defined questions when examining the relationship between two events where the second event is a result of the first event. Qualitative research techniques were also used to cover the study's qualitative component. According to Martens*(*2005), by asking probing questions, qualitative approaches aim to uncover the underlying motivations and aspirations of an event and attempt to explain how and why they occurred. It was possible to analyze the results across the study's numerous sections because the non-numerical variables (respondents' thoughts and ideas about the variables) required the use of qualitative approaches.

Source of Data

Primary data were gathered utilizing questionnaire approaches, and secondary data were also gathered. To collect secondary data, these tools were augmented by an examination of the available documentation. Below are the presets for these instruments and an explanation on how to use them.

Instruments of Data Collection

Questionnaire

A questionnaire served as the primary instrument for data collection and was used to obtain first-hand information from respondents. According to Martens*(*2005), in order to collect information from a respondent, a questionnaire is a collection of questions. Sekaran*(*2005) described a questionnaire as a research tool composed of a series of questions used to collect data from respondents. Both closed-ended and open-ended questions were incorporated into the study. Questionnaires were placed on the AB Bank Ltd premises and collected up later after the respondents filled them in order to provide respondents ample time to finish the forms and express their views and opinions in a methodical manner.

Documentary Review

Documents as data sources for a subject that is the focus of a specific study(Bridget & Cathy 2005). Document reviews assist in obtaining secondary data for the study to support the primary data from the field by analyzing the data available in various text books, journals, and organization reports. Furthermore, this method offers the researcher the access on the use of financial statements data, which would be difficult to uncover using other resources.

Study Population

Ngechu(2004)described a study population as a group of individuals, objects, or elements that share at least one attribute and from whom measurements are taken. As a result, the study population for this research consisted of 19 staff and 1740 customers of AB Bank Rwanda Plc, Gisozi main Branch.

Sampling Technique

Purposive sampling was employed to locate participants in this study. AB Bank Rwanda Plc respondents were selected through the use of a purposive sampling and simple random sampling technique. Saunders *et al*. (2007)assert that the combination of purposive sampling and simple random sample procedures allowed for greater attention to be placed on respondents who were most relevant to the study and had some prior knowledge of the variables. Purposive sampling was used because the study wanted to collect information from people who are largely relevant to the study's variables. This allowed for the selection of respondents who could help the study's goals.

Sample Size

According to Cooper & Schindler(2001), a sampling technique is a framework the researcher employs to assist in the selection of a sample as that portion of a population, which is why it comprises of any sub-group taken from the target population. A sample is an element chosen to represent the population (Kombo and Tromp,2009). Purposive sampling was used in this occasion to select a sample of 19 responsents from the staff of AB Bank Rwanda Plc, Gisozi Main Branch to discover which one could help the study's objectives be met.

The respondents were chosen based on their own logic, judgment, intelligence, and experience. And the sample size of customers of AB Bank Rwanda Plc, Gisozi Branch constituted by 65 respondents.

Therefore, the sample size for this research was calculated using Cochran;s formula as follows:

$$n=\frac{z^2*p*q*}{e^2}$$

Where: $n=\frac{1.65^2*0.5*0.5*1740}{0.1^2(1740-1)+1.65^2*05*05} = 65.5 \approx 65$

n= Sample size, N= Size of population, z= Coefficient of normal distribution, p= probability of success, q= probability of failure, e= margin errors. Basing on the above formula, the study used 90% as the confidence level, which according to Cochran is

more reliable. Thus, p= 0.5, q= 0.5, d= 10%= 0.1, z= 1.65

65 respondents from among AB Bank Rwanda Plc's, Gisozi Main Branch customers, chosen using simple random sampling, make up the sample. Applying the Cochran;s formula on the study population of 1,740 customers plus 19 respondents from staffs, we obtained n= 84, which represents the sample size.

