IMPACT OF TECHNOLOGICAL INNOVATION WITH PRODUCTS AND PROCESSES ON BANKING IN MYANMAR

A Thesis submitted by

Steven Linn

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Abstract

The developments in the information and communication technology sector have had a significant impact on the banking sectors in many parts of the world including Myanmar. Despite a history of political and economic turbulence in the past, Myanmar's banking sector has been at the forefront in the adoption of modern technologies to facilitate the delivery of banking services. The aim of this study was to determine the impact of technological innovation with products and processes on banking in Myanmar with a focus on profitability, operational efficiency, and customer satisfaction and loyalty among banks in Myanmar. In order to determine the impacts of technological innovations on Myanmar's banking sector, a mixed methods approach was adopted involving a survey of 205 bank customers and in-depth interviews with 8 senior managers of four banks in Myanmar. A structural equation model approach was adopted to assess the impacts of the technological innovations on customer satisfaction and customer loyalty while the thematic analysis of interview data revealed the impacts on profitability and operational efficiency. The findings of this study reveal a strong positive and significant correlation between usage of technological innovations, perceived usefulness of the innovations, perceived service quality, and customer satisfaction and loyalty ($p<0.05$). Similarly, technological innovations were found to have a positive impact on profitability of banks in Myanmar by increasing the banks' revenues and reducing the cost of service delivery. Technological innovations were also found to have a beneficial role in boosting operational efficiency of Myanmar banks by improving the quality of service, speed of service delivery, dependability of services, cost savings, economies of scale, employee productivity, improved communication, and compliance with "know-your-customer" (KYC) practices. Overall, the findings of this study demonstrate a positive role of technological

innovations in the performance of banks thus suggesting a need for greater innovation among Myanmar banking institutions.

Key words: technological innovations, banks, Myanmar, electronic banking, customer satisfaction, customer loyalty, profitability, efficiency

Certification of Thesis

This Standard Thesis is entirely the work of Steven Linn except where otherwise acknowledged. The work is original and has not previously been submitted for any other award, except where acknowledged.

Principal Supervisor: Dr. Shane Zhang

Associate Supervisor: Dr. Lujer Santacruz

Associate Supervisor: _____

Student and supervisors signatures of endorsement are held at the University.

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Abbreviations

ANA	Australia and New Zealand Banking Group Limited
ATM	Automated Teller Machine
AVE	Average Variance Extracted
AYA	Ayeyarwady, Bank
BIDV	Joint Stock Commercial Bank for Investment and Development of Vietnam
CAPEX	Capital Expenditure
CB	Co-operative Bank
CFA	Confirmatory Factor Analysis
CRM	Customer Relationship Management
DEA	Data Envelopment Analysis
EFA	Exploratory Factor Analysis
EFT	Electronic Funds Transfer
EPS	Earnings Per Share
GDP	Gross Domestic Product
ICBC	Industrial and Commercial Bank of China
ICT	Information Communication Technology
IDT	Innovation Diffusion Theory
KBZ	Kanbawza Bank
KYC	Know Your Customer
MAB	Myanmar Apex Bank Ltd
MEB	Myanmar Economic Bank
MIS	Management Information System
MPCU	Model of PC Utilization
MADB	Myanma Agricultural Development Bank

MFSPs	Mobile Financial Services Providers
MFTB	Myanma Foreign Trade Bank
MICB	Myanma Investment and Commercial Bank
MMK	Myanmar Kyat
MVA	Market Value Added
MWB	Myawaddy Bank Ltd
OCBC	Oversea-Chinese Banking Corporation Ltd
OECD	Organisation for Economic Co-operation and Development
PEOU	Perceived Ease of Use
PSQ	Perceived Service Quality
PU	Perceived Usefulness
ROA	Return On Assets
ROE	Return On Equity
TAM	Technology Acceptance Model
TTF	Task Technology Fit
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action
USD	United Stated Dollar
UTAUT	Unified Theory of Acceptance and Use of Technology
SCT	Social Cognitive Theory
SEM	Structural Equation Modeling
SOB	State-Owned Bank
SPSS	Statistical Package for the Social Sciences
SWIFT	Society for Worldwide Interbank Financial Telecommunication

CHAPTER ONE

INTRODUCTION

1.1. Background

The banking sector in many parts of the world today is characterized by intense competition for customers. In order to become more competitive than the other players are, banks have resulted to the adoption of new technologies that enable cost reduction and operational efficiency (Ilo et al., 2014). Banks that are technologically advanced have better capacity to meet customer needs, lower operating costs, and efficient operations. These factors contribute to an enhanced competitive position. Although the banking sector in Myanmar is still at infancy stage, competition among existing banks has been a key driver of technological innovation in the country's banking sector.

Myanmar's past military regime history meant that the country did not have a properly functioning financial system for fifty years since the 1960s. Instead, the country has had a rudimentary banking sector for a bigger part of its recent history. Myanmar's banking sector was aggravated by the 2003 banking crisis that led to collapse of some leading banks. The surviving banks refocused on supply of transaction services rather engaging in provision of credit and financial intermediation (Turnell, 2009). However, the banking sector in Myanmar got a lifeline since the reforms initiated in 2011 by the Thein Sein government. Since 2011, the financial services sector in Myanmar has enjoyed critical legislative reforms and considerable progress has been achieved towards modernizing the country's banking sector. An important element of the developments in Myanmar's banking sector has been the adoption of new technologies and innovations (Turnell, 2014).

Technological innovation has become a key factor in the survival of banks in the highly competitive financial services market. Most banks in Myanmar have leveraged on technology to improve the efficiency of their operations. Banks have also used technological innovation to enhance their products and services in order to maintain a competitive position in the highly competitive banking sector. Technological innovation refers to the development of new products, services, and processes using technology (Rosli and Sidek, 2013). It may also refer to the conception of new products, services, or processes are as well as the improvement of existing ones (Drucker, 2013). In the banking sector, technological innovation entails the process of inventing new products and methods of organizing the operations of a bank.

Financial institutions have adopted technological innovation as a strategy of enhancing their competitive advantage, as the banking sector becomes more competitive (Kubbr, 2007). Technological innovation contributes to a bank's competitiveness by facilitating the reduction of overheads through automation. Automation activities such as online banking and mobile banking enable banking organizations to serve their customers with minimal staffing costs. In addition to cost reduction, technological innovation further result in efficiency of operations and this improves customer satisfaction. According to Akhisar et al. (2015), technological innovation enhances the operational efficiency of banks particularly in developing countries where banks are able to leverage on new technology to enhance their modes of operations. Moreover, innovative technologies have enabled financial institutions to develop products that are responsive to the dynamic demands of the modern consumers (Davila et al., 2009). Technological innovations could also promote the capacity of organizations to enhance their strategic positioning and subsequently the ability of firms to maintain their competitiveness (Drucker, 2013).

Technology has played a key role in the development of the banking sector. One of the major technological innovations of the 20th century was the development of the automated teller machine (ATM) in the United States in 1969 (Lerner, 2006). The ATM technology revolutionized the banking system as customers no longer needed to visit banking halls to conduct financial transactions. In the past two decades, the development of internet technology has become the mainstay of banking innovation. Digital technologies and electronic banking systems have now removed the need for face-to-face bank-customer interactions. Today, numerous financial transactions such as checking the account balances, placing standing orders, requesting for credit, bank transfers, and making of payments can be done without the face-to-face interaction with the bank. Therefore, technological has become a key determinant of the performance of banks.

Technological innovation in the banking sector is primarily driven by increased competition. In highly competitive business environments, organizations that innovate are able to have superior performance compared to its competitors. According to Yildirim and Philippatos (2007) rivalry between banks play a major role in pushing the banks towards the exploration of ways of differentiation their products from those of competitors. In addition to the competitive nature of the banking sector, financial innovations in the banking industry have also been motivated by developments in the computer and telecommunication technologies. Moreover, private as opposed to public ownership, institutional ownership, laws, and corporate governance have also been shown to stir technological innovations in the banking sector (Ferreira et al., 2010; Aghion et al., 2009).

Technological innovations have revolutionized the banking business and therefore the impacts of technological innovation on banks have been explored in many parts of the world. For instance, Malhotra and Singh (2009) explored the impact on technological innovations on

Indian banks and found that banks that adopted new technologies were more profitable, had lower administrative expenses, had higher asset quality, and had higher efficiency in their operations. Siam (2006) found that electronic banking in Jordan improved customer satisfaction in addition to contributing to long-term cost savings. Al-Mabrouk and Soar (2009) while studying Libya established that there was a positive association between technological innovations and return on assets. Ilo et al. (2014) explored the impact of technological innovations on service delivery in the Nigeria's banking sector. The study found a positive association between technological innovation and customer satisfaction.

In Myanmar, technological innovations have been a key aspect of the operations of banks. Myanmar banks have adopted new technologies in efforts to cut down on operational costs as well as to improve their efficiency. One of the major technological innovations adopted in Myanmar's banking sector is internet banking, which is expected to cut down the costs of doing business and improve operational efficiency. Internet banking facilitates the access to banking services from remote locations. This technology has removed the limitations of the traditional bank branch model by allowing customers to access their accounts on a 24-hour basis. Electronic banking has the potential to enable banks to lower the costs of doing business as well as facilitating convenient access to bank services (Safeena et al., 2011). Customers are now able to view account balances, request bank statements, and initiate transactions. Therefore, banks that are fast in adopting these technologies stand to gain a competitive edge over their competitors.

Despite the global scholarly interest on the impact of technological innovation on banking, no studies yet have explored how technological innovation affects the Myanmar's banking sector. This is primarily due to the poorly functioning nature of Myanmar's banking sector following years of political turmoil. However, the recent few years have seen a growth

in the country's banking sector and an increase in the adoption of technological innovations. The current study sought to explore the impacts of technological innovation with respect to products and processes on the banking sector in Myanmar.

1.1.1 Banking industry in Myanmar

Myanmar's past political history has significantly shaped the banking industry. The country's banking industry has been characterized by lack of public trust following government interference in the banking sector and a series of economic crises that affected the sector. However, the banking sector in Myanmar has gone through significant reforms and growth since 2011 (Turnell, 2014).

The banking sector in Myanmar is tripartite in structure comprising of state-owned banks, semi-private banks, and private banks. In total, there are 28 banks operating in Myanmar. Much of the growth in Myanmar's banking sector is attributable to the domestic privately owned banks. In 2016, the total assets held by private banks in Myanmar were estimated to be 52 per cent while the value of banking assets held by non-private banks were valued at 48 per cent of the total asset base in the banking sector. The private banks also control higher market share in terms of loan books and total deposits. In 2016, 64 per cent of all the bank deposits in Myanmar were held by private banks. On a system-wide level, the total bank deposits in Myanmar have increased from US $8.2 billion in 2012 to US $19.2 billion in 2016. By 2019, bank deposits in the country are forecasted to exceed $36 billion (IMF, 2016). Despite the recent growth in its banking sector, Myanmar still lags behind when compared to other countries in the region. For instance, the country's extension of credit to the private sector was 18 per cent of the country's gross domestic product (GDP). This was much lower compared with neighboring countries. For instances, the Philippines has a credit

extension rate of 42% of the national GDP while Cambodia and Thailand have extension rates of 63% and 151%, respectively (Schellhase and Sun, 2017).

Three large private banks have dominated the banking sector in Myanmar over the years and have become to be invariously referred to as the Big Three (Schellhase and Sun, 2017). These include the Ayeyarwady, Bank, Kanbawza Bank, and the Co-operative Bank. The Kanbawza Bank (KBZ) is currently the largest bank in Myanmar by assets. The bank has an asset base of about $8 billion as well as the largest branch network. The Big Three banks have a combined market share of about two-thirds of all deposits and two-thirds of all loans in the country as well as a combined branch network of over 50% of all bank branches in Myanmar. The Big Three banks have been the major source of growth in the country's banking sector. For instance, the three banks grew by 60 additional branches between 2014 and 2016 while all the other banks in Myanmar only added seven branches. According to Schellhase and Sun (2017), the dominance of the three large banks in Myanmar makes it difficult for smaller banks to compete in the market.

In Myanmar, the state owns and controls four banks. These include the Myanmar Agricultural Development Bank, Myanmar Economic Bank, Myanmar Foreign Trade Bank, and Myanmar Investment and Commercial Bank (Turnell, 2014). Among the state-owned banks, Myanmar Economic Bank (MEB) is currently the largest with an extensive reach in many rural communities. The bank has about 9,000 staff and 350 branches. The state-owned banks in Myanmar have faced significant challenges that have it difficult for them to compete with the private sector banks. First, these banks have shown lack of transparency as most do not event report their financial performance. Second, the state-owned banks have failed to compete with the private banks primarily due to failure to invest in

information technologies. Moreover, state-owned banks follow government policies and regulations that are sometimes prohibitory to their mandates.

The semi-private or semi-official banks comprise of ten banks. These banks are owned partially by the state while some have close association with the government even though they are privately owned. Semi-private banks developed from reorganization of existing banking institutions by the government to serve certain purposes. For instance, the Sibin Thayaryay Bank was reorganized in 2013 and renamed Rural Development Bank with the mandate to support rural development initiatives. The Myanmar Fisheries and Livestock Development Bank was renamed Global Treasure Bank with an expanded capital to support enterprises beyond its previously agricultural base (Turnell, 2014). Other semi-official banks in Myanmar include the Myawaddy Bank, Innwa Bank, the Small and Medium Industrial Development Bank, Myanmar Citizens Bank Ltd., Myanmar Microfinance Bank Limited, Yadanabon Bank Ltd., Yangon City Bank Ltd., and Naypyitaw Sibin Bank Ltd (Schellhase and Sun, 2017).

The banking sector in Myanmar is regulated by the Central Bank of Myanmar. The Central Bank exercises supervision on the banks in addition to awarding licenses, engaging in general bank regulation, and ensuring that banks comply with laws and regulations in the banking sector. The state-controlled banking institutions operate under the direction of the government ministry in addition to being regulated by Myanmar central bank. The role of the Central Bank of Myanmar as the industry regulator was reinforced by the introduction of the Central Bank of Myanmar Law of 2013, which granted the central bank great independence (Turnell, 2014). Today, the banking sector in Myanmar is well-developed with competition among private banks being high. Technological innovation adoption has also been a key aspect of the country's banking sector.

1.1.2 Infrastructure Development

Telecommunication infrastructure is critical for the development of modern electronic banking systems. Although Myanmar remains one of the least developed Asian country in terms of infrastructure, it has made great progress in the past few years. The period between 2013 and 2017 witnessed rapid growth of Myanmar's telecommunications infrastructure. For instance, mobile penetration grew from 7% in 2013 to over 50% in 2015. Today, the country accesses internet and telecommunication services through fiber, towers, and broadband. Currently, there are over 32,000 kilometers of fiber and over 3,000 towers built around the country. There are over 14 million internet users representing 25.1% of the population. Mobile penetration is high with 47 million people having access to a cellular phone and an average of 87 subscriptions per 100 inhabitants (Central Intelligence Agency, 2019). Thus, the country has the appropriate infrastructure to support the development of banking innovations.

1.2. Problem Statement

The banking sector in Myanmar has faced numerous challenges, most of which can be traced to the political turbulence that has faced the country. The political turbulence and past military rule in Myanmar has significantly shaped the country’s financial history. The Myanmar banking sector has therefore been characterized by low consumer confidence. In 1962, for instance, the government engaged in nationalization of private banking organizations. The then military ruling authority later merged all banks into a single bank, which later split into four state-controlled banks. The 1990s saw the opening of the Myanmar banking sector to private banks. However, the banking sector in Myanmar has suffered from underdevelopment due to a combination of factors including the Asian financial crisis of 1997, the domestic banking crisis of 2003, and the political crisis that led to the imposition of

sanctions on Myanmar by the international community. The banking sector in Myanmar only revived its development from 2011 following the progressive reforms of the Thein Sein government (Schellhase and Sun, 2017). Despite the progress made in the banking sector, Myanmar's financial services sector still faces numerous challenges.

In addition to the negative financial history that has shaped Myanmar, banks in Myanmar are also faced by growing competition for customers. The environment in which banks operate today is highly dynamic, being characterized by intense competition among banks themselves. Today, Myanmar has 28 domestic banks operating in the country (Schellhase and Sun, 2017). These banks are engaged in a stiff competition for the available customers. With the opening up of the Myanmar economy, the rate of competition is expected to grow as new entrants, particularly foreign banks, target the Myanmar's market. The entrants of new players such as insurance firms, telecommunication companies, and online payment platforms that offer banking services has made the competition for customers even more aggressive. Any bank that fails to be innovative through adoption of new technology will fail to survive the competitive environment. Banks must devise innovative products and processes in order to attract new customers and retain existing ones.

The banking sector today is also characterized by changing consumer behavior. Achieving customer satisfaction in the modern digital world has become more difficult. The changes in consumer behavior are particularly noticeable in the retail-banking sector. Retail banks have to keep up with the changing consumer preferences and behaviors. For instance, banking customers today expect their banks to offer personalized and flexible services that suit to their needs. Moreover, customer's channel preferences are changing and becoming increasingly complex. The modern bank customer prefers flexible and convenient access to banking services. Therefore, banking institutions must innovate by developing or adopting

technologies that suit the changing consumer needs and behaviors. Such initiatives include credit and debit card customization, online account access, and mobile banking services among other strategies (Honka et al., 2017). Banks that fail to identify and respond to the changing customer needs, preferences, and behaviours are at a risk of losing their competitiveness as customers shift to banks that meet their demands. The changing consumer preferences and behaviours threaten the sustainability of banks that fail to innovate. Customers are the bloodline of every organization and more so for the banks since they bring revenue to the bank. For a bank to have a sustainable future, it must cultivate customer loyalty and satisfaction. Without customers, banks fail to generate revenue and their survival runs at risk (Skinner, 2014). As the business environment continues to change and as the behaviours and preferences of customer's change, the capacity to attract and retain customers becomes more difficult. Banks must therefore leverage on technology for them to be competitive in attracting customers to their businesses.

Technological innovations offer a solution to the problems facing the banking industry in developing countries such as Myanmar. However, despite the numerous benefits associated with the technological innovations, there is a downside to it. Technological innovations present various challenges to the banks and regulatory authorities. The major challenge associated with financial innovations is that these innovations carry certain risks and uncertainties that have potential to disrupt the stability of the banking sector (Mario, 2007). The interconnected nature of the financial system means that such risks may be systemic with far-reaching consequences on the entire banking sector. The global financial crisis that originated in the United States and led to collapse of major banking institutions has been attributed to systemic risks of financial innovations. Moreover, technological innovations have the potential to become obsolete and cause huge financial losses to the

adopting organizations. Therefore, banking institutions must exercise caution even as they adopt new technologies.

Despite the significance of technological innovation in the banking sector, its impact on bank performance, operational efficiency, and customer satisfaction is still poorly understood particularly within the context of Myanmar's banking sector. The role of technological innovation on the banking sector in Myanmar remains largely untested empirically. While banks in Myanmar have been rapid in their technological innovation drive, few or no studies have explored the impact of this innovation drive on the banking sector. Furthermore, previous studies in other regions have produced mixed results on the impact of technological innovations. For instance, some research studies have found that the cost of implementing technological innovations exceeds the financial benefits associated with such technologies in the long-term particularly in developing countries (Gutu, 2014; Hosein, 2013; Khrawish and Al-Sa'di, 2011). Therefore, the research on the role of technological innovation is inconclusive and further research is needed to validate the previous studies.

1.3. Objectives of the study

The general objective of this study was to determine the impact of technological innovation with products and processes on banking in Myanmar. Within the context of this study, technological innovation was considered as the process or technology that banks adopt and which has the impact of improving or enhancing processes, products, and services of a bank..

The study pursued the following specific objectives:

- To determine the impact of technological innovation in products and processes on the profitability of banks in Myanmar

- To determine the impact of technological innovation in products and processes on the operational efficiency of banks in Myanmar
- To determine the impact of technological innovation in products and processes on the customer satisfaction and loyalty among banks in Myanmar

1.4. Research Questions

This study was guided by three main research questions that included the following:

- ***RQ1:*** How does the implementation of technological innovation on products and processes impact the financial performance of a bank that has adopted the innovations?
- ***RQ2:*** How does the implementation of technological innovation on products and processes impact the operational efficiency of a bank that has adopted the innovations?
- ***RQ3:*** How does the implementation of technological innovation on products and processes impact the customer satisfaction and loyalty of a bank that has adopted the innovations?

1.5. Significance of the study

The past decade has seen a significant growth in the information and communication technology and subsequent adoption of the technology in the banking sector. The technological revolution in the banking sector has the potential to improve the Myanmar banking sector through facilitation of greater operational efficiency and improved customer satisfaction. Technological innovations in the banking sector offer an opportunity for banks to improve their financial performance while also promoting their competitiveness in the market. According to Liao (2009), new technologies such as mobile phones, the internet, and other ICT services create a platform for greater on interactivity between service providers and their customers. This study will be relevant to the banking institutions operating in Myanmar, as it will facilitate the evaluation of the importance of technological innovation on their operations. The study will

act as a reference point in evaluating their levels of technological innovation to assess whether they are in line with customer needs and expectations.

The results of this study may facilitate the development of better relationships with customers across the Myanmar banking sector. The study sought to explore how technological innovations influenced the customer relationships and customer loyalty among the studied banks. Therefore, the findings may be utilized by the Myanmar's banks to design and develop effective customer relationship management (CRM) systems based on the understanding of the importance of technology.

From a policy and regulatory perspective, this study is significant in that it demonstrates the need for the government to leverage on technology in order to support the growth of the financial services sector. The government of Myanmar has made significant progress in modernizing and reforming the country's banking sector (Turnell, 2014). The findings of the current study may inform government policy directions and decisions on supporting the banking sector.

This study also adds to the body of knowledge on the impact of technological innovation in the banking sector. Numerous studies have explored the impacts of technological innovations in various parts of the world with varying levels of evidence on the significance of technological innovation. However, little scholarly attention has been directed towards the banking sectors in developing countries. In Myanmar, the lack of a well-functioning banking system due to years of political turmoil led to lack of research on the country's banking system. Therefore, this study attempts to improve the current understanding on how technological innovation affects banks' performance, operations, and ability to meet customer needs within the context of the Myanmar banking sector. However, the study only acts as a one of the needed research initiatives on this topic.

Moreover, the study has important implications on the current understanding of the roles of technology in the performance of banks in Asian economies. Most Asian countries are bank-based economies where banks play the major role in distribution of capital. Most of the studies in this area has focused on western, market-based economies. Thus, the extension of the research in Myanmar will fill an important gap in literature.

1.6. Scope and limitations of the study

This study focused on the impact of technological innovations on three aspects of banks performance: financial performance, operational efficiency, and customer loyalty. The study was conducted for the period beginning 2012 and ending 2017, as this was a period of intense technological innovations in the banking sector. The study focused on an analysis of private banks in Myanmar including Kanbawza Bank (KBZ), Ayeyarwady, Bank (AYA), the Co-operative Bank (CB), and Yoma Bank. The four were selected for purposes of this study because they are the largest banking institutions in Myanmar with a significant market share. Their wide branch network ensured that they were representative of the entire banking sector. Moreover, these banks have greater utilization of electronic banking services compared to the other smaller or government-owned banks. The study involved both qualitative and quantitative methodologies.

This study only analyzed the role of technological innovations on four commercial banks in Myanmar. The study did not consider state-owned banks, insurance companies, and other financial players due to time and resource constraints. The major limitation experienced in this study was the unavailability of financial performance data among the banking institutions particularly small and state-owned banks. Since Myanmar's banking sector is still at the formative stages, there are hardly any historical data that or studies that could be used as a reference in this study.

1.7. Definition of key terms

State-owned bank: In the context of this study, a state-owned bank is a bank that wholly owned by the government of Myanmar or a government of Myanmar agency. In Myanmar, the government controls these banks. They include Myanmar Foreign Trade Bank, Myanmar Investment and Commercial Bank, Myanmar Economic Bank, Myanmar Agricultural Development Bank, and (Schellhase and Sun, 2017; Turnell, 2014).

Semi-official or semi-private bank: This refers to a bank that is partially owned by the government of Myanmar or one or many of its government agencies or a private bank that is associated by the government or its agencies and which is used to serve a special purpose (Turnell, 2014).

Private bank: A private bank refers to a bank that is wholly owned by private individuals and organizations and which has no association or ownership control by the government. These banks are solely regulated by the central bank (Schellhase and Sun, 2017).

Innovation: An innovation is the development of a new or significantly improved product, service, process, or method. Innovations include new or improved ideas, discoveries, new knowledge, research, creativity, inventions, prototypes, and continuous improvements (Schramm, 2017). Typically, an innovation takes time before it spread across the social system in an innovation diffusion process (Ilo et al., 2014).

Technological innovation: Technological innovation is a form of innovation that involves the development of new products, goods and services, processes, and methods through technological changes (OECD, 2013). Technological innovation may also be defined as the conversion of ideas and knowledge into new and commercially successful products, services, and processes (Schramm, 2017). Technological innovation is therefore a variant of the broad

definition of innovation. In the context of this study, technological innovations refers to the adoption of electronic banking technologies such as mobile banking, automated teller machines, internet banking, and cards payment services.

Electronic banking: Electronic banking may be defined as the use of computers and other electronic technologies to conduct banking activities and transactions. It is a broad term that includes most of the modern technologies used to implement banking transactions including the automated teller machines (ATMs), phone systems, personal computer banking, card technologies, and online banking technologies among others (Federal Trade Commission, 2012).

Mobile banking: Mobile banking refers to the use of mobile devices in facilitating access to bank accounts by customers as well as conducting of transactions such as checking of account status, transfer of money, making of payments, and trading on stocks among others primarily on a mobile device (Shaikh and Karjaluoto, 2015). Mobile banking is an innovative communication channel that facilitates the interaction between customers and banks through portable devices. Mobile banking is a form of electronic banking whose channel of delivery is the mobile device (Federal Trade Commission, 2012).

Internet banking: A form of electronic banking that allow customers to access their bank accounts primarily through the internet, obtain customer service, check account balances, transfer money, make bills, and interact with the bank on multiple issues (Brown and Buys, 2005). With proliferation and growth in access of internet services, most customers are now able to access banking services through mobile devices and personal computers.

Electronic commerce (e-commerce): E-commerce refers to the practice of conducting commercial transactions such as the purchase of goods and services between organizations or individuals as well as the transmission of funds through an electronic network, primarily the

internet. The transactions occur between business organizations (business-to-business), between business organizations and consumers (business-to-consumer or consumer-to-business), and between consumers themselves (consumer-to-consumer) (Ezeigbo, 2018). Banks play a critical role in facilitating e-commerce transactions.

Financial performance: This refers to the measure of how well a firm is able to utilize its assets in generation of returns. Financial performance is a broad term that is also used to refer to the overall financial health of a firm as measured by the revenue generated, profitability, return on assets, and return on equity. Other measures of financial performance include cash flows and market share performance. Financial performance in this study refers to the outcomes of financial measures such as return on assets and return on equity.

Operational efficiency: This is the level of effectiveness of converting inputs in a business organization into outputs. It is a measure of how effective an organization's operations are as measured by the ratio of inputs to outputs (Magad, 2013). Operational efficiency may also be considered as the capacity to produce or offer high quality products and services in a cost-effective manner. In this study, operational efficiency is the effectiveness of a bank in terms of quality, speed, and dependability of services as well as the associated cost savings.

Customer satisfaction: Customer satisfaction may be defined as the level of fulfillment that a customer achieves from the use of a product or a service. It is the customer's judgment of how effective a product or service is in fulfilling their expectations. Customer satisfaction may be positive in the case of over-fulfillment or negative in the case of under-fulfillment (Grigoroudis and Sikos, 2009). Customer satisfaction is a perceptual, psychological, evaluative process of fulfillment with a product or service. For purposes of this study, customer satisfaction is the overall satisfaction with the bank services as well as the satisfaction with individual banking technologies.

Customer loyalty: Customer loyalty refers to the positive, preferential attitude by customers towards a specific firm or its products, and the tendency for long-term purchase of a firm's products or consumption of its services (Peppers and Rogers, 2016). Customer loyalty is both an attitude and a behavior. The attitude implies that the customer has a positive and preferential attitude towards the products and services of a specific organization while behavior loyalty inclines a customer to engage in repeat purchase or consumption of the products or services of one organization and not another one (Peppers and Rogers, 2016). Customer loyalty is the strong preference for a bank to the extent of continued use of its services. It is the probability of not switching banks while recommending it to other customers.

1.8. Organization of the study

This thesis is organized into five chapters. Chapter one develops the background of the study by tracing the role of technological innovation in the banking sector. The introduction chapter further highlights the banking sector in Myanmar and its current tripartite structure. The aims of the study, research questions, significance of the study to Myanmar's banking industry and the scholarly world, and problem statement are also highlighted in the first chapter. The chapter concludes with a definition of key terms that are relevant to this study.

Chapter two of this thesis comprise of a literature review. The literature review chapter is organized into the theoretical literature review and the empirical literature review. The theoretical literature review in this thesis comprise of a theoretical framework that defines the applicable theories that support the concept of technological innovation in the Myanmar banking industry. The empirical literature review highlights the relevant studies that have been conducted in the area of technological innovation and its impacts on banks.

Chapter three of this thesis describes the methodology adopted to investigate the impact of technological innovation in products and processes on banking in Myanmar. The chapter highlights the philosophical foundations that informed the choice of the adopted methodologies as well as the research design, procedures, and data analysis approaches.

Chapter four of this thesis is the results chapter, which describes in details the findings of the empirical investigation conducted in the study. The chapter describes how technological innovation influences bank performance, operational efficiency, and customer loyalty and satisfaction using the data collected from the Myanmar banking sector.

The fifth chapter is the discussion chapter, which provides an explanation and evaluation of the study findings. The chapter also compares the findings of the current study with those of previous researchers in order to develop a discussion of the results within the context of the broader scholarly community.

Finally, chapter six of this thesis is the conclusion and recommendations chapter, which highlights the key findings and inferences from the results of the study. Based on the study findings, recommendations are suggested for improvement of the banking sector in Myanmar.

CHAPTER TWO

LITERATURE REVIEW

2.1. Introduction

This chapter contains a review of literature that is relevant to the study. The literature review is structured into two major sections. The first section of the literature review chapter is the theoretical literature review, where theories relevant to the study are reviewed. These theories include the innovation diffusion theory (IDT), theory of planned behavior, technology acceptance model (TAM), task technology fit theory, theory of reasoned action, Schumpeter theory of innovation, economic efficiency theory, and the unified theory of acceptance and use of technology (UTAUT). The second part of the literature review contains an empirical literature review involving a review of relevant empirical studies rd. The empirical review focuses on the association between technological innovation and bank performance, operational efficiency, and customer loyalty and satisfaction.

2.2. Theoretical Literature Review

Theories are important in guiding the research process and enabling the researcher to delineate the variables to be measured, the relationships to be evaluated, and the interpretation of findings (Padgett, 2016). Therefore, theoretical literature was important in this study as it facilitated the development of the framework for data analysis and interpretation of findings. Since the 1960s, several theories have been advanced to explain the adoption and acceptance of technologies and innovations. These theories include the following:

2.2.1. Innovation Diffusion Theory

Since the publication of his landmark book "*Diffusion of Innovations"* (Rogers, 1962), Everett Rogers' name has become synonymous with the theory of diffusion of innovations. The diffusion of innovation theory explains how innovations or new ideas are adopted. Diffusion of innovation is a step-wise process where individuals in a society obtain knowledge about the presence of an innovative product (Rogers, 2003). According to Rogers (1983), the innovation adoption process begins with the communication of the existence of an idea or innovation. An individual progresses from the gaining of knowledge about an innovative product or service to the formation of an attitude about it. An individual or organization that learns of a new product or idea develops an attitude towards them. This attitude may be positive or negative. Based on the attitude formed by the potential user, then a decision to either adopt or reject the innovation is made. Finally, the user implements the new idea and confirms their decision. With the emergence of social media platforms and increased usage of mobile phones, it is easier for internet and mobile phone-based innovations to be communicated today. According to Toole et al. (2012), diffusion of innovations today is largely driven by social and mass media, which are more effective advertising methods than the word of mouth. Therefore, the IDT considers the technology adoption process to be complex and multistage process that commences at the product or service adoption and culminates with the usage and implementation by adopters.

Rogers (1995) described innovation adoption process as a process that involves mental development where an individual moves from hearing about a product or innovation to the final adoption. Rogers' theory of innovation diffusion further postulated that individuals could be categorized into five groups based on their readiness to adopt new ideas or innovations. The first category of people is the innovators who comprise of the first

individuals to adopt an innovation. Rogers (1995) theorized that the innovators make up 2.5% of the population and have a strong willingness to take risks in trying out new ideas. Typically, the innovators are individuals who are highly social, are financially stable, young, belong to the high social class, and have previous contact with scientific sources. Their high risk tolerance drives them to experimenting with new technologies while their financial capabilities help them absorb any potential losses.

The early adopters are the second group of individuals in the innovation diffusion model. Rogers (1962) hypothesized that the early adopters are often the youthful people in the society. These individuals also have high social and financial status in addition to having higher education levels. These individuals make up about 13.5% of the population and are important in influencing others into adopting an innovation. In the context of innovations within the banking sector, Sulaiman et al. (2007) have demonstrated that early adopters of mobile banking were relatively younger consumers aged between 21 and 30 years with high disposable incomes. These individuals have high willingness to try out new technologies. Similarly, Polatoglu and Ekin (2001) analyzed the demographic characteristics of early adopters of electronic banking and established that the majority were young, highly educated, and affluent.

The third group, the early majority, makes up 34% of the population and is considered to take significantly longer in adopting an innovation. These individuals are typically characterized by higher social status and rarely have opinion leadership in the society. The fourth group comprise of the late majority, which also make up thirty-four percent of the people that adopt a product or innovation. These individuals will accept an innovation after most of the other people in the society has adopted it. Individuals falling under the late majority are considered to be risk averse and have high levels of skepticism about an innovation. Late majority

adopters have a status that is considered below average in the society, poor financial capabilities, and often exert no opinion leadership.

Finally, Rogers (1962) defined laggards as individuals that are last in adopting a technology. These individuals are typically characterized by an advanced age, low financial capabilities, low social status, and focused on traditions. The laggards tend to be influenced into adopting an innovation from family and friends (Rogers, 1962; Rogers, 1995).

In an analysis of the demographic features of internet banking users, Mann and Sahni (2012) demonstrated that late majority comprised of 30% of all respondents. These users sought information before adopting new banking services. On the other hand, the laggards made up 16% of the respondents. Like the late majority, the laggards sought information before accepting new banking technologies.

The IDT also suggests that the innovation acceptance require the presence of five key attributes. The first attribute is the relative advantage of an innovation. This is considered to be the extent to which people consider an innovative product or service to have better features and performance that earlier ones. Rogers (1983) defined relative advantage as the extent to which an innovation offers desirable consequences for the adopters compared to the other available alternatives. The theory of innovation diffusion suggests that users or consumers will easily adopt innovations that are characterized by clear advantages over previous ways of doing things. However, technologies or innovations that present no relative benefits to the users fail to be adopted. In the banking innovation adoption, for instance, customers adopt internet banking because it offers greater convenience, flexibility, and is time saving compared to the traditional banking model of conducting transactions at the bank branch (Firdous and Farooqi, 2017). Prior research in Estonia shows that relative advantage is positively associated with the use of internet banking (Eriksson, Kerem, & Nilsson, 2008).

Complexity is deemed to be extent to which an innovation is considered by users to be difficult to use. According to Rogers (2003), new technologies may be categorized according to a continuum of complexity-simplicity. Innovations that are deemed by users to be simple and easy to use are easily adopted than those that are deemed complex (Greenhalgh et al., 2004). In a survey of university students from the United Kingdom, Majekodunmi and Harris (2016) found that bank customers could fail to use new banking services if they found them more complex than existing ones. Another factor influencing the rate of innovation is compatibility, which is considered to be the degree to which an innovation is consistent with a users' expectations and values. In general, innovations that are more compatible to the users' needs, experiences, and values are easily adopted. This is consistent with the findings of Tan and Teo (2000) who found complexity to be a key determinant in the adoption of internet banking. Similarly, Kolodinsky et al. (2004) have found complexity to be negatively associated with internet banking.

Triability also influences the rate at which an innovation is adopted. Rogers (2003) defined triability as the degree to which a technology or innovation can be experimented by potential adopters on a limited basis. Since new innovations require a significant investment in time and resources, adopters may prefer using innovations that they have capacity to try out before committing resources on them. The availability of an innovation on trial basis gives time to potential adopters to explore the benefits and capabilities of the new technologies as well as identify and resolve potential problems before fully committing to its adoption. Therefore, greater levels of triability are associated with a positive adoption decision (Ramdani et al., 2009). Typically, users of electronic banking services start using them for simple services such as keeping track of payments. After this trail period, they become more familiar with electronic banking and move on to other types of services (Eriksson, Kerem, & Nilsson, 2008). Thus, trialability is essential in the process of innovation adoption in the banking

sector. In a recent study, Yoo et al. (2019) demonstrated that trialability could have a positive role in influencing the adoption of Bitcoin transaction services.

Finally, technology adoption is influenced by observability, which is considered to be the level at which the perceived benefits of a product are identifiable in the society. If an innovation generates positive, visible outcomes, then the innovation adoption increases as other potential users are drawn from the benefits accrued to the early adopters. According to Hayes et al. (2015), products and services that can be tried out or observed have the overall effect of enhancing the personal decisions towards the adoption of a product or service because users consider the ability to engage in trials as risk-reduction activities. In their study, hospital staffs were presented with potential innovations that allowed varied levels of experimentation and triability. The study findings revealed that innovations that allowed greater experimentation (triability) as well as those that enabled observable change predictions (observability) were associated with better adoption outcomes. In the context of banking innovations, a service is likely to be adopted at a faster rate if its benefits are easily observable (Yoo et al., 2019). Similarly, Al-Jabri and Sohail (2012) have established the existence of a positive relationship between mobile banking adoption and observability. Thus, the theory of diffusion is relevant in the context of banking technology adoption and diffusion.

Although the IDT has been the classical theory of technology innovation, it has received criticism for several reasons. First, the theory does not define the boundaries of social systems adopting the innovations and how these boundaries affect the innovation diffusion process. Furthermore, Rogers' theory does not explain the conditions required for the application of the theory or whether the theory is applicable in all organizational situations

(Lundblad, 2003). Nevertheless, the IDT offers a valid and reasoned explanation of the adoption of technological innovations in the banking sector.

2.2.2. Technology Acceptance Model

TAM can be traced to the works of Davis (1989) in his Doctorate studies. The theory was influenced by the theory of reasoned action with a focus on technological innovations. TAM could be considered a validated extension of the theory of reasoned action. The theory of reasoned action (Fishbean and Ajzein, 1975) postulated that an individual's behavior could be construed by considering his or her prior intention as well as the beliefs of that person. According to the theory of reasoned action, an individual's behavioral intentions are determined by his or her attitudes towards the behavior. Davis (1989) extended the theory of reasoned action to explain the influence of decision-making in technology adoption.

The TAM theory theorized the process acceptance and subsequent adoption of information systems. The TAM theory relates to the behavioral intentions of an individual in adopting information technology. In the TAM, behavioral intention of adopting a technology may be regarded as the attitude towards the use of the system and its perceived usefulness. The attitude towards the use of an innovation may in turn be explained by the perceived usefulness and perceived ease of use (Hernandez and Mazzon, 2007). Therefore, a user's acceptance of a technology according to the TAM is influenced by two factors: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU) (Davis, 1989).

Perceived usefulness (PU) is one of the factors that influence the acceptance of a technological innovation. It refers to the degree to which individuals believe that an innovation will be useful to them in terms of job performance. Davis et al. (1989) defined perceived usefulness as the subjective probability of technology use improving an individual’s performance. TAM postulates that people will decide on using or not using a

technology based on how useful they perceive the technology will be to their individual task performance. Perceived usefulness of a technology has a significant impact on the attitude and usage intentions. Chiu et al. (2005), for instance, have demonstrated that a positive correlation exists between mobile internet services. Therefore, banking innovations could be strongly influenced by perceived usefulness as postulated by the TAM theory. However, a perception of usefulness alone is not enough to determine whether a user will accept a technology.

The TAM introduces the second factor, perceived ease of use (PEOU). The PEOU is the degree to which a potential innovation adopter believes that innovation is not only easy to use but also demands minimal effort to use (Davis, 1989). The perceived ease of use is deemed to have a direct impact on the perceived usefulness of an innovation (Amin, 2007). Innovations that are easily adopted have a combination of being useful and having ease of use. Evidence suggests that the perceived ease of use of banking innovations has a significant impact on the attitudes towards the adoption (Wang and Liao, 2007). Hanafizadeh et al. (2012) found that the adoption of mobile banking among Iranian customers was significantly influenced by the perceived ease of use. The perceived ease of use not only affected the acceptance of the mobile banking technology but also the long-term adoption of the technology.

The TAM has been applied to investigate the adoption of technological innovations in the banking sector. For instance, Lee et al. (2011) examined the adoption of online banking among consumers through the TAM theory. The study findings revealed that users had higher possibilities of adopting internet banking services if they deemed the services to be useful and easy to use. In another study, Amin et al. (2008) examined the factors that influenced the intention to use mobile banking through a case study analysis Malaysian bank. Their findings revealed that the intention to use mobile banking was influenced by perceived ease of use,

perceived usefulness, perceived credibility, and information availability. Similarly, Koenig-Lewis et al. (2010) have found that a positive relationship exists between perceived usefulness and the intention to use of M-banking services. In the study, Koenig-Lewis et al. (2010) examined the factors that affected the adoption of mobile banking among young people in England. The findings revealed that perceived usefulness, compatibility, and perception of risk were the dominant factors that influenced the attitudes towards mobile banking.

Akturan and Tezcan (2012) examined the tendencies for the adoption of mobile banking among young people using the TAM framework. Their investigation involved an analysis of 435 university students on their attitudes towards mobile banking. The study revealed that the perceived benefit of the technology was a strong determinant of the students' attitudes towards mobile banking. The attitudes were in turn the major determinant of the intention to adopt mobile banking. The users' perceptions of risks also played a critical role in influencing the acceptance of the technology.

Although TAM is a powerful and robust model of predicting users' acceptance of technology, it suffers from several key limitations. First, TAM deals with users' perceptions that are often subjective and not on real observations of the real usage of innovations or technologies. Perceived ease of use and perceived usefulness may not necessarily reflect the behavioral intentions towards the adoption of technologies such as mobile banking. Another limitation of the TAM theory is that it only focuses on the determinants of the user's intentions while failing to elucidate what informs these intentions or how they may be manipulated to improve user acceptance. In addition, the theory is criticized for its focus on technological aspects without considering the social aspects that influence technological innovations. Moreover, the TAM may fail to capture other factors that influence technology adoption such as the

perception of risks particularly for new technologies. For instance, a study by Wang et al. (2003) had evaluated the application of the TAM in adoption of internet banking. The findings of the study by Wang and colleagues revealed that the TAM's concepts such as perceived ease of ease and perceived usefulness could not offer an appropriate explanatory thesis on the behaviors of the users in adoption of internet banking. Instead, Wang et al. (2003) expanded the TAM model to include a new factor labeled "perceived credibility" which was explained as being the perceived security and privacy levels of internet banking.

2.2.3. Task Technology Fit (TTF) Theory

The task technology fit (TTF) theory is also widely used to explain the adoption of various technological innovations. The model proposes that an innovation or technology is likely to enjoy wider acceptance among potential users if there is a matching of the adopters' tasks with the innovation's capabilities (Goodhue and Thompson, 1995). Goodhue and Thompson (1995) proposed that a host of factors such as the innovation's ease of use, its reliability its relationship with users, its quality and compatibility determines the task-technology fit. In addition, product timeliness, locatability, and authorization also influence the task-technology fit. The task-technology fit theory assumes that the existence of a good fit between task and technology would increase the individual performance and subsequently improve the likelihood of adoption of a technology. Individual performance is assessed in terms of improved efficiency, effectiveness, and quality (Goodhue and Thompson, 1995). In addition to individual performance, the task-technology fit theory proposes that the success of technology adoption could be affected by group performance.

Goodhue and Thompson (1995) tested the task-technology fit model by assessing how TTF influenced users within an organizational context. Their investigation showed that there was a correlation between the TTF constructs and users' performance. In a later study, Klopping

and McKinney (2004) evaluated the process of consumer e-commerce adoption. The TTF and TAM were used in investigating the process and motivation behind the participation of consumers in electronic commerce. The study tested the two models by examining data from a sample of 263 individuals who participated in a web-based survey. As predicted by the task-technology fit, technology characteristics were shown to be important in determining the attitudes of users. The constructs of the TTF model were shown to be complimentary to the TAM model as they extended the variables in the TAM theory.

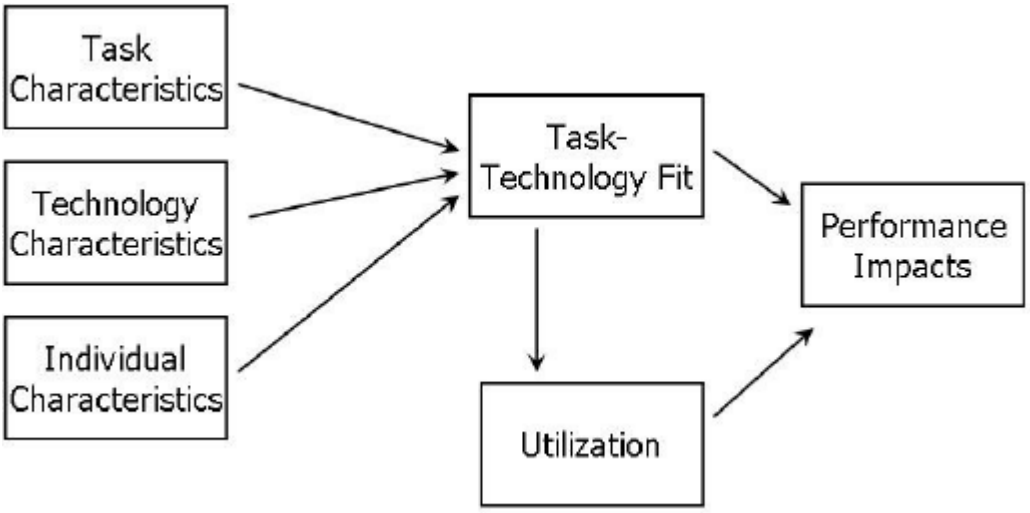


Figure 1: The task-technology fit

(Adapted from Goodhue and Thompson, 1995)

The task-technology fit is useful in analyzing the adoption of technological innovations in a wide range of information systems applications including electronic commerce systems such as internet banking. For instance, the task-technology fit model has been shown to be applicable in analyzing the adoption of mobile information systems (Gebauer and Shaw, 2004). In another study, Aljukhadar, Senecal, and Nantel (2014) employed a task-technology fit to evaluate the success of task performance by users in online context including an internet banking website. The findings of the study supported the predictions of the Task-Technology Fit model by showing that site ease of use and information quality were the major drivers of

success in task completion rather than the site's graphical interactivity, attractiveness, and security (Aljukhadar et al., 2014).