Data Analysis

To ascertain the effect of ICT innovation on the of microfinance performance, this research consider both quantitative and qualitative data that were coded, collected, analyzed using SPSS and presented using frequencies and tables. In addition descriptive statistics like Mean, Frequency, and Percentages on the respondent's traits, regression analysis was utilized to evaluate and anticipate the relationship between the predictor factors and the dependent variable. The following model was used:

Test of Significance

A Pearson coefficient Correlation (R) was used in the study to evaluate the linear relationship that exists between ICT innovation and microfinance performance. The coefficient of determination (R2) was used to show the percentage for which each independent variable explaining the change in dependent variable. Analysis of variance (ANOVA) was also used to test the significance of the model at 95% significance level. The following regression model was used for the purpose of the analysis:

$Y = \alpha + \beta 1X1 + \beta 2X2 + \beta 3X3 + \beta 4X4 + \beta 5X5 + e$

Where:

Y= Microfinance performance (financial sustainability and profitability),

X1 indicates Internet banking accessibility, X2 shows branch networking, X3 indicates digital financial services, X4 indicates software and computerized accounting system, X5 indicates customer satisfaction,

α indicates constant,

1, 2, 3, and 4 indicate coefficients to estimate,

e symbolizes error term.

RESULTS AND DISCUSSION

The Determinants of ICT Innovation in AB Bank Rwanda Plc

This section analyses and interprets findings from the data collected through questionnaires submitted to the respondents selected from the employees. All questions asked were analyzed and interpreted basing on objectives of the study. The study proposed to assess the effect of ICT innovation on microfinance performance in Rwanda by determining the ICT determinants and its relationship to the performance of AB Bank Plc during the period of study.

The Time and Extent of Introduction of ICT in AB Bank Plc

To understand how long and with which extent ICT has been introduced and used in AB Bank Plc, staffs were separately asked on the ICT introduction period while the client's respondents were asked to certify if, considering the services and products they received from AB Bank Plc, they find the results of ICT innovation. The details of findings are shown in the table below:

Table 1: Respondents' view on the introduction of ICT in AB Bank Plc

Staffs		
	Frequency	**Percentage**
Less than 2 Years	0	0
Between 2-4 Years	0	0
5 Years and above	19	100

Findings revealed that concerning the time ICT has been introduced in AB Bank Rwanda Plc, 100% of sampled staff testify that ICT in AB Bank Rwanda Plc has been used about 5 years and above. This implies that AB Bank Rwanda Plc has a good index, this is in conformity with Keivin *et al.* (2011) who specified that in banking institutions, ICT in now-a-days is not a matter of convenience but a survival factor. If microfinances, mostly public sector do not renovate their business by introducing ICT in its all aspects, their existence will become challenging.

The determinants of ICT innovation in AB Bank Rwanda Plc

In banking institution, ICT uses the newest technologies to process and communicate information. Electronic banking accessibility, branch networking, digital financial services, software and computerized accounting system technologies were taken as determinants of AB Bank Rwanda Plc.

Table 2: Respondents' view on the determinants of ICT innovation in AB Bank Rwanda Plc

Determinants	Frequency	Percentage
Internet Banking	67	79.8
Branch Networking	75	89.3
Digital Financial Services	73	86.9
Software&Computarised Accounting System	83	98.8

Findings shows that software and computerized accounting system (98.8%) and branch networking (89.3%) are the most used determinants of ICT innovation within AB Bank Rwanda Plc. The others determinants such as internet banking (79.8%), digital financial services (86.9%) are simply used also within AB Bank Rwanda Plc. These findings show that AB Bank Rwanda Plc mostly invested in ICT in all components. This is a good index for AB Bank Rwanda Plc and should impact positively on its competition with others financial institutions in the country and on its performance.

The findings on ICT determinants are in familiarity with Riggins & Weber(2016)who stated that competition forces MFIs to finance in ICT to realize increased efficacy and quality service delivery, to alleviate costs and increase efficiency to achieve customer needs and to boost their profitability.