Tam and Oliveira (2016) adopted the task-technology fit model in analyzing the performance impact of mobile banking. Their study sought to investigate the determinants of mobile banking for individual performance as predicted by the TTF theory. However, two additional variables of age and gender were incorporated in the model in addition to the TTF variables of task characteristics, technology characteristics, technology utilization, and individual performance. Using a sample of 256 individuals whose responses were analyzed to determine relationships, Tam and Oliveira (2016) were able to demonstrate that task-technology fit and technology utilization were important determinants of individual performance.

Like the TAM model, the TTF has been criticized for its focus on functionalities of the technology or innovations with little regard on the context within which the technology is employed (Perry et al., 2001). For instance, within the mobile device usage, nonfunctional features such as size and weight of the mobile phone have been shown to play a more active role in influencing the acceptance of a device (Gebauer and Ginsburg, 2006).

2.2.4. Theory of Planned Behavior (TPB)

The theory of planned behavior (Ajzen, 1991) postulates that the behavior of an individual is influenced by his or her behavioral intentions, which in turn affects the attitudes of that person. Behavioral intention is deemed to be the measure of the strength of a individual's readiness to exercise effort towards a certain activity. The theory of planned behavior hypothesize that behavioral intentions are influenced by three factors. The first factor is individual attitudes, which, is defined as the assessment whether positive or negative of a behavior. Behavioral attitude has a direct impact on the strength of the behavior as well as the beliefs that on the likely outcomes of a behavior (Capece and Campisi, 2013). According to

Alsajjan and Denis (2010), the overall attitude could be determined as the sum of individual outcomes as a product of desirability assessments for all expected outcomes.

Subjective norms constitute the second determinant of behavioral intentions. Subjective norms are the perceived pressures that an individual may encounter from other people forcing him or her to engage in a certain behavior. It is the belief about whether others approve or disapprove of a certain behavior. Subjective norms may be regarded as the personal beliefs on whether peers and individuals considered to be of importance to a person's life approve a behavior. In technology adoption, subjective norms play a critical role in determining whether an individual adopts a technology or not.

The third determinant of behavioral intention according to the theory of planned behavior is perceived behavioral control. Perceived behavioral control is the perceived ease or difficulty in performing a certain task (Capece and Campisi, 2013). Behaviors that are perceived to be difficult to perform are associated with lower intention to perform and actual behavior adoption.

The theory of planned behavior is useful in predicting customer behavior, particularly the attitudes towards new technologies or innovations. For instance, Capece and Campisi (2013) have adopted the planned behavior model in analyzing the adoption of electronic banking in Italy. The TPB was shown to be a robust model with good explanatory power in predicting the intentions of the customers in adopting the e-banking technology. In another study, Nasri and Charfeddine (2012) have investigated the adoption of internet banking in Tunisia through the framework of the TAM and theory of planned behavior. Both TAM and TPB were shown to have high explanatory power in explaining the behavior of customers in adopting e-banking services.

2.2.5. Unified theory of acceptance and use of technology (UTAUT) theory

This model may be traced to the works of Venkatesh et al. (2003) who merged eight prominent theories into one. These included the theories of innovation diffusion, planned behavior, technology acceptance, and reasoned action. The UTAUT model also involved the combined TAM and TPB theory, Motivational Model of PC utilization model (MPCU), and the Social Cognitive Theory (SCT) (Venkatesh et al., 2003). The eight theories were analyzed and consolidated into a single theory that explained the acceptance and utilization of technology.

The UTAUT model has four major components namely effort expectancy, performance expectancy, social influence, and facilitating conditions (Venkatesh et al., 2003). Venkatesh et al. (2003) define performance expectancy as the extent to which users of an innovation, system, or technology anticipates that the innovation will be helpful in their task performance. This implies that people are more likely to adopt an innovation if they perceive it to be of value in their job performance. The concept of performance expectancy borrows from the concept of perceived usefulness in Davis' TAM. Performance expectancy has been shown to be an important factor in predicting the intentions to the use of technology (Liu et al., 2014). The second concept of effort expectancy refers to the anticipated complexity associated with a technology or innovation as well as the amount of energy that users perceive to be required in using the innovation. In general, people tend to accept easily the technologies that they perceive to be simple and easy to use. Effort expectancy borrowed from the concepts of perceived ease of use from the TAM model (Davis, 1986), complexity from the MPCU model (Thompson et al., 1991), and the ease of use from the innovation diffusion theory (Rogers, 1995).

The third component of the theory is social influence, which Venkatesh et al. (2003) define as the belief of technology users with respect to the importance that other people attach to an innovation. When an individual perceive the important others to approve a new system, then they tend to adopt the system at a higher rate. On the other hand, individuals who believe that important others disapprove of an innovation tend to shy away from it. Within the banking innovations context, social influence could be regarded as the extent to which potential users perceive that other persons, particularly family and friends, believe that they could adopt the banking technologies (Baptista and Oliveira, 2015). The social influence concept is based on the concept of subjective norms from the TPB model. The subjective norms concept holds that an individual's attitude towards a certain social aspect or technology is partly influenced by how an individual's peers perceive it. Venkatesh et al. (2003) argued that technology adoption is influenced by the culture and social context within which an individual shares. In their study, Alaiad and Zhou (2014) found that social influence was an important predictor on intention to use technology.

The final construct of the UTAUT model is the facilitating conditions (FC), which refers to the extent to which an individual that facilitating infrastructure exists for utilization of the new technology (Venkatesh et al., 2003). Within the context of banking innovations such as mobile banking, users require the technical skills of using the mobile phone, using the internet, installing applications, and maintaining security. Therefore, facilitating conditions such as the existence of mobile banking tutorials, support, and demos will facilitate greater intention to use the technology (Baptista and Oliveira, 2015).

The theory has been shown to have high predictive power in studying the acceptance of mobile technologies among users (Yu, 2012). Baptista and Oliveira (2015) have used to UTAUT model to study the use of mobile banking in Mozambique. Questionnaires modeled

from the UTAUT model were distributed to the sampled population to examine the factors that influenced the acceptance and readiness for use of mobile banking. The UTAUT model was shown to have string predictive power in explaining the adoption of the mobile banking technology.

2.2.6. Schumpeter Theory of Innovation

While TAM, TTF, UTAUT, and the diffusion of innovation theories describe innovation from the perspective of the adopters of innovation, other theories such as Schumpeter's theory of innovation describe the innovation process from the innovators' perspective by trying to explain why innovations happen in the first place. Schumpeter (1939) argued that the key driver of innovations is the pursuit of new profits by independent inventors or organizations. Schumpeter (1939) theorized that an innovation brought with itself economic evolution, a process of changes in economic processes. Driven by the desire to make new profits, innovators according to this theory develop an innovation by seeking out opportunities and engaging in value generating activities. As the inventors enjoy the new profits, imitators are attracted to the supernormal profits and begin a wave of investment in the innovation. Ultimately, the profit margins for the innovation are eroded as the number of imitators' increase. A new innovation or set of innovations develops as an economy attains equilibrium within the course of the Kindratiev cycles. Entrepreneurship has a central position in Schumpeter's theory of innovation. According to the theory, innovations originate from the entrepreneurial drive for income generation.

Schumpeter's model theorizes that an economy is initially in a "circular flow" prior to innovation. In the circular flow, there are no changes in the economic system and the same products are produced in the same way each year. Within a circular flow state, the economy has a stationary equilibrium where no profits are generated, no interests, no savings, and no

involuntary unemployment exists. Within a circular flow economy, money plays the primary function of enabling the circulation of commodities (Schumpeter, 1934). Innovation occurs when an innovator, who is an entrepreneur, introduces change to the economic system and breaks up the circular flow. The change comes to the economic system as an innovation, which Schumpeter (1939) defines as any way of doing things differently. Schumpeter (1939) distinguishes an innovation from invention in that an innovation could occur without anything being invented. While invention is associated with scientific or intellectual input, innovation has no such scientific concerns. According to Schumpeter (1934), an innovation could take any of five forms. First, an innovation could take the form of a new product introduction in the market or the development of a product with enhanced quality. It may also involve the introduction of a new production method. Furthermore, the establishment of a new market could entail an innovation. Moreover, an organization could innovate through establishment of a new source of supplies for raw materials or half-manufactured goods and finally the establishment of a new form of organization such as a monopoly creation.

One of the key concepts in Schumpeter's theory is the aspect of business cycles. Schumpeter argued that the changes that are triggered by an innovation have an element of cyclicality that is modeled along the typical business cycles within a capitalist system. Schumpeter (1939) defined three business cycles named after the respective theorists: Kitchin, Juglar, and Kondratieff cycles. The Kitchin cycle takes about four years and is characterized by fluctuations in inventories and consumption. The Juglar cycle takes about nine years and involves fluctuations in the fixed investments in an economic system. Finally, the Kondratieff cycle takes the longest period of about fifty to sixty years and is characterized by fluctuations in production, price levels, and consumption. These fluctuations are caused by a significant innovation that causes some remarkable changes in an economic system. Therefore, innovations occur during the Kondratieff cycle.

The Kondratieff cycles are theorized to progress in four phases of economic fluctuations: inflationary growth (spring), stagflation (summer), deflationary growth (autumn), and depression (winter). The inflationary growth phase begins with the introduction of a successful innovation and subsequent imitations that result in appearance of similar innovations thus stirring economic growth in terms of inflation and productivity. The stagflation phase occurs when the economy reaches its growth limits. This period is often characterized by a short recession. The next phase is the deflationary growth, which is characterized by a stable economic growth. The deflationary growth phase is also characterized by selective growth in some industries as well as the emergence of new technological and social ideas. The final phase is the winter where the economic system is faced by severe depressions, contraction of the economy, and unemployment. However, the depression phase of the business cycle gives rise to generation of ideas and innovations (Schumpeter, 1939).

Another key construct in Schumpeter's theory of innovation is the concept of creative destruction or Schumpeter's gale. Creative destruction refers to the process by which new technologies and innovations bring about the demise of the old ones. Schumpeter (1939) argued that business cycles are recurrent in nature such that entrepreneurs introduce innovations that transform existing economic systems. These periods are characterized by periods of economic growth and booms. Imitators are attracted by the innovations and join in to establish a new economic equilibrium. The economy subsequently stagnates until another set of revolutionary innovations are developed that render the old ones obsolete. Therefore, the replacement of old technologies benefits new innovators in the process of creative destruction (McCann and Oxley, 2012).

Schumpeter's theory of innovation has been shown to be applicable in the banking sector. For instance, Leathers and Raines (2004) examined financial innovations within the framework of the Schumpeter's business cycles. Their study concluded that financial innovations in the "New Economy" business cycles were responsible for speculations and reckless finance in the banking sector. Schumpeter's concept of destructive finance has also been demonstrated to exist within the context of financial innovations. In their study, Aydin and Takay (2012) analyzed the destructive effects of financial innovations that precipitated the global financial crisis. Their study demonstrated the existence of the link between finance and the Schumpeterian business cycle waves. According to Aydin and Takay (2012), the first wave is created by entrepreneurs who introduce a new innovation that spreads through the financial services sector. Subsequently, the innovation causes speculations and bubbles start developing as additional entrepreneurs come into play.

2.2.7. Disruptive Innovation Theory

In his book, The Innovator's Dilemma, Christensen (1997) conceptualized the disruptive innovation theory to explain the emergence of technological innovation. Innovation is considered as a process where organizations transform labor, materials, capital, and information into more valuable products and services (Christensen, 1997). The disruptive innovation theory recognizes two forms of innovations. The first type of innovation is the sustaining innovation whose model involves growth generation through provision of better performance in the existing market. Innovations are considered sustaining when they are radical or incremental. Such sustaining innovations are usually exploited by the established industry players. Therefore, sustaining innovations do not cause revolutionary changes in the industry. The second form of innovations comprise of the disruptive innovations. Christensen defined disruptive innovations as the technologies that offer different values from those

offered by mainstream technologies. These technologies are revolutionary in nature, radical, discontinuous, emergent, or constitute breakthroughs (Yu and Hang, 2010). Initially, established firms are unwilling to adopt the disruptive innovations for two major reasons. First, the technologies often do not satisfy the needs of the existing and most profitable customers. Second, disruptive innovations often offer lower profit margins compared to the sustaining innovations (Enders et al., 2007).

Disruptive innovation is not an event or product but rather occurs in a process. Disruptive technologies occur along a product performance and customer demand trajectories. On the product performance trajectories, the theory predict that products and services improve over time while the customer demand trajectories predict that customers' willingness to pay for improved performance improve as the quality improves. Established industry players continue introducing high quality products and services that continue to serve the high end market where the profitability is highest. In the process, established firms tend to ignore the needs of the low-end and mainstream markets leaving an opportunity for new entrants to establish in the neglected low-end market (Christensen et al., 2015). In the early stages, the disruptive technology may have non-standard performance attributes and therefore only attracts the niche segments that tolerate the low performance. However, further developments occur improving the performance of the technology to a level that satisfies the mainstream market. Disruption occurs when the new technology displaces the mainstream technologies in the market as performance overshoots and the technology becomes widely accepted (Yu and Hang, 2010).

The disruptive innovation theory has been proposed as a potential theory for explaining the emergence of financial innovations such as internet banking and mobile banking. However, the disruptive nature of these banking technologies is relative and varied geographically. In

Kenya, for instance, the mobile money transfer service known as M-Pesa has been widely considered a disruptive technology. Developed by Safaricom Company Limited as a mobile transfer service, the technology rapidly gained popularity to become the largest source of transactions in the country. Today, the traditional banks in Kenya have been forced to integrate the M-Pesa platform in their banking systems. M-Pesa is considered disruptive as it has created new markets for previous unbanked populations in addition to disrupting the Kenyan financial services sector (Ngugi and Komo, 2017).

2.2.8. Economic Efficiency Theory

The TAM, TTF, UTAUT, and the diffusion of innovation theories examine the motivation behind and process of innovation adoption while Schumpeter's theory of innovation explain why innovations happen in the first place. The economic efficiency theory explains how innovations affect efficiency of organizations (Matthews, 2010). The economic efficiency theory suggests that organizations should structure their output in a way that minimizes the cost per unit of production (Musara and Fatoki, 2010). The economic efficiency theory separates economic efficiency into two: technical efficiency and allocative efficiency (Farrell, 1957). Technical efficiency occurs when there is a balance between output and inputs in a production system. To achieve technical efficiency, an increase in any output must be followed by a reduction in another output or an increase in at least one input. On the other hand, a reduction an input must be followed by an increase in at least one input or an increase in at least one output (Matthews, 2010). In a typical business firm, inefficiencies occurs when the levels of outputs are low compared to the fixed and variable costs, which results in spreading of the fixed costs over a small number of units. On the other extreme end, overproduction while taking advantages of economies of scale results in additional costs that emanate from overstressing of existing systems resulting in diseconomies of scale. Therefore,

maximum operational efficiency is achieved when a firm produces output at a level that takes advantage of all economies of scale without overstraining the existing systems (Musara and Fatoki, 2010).

Allocative efficiency refers to the how various inputs are combined to generate a mix of various outputs (Matthews, 2010). Allocative efficiency is concerned with the way in which existing resources are allocated for output generation. At the firm level, allocative efficiency is maximized when a firm produce at the optimal output level using a combination of goods and services that maximize the overall benefits to the firm as a whole. According to Musara and Fatoki (2010), allocative efficiency is achieved when no other pattern of resource utilization can produce better results in terms of benefits to all stakeholders in a firm.

The economic efficiency theory helps to explain the concept of operational efficiency of banking institutions. Technological innovations in the financial services sector helps in minimizing the resource inputs required to generate a desired level of output. According to Porteous and Hazelhurst (2004), the adoption of electronic banking and mobile banking services in a bank in South Africa led to technical efficiency as the number of customers served by the system was much higher than that served by conventional banking systems. Rouse and Tripe (2016) have demonstrated the usefulness of the economic efficiency theory by analyzing the allocative and technical efficiency of banks in New Zealand.

2.3. Empirical Literature Review

In an empirical investigation, the aim of the literature review is not only to unveil the theories that underpin the study's arguments but also to show the related extant knowledge (Nakano and Muniz, 2018). This helps to place the study in context as well as facilitate the identification of research gaps. This section reviews the empirical investigations that have

been conducted to determine the impacts of technological innovations on financial performance, customer satisfaction, and operational efficiency of banks.

2.3.1. Impacts of technological innovations on the financial performance of banks

2.3.1.1. Impacts on profitability

Financial performance has historically been a primary measure of organizational success, a foundation for strategic planning, and a point of reference for managerial remuneration (Ittner and Larcker, 1998). Financial performance measurement involves the assessment of accounting measures such as sales revenue, profits, return on assets, and return on equity among others (Ozkan et al., 2017). Assessment of financial performance also involves other methodologies such as ratio analysis, performance measurement against a budget, benchmarking, or a combination of these methods (Grant, 2016). Much of the literature on the effects of technological innovations on banks' financial performance has focused on exploring the correlation between various measures of financial performance with the adoption or use of various banking technologies.

DeYoung, Lang and Nolle (2007) have investigated howinternet technology affects the performance of banks with a focus on U.S. community banks. In this study, the financial performance of a sample of U.S. community banks that had adopted internet banking was compared with that of banks that had employed branch-only banking for the period 1999-2001. The study findings revealed that the banks that had adopted internet banking had a significantly higher profitability compared to those that used branch-only banking thus suggesting a potential financial performance benefit of internet banking. Similar findings on the impacts of internet banking were reported by Hernando and Nieto (2007) who investigated the effects of internet banking on the financial performance of banks in Spain. By examining a sample of 72 banks, Hernando and Nieto (2007) found that internet banking

led to significant declines in transaction costs and subsequently led to improvement in overall banks' profitability.

The findings of DeYoung et al. (2007) suggest that first adopters of banking innovations achieve a financial and operational advantage over late adopters. Consistent with this idea, Mabrouk and Mamoghli (2010) have demonstrated that financial innovations are characterized by an element of first mover advantage. According to Mabrouk and Mamoghli (2010), commercial banks that adopt new products or processes always enjoy more profits. In their study, Mabrouk and Mamoghli (2010) assessed the effects of financial innovation adoption on the financial performance of banks. Their study categorized innovations into two: process innovations (such as ATM and credit cards) and product innovations (phone banking). The study further categorized the adoption behaviors into first movers and imitators if first movers. The study findings revealed that first movers in product innovations were more profitable than late movers and imitators.

Consistent with the findings of DeYoung et al. (2007), Arnaboldi and Claeys (2008) examined the impact of internet banking on the performance of banks European countries of Italy, Spain, Finland, and the United Kingdom. Data on bank performance and the model of banking adopted were collected for the period 1995 to 2004. The study findings showed that banks that adopted internet banking had better performance in terms of average returns on assets compared to the banks that adopted the traditional brick and mortar branch only banking. The study further revealed that the operational costs of the banks that adopted internet banking were lower. However, the authors suggested that internet banking alone could not result in higher financial returns since some clients still prefer personal interactions in the physical bank branch. The authors further suggested that internet banking being a process innovation is driven by external factors beyond the bank's control such as broadband penetration and internet access. Similarly, Ciciretti, Hasan & Zazzara (2009) analyzed the

role of internet banking in the Italian banking sector by comparing the performance of banks that had adopted internet banking and those that had not. The findings revealed the existence of a strong positive correlation between the practice of internet banking adoption and profitability of the sampled banks.

Within the Jordanian banking sector, Jalal-Karim and Hamdan (2010) sought to investigate the effects of investments in information technology on the financial performance of banks. Their study involved the regression analysis using the Pooled Least Square method to determine the association between IT investment and operational and financial performance of banks in Jordan. The results of the study revealed that a direct, positive, and significant relationship existed between the use of management information system (MIS) among banks in Jordan and various performance measures including earnings per share (EPS), market value added (MVA), net profit margin, and return on assets. However, the adoption of the MIS was not shown to have a significant impact on the return on equity. Similarly, Romdhane (2013) have demonstrated that investment in information technology has a positive impact on banks' performance. Romdhane (2013) collected panel data from a sample of 15 banks drawn from the Tunisian banking industry for the period 1998-2009. Cost efficiencies were estimated using the Standard Frontier Approach. The findings of the study revealed that a positive impact existed between the level of IT investment and banks' performance.

2.3.1.2. Impacts on ROA and ROE

Research studies on the impact of technological innovations have focused on the measurement of financial performance in terms of return on assets (ROA) and return on equity (ROE). Beccalli (2007) investigated how investments in IT could affect the performance of European banks. The study involved an analysis of data from a sample of

over 700 banks from various European banks for the period 1994 to 2000. In the study, Beccalli (2007) employed the Stochastic Frontier Analysis to determine the efficiencies of the sampled banks. The study results showed that IT investments had a negative impact on the short-term profitability of the sampled banks in terms of negative return on assets and return on equity. However, the study revealed that a positive associated existed between IT investment and bank performance in the long-term. IT investment reduced the long-term costs for the sampled banks and therefore lowered the annual production costs. Overall, the results of the study suggested that IT investments have a positive impact on long-term profitability of the banks as well as the competitiveness of the bank.

Akhisar, Tunay, and Tunay (2015) examined the effects of technological innovations on bank performance with a focus on electronic banking services. Their study involved a collection of data from a sample of 23 countries drawn from both developing and the developed world from 2005 to 2013. Electronic banking data analyzed in the study was obtained from BIS' Payment Systems Statistics and World Bank's World Development Indicators. On the other hand, bank performance data was obtained from the IMF's Financial Soundness Indicators. Correlation analysis revealed a strong correlation between key performance indicators such as return on assets (ROA) and return on equity (ROE) of the banks and the adoption of electronic banking (internet banking, automated tellers, electronic cards, and point of sale services). The major strength of this study was that it involved a collection and analysis of cross-country data thus reflecting an international perspective.

Sujud and Hashem (2017) studied the impact of bank innovations on the profitability of Lebanese commercial banks. Their study explored the impact of electronic bank innovations such as credit and debit card, automated teller machines, point of sale terminals, electronic funds transfer, mobile banking, and internet banking. These technologies were examined in relation to their effects on return on assets and general profitability of the Lebanese banks.

Data was collected through questionnaires administered to senior management personnel from the sampled banks. The findings of the study revealed that profitability and return on assets was significantly associated with the adoption of banking technologies.

While internet banking has been shown to have a positive role in boosting the financial performance of banks (DeYoung et al. (2007; Arnaboldi and Claeys, 2008), its role has emerged to be more of a complimentary role to the physical banking model rather than as a substitute. This is mainly due to customer requirement for personalized service at the branch level (Arnaboldi and Claeys, 2008). This hypothesis is supported from the findings investigations conducted by Hasan, Schmiedel, and Song (2010). In their study, Hasan et al. (2010) explored the performance of multi-channel commercial banks when contrasted with the performance of traditional banks within the Italian banking sector. The adoption of the internet was demonstrated to positively influence the performance the banks as measured by the return on assets (ROA) and return on equity (ROE). The multi-channel banking model was also shown to be more effective in promoting bank performance.

In a recent study, Chipeta and Muthinja (2018) have investigated the relationship between bank's financial innovation and the financial performance within the Kenyan banking sector. The study focused on the branchless banking models such as the automated teller machines, internet banking, agency banking, and mobile banking. The authors employed the Koyck dynamic distributed lag model in in estimating the relationship between the financial innovations adopted by banks and financial performance. The study findings revealed that the banks' return on assets (ROA) and return on equity (ROE) were significantly and positively correlated with financial innovation variables including internet banking, ATM, mobile banking, agency banking, and internet banking.

Scott, Van Reened, and Zachariadis (2017) note that studies involving short-term investigations of the impact of innovations on bank performance fail to take into account the potential long-term benefits accrued to adopters in comparison to non-adopters. Their study involved a collection of a large dataset comprising of 6,848 banks drawn from 29 countries across the Americas and Europe. The aim of this study was on understanding the impacts of the adoption of the SWIFT (Society for Worldwide Interbank Financial Telecommunication) technology on bank performance. The authors supplemented empirical research with the collection of qualitative data from field interviews. The study findings revealed that the adoption of the SWIFT technology had a positive impact on the profitability of banks in the long-term. The study further demonstrated that SWIFT technology benefits were higher for big banks compared to the smaller ones. However, a weak or negative correlation was reported in the first few years of SWIFT adoption while the benefits in terms of financial performance could take up to ten years to be realized.

While most studies report a positive impact of technological innovation on financial performance of banks, a few studies have reported insignificant or negative relationship while others have reported mixed results. Onay and Ozsoz (2013), for instance, investigated the impact of internet banking on bank performance in Turkey. Their study involved an analysis of panel data on 18 Turkish retail banks for the period 1990-2008. While internet banking was shown to improve deposits and loans per branch, a negative impact was reported on bank profitability following two years of adoption. The authors explained that the negative association was due to increased competition emanating from internet banking and subsequent decline in interest incomes. In support of this explanation, a previous study by Angelakopoulos and Mihiotis (2011) has investigated the challenges of e-banking within the Greek banking sector and found factors such as competition for customers, concerns over

privacy and security, and low internet usage as some of the key issues that have a negative influence on e-banking adoption.

Consistent with the findings of Onay and Ozsoz (2013), Yang et al. (2018) made similar observation in an investigation of electronic banking in China. In their study, Yang et al. (2018) collected financial performance data and e-banking adoption on five Chinese banks for the 10-year period 2003-2013. Bank performance was assessed in terms of the operating and net interest margin, ROE, ROA, and efficiency ratio. Electronic banking was shown to improve the ROA, ROE, and OM while negatively affecting net interest margin and efficiency ratio. Some of the factors that were suggested to negatively affect bank performance following the adoption of e-banking included the intensity of competition, high level of risk associated with the internet banking services, and the increase in costs due to the need for service promotion aimed at attracting customers.

Cyree, Delcoure, and Dickens (2009) have confirmed that digital banking is associated with lower profitability. In their study, Cyree and coauthors examined the performance of internet-primary banks by comparing these banks with newly chartered traditional banks. Internet-primary banks in this study were defined as electronic or virtual bank models having little or no branching systems and therefore relying on the physical networks of other institutions to meet the physical transaction needs of the customers. In contrast, newly chartered banks were defined as banks that were chartered after 1996 through 2003. Univariate analysis of the data for the two samples revealed that internet-primary banks had lower ROE, ROA, and net interest margin compared to the newly chartered banks. Similarly, the ROE, ROA, and net interest margin were lower for internet-primary banks when compared with traditional banks. However, the internet-primary banks were shown to have higher profit efficiency compared to the sample of newly chartered traditional banks. The results suggest that while the accounting profits of internet-primary banks could be lower, the profit efficiency is higher.

The results further suggest that the size of the bank is a significant factor in determining the amount of benefits derived from the internet banking model.

Arnaboldi and Claeys (2010) also reported negative impacts of internet banking on financial performance within the European context. In the study, a panel of 60 banking institutions comprising the largest banking groups in the European Union for the period 1995 to 2005 was used to investigate effects of online services adoption. The study findings also suggested that banks that adopted internet bank had poor performance. This was mainly due to the high initial costs of investment in technology that exceeded the associated cost savings s. Arnaboldi and Claeys (2010) concluded that internet banks failed to create adequate synergies with other banking services and therefore financial innovations related to internet banking failed to stimulate financial performance. However, as Yang et al. (2018) reported, the initial investment could be high compared to the financial benefits but greater adoption by adoption by customers could result in improved performance in the long-term.

2.3.1.3. Impacts on stock performance

The bulk of research studies on the impact of technological innovations have measured firm performance in terms of accounting profit measures. However, these measures only capture the past or existing performance rather than the expected future cash flows (Stanfield et al., 2012). Boasson and Boasson (2006) were among the first researchers to measure the impact of technological innovations in the banking sector by evaluating firm performance in terms of stock market returns. In the study, Boasson and Boasson (2006) examined whether IT innovations could increase the stock market value of the banking industry. The authors collected data on IT innovations by measuring IT-related budgets, IT innovations ranking, and number of IT employees in the investment banking industry for the period 1994 to 2003.The stock market performance of the sampled firms was compared with their IT

innovations along with a comparison with the industry peers. The findings of this study revealed that firms that had higher investments in IT innovations tended to outperform their peers in the stock market. The study findings suggest that IT innovations had a positive impact not only on accounting profits but also on stock market valuation.

A recent study by Li, Spigt, and Swinkels (2017) has demonstrated that IT-related innovations in the banking sector could have positive impacts on the stock prices of banking institutions. In this study, Li et al. (2017) sought to investigate the role of FinTech digital banking on the stock returns on U.S. retail banks. The authors collected data from 47 U.S. retail banks for the period 2010 to 2016. The data comprised of the dollar volume of FinTech funding as well as the number of deals completed. A regression analysis was conducted for panel data to determine the correlation between the FinTech innovation and stock returns. The results of the study showed that a significant positive relationship existed between innovation among FinTech firms and stock returns among the retail banks.

2.3.2. Impacts of technological innovations on operational efficiency

2.3.2.1. Operational and technical efficiency

Operational efficiency is considered the effectiveness within which resources are transformed into useful outputs as well as the progress towards the achievement of predetermined goals. Operational performance in service delivery entails three performance factors: quality, speed, and dependability. A service delivery system is considered to have operational efficiency if it has prompt delivery (speed), dependability of service, and consistent quality (Kumar et al., 2011). Operational performance could also be measured using four criteria: quick delivery compared to the competitors, costs relative to those of competitors, customer satisfaction, and overall productivity (Rahman et al., 2010). Banking innovations have been shown to improve the operational management of banks and their capacity to offer services to the customers

(Saleem and Rashid, 2011). According to investigations by Saleem and Rashid (2011), mobile banking enhances the operational management of commercial banks by facilitating customers to access banking services without having to visit the bank. Mobile banks also facilitate the operational management of a bank by facilitating the banks to reach unbanked populations through agency banking systems and mobile systems (Saleem and Rashid, 2011).

Prior studies have showed that the use of technological innovations has a significant impact on operational efficiency of banks. Early studies on the impacts of technological efficiency measured the impacts of computer adoption and use on banks. In one of the earliest studies, Daniel, Longbrake, and Murphy (1973) investigated the effects of technology on the economies of scale for demand deposits of banks. Their study explored the influence of the diffusion of computer use on operating costs using a sample of U.S. banks. The study employed a Cobb-Douglas function where production was estimated using the number of deposit accounts. The study findings revealed that banks that had used computers for longer periods had lower operating costs compared to those that had used computers for relatively shorter periods.

Lawrence and Shay (1986) examined the operational efficiency of banks after the adoption of computers by measuring the cost of computer rental. The study findings revealed that the adoption of computer use and the decline in the cost of computers improved the operational efficiency of banks by reducing the rate of personnel employment. According to Lawrence and Shay, the adoption of computers in the banking sector led to a substantial reduction in the workforce. Computerization was shown to result in a significant improvement in operational efficiency and decline in operational costs. In line with these findings, investigations by Alpar and Kim (1990) revealed that the adoption of ICT positively influenced the productivity. In Italy, Casolaro and Gobbi (2007) estimated the cost and profit functions of a sample of 600 Italian banks. The study analyzed the ICT adoption in relation to the banks'

productivity for the period 1989 to 2000. The findings revealed that the adoption ICT capital-intensive technologies had a positive impact on total productivity.

Later studies have explored the operational efficiency of other banking innovations including electronic banking services. The automated teller machine (ATM) technology has witnessed an exponential innovation diffusion and adoption throughout the world primarily due to their efficiency in accessing banking services (Kocisova et al., 2018). Damar (2006) employed the Data Envelopment Analysis (DEA) methodology in measuring the impacts of the ATM networks on the productive efficiency of Turkish banks. The DEA method was used in estimating the technical efficiency and scale efficiency for the period 2000-2003. The study focused on evaluating whether the bank obtained positive benefits from the implementation of the ATM technology. The findings of that study revealed that banks obtained positive effects in terms of operational and technical efficiency from the adoption of ATM technology. However, multiple factors were shown to determine the potential of the banks in realizing these benefits including the geographical distribution of the ATM networks as well as the level of competition between banks. Consistent with the findings of Damar (2006), Floros and Giordano (2008) reported similar findings while investigating the Greece banking sector. In their study, Floros and Giordano (2008) adopted the DEA approach in analyzing data from ten commercial banks in Greece to assess the operational efficiency of the ATM technology within the Greek banking sector. The findings of the study revealed that the operational efficiency was higher in larger banks as well as the ones with a higher number of ATMs.

In a recent study, Shamim et al. (2017) conducted an efficiency analysis of automated teller machines on the Japanese financial institutions. The study adopted a stochastic frontier methodology in determining the banks' costs and profit efficiency. The authors also empirically investigated the relationship between the number of ATMs and the inefficiency

scores. The findings of the study revealed that the ATM technology helped to facilitate cost minimization of the banks as well as operational efficiency. The ATM technology also enabled the banks to spend the saved funds in hiring highly qualified staff. The findings suggest that shifting routine bank transactions from the branch to the low cost ATM channel could help the banks in achieving significant cost reductions as well as enhancing operational efficiency.

Kocisova, Gavurova, and Sopko (2018) have examined the effects of cards and terminals' networks on operational efficiency of banks within the European Union. In this study, the data envelopment analysis (DEA) method was used to analyze data drawn from 27 EU countries for the period 2005 to 2015. The Mamquist Index was employed in analyzing the reasons behind the changes in the efficiencies of the bank during the study period. The study findings revealed that the expansion in the network of electronic terminals and payment cards was positively associated with the level of efficiency of the banks. However, the growth in efficiency was negative if the increase in the number of terminals and cards was slower than the growth in the number of transactions and usage. The findings suggest that even though ATM expansion is positively associated with operational efficiency, the benefits may be lost if the market conditions are not favorable for increased level of adoption.

Although prior research suggests an improvement in operational efficiency following the adoption of ATM technology, a few studies have reported negative or insignificant associations (Sathye and Sathye, 2017; Kondo, 2010). Sathye and Sathye (2017), for instance, examined whether ATMs had an impact on the technical efficiency of Indian banks. The study tested the hypothesis that ATM intensity had a positive impact on the cost efficiency of Indian banks. To test this hypothesis, the bootstrap DEA approach was used to assess the operational efficiency of the 293 banks for the period 2007 to 2011. A regression model was used to estimate the relationship between the variables. The findings of the study

revealed that ATM intensity was negatively correlated with technical efficiency. The negative impact was attributed to the potential low usage of alternative banking service channels thus requiring banks to continue using manual services. The authors further suggested that the technology adoption in India was going through the initial phases where high capital and operating costs offset the operational and financial benefits of the technologies. Therefore, these findings suggest that the financial and operational benefits could increase in the long-term as Scott, Van Reened, and Zachariadis (2017) have reported.

Internet banking has been shown to improve the efficiency of banking institutions through reduction in administrative expenses as well as the capacity to serve a larger customer base using limited resources (Stoica et al., 2015). In their study, Stoica et al. (2015) examined the impact of internet banking adoption on the operational efficiency of banks in Romania. In this study, the DEA approach was employed in computing the efficiency scores of a sample of 24 Romanian banks. The findings of this study revealed that internet banking had a positive impact on the efficiency of the sampled banks.

Xiusheng and Wanhua (2013) examined the efficiency impacts of online banking models within the Chinese context. The study investigated the efficiency of three Chinese banks, namely the Bank of Beijing, the Beijing Rural Commercial Bank, and the Industrial and Commercial Bank of China. The study adopted the Data Envelopment Analysis (DEA) method to measure efficiency. The authors identified four forms of bank efficiency: scale efficiency, technical efficiency, pure technical efficiency, and returns to scale. The input variables in the DEA model comprised of the IT and business personnel costs, IT software and hardware systems, and promotion and operation costs while output variables were the amount of online trading and business income. The findings of this study revealed that the adoption of online banking in the Chinese banks had a positive impact on the overall efficiency of the banks.

In line with the approach employed by Xiusheng and Wanhua (2013), Qin, Wang, and Huang (2016) examined the efficiency of listed Chinese banks in the internet finance era. Their study employed the combined DEA and PCA model to assess the efficiency performance of 16 commercial banks operating in China. In this study, banks were categorized into four groups based on the focus of their businesses: internet business oriented, traditional business oriented, internet business oriented banks overburdened with traditional businesses, banks that balance internet business with traditional businesses. Each of these business models were shown to have their own unique advantages. However, banks with a strong focus on internet business had a higher efficiency score, lower operational costs, and capacity to reach multiple customers. Banks that focus on internet business models had nevertheless lower branch network and little brand influence. Therefore, the authors concluded that while banks with a stronger focus on the internet have the benefit of high efficiency, these banks must balance their online presence with an increase in the physical bank presence.

Mobile banking has also been shown to be a major driver of operational and technical efficiency in banking institutions. Arnaboldi and Claeys (2010) have established that branchless banking contributes to improvement in the operational efficiency of commercial banks. Furthermore, investigations by Al-Jabri and Sohail (2012) on mobile banking in Saudi Arabia reports that the adoption of mobile banking has led to a growth in the volume of transactions among commercial banks.

Other studies have examined the operational efficiency of banks from the perspective of the cost efficiency of technological innovations. For instance, Delgado, Hernando, and Nieto (2007) examined the experience and scale efficiencies of internet-primary banks in Europe. Their findings revealed that internet banks had higher scale economies. Arnaboldi and Claeys (2010) have also established that internet banks have lower operational costs compared to traditional banking models. Moreover, investigations by Sana et al. (2011) reveal that

electronic banking contributes to efficiency by reducing the costs of labour and cost of service delivery in addition to facilitating an improvement of accuracy, reliability and quality of services offered by a bank.

2.3.2.2. Employee productivity

Technological innovations within the banking sector have also been shown to be a major driver of employee productivity (Abbas et al., 2014; Yavas et al., 2015; Obeng et al., 2018). According to Singh and Kamlesh (2013), technological innovations facilitate knowledge acquisition and sharpening of the skills set of employees thus improving the overall human capital efficiency. Abbas et al. (2014) examined the impacts of technological innovations in the performance of a Pakistani bank. Their study employed the collection of data through a survey involving unstructured interviews with bank employees and the survey responses analysed using the SPSS software. The study findings revealed that technology greatly enhanced the productivity of the bank employees. Specifically, technology was shown to save of time, reduce the workloads of the employees, and enhance control over mistakes and errors. Furthermore, Abbas et al. (2014) reported that technology innovations within the bank facilitated quick access to information thus enabling the bank employees to offer quick and quality services to customers. Within the Nigerian context, Oluwatolani et al. (2011) examined the impact of information technology on the Nigerian banking industry. Their study findings revealed that the use of magnetic ink character reader (MICR) helped in reduction of manual work for the employees by facilitating automatic reading on cheques and generation of information about account holders. The MICR technology was shown to enhance the accuracy of cheque reading and account number identification thus improving overall employee productivity.

Similar to the findings of Oluwatolani et al. (2011), Nuskiya (2018) has reported an improvement in employee performance from the adoption of innovation technologies within the Sri Lankan context. Nuskiya (2018) examined the performance of employees in a Sri Lankan bank through the survey of 50 participants and correlational analysis to determine the level of association between IT use and productivity of employees. IT applications were shown to result in several benefits including improvement in employee satisfaction, reduction in employee workload, sharpening of employee skills, and reduction in the frequency of errors. For instance, technological innovations such as the ATM, mobile banking, and electronic banking were reported to have helped in eliminating long queues in the bank thus reducing workload and minimizing employee stress. In consistent with these findings, Yavas, Jha, and Babakus (2015) have reported that service technology helps to improve job satisfaction and organizational commitment. However, Yavas et al. (2015) report that servant leadership is necessary for the bank to enjoy the benefits of service technology on employee performance.

Obeng, Boachie, and Liu (2018) have demonstrated that technological innovation contributes to bank operation efficiency by promoting employee productivity. In the study, data was collected from seven Ghanaian banks for the period 2010 to 2015. The data comprised of survey responses employees drawn from the studied banks. The respondents were employees who used IT-facilitated services and processes. A sample of 165 bank employees was surveyed and their productivity measured. A logistic regression analysis revealed that there was a strong association between employee productivity and the use of IT processes and services. The study findings further suggest that banks that have new or improved processes and services due to IT innovation have employees who perform their duties efficiently, have high satisfaction levels, stay longer with the bank, and have high overall productivity.

2.3.3. Impacts of technological innovations on customer relationships

Prior research on the impacts of technological innovations has focused on the outcomes of customer relationships. According to Skinner (2014), customers are the bank's bloodlines since they bring revenue to the bank. Customer relationships are often measured in terms of customer satisfaction and customer loyalty. Customer satisfaction measures how well a bank is able to meet the expectations of its clients with respect to the offered products and services (Skinner, 2014). When customers'' expectations are met, then this increases customer loyalty. Therefore, there must be customer satisfaction for customer loyalty to exist. Without customer satisfaction, customers cannot be loyal to a company but they instead look for better services elsewhere (Thuli and Bharadwaj, 2009). Prior research on the impacts of technological innovations within the banking sector has explored how these innovations affect customer satisfaction and customer loyalty.

2.3.3.1 Impacts on customer satisfaction

Customer satisfaction may be defined as the individual's assessment of the provider's performance against their expectations (Agarwal et al., 2009). Satisfaction improves when the customers perceive the service offered to exceed their own expectation. When customers are satisfied with the kind of service offered by a bank, they tend to believe that the bank will offer similar satisfactory experiences in the future (Portuese, 2006). Customer satisfaction is a major influencing factor in making decisions regarding future purchase intentions with customers who are satisfied with a product or service having greater likelihood of making a repeat purchase (Tan et al., 2016). Thakur (2014) observes that satisfied customers are not only motivated to patronize a service provider but are also likely to recommend the provider to other potential customers. In contrast, dissatisfied customers are less likely to recommend a product to other customers and neither are they likely to make repeat purchases (Parawansa,

2018). In today's highly competitive environment, having a pool of satisfied customers is a critical strategy for every organization. Research on the impacts of technological innovations on customer satisfaction has taken the approach of assessing the impacts of individual technological innovations such as ATM, internet banking, and mobile banking among others.

Polatoglu and Ekin (2001) investigated the acceptance of online banking in Turkey by examining the case of Garanti Bank. Using a survey of 150 respondents, the researchers demonstrated that online banking led to customer satisfaction with customers finding the benefits of reliability, accessibility, and cost savings as the key drivers of satisfaction. Most of the respondents were satisfied with the level of service provided by online banking. The customers perceived the accessibility and convenience afforded by online banking as primary drivers of continued use. In another study, Pikkarainen et al., (2006) examined the level of satisfaction among users of internet banking in Finland. The study involved an analysis of responses of 268 respondents who were users of online banking services. The findings of the study revealed that customer satisfaction among users of online banking services was high in Finland. Customers cited benefits such as ease of use and timeliness. However, the authors recommended the enhancement of online banking services through personalization and improvement of user interfaces in order to improve the level of satisfaction.

The convenience provided by technological innovations such as internet banking is an important factor that positively influences customer satisfaction. Investigations by Khazaei et al. (2014) have established that the convenience obtained from internet banking is an important attribute that promotes positive evaluation of banking services. The convenience of internet banking enables bank customers to access banking services at their time and place convenience (Ong et al., 2014).

In Australia, Herington and Weaven (2009) investigated the satisfaction level of customers who used internet banking. The study involved an examination of responses from a survey of 200 respondents comprising of Australian internet banking customers. In consistent with the findings of Pikkarainen et al. (2006), Herington and Weaven (2009) found that the personalization of the bank website, user friendliness, and site organization were important determinants of the level of customer satisfaction. The findings of the study suggested that service quality of internet banking was a major determinant of the level of customer satisfaction.

Investigations by Nupur (2010) in Bangladesh have confirmed the positive association between internet banking and customer satisfaction within the banking sector. In this study, the researcher examined a sample of 250 respondents who comprised of Bangladeshi bank customers. An analysis of the survey data revealed that a significant and positive association existed between the usage of internet banking products and customer satisfaction. The study further revealed that the key factors influencing the level of satisfaction with internet banking services are responsiveness, reliability, and assurance.

Asiyanbi and Ishola (2018) investigated the impact of e-banking services on customer satisfaction in Nigeria. Their study adopted a survey methodology in which a sample of 100 bank customers filled a self-report questionnaire. Correlation analyses revealed that most customers in Nigeria used electronic banking services including ATM services (98%), electronic transfer (97%), and internet banking (85%). The study findings further revealed that customers were satisfied with electronic banking particularly due to the ease of accessibility. Other benefits identified with electronic banking included time savings and flexibility. Consistent with the findings of Asiyanbi and Ishola (2018), Hammoud, Bizri, and El Baba (2018) have established a positive association between e-banking and customer satisfaction in Lebanon. The study involved the collection of data using a survey of bank

customers and a subsequent analysis of the relationship between the variables. In addition to showing a positive association between e-banking and customer satisfaction, the study identified factors associated with the e-banking system that influence customer satisfaction including the ease of use, reliability, efficiency, responsiveness, privacy, and security. These findings are consistent with those of previous investigations by Ling et al. (2016) who examined the customer satisfaction of internet banking in Malaysia. Their findings revealed that customer satisfaction with internet banking services was determined by factors such as privacy, security, convenience, and web quality. The quality of the service and speed of internet services were also found to be important factors. These findings suggest that the existence of an electronic banking system alone cannot guarantee customer satisfaction but the platform itself must be friendly to the customer.