Internet banking accessibility within AB Bank Rwanda Plc

Table 3: Respondents' view on the use of determinants of ICT in AB Bank Rwanda Plc

	Staffs		Clients	
	Frequency	Percentage	Frequency	Percentage
Agree	17	98.5	55	84.6
Disagree	2	10.5	10	15.4
Total	**19**	**100**	**65**	**100**

The findings from respondents in table 3 present if in AB Bank Rwanda Plc use internet banking is accessible. These findings confirm that 89.5% agreed that AB Bank Rwanda Plc has the internet banking while 10.5% others disagree for that option whereas 84.6% of clients respondents agree for the internet banking whereas 15.4% disagree for this option.

We concluded that the staffs are adequately informed on internet banking accessibility in AB Bank Rwanda Plc as well as the clients. This is an indicator that this determinant of ICT is used in AB Bank Rwanda Plc in the way that it is evidently visible in the services and products the clients receive in AB Bank Rwanda Plc. These results are enough confirmed by the findings on the kind of

internet or electronic banking accessible in AB Bank Rwanda Plc services and products.

Extent use of Electronic Banking Services and Products in AB Bank Rwanda Plc

Respondents were asked to identify exactly what kind of electronic banking services and products AB Bank Rwanda Plc offers to its customers, the respondents chose as follows:

Table 4: Respondents' view on the electronic banking services and products AB Bank Rwanda Plc offers to its customers

Electronic Banking Services &Products	Employees		Clients	
	Frequency	Percentage	Frequency	Percentage
PC Banking	0	0	58	89.2
Online Banking	0	0	38	58.5
Phone Banking	0	0	37	56.9
All the Above	19`	100	15	32.1

From the data presented, it is important to notice that an important portion of respondents confirm that among these mentioned electronic banking services, all of them are used within AB Bank Rwanda Plc. That affirmation explains the reason why the internet banking accessibility was highly used in AB Bank Rwanda Plc as result of ICT innovation.

The finding also shows that the staffs are satisfactorily informed on internet banking accessibility in AB Bank Rwanda Plc as well as clients. Even though, are at the different level, both staff and clients agree that the most characteristics of electronic banking usage in AB Bank Rwanda Plc are PC banking and online banking. The results confirm also the fact that AB Bank Rwanda Plc invested enough in ICT innovation which give to AB Bank Rwanda Plc's growth in future. This is supported by Keivin *et al.* (2011) who stated through the electronic banking, potential customers and big companies are shifting their accounts from traditional banks to fully computerized banking system (E-banks).

Table 5: **Respondents' views on the extent use of branch networking in AB Bank Rwanda Plc**

Responses	Staffs		Clients	
	Frequency	Percentage	Frequency	Percentage
Agree	11	57.9	37	56.9
Strongly Agree	8	42.1	14	21.5
Disagree	0	0	5	7.7
Strongly Disagree	0	0	7	10.8
Not Sure	0	0	2	3.1
Total	**19**	**100**	**65**	**100**

Based on the findings in table 5, 42.1% and 57.9% respondents from staffs respectively strongly agree and agree that there is a branch networking within AB Bank Rwanda Plc. And also 21.5% and 56.9% of clients' respondents respectively strongly agree and agree that ICT system of branch networking exists in AB Bank Rwanda Plc. 10.8% and 7.7% of them respectively strongly disagree and disagree the existence of branch networking in AB Bank Rwanda Plc while 3.1% of them say to be not sure for that statement. The analysis shows that system of branch networking is already exist in AB Bank Rwanda Plc and confirm precisely the results above. AB Bank Rwanda Plc has invested massively in

branch networking and this is a good index in line with TSB(2014)who argued that the future of banking lies in branches and technology-enabling clients to bank where they want, how they want and when they want.

Table 6: Respondents' views on the use of digital financial services at AB Bank Rwanda Plc

	Frequency	Percentage
Agree	81	96.4
Disagree	3	3.6

Findings show that 96.4% of all respondents agree to the existence of digital financial services within AB Bank Rwanda Plc whereas 3.6% of them are not sure for the affirmation. This actual situation of AB Bank Rwanda Plc on digital financial services that boosts its services and products strategies. The Digital Financial Services comprises mobile financial services (MFS) used to access banking services and financial transactions. It comprises the broad range of financial services accessed and provided through digital channels, as well as payments, credit, savings, transfers and insurance, mobile phones, Point of Sale, electronically enabled cards, tablets and any other digital system (Keivin *et al.* 2011).

If AB Bank Rwanda Plc wants to be competent in the future, it must think strongly to its capacity to fulfill the actual customer needs, this is supported by TSB(2014) which argued that for bank, this capacity to meet that customer needs is crucial because the customers are adopting mobile and digital banking at a step we have never seen previously.

The findings on digital financial services lead the study to maintain that within AB Bank Rwanda Plc there is a use of digital financial services. This is a good guide because, by referring on BNR(2015)financial stability report, it is shown that in Rwanda, the mobile banking technology is playing a big role to increase electronic payments and encourage the access and usage of financial services and products by growing the usage of mobile financial services and E-banking products(BNR,2015). Today, the mobile financial services like Mobile money in Rwanda is the fastest; easiest and most cheap way to send money to anybody; anywhere in Rwanda which interest many users particularly from the distant area. Currently, microfinances and other financial institutions have already spent in digital financial services.

Table 7: Respondents' views on the use of software and computerized accounting system in AB Bank Rwanda Plc

	Staffs	
	Frequency	Percentage
Agree	19	100
Disagree	0	0

Findings show that 100% of staff respondents agreed that software and computerized accounting system is used within AB Bank Rwanda Plc while none of staff's respondents replied otherwise to this statement. Computerized accounting system is highly used within AB Bank Rwanda Plc which explains a good and rapid services oriented to the customers as reported. In five years ago, AB Bank Plc there was "Perfect" as software. This contributes greatly on the performance of AB Bank Rwanda Plc, this also is supported by Teece(2013) who argued that the use of computers is time-saving for businesses and all financial information for the business is well organized so that the computerized accounting systems are central to businesses in different ways such as time and cost savings, organization and precision, storage and rapidity and easy delivery of financial information.

Client's satisfaction of AB Bank Rwanda Plc services and products

Respondents were asked to provide their views on client's satisfaction of AB Bank Rwanda Plc services and products, and the following table presents their views:

Table 8: Respondents' views on the client's satisfaction of AB Bank Rwanda Plc services and products

Methods	Frequency	Percentages
Assurance	53	81.5
Reliability	61	93.8
Empathy	59	90.7
Responsiveness	49	75.4
Tangibility	44	67.7

Findings show that client's satisfaction in AB Bank Rwanda Plc stands as follow: assurance (81.5%), reliability (93.8%), empathy (90.7%), responsiveness (75.7%) and tangibility (67.7%). AB Bank Rwanda Plc should pay more attention on each one of them in order to improve the quality of services and products to their clients asserting with the lowest to the highest characteristic in percentage of satisfaction. These findings are in conformity with Parasuram *et al.* (*(*2005) who stated ten criteria of service quality used by consumers in evaluating service quality and combined them into five broad dimensions of customer satisfaction evaluation.

The indicators of Microfinance Performance in AB Bank Before and After ICT Innovation

After analyzing the ICT determinants within AB Bank Rwanda Plc, the study intended to assess the effect of ICT innovation on microfinance performance in Rwanda by analyzing the AB Bank Rwanda Plc's indicators of financial performance before and after ICT innovation. In analyzing the level of performance of AB Bank Plc, the study assessed the performance before and after ICT innovation as depicts in the following table:

Table 9: Level of performance of AB Bank Rwanda Plc during the period of study

Level of Performance	2018	2019	2020	2021
Interest Income	3,621,355	4,599, 717	4,050,749	4,407,235
Net Interest Income	1,735,140	1,513,841	1,644,161	2,565,768
Net Operating Income	1,897,600	3,403,860	1,685,499	4,984,450
Profit of the Year	(1,176,639)	(288,306)	(1,975,677)	1,581,199