Moraru and Duhnea (2018) have studied the association between e-banking and customer satisfaction within the Romanian banking industry. The researchers collected data through a survey of 667 bank customers. The questionnaire assessed the level of satisfaction among the respondents as well as the determinants of satisfaction with the banking services. Correlation analysis between the variables revealed a strong positive correlation between e-banking and the level of customer satisfaction. Furthermore, convenience provided by electronic banking and the quality of the service were found to be important determinants of the level of customer satisfaction with electronic banking services.

Banking innovations have also been shown to have a positive impact on other aspects of customer satisfaction including attraction and retention (Agolla et al., 2018). In their study, Agolla et al. (2018 examined the impacts of banking innovations on customer satisfaction, attraction, and retention. The study involved a collection of data by survey method from customers leaving banking halls in the city of Gaborone in Botswana. A sample of 88 customers was examined with the results showing a significant positive correlation between

banking innovation and the level of customer satisfaction. Similarly, strong associations were reported between the presence of banking innovations and customer attraction and retention. The results suggest that customers get attracted to the banking innovations and are satisfied with the level of service offered by the banks, which subsequently results in retention of these customers.

Sampaio et al. (2016) have compared three different countries namely Brazil, USA, and India to assess the impact of mobile banking on customer satisfaction. The study's purpose was to examine the role of perceived justice affects the relationship between the benefits of mobile banking and customer satisfaction. The study introduced an important aspect of cross-cultural perspective in investigating the role of uncertainty avoidance and perceived justice. A survey methodology was adopted in which bank customers who used mobile banking apps were interviewed with a total of 383 respondents participating from UAS, India, and Brazil. The findings of the study revealed that the benefits of mobile banking were positively correlated with customer satisfaction. In addition, trust and loyalty were found to be important consequences of customer satisfaction.

The quality of the technological innovation has been shown to be a major determinant of the level of satisfaction among users of the banking services. Ayo et al. (2016), for instance, investigated how the quality of e-banking service influenced e-banking behaviors such as attitude and customer satisfaction. By examining questionnaire responses from 254 banking customers, the researchers demonstrated that the perceived quality of the electronic banking service had a strong influence on use of e-banking and customer satisfaction. Factors such as the availability and reliability of the e-banking system, the responsiveness of the banking system, the competence of the supporting staff, and the nature of the service selection were also shown to be important factors in determining the perceived e-service quality. The

findings of this study suggest that the quality of the electronic banking promotes customer satisfaction, which subsequently promotes repeat use of e-banking services.

In line with the findings of Ayo et al. (2016), Amin (2016) has explored the association between the quality of internet banking services in Saudi Arabia and its impacts on customer satisfaction and loyalty. The findings from a survey of 520 respondents revealed that the quality of the internet banking service including site organization, efficiency of the website, personal needs, and user friendliness had a strong influence on customer satisfaction and loyalty. In line with these findings, Arcand et al. (2016) demonstrated the existence of a positive relationship between the quality of mobile banking service and customer relationship. Their study involved a survey of 375 owners of mobile phones who were frequent users of mobile banking services in Canada. The findings of the study revealed that the mobile banking service quality was a string predictor of customer satisfaction and commitment. These findings suggest that banking institutions must do more than just developing technological innovations and delivering them to the customers. Instead, banks must ensure that their service innovations are of the highest quality. Moreover, banks must ensure that their service innovations enhance convenience, accessibility, and security (Amin, 2016; Arcand et al., 2016).

2.3.3.2. Impacts on customer loyalty

The concept of customer loyalty has been well-established in literature as an important measure of the effectiveness of financial institutions. Oliver (199) defined customer loyalty as the continued commitment by customers to a certain product, service, or brand offered an organization. Customer loyalty behaviors include world of mouth recommendation, increased scale of relationship, increased scope of relationship, continued purchase of services from a financial institution, and increased frequency of purchases (De Ruyter et al., 2008).

According to Baloglu (2002), customer loyalty is measured using two dimensions namely, behavioral loyalty and attitudinal loyalty. Attitudinal loyalty reflects the existence of feelings that create an individual's attachment to an organization or its products and services while behavioral loyalty refers to the extent to which the attitudinal feelings are translated to repurchase behaviors such as repeated purchase and word of mouth recommendations (Zeithaml et al., 2006).

Ho and Ko (2008) examined the effects of self-service technology (SST) on customer value and readiness. The study sought to determine whether the SST derived from internet banking had an impact on customer value and customer readiness for continued use of the internet banking services. The study involved an online survey where 771 bank customers participated and structural equation modeling for analysis of the responses. The findings of the study revealed that self-service including system usefulness, ease of use of the system, cost savings accrued from the use of the system, and self-control had a positive impact on customer value and readiness. Subsequently, customer's loyalty was shown to improve as their readiness to use internet banking in future was shown to improve. The findings suggest that the self-service component of internet banking promotes continued use of internet banking.

In a study on the New Zealand banking sector, Kingshott et al. (2018) have evaluated the role of technological innovations in customer loyalty. The focus of the study was the determination of the differences in the integration of online platforms by local, national, and foreign banks in New Zealand. The researcher collected data from a survey of 336 business customers of the New Zealand banking industry. The data revealed that both online and offline service quality affects the customer satisfaction with electronic banking services. This in turn affects the customer trust and commitment towards the bank and overall loyalty towards the bank. The findings further suggested that trust and commitment on loyalty

derived from e-banking was stronger for national and local banks compared to foreign-branded banks thus reflecting the nationalist behavior of New Zealand bank customers.

A substantial body of prior research on the impact of bank innovations on customer loyalty suggests that customer loyalty is one of the major outcomes of customer satisfaction (Edvardsson et al., 2000; Casaló et al., 2008; Thukar et al., 2014; Aghadaie et al., 2015; Ayo et al., 2016). For instance, Casaló et al (2008) investigated the role of customer satisfaction on development of customer loyalty and positive word-of-mouth for customers of e-banking. Spanish-speaking respondents were surveyed on their experiences and level of satisfaction in using the websites of leading banks such as Deutsche Bank, BBVA, and La Caixa. The findings revealed that customers who experienced previous satisfaction with a bank website demonstrated positive word of mouth and loyalty behaviors. The findings of this study implied that banks need to prioritize on ease-of-use in website development in order to cultivate satisfaction and customer loyalty. Thakur (2014) examined the factors that keep users of mobile banking loyal. In the study, Thakur demonstrated that satisfaction from mobile banking emanating from previous interactions was the major determinant of customer loyalty. In addition, the study findings revealed that customer satisfaction and loyalty were positively correlated with the usability of mobile interface. This study suggests that customer satisfaction is a prerequisite factor for achievement of customer loyalty in the banking sector.

The findings of Casaló et al (2008) and Thukar (2014) are consistent with the definition of customer loyalty proposed by Ab-Hamid (2006) who opined that customer loyalty occurs in a multiple-stage process. The first phase, defined as cognitive loyalty, involves the development of preferences towards a specific banking institution over other banks or services due to superior quality of service. Once the customers attain the desired satisfaction level, then they move to the affective loyalty phase. In the affective loyalty phase, the customers develop positive attitudes towards a bank or specific product offered by a bank.

Upon continuous positive experiences, customers then move to the cognitive loyalty phase, which is described as the phase where customers show intention and commitment for repurchase of products offered by a bank. Therefore, the intention for repurchase and continued relationship with a bank is derived from previous customer satisfaction (Ab-Hamid, 2006; Thukar, 2014). Moreover, Aghadaie et al. (2015) explored the role of electronic banking in influencing customer satisfaction and loyalty. Their investigations involved an examination of data collected from a survey of 250 bank customers in which their satisfaction and loyalty levels were measured against the use of electronic banking. The findings of the study revealed that electronic banking was a strong predictor of customer satisfaction, which in turn cultivated customer loyalty. In consistent with these findings, Ayo et al. (2016) demonstrated that customer satisfaction with electronic banking services was prerequisite for long-term use of an e-banking service thus suggesting the sequential relationship between customer satisfaction and loyalty.

While most studies have explored the subject of customer loyalty and banking technological innovations from the perspective of bank customers, a few studies have explored the subject from the bank managers' perspective. Janosson and Letmark (2005) conducted qualitative interviews with bank managers to obtain their in-depth assessments of the determinants of customer loyalty in internet banking in Sweden. The bank managers interviewed perceived internet banking to be beneficial to customers in terms of enhancing accessibility and convenient access to banking services. However, there were perceptions of the problems associated with feelings of insecurity among users of internet banking. Interviewed bank managers perceived internet banking as a key contributor to customer loyalty through cultivation of positive relationships and constant interactions. In another study, Larsson and Viitaoja (2017) examined the perspectives of bank staff on the challenges of cultivating customer loyalty in digital banking. The study involved collection of data through in-depth

interviews with ten bank managers on digital banking and its effects on customer satisfaction and loyalty. The managers perceived the benefits of internet banking such as interactivity, choice, and convenience as critical in cultivating customer satisfaction and loyalty. However, the bank managers believed that the perceptions of insecurity among customers were the major challenges in the adoption of digital banking.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter highlights the research methodologies adopted to investigate the impact of technological innovations in Myanmar banking sector on bank performance and customer satisfaction. Saunders et al. (2012) points out that conducting research involves the use of different methods and approaches based on the specific needs and requirements of a research project. According to Jankowicz (2005), a research methodology is acceptable if the researcher can give rationale and justification for the particular method or methods used. Therefore, this chapter seeks to justify the research approach and methods used in investigating the research question. This chapter begins with an introduction to the other chapters in the chapter. The chapter also highlights the research philosophies and paradigm with which the researcher identifies with and which guide the overall research approach. The chapter also gives a detailed account of the research methods and research design used in the study. This study adopts a mixed methods research methodology where both qualitative and quantitative research methods are used together in the same study. The methods of data collection and analysis are also discussed along with the rationale for their use. The chapter concludes with an overview of the considerations made for matters such as validity, reliability, trustworthiness, and the ethical considerations made for the study.

3.2. Research Setting

This study was conducted in Myanmar in the period of February to March 2019. The setting of this study may be described as a field study. Field studies are conducted in real-life

settings. The research involved a survey of customers using banking products in Myanmar as well as in-depth interviews with bank managers. The surveys were conducted within the respondents' settings. The respondents were provided with printed questionnaires and asked to fill and return them to the field researchers. The interviews were conducted at the places of convenience of the respondents, mostly in their offices. This setting helped to create an environment of relaxation and openness and therefore helped to enhance the authenticity of the respondents' answers to interview questions.

3.3. Research Philosophy

Saunders et al. (2015) considers research philosophy as the ways of looking at the world and interpreting what is being studied. Therefore, it is the way of interpreting the world and which influences the research process. A research philosophy consists of four major components: epistemology, ontology, axiology, and methodology. In this study, considerations of epistemology and ontology were made in determining the research approach, design, and methods.

3.3.1. Epistemology

Epistemology refers to the assumptions about the nature and form of knowledge. Epistemology is concerned with how knowledge is created, acquired, and communicated with other human beings. Epistemology is also concerned with the relationship between the researcher and the knowledge. According to Kivunja and Kuyini (2017), there are four sources of knowledge namely: intuitive, authoritative, logical, and empirical. While intuitive knowledge is based on beliefs, faith, and intuition, authoritative knowledge is based on information gathering from knowledgeable people, leaders, and books. On the other hand, epistemology based on logical knowledge involves a situation where the researcher relies on

reason in knowing the truth while empirical knowledge is the one that is gained through collection of demonstrable objective facts and experiences (Weber, 2017).

Two opposing epistemological stances have been adopted by researchers for many years namely objectivism and subjectivism. Objectivism refers to the belief that truth and meaning exists within an object and are therefore independent of human subjectivity (Lee, 2012). Under objectivism, researchers seek to eliminate all contextual factors in order to make observation of a phenomenon as it exists independent of the human mind. This helps to remove human biases thus resulting in the discovery of knowledge. Objective epistemology is based on the assumption that the phenomenon under observation is not changed by the researcher making the observation and neither does the phenomenon influence the researcher. Adhering to the objectivist epistemology means engaging in impartial observation, which is not in any way influenced by human factors. Moreover, the objectivist epistemology assumes that knowledge is universal and universally applicable since the outcomes of observation do not change regardless of the observer (Gotthelf & Lennox, 2013; Levers, 2013).

On the other hand, subjectivism assumes that knowledge is subjective since it is construed through the lenses of human factors such as race, ethnicity, gender, language, and social class. The subjectivist epistemology assumes that knowledge is influenced by individual reflections and personal interpretations. In subjective research, observations made in a research study are influenced by the person making the observation. On the other hand, the observer is influenced by the phenomenon being observed. Under the subjectivist epistemology, the goal of research is to develop an understanding of a phenomenon through socially construed knowledge (Levers, 2013).

In this study, the researcher accepts that knowledge may be objective and subjective. The researcher accepts multiple forms of knowledge while accepting that the research process is

socially construed. This is the essence of the mixed methods research methodology adopted in this study. In this study, quantitative data is obtained through a survey and subjected to statistical methods of analysis to facilitate the prediction of patterns. On the other hand, subjective data was obtained through interviews with a small group of respondents comprising of bank managers of Myanmar banks. Therefore, this study adopts a flexible epistemology that accepts both objective and subjective data as being accurate reflections of reality.

3.3.2. Ontology

While epistemological assumptions are concerned with the nature of knowledge, ontology is concerned with what constitutes reality. The major concern of ontological assumption is whether reality exists independently of human experience and consciousness or whether it exists within the context of human experience and consciousness (Ormston et al., 2014). Ontology is concerned about whether reality is construed within our mind or it exists independently. The two major contrasting ontologies are the critical realist and the relativist ontologies. Critical realism refers to the ontological perspective that assumes that reality exists independently of the human mind irrespective of whether the reality can be comprehended or experienced (O'Reilly & Kiyimba, 2015). Under the critical realist ontology, the existence of reality does not necessitate the awareness of knowledge. Critical realists believe that the world exists independently of the human mind. Therefore, the aim of research according to critical realists is to identify and describe phenomena (Bergen et al., 2010).

On the other hand, the relativist ontology refers to a belief in reality that is comprised of subjective experiences. From a relativist perspective, nothing exists outside human thoughts and therefore reality cannot be differentiated from the subjective experiences of that reality.

The relativist ontology accepts that reality is construed through human experience. Since different people have different perceptions of truths and realities, it follows then that the multiple interpretations of experience give rise to multiple realities (McLachlan and Garcia, 2015). Therefore, the relativist ontology accepts that there is no single universal version of reality but instead there are as many versions of realities as there are people perceiving a phenomenon. Under the relativist ontology, the aim of conducting research is to understand the subjective experiences of reality as well as the multiple truths associated with it (O'Reilly & Kiyimba, 2015).

The aim of the current study was to investigate how technological innovations with products and services have affected the banking sector in Myanmar. In conducting this research, both qualitative and quantitative research methods were used. Therefore, this study was guided by the relativist ontology that assumes that reality is subjectively construed. The findings of the interviews reflect subjective realities of the respondents and therefore the aim of the study was to develop an understanding of these subjective experiences. The researcher assumes that reality cannot be defined from a single perspective but is instead construed from multiple perspectives.

3.4. Research Paradigms

A research paradigm refers to the system of ideas or worldview that researchers use in generating knowledge. A research paradigm is the set of beliefs, assumptions, criteria, and research strategies that guides the research process. Willis (2007) defines a paradigm as a comprehensive belief system, worldview, or framework that guides research and practice in a specific field. When undertaking research, it is important for the researcher to consider his or her belief system on what constitutes reality and knowledge. The researcher's perceptions, assumptions, and beliefs on the nature of truth and reality may have a significant influence on

how research is undertaken in a research project. Therefore, it is important to discuss the philosophical assumptions and paradigms in a research study in order to understand the research choices. According to Roulston and Shelton (2015), researchers may have inherent preferences that could shape the research designs or even introduce researcher biases. Therefore, describing the researcher's philosophical foundations helps to determine whether the research designs are consistent with the research problem. Different research paradigms inspire researchers to adopt different ways of investigating a research phenomenon. In this study, several research paradigms were considered including the following:

3.4.1. Positivist paradigms

Positivism assumes that absolute truth can be obtained through objectivity and scientific hypothesis testing. Positivists collect quantitative data and use objective methods to measure the data in order to derive empirical evidence (Neuman, 2006). Positivists assume that the quantitative data obtained from the research process is not influenced by social, cultural, or other human factors. Researchers who adopt the positivist paradigm explain results in quantitative terms to show the interaction between variables and causal-effect relationships between variables. The focus of positivist research is on objectivity, the use of scientific research methods, and use of statistical methods of data analysis (Antwi, S. K., & Hamza, 2015). Quite often, positivist researchers begin with a hypothesis derived from theory and then use observation and quantitative research methods to prove or disprove the hypothesis. Moreover, positivist researchers assume that laws and principles derived from a research process may be generalized to other similar situations (Sarma, 2015). Positivism emphasize on using highly structured and systematic research processes and the analysis of data in an objective manner that is value-free (Neuman, 2006).

3.4.2. Postpositivist paradigms

The postpositivist paradigm is similar to positivism in that it places great emphasis on the requirements for precision, objectivity, logical reasoning, and empirical evidence (Wahyuni, 2012). However, it differs from the positivist paradigm in that it does not confine itself to what may be physically observed. The postpositivist paradigm is grounded on the objectivist epistemology and critical realist ontology. The postpositivist paradigm is based on the understanding that the requirement for generation of absolute truth through scientific methods is untenable in the modern world. Therefore, postpositivists assume that while universal laws and truths may exist, their discovery is nearly impossible and only partial segments of the truth can be developed (Sławecki, 2018). Postpositivism further assume that knowledge is influenced by contextual factors. However, objective investigation is still considered the most appropriate way of discovering the truth (Levers, 2013). The research methodology in postpositivist paradigm is primarily quantitative where the researcher seeks to identify and discover knowledge and then describe and analyze the patterns and structures of that knowledge.

3.4.3. Interpretivist Paradigm

The interpretivist research paradigm accepts subjective human experiences as constituting knowledge. In contrast to the positivist and postpositivist paradigms, the interpretivist paradigm assumes that it is important to explore the subjective meanings that motivate people's actions in order to enhance the understanding of the reality behind them (Saunders et al., 2009). The interpretivist research paradigm further assumes that individuals experience social and physical realities differently and therefore the aim of research is to identify what is meaningful to the individuals being investigated (Antwi, S. K., & Hamza, 2015). Interpretive research allows the researcher to determine the socially construed meanings of reality. The

research methods that are consistent with the interpretivist include interviews, ethnographies, focus groups, case studies, and participant observation. The interpretivist paradigm is based on a relativist ontology and subjective epistemology. According to Levers (2013), interpretivist research assumes that knowledge is influenced by the specific circumstances that influence the researcher and the research process including cultural, historical, temporal, and other subjective factors. Under the interpretivist paradigm, researchers accept that reality and meaning exists in multiple forms. Therefore, there are different ways of knowing and construing reality. The focus of research in interpretive paradigm is the recognition and narration of meaning of human beings, their experiences, and actions as socially construed (Petty et al., 2012).

3.4.4. Constructionist paradigm

The constructionist view holds that reality is construed by the researcher. The constructionist philosophy is based on the assumption of relativist ontology, which holds that multiple realities exist in the research process. The paradigm is also based on the subjective epistemology where knowledge is considered to be subjective. The constructionist paradigm combines the aspects of both postpositivist and interpretivist paradigms. The paradigm assumes that meaning is co-created by the researcher and the research participant through the interaction between the two participants. Therefore, the meaning in the research process is influenced by the researcher's interpretation and the subjective aspects of the participant and the society. Under the constructionist approach, knowledge is constructed rather than discovered through the interaction between the researcher and the observed phenomena (Levers, 2013).

3.4.5. Critical Theory

The critical theory paradigm views the world as being composed of virtual reality that is construed through a multiplicity of human values. This reality is influenced by multiple values associated with human beings including gender, social, political, and ethnic values among others. Therefore, the critical theory paradigm assumes that knowledge is not only subjective in nature but also grounded in historical and social factors that result in value-dependent judgments. Critical theory combines the realist ontology assumptions with the assumptions of subjective epistemology. Critical theory is applied in long-term ethnographic or historical studies of structures and processes. The aim of critical theory is transformation where the researcher seeks to eliminate certain conceptions among the participants and have them support a given viewpoint (Guba and Lincoln, 1994).

3.4.6. Paradigm for this research

In the current study, the several research paradigms were considered for appropriateness in adoption in the research process including the positivist, post-positivist, interpretivist, constructionist, and critical theory. The positivist and postpositivist paradigms were deemed unsuitable in directing the direction of the study for several reasons. First, the requirement of objectivity stipulated by positivist and postpositivist research paradigms were inconsistent with the data collected in the study. The study sought to explore how technological innovations had influenced bank performance in Myanmar. To explore this research problem quantitatively, financial data of banks in Myanmar was required for several years and be subjected to statistical analysis in order to detect patterns. However, financial statements of Myanmar banks are largely unavailable with only a handful of banks publishing their financial performance. Therefore, the available financial data was so limited to facilitate quantitative research. Instead, the current study involved a collection of subjective

information from interview data. Second, the positivist and postpositivist paradigms were deemed unsuitable for the current research due to their epistemological limitations. Epistemological assumptions under positivist and postpositivist paradigms stipulate the use of closed questions in questionnaire design and therefore do not allow the discovery of new knowledge that could emerge from open-ended questions in interviews. The current study involved interviews in which new information was allowed to emerge freely during interviews. The researcher assumed that knowledge could not only be developed through objective data collection methods but also subjectively construed through qualitative methods.

The critical theory paradigm was not deemed relevant to the current study, as the research was not a long-term study and neither was the objective of the study the transformation of individuals' consciousness. Moreover, the researcher was not part of any of the institution being investigated and was not part of the sample population.

The current study accepted the interpretivist-constructionist paradigm as the most suitable for guiding the research process. The interpretivist-constructionist paradigm accepts both the interpretivist and constructionist philosophies. Under this paradigm, meaning are not only subjectively construed by the research subjects but also co-created through interaction between the researcher and the phenomena under investigation. The constructionist paradigm accepts postpositivism and therefore assumes that data collected through objective methods such as surveys as suitable components of knowledge. On the other hand, the interpretivist paradigm accepts subjective information obtained through methods such as interviews to be acceptable forms of knowledge. The current study involved the collection of data through a survey and subsequent analysis of the survey data through statistical methods. On the other hand, subjective experiences of bank managers were obtained through interviews and the use of non-statistical methods to analyze the interview data. Since the current study sought to

determine the impacts of technological innovations on bank performance using a small population of bank managers, the qualitative methodological approach that is consistent with the interpretivist perspective was adopted. However, quantitative methods were adopted for analyzing survey data obtained from a survey of a larger sample of bank customers whose opinions were used to determine the level of satisfaction with the technological innovations. Therefore, the interpretivist-constructionist paradigm was most suitable in this study.