Source: AB Bank Plc, annual financial reports, 2018 to 2021

Considering the ICT innovation within AB Bank Plc, interest income during the three years has changed considerably as it affect also Net interest Income of the bank. The main factor of this reduction is the covid-19 pandemic and all the consequences related to it. Since the effectiveness of a company depends on its capability to achieve its goals and objectives, its performance cannot be left to chance, but has to be planned. For a successful performance, directed business operations should be performed. To that end, management has to be in possession of high-quality information, which is in the domain of budgeting. Ross *et al*. *(*2005) indicated that the net profit margin shows a return on every unit of sale after taking into account both cost of sale and expenses.

The Profitability Indicators of AB Bank Rwanda Plc

To achieve the second objective of this study, financial statements were analyzed to examine the profitability indicators of AB Bank Plc. The analysis was based on the financial statement provided

during the period from 2018-2021. Respondents were asked to illustrate the profitability of indicators of bank which are: Net profit margin, Return on assets (ROA), and Return on equity (ROE) as discussed below:

Table 10: Profitability of AB Bank Plc during the last years

Years	2018	2019	2020	2021
ROE	18.05%	13.35%	14.5%	22.39%
ROA	10.35%	7.15%	9.44%	17.3%
Net Profit Margin	-	-	-	0.54

Source: AB Bank Rwanda PLC, annual financial reports, 2018 to 2021

Table 10 shows that for 1 Rwf invested by AB Bank Plc shareholders generated returns on equity of 18.05% of total returns in 2018 and 13.35% in 2019, 14.5% as net profits in 2020 while the amount generated in 2021 was 22.39%. From these results is shown that the ROE of AB Bank Plc reduced from 2018 and the same explanation is given of this reduction as due to recent changes in economic conditions which occurred during the period of study. Despite this reduction, the value of ROE was positive indicating that AB Bank Plc was able to produce positive and adequate earnings. Moreover, these results demonstrate that AB Bank Plc maximized profits. Ross *et al*. *(*2005) stressed that ROE measures how much the company is earning after tax for each dollar invested in the company.

Findings in table 10 shows the profits earned from total assets. From the table, it was established that ROA was 10.35% in 2018 and 7.15% in 2019, 9.44% in 2020 while it was 17.3% in 2021. This indicates that 1 Rwf invested in assets by AB Bank Plc in assets generated 10.35% of their returns as net profit in 2018 while the amount generated 7.15% in 2019, 9.44% in 2020 and 17.3% in 2021. These findings show that there was a changing return on assets over time in the period study whereby there was a positive return on assets during the period of study.

These results agree with Van Horne*(*2005) who indicated that the return on assets of corporate firms can be measured to identify whether the total assets are idle or not and stated that the higher ratio in relation to the industry average ratio shows that the total assets are having much return to the investors and the lower ratio compared to the industry average shows that the company's assets are idle. Van Horne*(*2005) added that in general terms, a higher ratio indicates better profit and efficiency in the utilization of the assets of the firm while the lower ratio is the indicator of inefficiency in the use of the company's assets.

Table 10 shows that the profitability of AB Bank Plc reduced over years due to the pandemic, as from 2018 to 2020 there was no profit margin means that the company experience losses, but in the following year 2021, a unit change of revenue generate an increase of net profit by 54% of their returns. Ross *et al*. (2005) indicated that the net profit margin shows a return on every unit of sale after taking into account both cost of revenues and expenses.

The influence of ICT on performance indicators of AB Bank Rwanda Plc

Analysis of influence of ICT on microfinance performance indicators of AB Bank Rwanda Plc. Table below displays the following results:

Table 11: Respondents' view on the on microfinance performance indicators of AB Bank Rwanda Plc

	Staffs	
Indicators of Microfinance Performance	**Frequency**	**Percentage**
Financial Profitability and Sustainability	19	100
Portfolio Quality	14	73.7
Financial Efficiency and Productivity	17	89.2

From findings staffs of AB Bank Rwanda Plc are aware of indicators of microfinance performance as shown by 73.7% of staffs confirm portfolio quality, 89.2% of staffs confirm financial efficiency and productivity, and 100% of staffs confirm financial profitability and sustainability are the financial performance indicators influenced by ICT innovation. Therefore, these financial indicators are not influenced by ICT at the same level. For the staff respondents, the ICT innovation influences firstly on financial sustainability and profitability, secondly on financial efficiency and productivity and finally on portfolio quality. This is in line with Kimata*(*2013)who established that ICT innovation is a major contributor to financial performance of financial institutions.

Table 12: Respondents' view on the influence of ICT innovation on microfinance performance indicators of AB Bank Rwanda Plc

	Staffs	
Indicators of Microfinance Performance	**Frequency**	**Percentage**
Portfolio Quality or Loan Repayment	14	73.7
Financial Efficiency	19	100
Financial Profitability and Sustainability	19	100
Productivity	12	63.2

Findings revealed that the majority of staffs of respondents agreed to a very great extent that ICT innovations contributed to productivity (63.2%), financial profitability and sustainability (100%), financial efficiency (100%) and portfolio quality or loan repayment (73.7%).

This also is supported by Teece*(*2003) who argued that the use of computers is time-saving for businesses and all financial information for the business is well organized so that the computerized accounting systems are central to microfinances in different ways such as time and cost savings, organization and precision, storage and rapidity and easy delivery of financial information.

The Relationship Between the Determinants of ICT Innovation and Microfinance Performance Indicators of AB Bank Rwanda Plc.

After analyzing the ICT determinants in AB Bank Plc and the AB Bank Plc's indicators of financial performance before and after ICT innovation, the study intended to measure the relationship between the determinants of ICT innovation and microfinance performance indicators of AB Bank Rwanda Plc.

Comparison of the situation before and after ICT utilization in AB Bank Rwanda Plc

Table 13: Respondents' view on the comparison of the situation before and after ICT innovation in AB Bank Rwanda Plc

	Staffs	
	Frequency	**Percentage**
Agree	**19**	**100**
Disagree	**0**	**0**
Total	**19**	**100**

After comparing the condition before and after ICT innovation in AB Bank Plc, findings show that 100% of all staff respondents agree that ICT innovation have a high influence to the AB Bank Plc's performance compared to the previous situation (without ICT innovation). These results are supported by Kamau*(*2014) who carried out a study on the effect of ICT on the financial performance of microfinance institutions and concluded that there was a positive correlation between ICT innovation and financial performance of MFI's.

Relationship Between ICT Innovation and Microfinance Performance of AB Bank Rwanda Plc

Table 14: Respondents' view on relationship between ICT innovation and microfinance performance of AB Bank Rwanda Plc

	Staffs	
	Frequency	**Percentage**
Agree	19	100
Disagree	0	0
Total	**19**	**100**

Findings in table 14 show that 100 % staffs respondents consider strong positive relationship between ICT innovation and performance of AB Bank Plc. Furthermore, to prove this relationship between ICT innovation and performance of AB Bank Plc, the study used a regression analysis whereby the coefficient of determination and the coefficient of correlation were obtained and interpreted. The following tables display the model summary, regression coefficients analysis and the correlation between ICT and performance (Y) of AB Bank Rwanda Plc.

Statistical Relationship Between ICT Innovation and Microfinance Performance of AB Bank Rwanda Plc

To establish the relationship between ICT innovation and microfinance performance, regression analysis was used to obtain the Pearson Correlation coefficient and the coefficient of determination as depicted in the table below.