3.5. Research Methodology

3.5.1. Quantitative research methods

Research methodologies are broadly classified into three: quantitative, qualitative and mixed methods research. In quantitative research methods, the information collected and processed is in form of numerical data. This data is obtained through systematic research processes. Typically, statistical methods are employed in analyzing the data. Quantitative research involves the analysis of numerical data in order to describe or explain a phenomenon. This allows the researcher to reject or accept research hypothesis based on the findings of statistical tests (Sarosa, 2007). In social sciences, quantitative methods are appropriate when the aim of a research study is to establish quantifiable understanding of human experiences. Quantitative methods involve the use of experiments, surveys, standardized observation studies, and correlation studies. In these studies, researchers seek to measure and analyze causal relationships between variables. Quantitative research methods are based on the positivist and postpositivist paradigms where the focus is to measure variables and test hypothesis in order to explain a phenomenon. In quantitative research methods, the focus is on minimizing or eliminating the human factor in the research process. Quantitative research methods emphasize the need for objectivity when conducting research. Such methods are characterized by standardized protocols and data analysis based on numerical and statistical

methods (Neuman, 2006). Furthermore, quantitative studies assume that the research process is value free and results are replicable and generalizable across similar research settings (Creswell and Creswell, 2017).

The current study involved the use of quantitative research methods where data was collected through a survey approach. A survey of customers in the Myanmar banking sector was conducted to determine their opinion of technological innovations in their banks. This helped to quantitatively measure the level of customer satisfaction and loyalty among the respondents as a result of adoption of various banking innovations. The nature of data collected from the survey was deemed appropriate for the application of quantitative research methodology.

3.5.2. Qualitative Research Methods

While quantitative research methods involve the collection and analysis of numerical data, qualitative research methods emphasize the collection of data comprising of descriptive words and texts. Qualitative research methods are appropriate when the information collection comprise of values, opinions, and behaviors of human beings. This approach is useful because it allows the researcher to gain extensive and in-depth information about a phenomenon. Qualitative research methods recognize that individual perspectives of the research are important since they represent the role of the researcher in studying and interpreting the outcomes of the research process. Qualitative researchers accept that knowledge may be subjective and socially construed. Therefore, the researcher's values, experiences, beliefs, and preconceptions could influence the research process (Neuman, 2006). The qualitative research methods are founded on the interpretive research and critical paradigms. In qualitative research, the researcher focuses on exploring and gaining an understanding of the meanings that people attach to a specific social or human problem under

investigation. The researcher is actively involved in making meaning of the data obtained from the results of the study (Creswell and Creswell, 2017). Qualitative research methods typically involve the use of interviews, ethnographies, focus groups discussions, case studies, and phenomenological studies. One of the major limitations of qualitative research methods is the potential bias that may be introduced in the research process by the researcher as well as the subjective nature of the results. Moreover, the findings of studies conducted through qualitative research methods are generally not generalizable to other similar situations. However, the approach is most appropriate in obtaining in-depth understanding of complex phenomenon as well as being useful in exploratory research where quantitative research methods cannot be applied.

Some sections of the current research study were deemed to be most suitably researched through qualitative research methods. The research involved conduct of interviews with bank managers of Myanmar banks whose experiences and observations formed the basis of understanding the impact of the technological innovations adopted by the studied banks. Due to the limited number of respondents available, it was impossible to collect numerical data from these interviews. Instead, the researcher focused on in-depth interviewing in order to identify common themes and patterns from the interview data. The semi-structured nature of the interview helped in discovering new themes and concepts as they emerged through the research process.

3.5.3. Mixed Methods Research

The other research approach adopted in research studies is the mixed methods research. This method of research combines the elements of both qualitative and quantitative research in the same study (Uprichard and Dawney, 2019). Mixed methods research involves the collection and subsequent analysis qualitative and quantitative data. In mixed methods research, the

findings of one method are evaluated alongside the findings of another method. Alternatively, data synthesis occurs across different research methodologies. Integration remains at the center of mixed methods research because the researcher mixes different methods to obtain information from multiple sources (Uprichard and Dawney, 2019). The major benefit of the mixed methods research is that it allows the maximization of benefits derived from both qualitative and quantitative methods. The mixed methods research is based on a pragmatic approach, which views the selection of research approaches as being guided by the pragmatic considerations of the suitability of different approaches based on prevailing situations and nature of the research problem. The primary assumption of the mixed methods research is that the combining qualitative and quantitative research methods has the overall impact of enhancing the understanding of the research problem as opposed to the case where only one approach is adopted (Creswell and Creswell, 2017). The mixed methods approach further assumes that social phenomena are so complex that they cannot be explored using a single research perspective. Instead, social phenomena are best studied through a multidimensional approach that seeks to capture knowledge through different modes of explorations. Therefore, mixed methods facilitate a deeper analytic approach as well as the adoption of a more comprehensive approach to the research process (Uprichard and Dawney, 2019).

The current study adopted a mixed methods research approach where both quantitative and qualitative research methods were used. The quantitative research method involved the collection of survey data comprising of responses to a questionnaire that sought to measure the level of customer loyalty and satisfaction among bank customers in Myanmar. The numerical nature of the data collected and the large sample size examined facilitated the use of statistical methods to assess the level of customer satisfaction and loyalty following the adoption of technological innovations. On the other hand, qualitative approaches were used to collect and analyze interview data obtained from interviews conducted with managers of

banks in Myanmar. The interviews involved open-ended discussions with five managers whose perspectives helped to develop an understanding of the impact of technological innovations on the Myanmar banking sector.

The mixed methods research approach adopted in the present study has numerous benefits including giving a comprehensive account of the phenomenon under investigation, giving clear links between concepts under investigation, and having a practical approach to the research problem investigation. In addition, the mixed methods research gives the benefit of triangulation where a research problem is investigated using multiple methods in order to gain multiple perspectives. Moreover, the mixed methods approach improves the validity of the research in addition to ensuring that research questions that cannot be answered with one research method are explored using another method.

The collection of quantitative and qualitative data helped to develop a better understanding of the true impact of technological innovations with products and services in Myanmar's banking sector. The qualitative data from semi-structured interviews helped to gain an in-depth understanding of how managers perceived technological innovations to have affected the financial performance of the banks while the quantitative data collected from surveys helped to analyze patterns of customer satisfaction and relate them to the findings of the interviews. Integration of the results of the qualitative and quantitative methods helped to form a broader picture of the relationship between the main variables of interest. According to Uprichard and Dawney (2019), integration of qualitative and quantitative results is critical in developing an understanding of social phenomena through the assessment of multiple perspectives.

3.6. Research Design

The research design refers to the overall plan for collecting information that answers the research questions in a study. It is the strategy for collecting and analyzing data in a way that seeks to ensures the relevance of the research protocols while at the same time ensuring the economy of the procedure. According to Kombo and Tromp (2009), a research design may be considered as the overview of the overall research approach and the chosen research methods. A research design describes the overall structure or blueprint of the research process from the formulation of research questions and hypotheses to the final stages of reporting the findings of a study. Identifying the research design in a study is important because it helps to determine the research operations and procedures that yield the most information with minimal expenditure in terms of time, effort, and money. The choice of the research design adopted in a study is influenced by factors such as the nature of research questions, the hypotheses tested, the variables examined, the research settings, the data collection methods, and the data analysis methods. There are three broad categories of research designs adopted in social science research namely exploratory, descriptive, and explanatory research (Neuman, 2006). The exploratory research design involves the general research plan where the focus is on gaining of more insights into a certain phenomenon. On the other hand, explanatory research design is focused on explaining the causes of an observable phenomenon. Descriptive research involves the collection of facts in order to give a comprehensive picture of a phenomenon under study.

The present study adopted a mixed methods design and therefore mixed two research designs in the same study. The qualitative research part of the study adopted an exploratory research design. The impact of technological innovations on the financial performance and operational efficiency on Myanmar's banking sector has not been explored before. Therefore, this study takes an exploratory approach to explore the interplay between these factors in order to guide

future investigations on the field. Exploratory research designs are suitable for investigating phenomena that have not been studied before. According to Zikmund et al. (2013), exploratory research serves the purposes of diagnosing a situation, screening for alternatives, and discovering new ideas. The present study sought to enhance the understanding of how technological innovations influence various aspects of bank performance and therefore fitted within the purpose of diagnosing the situation.

On the other hand, the quantitative component of the research adopted a descriptive research design. A descriptive research design involves a systematic research method of collecting large amounts of data with the aim of testing hypotheses. In a descriptive study, the researchers engage in observations, counting, measuring, delineation, or classification in order to have an accurate portrayal of the characteristics of individuals, situations, groups, or frequencies of a certain phenomenon. Therefore, the current study used a descriptive survey design to collect and analyze data that presented the characteristics of bank customers in Myanmar. The respondents' demographics, preferences, satisfaction, and loyalty levels towards certain banks were explored through collection of survey data in form of closed questions in a questionnaire. This follows from previous similar studies that have adopted descriptive research designs. In a study of the impact of electronic banking on the profitability of banks in Kenya, Vekya (2017) adopted the descriptive research design, which helped to assess the association between the variables of interest.

3.7. Data Collection Methods

In this study, two main methods of data collection were used to collect information that formed the basis of the results of the study. For the quantitative data, a survey method was used to collect data with the help of a questionnaire instrument. On the other hand, qualitative data was collected through semi-structured interviews.

3.7.1. Surveys

Surveys are some of the most commonly used quantitative methods for investigating social phenomena. Surveys involve the collection of information in form of the opinions of a sample of individuals drawn from a population with the aim of developing knowledge about a problem under investigation. Therefore, the data collected from surveys is quantitative in nature and may be subjected to statistical testing analysis in order to make generalizations about the study. The current study involved a survey of bank customers in order to collect their opinions regarding to their satisfaction with bank innovations and technologies. The survey also sought to measure the level of customer loyalty that was attached to the banks that had adopted technological innovations on various products and services. Several factors informed the choice of the survey method in the current study. First, the survey method facilitated the collection of a large volume of numerical data on the opinions of bank customers. The survey gave an opportunity for the collection of data with sufficient detail and quality to discover patterns of customer satisfaction and loyalty. Moreover, surveys are easy and convenient to distribute to a large number of respondents. The survey method offered a suitable method of testing the hypothesis that technological innovations positively improved customer satisfaction and loyalty. The survey method was also deemed appropriate because it gave access to a large population of respondents drawn from the Myanmar banking sector.

In the present study, questionnaires were distributed to eligible respondents between February and March 2019. The questionnaire was personally distributed to customers of various banking institutions in Myanmar. The questionnaires were accompanied by a participant information sheet in English and Burmese explaining the nature and purpose of the study as well as inviting the respondents to participate in the survey. The survey instrument comprised of closed ended questions on a Likert-scale where respondents were asked to indicate their level of agreement to several statements in the range of 1 (strongly disagree) and 5 (strongly

agree). The questionnaire distributed to the customers had two main sections. The first section sought to collect the demographic data of the respondents including their gender, level of education, and period of usage of banking services. The second section sought to determine how satisfied the customers were with the banking services offered by their banks. The respondents were asked to identify the banking technologies that they used frequently as well as the innovations that they found most useful in their lives. One of the survey questions sought to determine the level of satisfaction with electronic banking compared to the traditional banking methods. The respondents were also asked to indicate their level of satisfaction with various banking technologies including mobile banking, automated teller machines, electronic funds transfer, and debit and credit cards. In order to assess the level of loyalty among the customers, the respondents were asked to state their likelihoods of continuing to use the technological innovations within their preferred banking institutions. Customer loyalty was also measured by evaluating whether the customers had intentions to switch banks as well as asking the respondents whether they would recommend their current banks to other customers. This study also measured the major determinants of customers' preference of technological innovations. Finally, customers were asked to state the major challenges that they encountered in the use of banking technologies.

The sampling strategy aimed at obtaining a representative sample of bank customers in Yangon. The sample was representative because it covered all the bank branch categories including small, medium, and large branches. Moreover, the sample was relatively large with 205 respondents interviewed. The random sample was obtained by generating random numbers using Microsoft Excel. For the period of sampling, customers leaving the bank branches were counted and potential respondents picked using the random numbers. This ensured that the sample was unbiased and representative. A total of 250 respondents were approached with 205 agreeing to participate. Thus, the study had an average response rate of

83%. Fincham (2008) notes that response rates above 80% are appropriate for external surveys. Fincham (2008) further observes that incentives improve the response rate. However, no incentives were offered in the present study. This could have reduced the response rate in the study. Nevertheless, most respondents were willing to participate in the study without incentivization because the researcher clearly explained the potential benefits of the study.

After questionnaire set was confirmed, the Survey was conducted in Yangon, which is economic capital of Myanmar. Yangon was selected for this study because the dominance of banking services in the area ensured that the sample collected was representative of the entire banking sector. Yangon has the highest bank branches per inhabitants with 6.4 branches serving 100,000 persons (GIZ, 2016). Yangon consists of four districts namely: East, West, South and North districts. 50 samples were collected from each district and 55 in the East district for a total of 205 samples. The sample size was deemed appropriate to collect enough quantitative data considering the length of the questionnaire. In each district, the survey was done at 7-8 bank branches and collected 6-7 samples per branch. The selection criteria of the bank branches included: a) maximum 3 branches and minimum 2 branches in each district per large domestic leading bank b) a balanced mixture of branch sizes between large, medium and small branches and c) the distance between branches to ensure that bank branches where survey was conducted were fairly distributed in the four districts. At the survey branch, the Survey team waited outside the bank branch and distributed the questionnaire randomly to chosen customers before customers left the branch. The customers were requested to fill up the questionnaire. Each customer took 2-3 minutes to complete. The data collection was conducted between 10:00 a.m. and 1.00 p.m. local time in all cases. Most customers were able to answer the questionnaire with minimal assistance. However, the challenge was to ensure the customers understand the questions. Thus, a brief explanation was done to each

customer about the purpose of the survey and how the customer could answer each question. While, customers were filling the form, they were also guided if they seemed to face difficulties in answering questions. Generally, it took about 20-30 minutes per survey.

3.7.2. Interviews

Interviews are the most common forms of data collection in qualitative research. The interview method was used to obtain the perspectives of bank managers on their assessments of the impacts of technological innovations on bank performance. Semi-structured interviews were deemed ideal for the current study as they helped to enhance the flexibility of the interview process. In a semi-structured interview, the interviewer prepares interview questions using the interview guide. However, the interviewer is flexible enough to allow the interviewing process deviate slightly from the interview guide in order to allow the respondents to raise important issues that may not have been captured in the interview guide. One of the advantages of the semi-structured interview is that it provides the interviewees with the freedom to express personal views according to their own understanding and not that of the researcher. The semi-structured interview process further allows a two-way communication between the researcher and the respondent. The current study involved interviews that followed a semi-structured format. The respondents were encouraged to engage in free expression of their views and explore issues that they deemed relevant to their experiences.

The interview methodology was used to collect data on the impact of technological innovations on bank profitability and operational efficiency. The major reason why the interview method was selected for investigating this phenomenon was the limitations in numerical data. Having emerged from years of turbulent political environment, the Myanmar's banking sector was severely affected and has only regained composure in the last

decade. Most banks do not publicly report their financial performance data and the few that publish their financial reports have only done so for the past few years. Therefore, it is not possible to make annual comparison of financial records due to the unavailability of data. In addition, the interview method was deemed most suitable because it facilitated the collection of rich data through in-depth interviews with knowledgeable persons. The interview method has been used in other studies to examine the impacts of technological innovations on the banking sector. For instance, while investigating the impacts of innovations on bank performance, Scott, Van Reened, and Zachariadis (2017) used a survey approach supplemented with the use of in-depth interviews. Similarly, Abbas et al. (2014) used a mixed methods research approach involving both interviews and surveys.

The interview questions used in this study were open-ended as opposed to the closed questions used in the survey. This allowed the interviewees to express their personal opinions in their own words as opposed to those of the researcher. During the interviews, bank managers from various banks in Myanmar participated in providing their insights on the impacts of bank innovations on financial performance and operational efficiency of their banks. The interviews were conducted in person by the researcher through face-to-face conversations. Face-to-face interviews were considered most appropriate because they allowed the researcher to observe the interviewees' body language in order to construe certain expressions and attitudes as observed by King et al. (2018). The face-to-face interactions also helped to build rapport with the interviewees and therefore enhanced the feeling of flexibility and openness that enhanced the quality of the responses.

Prior to the actual interviews, contacts were made through mobile phone with potential interviewees to arrange for the interviews. The researcher first sent out the participant information sheet to the interviewees explaining the nature and purpose of the study. The participants were also asked to sign an informed consent form after which they were invited

to dedicate time for the interviews. The interviews were conducted at the convenient place and time given by the respondents. Five of the interviews were conducted at the offices of the bank managers at their respective bank branches while three interviews were held at corporate headquarter offices. All interviews were conducted in the afternoons and recorded using a tape recorder. All interviews were conducted and transcribed in the English language. Each interview lasted between 30 minutes and 50 minutes. Each interview followed the format of a conversation. The researcher used a similar style of language for all the interviews in order to enhance consistency and uniformity. After each interview, the data was transcribed and entered into a personal computer where each interviewed was stored using a unique identifier code.

The interview guide used in this study comprised of open-ended questions that sought to determine how bank managers perceived bank innovations and their impact on bank financial performance and operational efficiency (Appendix 1). The first section of the interview guide sought to collect data on the demographic information of bank managers of Myanmar banks interviewed in the study. In this segment, data was collected on the managers' ages, name of bank, levels of education and number of years they had worked in their current bank. The second part of the interview guide sought to determine how the interviewees perceived technological innovations in the context of influencing financial performance. The third part of the interview guide focused on obtaining the opinions of the bank managers on how they believed technological innovations had influenced the operational efficiency of their banks. The questions asked to the respondents in this respect are summarized below:

Table 1: Summary of interview questions according to various research themes

Research theme	Interview questions
Impact of technological innovations on financial performance	• What technological innovations are currently adopted by your bank? • Which technological innovation do you think has had the greatest impact on your bank's financial performance? • In your opinion, have these technological innovations boosted your bank's profitability in terms of net income? • To what extent do you think that electronic banking has had on your bank's revenue? • What is your assessment of the return on assets (ROA) of the technological innovations at your bank? • What is your assessment of the return on equity (ROE) of the technological innovations at your bank? • Do you think that customer deposits have improved since your bank adopted electronic banking technologies? • In your own assessment, what impact has the adoption of electronic banking technologies had on shareholders' wealth?
Impact of technological innovations on operational efficiency	• To what extent do you think that the adoption of technological innovations has affected operations at your bank in terms of the following? Quality of service; Speed of service delivery; Dependability of service. • To what extent to you think that electronic banking has affected operational costs at your bank. • Has your bank benefited from any cost savings as a result of the adoption of electronic banking? • In your own assessment, to what extent do you think that technological innovations facilitate the enjoyment of economies of scale? • How would you assess the role of technological innovations in improving employee productivity at your bank? • Do you think that the level of wastage has reduced due to the technology adoption? • What other aspects of banking operations do you feel are affected by technological innovations? • What challenges are encountered in banking operations as a result of electronic banking?

3.8. Population and sampling

3.8.1. Survey Sample Selection

A sample refers to a component of a population that is selected to represent the entire population while the population refers to the entire collection or set of all elements such as

objects, individuals, or measurements that are of interest in an investigation (Pyrczak, 2016). In the present study, the study population comprised of the entire collection of all customers in Myanmar banks who use various technological innovations. The sample comprised of a segment of the population who were selected to participate in the survey comprising of individuals living in Myanmar at the time of the study and who had access to various technological innovations such as mobile banking, ATM, debit and credit cards, and internet banking. This sample was considered most suitable for assessing the level of customer satisfaction and loyalty associated with the use of these innovations.

In survey sampling, several sampling methods may be used including random sampling, stratified sampling, convenience sampling, systematic sampling, and purposive sampling. These sampling methods are generally grouped into probability sampling methods and nonprobability sampling methods. Probability sampling involves the selection of participants where the process is randomized such that each individual in the population has equal chance of being included in the sample (Creswell and Creswell, 2017). On the other hand, non-probability sampling use methods other than probability and randomized techniques. In the current study, a random sample of 205 individuals was obtained from various banking institutions in Myanmar and questionnaires distributed to them. According to Mullinix et al. (2015), the size of the sample should be guided by specific factors of the research project. In the present study, the final sample of respondents comprised of 205 customers. Worthington and Whittaker (2006) notes that sample sizes of between 150 and 200 are adequate for most survey research procedures. The survey data was processed for data entry by coding for subsequent entry to the Statistical Package for the Social Sciences (SPSS) version 23.

The sampling procedure involved a random selection of customers from various banks and asking them to participate in the study. The nature of the study was explained to the potential participants and those who agreed to participate in the research process were provided with

printed questionnaires along with the participant information sheet (Appendix 2). The sampling was conducted in various banking institutions including private, semi-private, and government-owned institutions.

3.8.2. Interview Sample Selection

While quantitative research focuses on collection of quantitative data and use of statistical methods to analyze the data for purposes of obtaining generalizable results, qualitative makes no assumptions on the generalizability of the results. In qualitative research, a large sample size is not required and neither are random sampling methods necessary. Instead, sampling is aimed at obtaining a sample of respondents that satisfies a specific purpose in the research process. Therefore, sampling methods in qualitative research are generally considered to be purposive. The sample size and sampling method in qualitative research is dependent on the purpose of the study and the research needs of the study. In general, participants in a qualitative inquiry are selected based on their personal experiences or their knowledge of the topic under investigation (Cleary et al, 2014). Cleary et al. (2014) stipulates five principles that guide sample selection in qualitative research studies. First, sample sizes are generally small but are intensively studied. Second, participants are selected using purposive sampling methods. Moreover, the theoretical framework of the study guides the selection of participants. The sample selection is also quite often conducted in a sequential rather than a pre-determined approach. Finally, a rationale for the selection of sample participants is often needed (Cleary et al, 2014).

In the present study, a convenient sample of five individuals was examined comprising of bank managers in Myanmar. Convenient and purposive sampling techniques were used to obtain a sample of participants who were interviewed in the study. Purposive sampling was used to select individuals with expert knowledge, wealth of experience, and academic

training that were relevant to the current study. The study targeted bank managers whose job positions gave them access to information and knowledge on the financial performance of their companies as well as those of their peers. Convenient sampling was used to contact respondents who were easy to access. Due to the bureaucratic nature of business and corporate culture in Myanmar, it was not easy to gain access to top bank managers. However, those initially contacted were requested to suggest other potential participants through the snowballing technique. The purposively selected sample provided an ideal pool of participants who were knowledgeable about bank operations and financial performance. The final sample comprised of five individuals drawn from three banking institution. The sample was deemed adequate because it provided an adequate number to achieve data saturation. Having a large sample in qualitative research studies results in redundancy of information where sequential conduct of interviews results in repetition of concepts multiple times without generation of any new themes or concepts (Cleary et al, 2014).

3.9. Data Analysis

The present study collected both qualitative data and quantitative data. Qualitative data comprised of interview data collected from bank managers of selected Myanmar banks. Quantitative data comprised of survey data from collected through questionnaires administered to a sample of customers of Myanmar banks. The two types of data were subjected to various methods of data processing and analysis as described in the following sections.

3.9.1. Survey data analysis

Quantitative data is usually analyzed through the use of statistical procedures. Statistical tests may include simple procedures such as computing means to more sophisticated ones that

involve the test of hypotheses. In the current study, survey data was first entered on a Microsoft Excel Spreadsheet program and coded for easy analysis. Descriptive statistical analysis was conducted to determine the frequencies and means of various variables including the length of banking, levels of education, the most commonly used technologies, and the technologies that customers found most relevant. The descriptive analysis helped to capture the key characteristics of the sample and population and the overall level of satisfaction with various bank innovations. Means and variance of customer responses were used to describe levels of customer satisfaction and loyalty. Customer satisfaction was measured by directly asking the respondents to indicate the level of satisfaction with various products and services while customer loyalty was measured by determining the readiness of the customers to engage in continued use of the products and services of a bank as well as their readiness to recommend their banks to other customers.