Table 15: Model summary

Model	R	R-square	Adjusted R-Square	Std. Error of the Estimate
1	0.987a	0.976	0.974	512.96865

a. Predictors: (Constant), Internet banking, Branch networking, Digital financial services, Software and computerized accounting system, Clients' satisfaction indicators

Results in table 15 provide both the coefficient of determination (R^2) and the coefficient of correlation (R). The coefficient of determination (R^2=0.976) explained the explanatory power of the model and indicates that 97.6% of variation in the microfinance performance of AB Bank Plc is being explained by the variation in the explanatory variables such as internet banking accessibility, branch networking, digital financial services, software and computerized accounting system and clients satisfaction indicators. The results show that internet banking accessibility, branch networking, digital financial services, software and computerized accounting system and clients satisfaction indicators positively predict the variation on microfinance performance of AB Bank Plc as adjusted R Square equal to 0.974 which means 97.4% the independent variable (ICT innovation) predict the variation of dependent variable (Microfinance performance of AB Bank Plc expressed by financial sustainability and profitability in the model).

But, the R^2 of 97.6% indicates that there are other variables that affect the financial sustainability and profitability of the AB Bank Plc which are not captured by the model formulated in the study that account for about 2.4% variation not explained by the model. This great portion of variation is due to the fact that AB Bank Plc invested greatly in ICT. The coefficient of correlation (R=0.987) is greater than 0.5 and close to one. This indicates that there is a positive and strong relationship between ICT innovation and financial sustainability and profitability of AB Bank Plc. These findings are in

line with Musa *et al.* (2012) in their study to assess the impact of investment in information and communication technology on performance and growth of microfinance institution.

Table 16: ANOVA

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	181.728	4	45.431	5.254	0.001[a]
	Residual	553.342	63	8.645		
	Total	735.070	67			

The analysis of variance in table 16 shows that the independent variables are statistically significant in predicting the dependent variable. This is in view of the p-value of 0.001 thus, the model overall is a good fit. The f-ratio tests whether the regression model is fit in the data. The ANOVA finding expose that F calculated is 5.254 while F critical or from F table is 2.48.

Since the value of F calculated is greater than F critical (5.254>2.48) this implies that the overall regression model was significant.

Table 17: Coefficients

Model	Unstandardized Coeff		Standardized Coeff	t	Sig
	B	Std. Error	Beta		
Constant	694.602	607.787		1.142	0.260
Internet Banking	2.183	8.363	0.661	4.982	0.00
Branch Networking	3.231	10.541	0.008	-0.306	0.760
Digital Financial Services	5.964	13.387	0.014	0.445	0.658
Software and Computerized Accounting System	7.438	15.143	0.065	0.733	0.056
Clients 'Satisfaction Indicators	9.544	17.513	0.060	0.674	0.044

The model equations as indicated by table above become:

Y=694.602+2.183X1+
3.231X2+5.964X3+7.438X4+9.544X5

Where; **Y=** Microfinance performance, X1=Internet banking, X2=Branch networking, X3= Digital financial services, X4= Software and computerized accounting system, X5= Clients' satisfaction indicators.

The results tabulated above indicate that all (X) values are positive which means that there is positive relationship between ICT innovation and microfinance performance determined here by the profitability and sustainability of microfinance institutions specifically in AB Bank Rwanda Plc. That means the existence of a proportion of change of profitability and sustainability of AB Bank Rwanda Plc that results in the change of one of the predictors specified for the model.

From the table 17, it is shown that the coefficient of internet banking accessibility shows a positive relationship with the microfinance performance indicators represented by financial sustainability and profitability. Internet banking accessibility of 2.183 indicating that a change in new input in internet banking access will increase the microfinance performance by approximately 2.183.

Accordingly, the coefficient of branch networking of 3.231 indicates a positive relationship with the AB Bank Plc's profitability and financial sustainability. The value of 3.231 shows that an increased percentage in branch networking of the AB Bank Plc generates an increase in the values of the financial sustainability and profitability by 3.231 units when this ICT determinant is used. The coefficient of digital financial services of 5.964 indicates a positive

relationship with the AB Bank Plc's performance. The value of 5.964 shows that an increased percentage in digital financial performance of the AB Bank Plc generates an increase in the values of the financial sustainability and profitability by 5.964 units when this ICT determinant is used.

The coefficient of software and computerized accounting system of 7.438 indicates a positive relationship with the AB Bank Plc's financial performance. The value of 7.438 shows that an increased percentage in software and computerized accounting system of the AB Bank Plc generates an increase in the values of the financial sustainability and profitability by 9.544 units when this ICT determinant is employed only. The coefficient of clients' satisfaction indicators of 9.544 indicates a positive relationship with the AB Bank Plc's performance. The value of 9.544 shows that an increased percentage in clients satisfaction of the AB Bank Plc generates an increase in the values of the financial sustainability and profitability by 9.544 units when this ICT determinant is employed only.

The study reports the existence of positive and strong relationship and effect between ICT innovation and performance of AB Bank Rwanda Plc. The strength of the impact is positively strong due to the high investments made by AB Bank Plc in ICT. These findings are in line with are Kipesha (2013) who studied the impact of ICT on efficiency and financial sustainability of MFI's. He found the correlation results imply ICT has a positive impact on efficiency and sustainability as they move in the same direction. He concludes the strength of the impact was found to be high investments in ICT among microfinance institutions.

CONCLUSION AND RECOMMENDATIONS

This study analyzed the effect of ICT innovation on microfinance performance in Rwanda with case study of AB Bank Rwanda Plc. It was carried out for the period from 2018 to 2021. The study did a descriptive research design and used both qualitative and quantitative methods to find out how ICT innovation affects performance of microfinance in Rwanda. It was carried out on the sample size of 164 respondents selected by purposive sampling technique and simple random sampling technique. It used both primary and secondary data collected using questionnaires and documentary review. Their hypotheses were verified by regression analysis model using the Statistical Package for Social Sciences (SPSS).

This study found that ICT had been introduced and used in AB Bank Plc about 5 years and above. Among five determinants of ICT in the study (internet banking accessibility, branch networking, digital financial services, software and computerized accounting system and clients 'satisfaction, the study reported that only software and computerized accounting system and branch networking are the most used determinants of ICT in AB Bank Plc. While, clients 'satisfaction is likewise highly significant in AB Bank Plc, all determinants of dependent variable (portfolio quality or loan repayment, financial efficiency and productivity, financial profitability and sustainability are the performance indicators influenced by ICT innovation but not at the same level. ICT affect firstly on financial sustainability and profitability, secondly on financial efficiency and productivity and finally on portfolio quality. The study reported also on the relationship between the predictor variables ICT determinants and the dependent variable (Microfinance performance). The results confirmed a positive and strong relationship between ICT innovation and microfinance performance of AB Bank Plc represented in the regression model by financial sustainability and profitability of AB Bank Plc. With positive coefficients, the findings of the study revealed that ICT innovation move in the same direction with the microfinance performance. Thus, the strength of the impact was found to be very high due to the investments in ICT made by AB Bank Rwanda Plc.

Based on the findings suggestions, the study suggested that:

- AB Bank Plc should upgrade technology to adjust to customer's requirements by investing

in development and equipping current facilities and technology with various purposes to familiarize to customers' demands in its services and products distribution such as: electronic banking, internet banking because all clients are not satisfactorily informed about it.

- AB Bank Plc should integrate ICT in management accounting to interlink its business activities and its stakeholders and the general public because this will help the microfinance to achieve its goals and objectives, to perform well and achieve significant productivity gains.
- Due to importance of branch networking as a computerization and inter-connecting of geographically dispersed separate bank branches into one combined system for the creating and sharing of associated customer information, and it offers faster rate of inter-branch relations. AB Bank Plc should invest massively in branch networking because some clients are not aware other are not sure about the networked branches, this will combine masses customer as one scheme, replicated separation of labor between bank branches with its related positive impact on efficiency between the branches, and it will restricts customer travel distance to bank branches.

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