Structural equation modeling (SEM) was conducted to examine the relationships between technological innovations with bank products and services, customer satisfaction, and customer loyalty. The SEM enables the test of all constructs in a hypothesized model in order to determine dependability and patterns of relations within variables. Statistical analysis was used to test the impact of each construct in order to determine the factors that influenced customer loyalty and satisfaction. Structural equation modeling (SEM) was used to verify multiple regression and test the hypotheses of the study. Survey data was analyzed using the SPSS AMOS package. The package allows the simultaneous test of model fit as well as the comparison of means, variances, and regression coefficients. Survey data was subjected to preliminary data analysis through normality, homoscedasticity, and multi-collinearity tests. Exploratory factor analysis (EFA) and Confirmatory factor analysis (CFA) techniques were employed in estimating the factor loading in the framework (Kline, 2010). Cronbach's alpha, average variance extracted (AVE), t-value, and Pearson's coefficient were calculated for the

constructs. All hypotheses were tested at the 5% significant level with the unit of analysis being the customer's mean rating (1-5) for each construct. A final correlation analysis was conducted to determine the level of correlation among the latent constructs. The statistical tests conducted in this study were implemented using the Statistical Package for Social Science (SPSS) version 23. In addition, LISREL 10.1 (Student version) was used to visualize the relationship between variables.

3.9.2. Interview data analysis

In the analysis of qualitative data, the objective is the discovery of themes and patterns that emerge from interview data rather than the derivation of statistical measures and results. In the present study, interview data was first processed by transcribing the recorded interviews into text. Once transcribed, the contents in the notes were validated by asking the participants to confirm their accuracy. During this process, all the participants agreed with the contents of the interview transcripts while one of them added more information for further clarification.

The transcribed interview data was subjected to a coding process prior to thematic analysis. The coding process involved reading the interview transcripts and identifying the major expressions, which were identified as codes. The process was repeated several times in order to reduce the number of codes by eliminating duplications and unnecessary codes. The NVivo Software was used in the coding process.

The main activity in the interview data analysis was the identification of themes present in the interview data. The researcher read through the interview transcripts many times with close reference to the pre-identified codes with the aim of identifying recurring themes. The interview data was analyzed in order to identify themes that emerged in the interviews relating to the impacts of technological innovations on the banks. While reading the interview transcripts, the researcher identified the key phrases used by each of the respondents and used

these phrases to identify the key patterns and common themes. The frequency of the common codes, phrases, and themes were quantified but were not subjected to statistical analysis. Themes began emerging after reading the transcripts of the second interview. After the themes were identified, the next step involved verifying the themes. The verification process involved comparing the themes with the interview codes and looking for evidence from the interview transcripts. Themes that had no explicit expressions within the interview data were removed. Subsequently, the researcher continued reading through the interview transcripts many times while looking for verbatim evidence to further corroborate the themes. The personal response by each interviewee to each question was used in identifying the themes in this study. The themes were described and developed using textual evidence from the interview transcripts.

In conducting the analysis of interview data in the present study, the researcher followed the inductive approach to data analysis. The inductive approach is a method of data analysis in which the researcher does not have pre-existing conceptualizations of theories guiding the data analysis process. Instead, the researcher explores the data and goes ahead to formulate theories that emerge from the data analysis process. On the other hand, the deductive approach begins with theory and then moves towards the validation of the theory based on the findings from data analysis (Lopez, 2013). In the present study, the researcher approached the data analysis process without preconceived theories or ideas on what was expected from the findings. This helped to eliminate any potential biases from subjective ideas of the researcher during the findings interpretation.

3.10. Validity and Reliability

3.10.1. Validity

For a research study to contribute to knowledge development in a particular field of study, it must have sufficient reliability and validity. Validity is concerned with whether the research instruments measure what they purport to measure. Failure to have validity in a research process could result in meaningless results that do not reflect the true position of the research objects. There are several forms of validity considered in this study including content and construct validity. Content validity is the degree to which the items in a research instrument have the right content that is representative of the subject matter of the research study. A measurement instrument is considered to have content validity if it asks the right questions and is framed in a non-ambiguous way (Cooper and Schilder, 2011). In the present study, content validity was achieved by ensuring that the interview and survey questions were formulated in a clear and non-ambiguous manner. The questions were relatively short and specific. Moreover, the researcher avoided the use of slangs, prejudicial phrases, and derogatory terms when formulating the interview and survey questions. Content validity in this study was further enhanced by allowing other people including the academic supervisors an opportunity to review the interview and survey questions. The inputs from the supervisors who are experts in the field helped to ensure that the questions were highly focused and specific.

Construct validity is concerned with whether research instruments measure the target construct or concept of a study. A research instrument is considered to have construct validity if the test measures are consistent with the theoretical models guiding the study. Construct validity measures the internal and external validity of findings of a study. Internal validity assesses whether results obtained are true or whether they have been affected by other

confounding factors while external validity assesses whether the findings may be generalized to other settings (Cooper and Schilder, 2011). In the present study, the researcher did not notice any events that could have affected the responses of the respondents and therefore no significant threat to internal validity existed. On the other hand, external validity was achieved for the survey results by obtaining a relatively large sample, which ensured that the findings were generalizable to other similar settings. However, the qualitative results obtained from interview data were not subject to external validity since there was no requirement for the results to be generalizable to similar populations. The aim of the interviews was to gain an in-depth understanding of how technological innovations influenced performance of banking institutions in Myanmar. All efforts were taken to ensure that any threats to validity in this research study were eliminated.

3.10.2. Reliability

Reliability is concerned with the accuracy, dependability, and stability of data. A research instrument is considered reliable if it offers consistent measurement results across various items and time. Instruments that give consistent results are generally considered to be reliable. One of the ways of achieving reliability in a research study is through pilot testing (Cooper and Schilder, 2011). In the present study, a pilot test was conducted to test the reliability of the questionnaire. The pilot test involved 7 individuals drawn from Yankin. The participants in the pilot test comprised of holders of bank accounts in Myanmar. The participants were asked to fill the questionnaires and their inputs obtained on improvement of the questionnaire. The results of the pilot were coded and used to calculate the Cronbach's reliability test. The questionnaire had a Cronbach reliability test of 0.83, which was above the 0.7 figure recommended for survey methods.

The credibility of the results of the current study were further enhanced by requesting the participants in the study to confirm the truthfulness of the interview transcripts. Once the interview data was transcribed into text, the researcher requested the interviewees to conform that the transcripts were a reflection of their opinions.

3.11. Ethical Considerations

When conducting research, researchers are expected to follow a certain code of behavior that is deemed appropriate in research practice (Saunders et al., 2003). The need for ethical considerations is even greater when the research process involves human subjects as participants. In this study, several ethical considerations were made. First, this study obtained an ethical approval and clearance from the university. The approval was based on the submitted research proposal, which was reviewed by two academic supervisors and cleared for actual research process. Second, the privacy and confidentiality of the research participants was guaranteed throughout the study. The privacy and confidentiality of the participants was achieved in several ways. The first strategy involved observing the anonymity of the respondents by asking them not to provide personal details about themselves. No details about the names, addresses, and other personal information about the respondents was collected in this study. Instead, only general demographic information was collected and this ensured that participants were not identifiable in the study. The respondents in both the survey and interviews were given alphanumeric codes that were used as personal identifiers throughout the study. The interviewees, for instance, were assigned the codes BM1, BM2, BM3, BM4, and BM5.

In addition to guaranteeing the anonymity of the respondents, informed consents were obtained from each of the respondents who participated in the survey and interviews. All participants were requested to sign a written informed consent form which contained the

agreements to participation in the study. The informed consent form provided details of the research project including the research aims and objectives as well as the research procedures. Providing this information ensured that the participants were fully informed about the nature of the project prior to signing the consent form. The participants were informed that participation to the research project was on a voluntary basis. The informed consent form also informed the participants of their freedom to withdraw from the research process at any time of the study. Moreover, participants were informed of their right to refusal to answering any of the questions that they felt was inappropriate.

All data collected and processed in this study was treated with utmost confidentiality and security. The completed questionnaires were stored safely in a locked drawer where access to the data was restricted. Once completely coded, the questionnaires were destroyed through shredding. The data stored in the personal computer of the researcher was secured with a password. Similarly, the interview transcripts were stored safely in a computer and secured safely with a password. The tape-recorded interviews were also stored safely in a locked drawer and will be destroyed once the research process is totally completed. The raw data stored in a personal computer will also be deleted three years after completion of the project.

Finally, the researcher adhered to ethical principles relating to academic honesty and good research practices by ensuring that all reports of the research project were plagiarism-free. Any external information cited in the reports was adequately acknowledged using the APA Sixth Edition. Moreover, the researcher avoided the use of guiding questions during the interview process while maintaining the highest levels of professionalism. The researcher also promised to give soft copies of the published reports generated from the study and intends to do so to those who requested them. No conflict of interests existed on the part of the researcher and the findings of the study were used for academic purposes only.

3.12. Conclusion

This study adopted an interpretivist-constructionist paradigm in guiding the research process. This paradigm was considered the most suitable, as it allowed the researcher to accept multiple forms of knowledge including those of qualitative and quantitative nature. A mixed methods research approach was used in the present study where both qualitative and quantitative data were collected. Qualitative data comprised of interview data collected from in-depth interviews conducted with bank managers of selected Myanmar banking institutions. The interviews helped to gain an understanding of how technological innovations with products and services in Myanmar's banking sector have affected bank performance in terms of operational efficiency and financial performance. On the other hand, quantitative data comprised of survey data obtained through administration of questionnaires to a sample of customers of various Myanmar banks. The data obtained through surveys was used to determine the level of customer satisfaction and loyalty among customers who use technological innovations in Myanmar banks. The data collection process lasted between February and March 2019. The survey data was subjected to statistical analysis involving descriptive statistical analysis and inferential analysis through regression model construction. Interview data was subjected to thematic analysis where the interview transcripts were read numerous times in order to identify recurring themes. The research methodology adopted in this study has high validity and reliability since careful considerations were made while designing the data collection instruments. This ensured that the findings of the study are credible and free from biases. All ethical issues were adequately addressed in this study. The next chapter contains a detailed description of the findings of the study.

CHAPTER FOUR

FINDINGS

4.1 Introduction

The objective of this study was to examine the impacts of technological innovations with products and services on financial performance, operational efficiency, and customer satisfaction and customer loyalty within the context of the Myanmar's banking sector. The banking sector in Myanmar has achieved significant growth in the recent past following the political and economic stability that has been witnessed in the past decade. Technological innovations have been at the center of service delivery in Myanmar's banking sector. Therefore, this study sought to determine whether these innovations have been beneficial to the banks in terms of enhancing their competitiveness. The present study involved a survey of 205 bank customers drawn from various banking institutions to assess their level of satisfaction with the banking innovations introduced by their banks. A qualitative study was also conducted by interviewing bank managers in order to determine the potential impacts of technological innovations on bank financial performance and operational performance. This chapter presents the findings of the survey and interviews. The chapter highlights the demographic characteristics of the respondents as well as the findings of statistical tests conducted on the survey data. The next segment discusses the major themes and concepts that emerged from interviews with bank managers on the financial and operational performance of the banks under investigation.

4.2. Findings of the survey

4.2.1. Demographics characteristics

The study involved a survey of 205 customers of various banks in Yangon, Myanmar. The customers were surveyed at different bank branches. The majority of the customers surveyed in this study were female. There were 113 female respondents accounting for 55.12% of the respondents while male respondents were 92, accounting for 44.88% of the sample. With respect to the education level, a majority of the respondents had post-secondary qualification with 79% of those surveyed indicating that they had a basic degree or a master's degree while the remaining 21% had high school qualifications or basic education as shown in table 2 below. A majority of the respondents (68.3%) indicated that they possessed an undergraduate degree qualification while a few possessed post-graduate qualifications (10.7%).

Table 2: Demographic characteristics of the respondents

Item	**Variable**	**N**	**Cumulative percentage**
Gender	Male	92	44.88
	Female	113	55.12
	Total	*205*	*100%*
Level of education	High school	43	21%
	Bachelor's degree	140	68.3%
	Master's degree	22	10.7%
	Total	*205*	*100%*
Years of bank service use	1 year	27	13.2%
	1-3 years	61	29.8%
	3-5 years	66	32.2%
	Over 5 years	51	24.8%
	Total	*205*	*100%*
Preferred Bank	AYA Bank	64	31.2%

CB Bank	46	22.4%
KBZ Bank	76	37.1%
Yoma Bank	19	9.3%
Total	*205*	*100%*

The bank customers surveyed in this study were also asked to indicate their preferred banking institutions with the majority indicating that they were customers of Kanbawza Bank (KBZ). When asked to state their most preferred banking institution, 37.1% of those surveyed indicated that they preferred KBZ. The second in popularity among the Myanmar banks is Ayeyarwady Bank (AYA). 31.2% of those surveyed indicated that indicated that Ayeyarwady Bank was their bank of choice. The cooperative Bank (CB) came third in terms of popularity with 22.4% of those surveyed indicating that the Cooperative Bank was their bank of choice. The Yoma Bank had the lowest customer preference 9.3% of the respondents indicating that Yoma Bank was their most preferred bank. These findings are consistent with previous bank preference survey statistics that put the four banks ahead of their peers in terms of customer preference. According to Schellhase and Sun (2017), KBZ, Cooperative Bank, and AYA are popularly known as the Big Three in Myanmar because they are the largest and command the lion share of the market share. The three institutions collectively command a market share of over 50%. KBZ is the largest bank in the country followed by AYA and Cooperative Bank in that order. In the present study, the survey data indicates that KBZ and AYA Bank have the highest market shares since most customers have a preference for them.

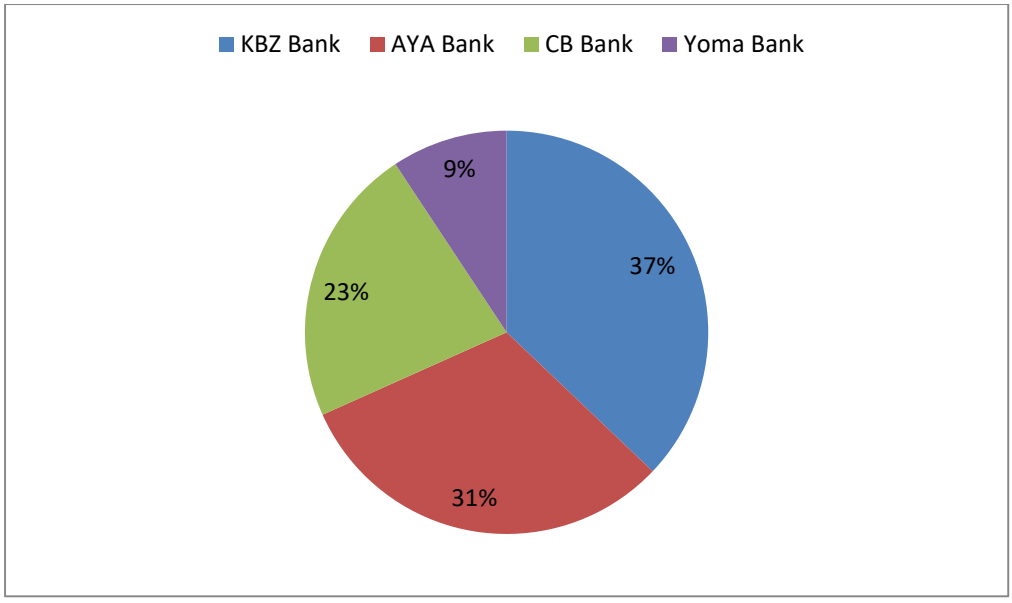


Figure 2: Percentage market share among the Myanmar banks

In addition to the preferred bank, the respondents were also asked to indicate the number of years that they had used the services of their preferred banks. The data collected in the survey indicate that a majority of the respondents had used the services of their preferred banks for 3-5 years. Those who indicated that they had between 3 and 5 years of service usage were 32.2% of the total respondents while those 1-3 years of service were 29.8%. Another 24.8% of the respondents had used the bank services for over five years while only 13.2% of the respondents had used the bank services for one year or less. This indicates that the majority of customers who participated in the survey had used the services of a bank for a relatively long period. Therefore, the respondents had adequate experience of service usage to be able to form opinions on the bank services. Figure 3 below summarizes the number of years of service usage among respondents.

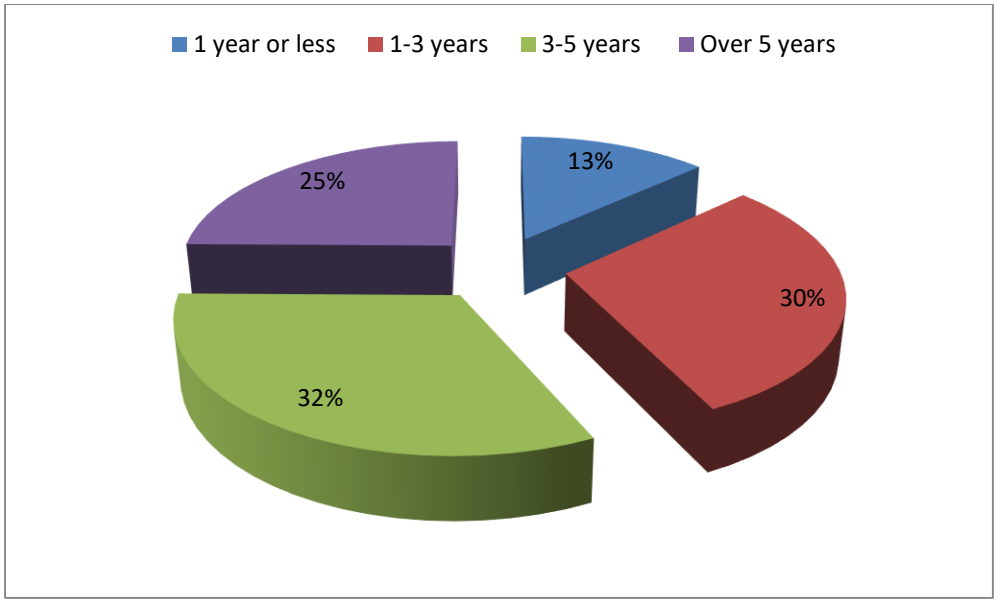


Figure 3: Number of years of use of bank service among respondents

4.2.2. Usage of banking technologies in Myanmar

The respondents were asked to indicate the banking technologies that they used most frequently. The respondents were asked to state the technology that they had used in the past one month with the available choices being the ATM, mobile banking, internet banking, electronic funds transfer, and cards. The results indicate that the automated teller machine (ATM) remains the most famous banking technology in Myanmar today. Nearly all the respondents indicated that they had used an automated teller machine in the past one month. In total, 193 individuals or 94% of all respondents indicated that they had used at ATM in the past month while only 6% of the respondents had not used an ATM in the recent past. The popularity of the ATM technology could mainly be attributed to the availability of ATM machines across the country. According to Schellhase and Sun (2017), the number of ATMs in Myanmar has increased consistently over the years from a few hundred in 2013 to nearly 2,000 in 2016. The convenience afforded by the ATM machine could also be a contributing factor to the popularity of the ATM technology. With the ATM machine, customers do not need to visit the bank to make withdrawals or deposits. Moreover, the ATM machine allows

customers to access banking services outside the ordinary banking hours. In a study of the Ghanaian banking sector, Narteh (2015) has found that self-service technologies such as the ATM machine have high convenience attributes that make them attractive to customers.

Mobile banking is the second most commonly used technology with 52.7% of those surveyed indicating that they had used mobile banking in the past one month. The popularity of mobile banking could be attributed to the high usage of mobile devices in Myanmar. Most people today have access to a mobile device, which has become a part of daily life.

The findings of the survey reveal that internet banking, electronic funds transfer, and debit and credit cards are less popular among consumers of banking products in Myanmar. Among the respondents surveyed in this study, only 18.5% indicated that they had used internet banking in the past one month. Similarly, a smaller portion of the respondents accounting for 9.3% indicated that they had used electronic funds transfer service in the past one month. This may be due to the fact that EFT transactions are high volume transactions that are rarely used by consumer bankers who formed the bulk of the respondents in this survey. Finally, 9.8% of the respondents indicated that they had used debit and credit card transactions in the recent past as shown in the table below.

Table 3: Most frequently used banking technologies among bank customers in Myanmar

Banking technology	Responses	
	N	Per cent
Automated teller machine	193	94%
Mobile Banking	108	52.7%
Internet banking	38	18.5%
Electronic funds transfer	19	9.27%
Debit and credit cards	20	9.75%
Total	378	184.22%

About 71.2% of the respondents used mobile and internet banking technologies. However, the numbers of internet banking users were significantly fewer than those who used mobile banking. This could be due to the respondents' perception of internet banking as exclusively the use of banking websites to conduct banking services. Internet penetration remains low in Myanmar with only 25.1% of the population accessing (Central Intelligence Agency, 2019). On the other hand, innovations in the mobile banking sector allow users to access banking services without internet.

4.2.3. Perceived usefulness of banking technologies

In addition to assessing the most frequently used banking technology, the respondents were also asked to indicate the banking technologies that they deemed most useful and relevant to them. The findings were consistent with those of the frequency of use with the ATM and mobile banking being considered the most relevant technologies. Among the bank customers surveyed in this study, 93.65% of them indicated that they found the ATM the most useful banking innovation. This observation could also be attributed to the high perceived usefulness of the ATM technology among customers. Similarly, a majority of the respondents indicated that they found mobile banking to be the most useful technology with 55.12% of those sampled indicating that mobile banking was one of the technologies they found most useful. On the other hand, internet banking, electronic funds transfer, and the credit and debit

cards were perceived to be less useful to the customers. Among those surveyed, 16.6% stated that they found internet banking technology to be among the most useful while 10.24% were of the opinion that debit and credit cards were most useful. Finally, 10.73% of the respondents indicated that they found the EFT technology to be most useful.

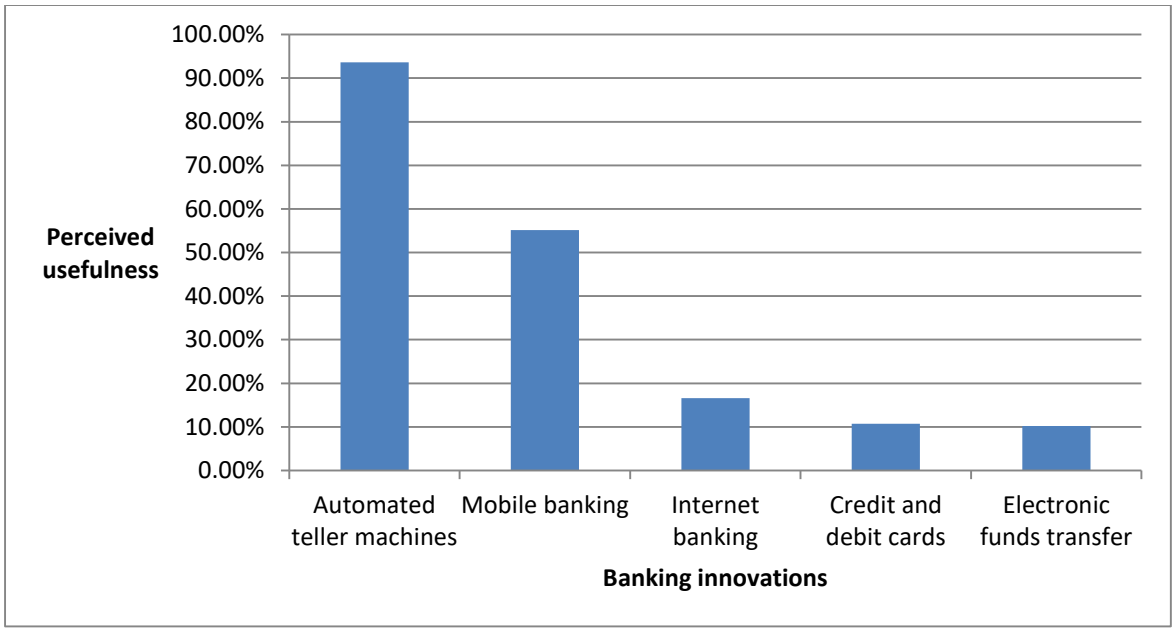


Figure 4: Perceived usefulness of various banking technologies in Myanmar

4.24. Perceived Service Quality of banking technologies

In this study, the respondents were asked to indicate the factors that they deemed most valuable in electronic banking. The respondents were provided with a choice of four factors based on previous findings in literature namely convenience, accessibility, ease of use, cost savings and others. Only one respondent indicated a factor outside the four categories. The findings of the study revealed that accessibility and ease of use were the most important driving factors on satisfaction with electronic banking. In total, 60% of the respondents indicated that accessibility was the most useful factor of electronic banking while 49.3% of the respondents were of the opinion that ease of use is the most useful factor of electronic

banking. This is consistent with the results of the present study that put the ATM technology as the most preferred technology among customers of banking institutions in Myanmar. In addition, a significant proportion of the respondents believed that convenience (35.6%) and cost savings (23.9%) were most useful factors of electronic banking. Electronic banking technologies such as the ATM, mobile banking, and internet banking allow customers to access banking services at any time of the day and night. This could explain the high desirability of accessibility among the factors that are deemed useful by consumers. Similarly, these technologies can be easily used by consumers with minimal technical knowledge. Convenience is also a major determinant of the adoption of electronic banking. The electronic banking technologies allow customers to access banking services without having to travel to the bank or wait in long queues to be served at the branch. This also lowers the cost of banking by eliminating travel time. Furthermore, electronic banking services are charged at a lower cost compared to branch transactions. The self-service nature of the electronic banking services also enhance the level of convenience associated with these banks as reported by Narteh (2015).

Table 4: Quality factors deemed most useful in electronic banking

Most important service factor in electronic banking	Responses	
	N	Per cent
Convenience	73	35.6%
Accessibility	123	60.0%
Ease of use	101	49.3%
Cost savings	49	23.9%
Others	1	0.48%
Total responses	347	169.28%

4.25. Customer Satisfaction with technological innovations

The respondents were asked to indicate their level of satisfaction with electronic banking compared to traditional banking methods. On a scale of 1 to 5 with 1 being the highest level of satisfaction and 5 being the lowest level of dissatisfaction, the customers indicated high level of satisfaction with electronic banking technologies. Overall customer satisfaction with electronic banking was high with a mean of 2.03. The study findings suggest that bank customers in Myanmar derive high satisfaction from the usage of the banking technologies.

The respondents were also asked indicate their level of satisfaction with individual banking technologies. This helped to assess the satisfaction levels between different banking innovations. The study findings revealed that the level of customer satisfaction with banking technologies was highest for mobile banking with a mean of 2.11 satisfaction with the technology. This shows that most respondents indicated that they were either satisfied or totally satisfied with the technology. Similarly, high levels of satisfaction were observed across the other banking technologies with electronic banking recording the lowest satisfaction score of 2.44 as shown in the table below.

Table 5: Mean and standard deviation scores for measures of customer satisfaction

Item	Mean	Standard deviation
Overall satisfaction	2.03	0.4599
Satisfaction with ATM	2.17	0.1384
Satisfaction with mobile banking	2.11	0.1438
Satisfaction with internet banking	2.29	0.0755
Satisfaction with electronic funds transfer	2.44	0.0424
Satisfaction with credit and debit cards	2.38	0.0416

4.26. Customer loyalty with banking technologies

Customer loyalty in this study was measured using a five-point instrument ranging from totally agree (1) to totally disagree (6). The respondents were asked to state the extent to which they agreed to four statements that sought to determine how loyal they were to their banks. The respondents were asked to indicate whether or not they were considering switching to another bank in the near future. They were also asked to indicate whether they had a strong preference for the bank due to the use of banking technologies. Another question sought to determine whether the respondents would recommend the service to other customers.

The level of customer loyalty was generally high among the respondents with most either agreeing or totally agreeing to the questions on customer loyalty. Continued use of bank services scored the highest with a mean of 1.98 thus indicating strong loyalty to current banks. On the other hand, not switching the bank scored the lowest with a mean of 2.78. Overall, respondents have little preponderance to switch banks while they show strong preference for the banks. The respondents have also agreed that they will likely recommend their banks to other customers. Therefore, the use of banking technologies is an important driver of customer loyalty.

Table 6: Mean and standard deviations of the measures of customer loyalty

Item	Mean	Standard deviation
Not switching banks	2.78	0.3119
Strong preference for the bank	2.15	0.1899
Potential to recommend the bank	2.18	0.2306
Continued use of bank services	1.98	0.0919

4.27. Challenges of electronic banking

The questionnaire also sought to determine the challenges that customers encounter in the use of various banking technologies. All the respondents were adults aged over 18 years. Thus, they had varied perceptions of technological challenges. The respondents were given five choices based on previous findings in literature namely; security concerns, privacy issues, complexity of electronic banking, lack of personal interactions with the bank, and others. In addition, the respondents were given an option to state “no challenges” if they had not experienced personal challenges with electronic banking. The major challenge that was identified by the respondents was the complexity associated with electronic banking where 26.25% of those sampled citing this as the major challenge. The respondents also identified security concerns as a major challenge associated with electronic banking. In total, 20.28% of the respondents identified security issues as their major problem with respect to the usage of electronic banking. Another major problem that was cited by the respondents was privacy concerns where 18.95% of those surveyed indicated that they viewed privacy as the major problem of electronic banking. Cumulatively, security and privacy concerns were identified as major issues of concern by 39.23% of those surveyed in this study. Only a small segment of the sample forming 9.89% of the respondents identified the lack of personal interaction as a major problem with electronic banking. However, it was noteworthy that a significant proportion of the respondents indicated that they experienced no challenges in electronic banking. In total, 37.07% of those surveyed indicated that they saw no problems in the usage of electronic banking technologies.

The findings of this study suggest that 76% of the respondents had experienced various challenges in their use of electronic banking while 37% had not encountered any challenges. This demonstrates a need to enhance the electronic banking systems in order to reduce the current challenges identified by the respondents. As the banking sector in Myanmar is still at

the growth stage, it is expected that various challenges and issues would be present particularly in the usage of various banking technologies.

Table 7: Major challenges associated with electronic banking

Challenges	Counts	Per cent of responses
Security concerns	42	20.28
Privacy	39	18.95
Complexity	54	26.25
Lack of personal interaction	20	9.89
Others	1	0.49
No challenges	76	37.07
Total	232	112.93

4.3. Structural Equation Modeling

4.3.1. Preliminary Data Analysis

The data was subjected to preliminary data analysis in order to identify the main characteristics of the data as well as test the data for normality, homoscedasticity, and multi-collinearity. It was important to conduct this preliminary data screening in order to assess its suitability for structural equation modeling (SEM).

4.3.1.1. Missing Data

A total of 205 samples were collected in this study. From the expected responses, there were 8.57% of missing values comprising of non-responses from the respondents. The missing data in this study was considered acceptable because it did not exceed 10%. According to Cohen et al. (1983), missing data of up to 10% is unlikely to undermine the interpretation of results. The missing data were therefore not considered a significant issue in the subsequent data analysis.

4.3.1.2. Model constructs

This study included five major constructs along with 25 first-order dimensions. The bank innovation usage (BIU) measured the extent to which respondents used various banking technologies. Bank innovation usage had five primary dimensions: ATM (BIU1), mobile banking (BIU2), internet banking (BIU3), electronic funds transfer (BIU4), and credit and debit cards (BIU5). The second construct, perceived usefulness of technologies (PU) also included five dimensions along the main banking technologies including ATM (PU1), mobile banking (PU2), internet banking (PU3), electronic funds transfer (PU4), and credit and debit cards (PU5). The third construct, perceived service quality (PSQ) measured the perception of the respondents on the values of key dimensions of banking technologies including:

convenience (PSQ1), accessibility (PSQ2), ease of use (PSQ3), and cost savings (PSQ4). The customer satisfaction (CS) construct was measured along six dimensions including: overall satisfaction with electronic banking (CS1), satisfaction with ATM (CS2), satisfaction with mobile banking (CS3), satisfaction with internet banking (CS4), satisfaction with electronic funds transfer (CS5), and satisfaction with credit and debit cards (CS6). Finally, the customer loyalty (CL) construct was measured using four dimensions including not switching banks (CL1), strong preference for the bank (CL2), potential to recommend the bank (CL3), and continued service use (CL4).

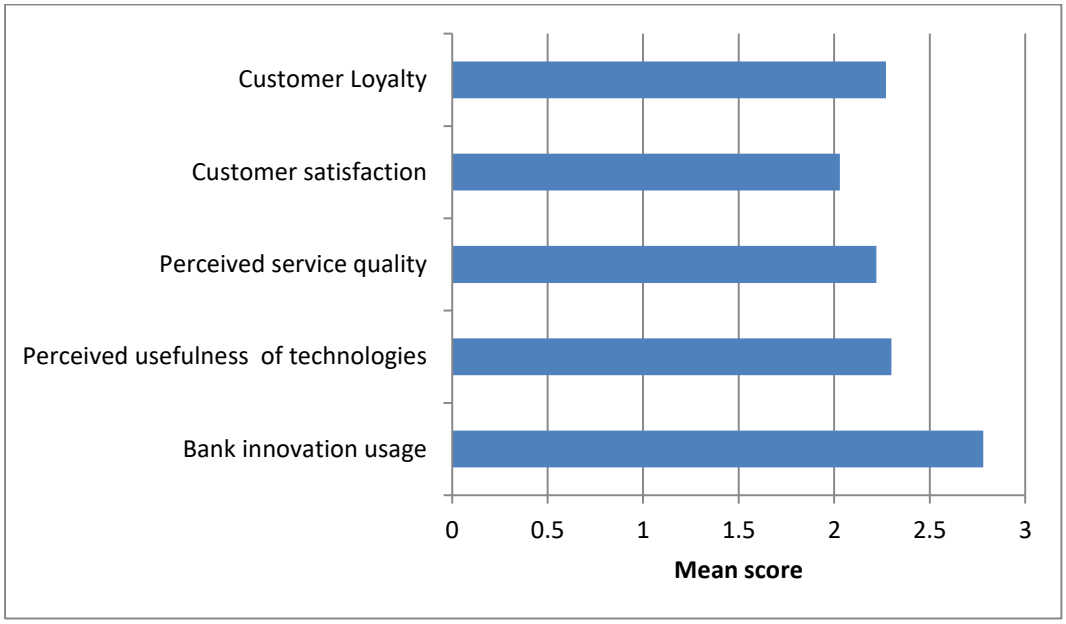


Figure 5: Distribution of mean scores for the model constructs

4.3.1.3. Multicollinearity

Multicollinearity exists when there is a perfect linear relationship among some or all of the independent variables. The data was tested for multicollinearity using the Variance Inflation Factor (VIF) and tolerance values. The VIF was calculated as $1/(1-R^2)$ while tolerance values were calculated as $1-R^2$ for the four major variables. According to Pallant (2010), tolerance values should be higher than 0.1 while VIF values should be lower than 10.0 for non-collinearity assumption to hold. The VIF and tolerance values for all the four variables were within the acceptable limits in this study as shown in the table below. The highest tolerance value was 0.872 for perceived usefulness while the highest VIF value was 1.714 for bank innovation usage.

Table 8: Multicollinearity test results for the model constructs

Model	**Tolerance** $(1-R^2)$	**VIF** $1/(1-R^2)$
BIU	0.743	1.714
PU	0.872	1.169

PSQ	0.628	1.607
CS	0.617	1.496
CL	0.774	1.375

4.3.1.4. Heteroscedasticity

In this study, heteroscedasticity was examined using the Breusch-pagan test. The test is a chi-squared test for testing the significance of the linear regression model. If the test generates a p-value that is lower than the critical value (0.05), then heteroscedasticity is assumed. In the present study, the Breusch-pagan test was calculated using SPSS and found to have a p-value of 0.47856 and therefore the assumption was not violated.

4.3.1.5. Reliability Tests

The internal consistency in this study was examined using the Cronbach's alpha. Cronbach's alpha was calculated using the reliability analysis tool in SPSS. The Cronbach's alpha for all the variables except customer loyalty were above the recommended value of 0.7. This indicates high internal consistency and therefore shows that the constructs were measuring the same thing.

Table 9: Measures of internal consistency

Construct	Number of items	Cronbach's alpha
Usage of bank innovations (BIU)	5	0.810
Perceived usefulness of banking technologies (PU)	5	0.722
Perceived service quality (PSQ)	5	0.735
Customer satisfaction (CS)	6	0.692
Customer loyalty)	4	0.528

4.3.2. Exploratory factor analysis

The structural model assumed that bank usage was positively correlated with customer satisfaction and loyalty (H1). The model further assumed a positive association between perceived service quality and customer satisfaction and loyalty (H2). The model also assumed that the perceived usefulness of the banking technologies led to customer satisfaction and loyalty. An initial exploratory analysis reveals that five factors emerged with 25 dimensions. Only one factor "others" in the perceived service quality construct was dropped due to low factor loading. The factor loadings ranged from 0.71 to 0.97 for the items. Moreover, all elements were significant as their t-values exceeded the 0.05 critical values.

Table 10: Exploratory factor analysis results

Constructs / Dimensions	Factor loading	t-value	AVE	Dimension weight
Bank innovation usage		**33.14**	**0.78**	**0.73**
BIU1	0.91	32.16		
BIU2	0.85	52.44		
BIU3	0.81	44.63		
BIU4	0.88	58.36		
BIU5	0.91	84.37		
Perceived usefulness of technologies		**74.65**	**0.77**	**0.87**

PU1	0.86	46.22		
PU2	0.81	127.40		
PU3	0.90	138.23		
PU4	0.87	58.57		
PU5	0.77	43.52		
Perceived service quality		**41.18**	**0.79**	**0.78**
PSQ1	0.79	55.18		
PSQ2	0.94	132.78		
PSQ3	0.96	216.73		
PSQ4	0.94	153.88		
PSQ5	0.97	60.13		
Customer satisfaction		**60.20**	**0.97**	**0.82**
CS1	0.78	122.46		
CS2	0.96	251.70		
CS3	0.88	71.69		
CS4	0.83	54.34		
CS5	0.87	77.29		
CS6	0.95	211.35		
Customer Loyalty		**67.7**	**0.79**	**0.84**
LTY1	0.76	88.43		
LTY2	0.71	102.39		
LTY3	0.83	54.27		
LTY4	0.86	79.18		

4.3.3. Confirmatory factor analysis

After the exploratory factor analysis, a confirmatory factor analysis (CFA) was conducted with the loaded factors to verify that the measurement model fitted the data. Fit indices were calculated with the results confirming the factor structure in the EFA as a best fit measurement model. The results indicate that the model had a root mean square of approximation (RMSEA) of 0.074 and a comparative fit index (CFI) of 0.97. According to Kline (1998), RMSEA values of below 0.05 indicates close fit, those between 0.05 and 0.08 indicates an acceptable fit and values above 0.08 indicates a poor fit. Therefore, the model was a good fit for the constructs' items.

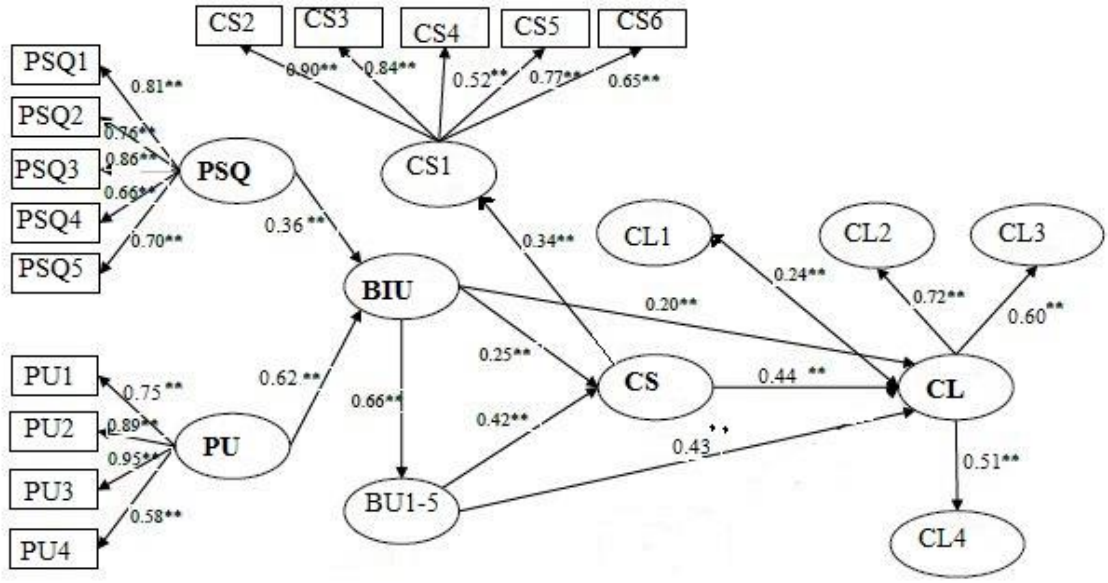
Table 11: SEM Model fitness assessment

Indexes	**RMSEA**	**CFI**	**X^2/df**
Results	0.074	0.97	2.61

Criteria	<0.08	>0.9	<3.0

4.3.4. Model fitting

A structural equation model was generated using LISREL 10 showing the relationship between variables and constructs. In general, the model shows that bank customers' usage of bank technologies is positively associated with the perceived usefulness of the technologies and the perceived service quality. These three factors in turn affect customer satisfaction and customer loyalty. Moreover, the model suggests that customer loyalty is a function of customer satisfaction as shown in the figure below.



Abbreviations: PSQ = perceived service quality; PSQ1= convenience, PSQ2= accessibility, PSQ3= ease of use, PSQ 4= cost savings; PU= perceived usefulness, PU1 = usefulness of ATM technology, PU2= usefulness of mobile banking technology, PU3 = usefulness of internet banking technology, PU4 = usefulness of EFT technology; BIU = bank innovation usage, BIU1-5: usefulness of various banking technologies; CS1= overall satisfaction with bank technologies, CS2 = satisfaction with ATM technology, CS3 = satisfaction with mobile banking technology, CS4 = satisfaction with internet banking technology, CS5 = satisfaction with EFT technology, CS6 = satisfaction with credit cards and debit cards; CL1= not switching banks, CL2= strong preference for the bank, CL3= potential to recommend the bank, CL4= continued service use

Figure 6: The structural equation model

(Adapted with modification from: Krisnanto and Novianti, 2019)

As shown in the figure above, bank innovation usage is affected by three main factors, namely perceived usefulness, perceived service quality, and customer satisfaction. Customer satisfaction in turn influences customer loyalty. Thus, usage of bank innovations affects customer loyalty.

4.3.5. Correlation analysis

A correlation analysis was conducted to determine the level of correlation among the latent constructs. The correlation model was run on SPSS with a total of 25 variables. According to Pallant (2010), correlation analysis helps to determine the relationship among a group of variables. A perfect correlation is deemed to exist when the correlation coefficient is 1.0 while a strong correlation exists when the correlation coefficient is above 0.5. The lowest correlation in this study was between perceived usefulness of banking technologies and perceived service quality ($r=0.19$, $p<0.05$). The highest correlation was observed between bank innovation usage and overall customer satisfaction ($r=0.72$, $p<0.05$). The results further show that all correlation coefficients are positive thus demonstrating a positive association between usage of banking technologies, perceived usefulness of banking technologies, service quality, customer satisfaction, and customer loyalty within the Myanmar banking

sector. The results of the Pearson correlation between the items examined in the model are shown in the table below.

Table 12: Correlation matrix for the SEM model constructs

	1	2	3	4	5	6	7	8	9	10	11	12	13
1	1												
2	0.66	1											
3	0.68	0.19	1										
4	0.72	0.48	0.64	1									
5	0.56	0.62	0.52	0.56	1								
6	0.54	0.55	0.61	0.50	0.63	1							
7	0.60	0.51	0.56	0.49	0.51	0.45	1						
8	0.68	0.46	0.52	0.58	0.56	0.64	0.60	1					
9	0.53	0.49	0.68	0.39	0.43	0.62	0.42	0.54	1				
10	0.51	0.56	0.55	0.46	0.68	0.59	0.62	0.45	0.52	1			
11	0.59	0.56	0.64	0.58	0.63	0.55	0.53	0.44	0.53	0.58	1		
12	0.62	0.62	0.58	0.48	0.42	0.66	0.51	0.51	0.65	0.65	0.59	1	
13	0.55	0.49	0.58	0.42	0.39	0.66	0.49	0.61	0.51	0.46	0.65	0.48	1

Note:

1- Bank innovation usage

2- Perceived usefulness of banking technologies

3- Perceived service quality

4- Overall customer satisfaction

5- satisfaction with ATM technology

6- satisfaction with mobile banking

7- satisfaction with internet banking

8- satisfaction with EFT technology

9- satisfaction with credit & debit cards

10- not switching banks

11- strong preference for the bank

12- potential to recommend the bank

13- continued service use

4.3.6. Structural model

The structural model had four hypotheses, which were tested through the analysis of t-values. First, it hypothesized that the usage of bank innovations (BIU) was significantly affected by customer satisfaction (CS) and loyalty (CL). Second, it hypothesized that the perceived usefulness of banking technologies (PU) was significantly affected by customer satisfaction and loyalty. It also hypothesized that a significantly positive association existed between the perceived service quality (PSQ) of bank services and customer satisfaction and loyalty. Finally, it was hypothesized that bank innovations' usage had a significant association with perceived usefulness and perceived service quality of banking technologies. As predicted by the TAM, perceived usefulness of an innovation is one of the key determinants of its acceptance among users. The theory of task technology fit hypothesizes that the quality of an innovation determines its adoption. Thus, perceived usefulness and quality perception could influence the adoption of banking technologies.

The path coefficient test was used to evaluate the relationship between the constructs hypothesized in this study. The table below shows the path coefficients (β) and the associated t-values from the model constructs.

Table 13: Results of hypothesis testing and the structural model

Hypothesis	**B**	**t-value**	***p* value**	**Decision**
H1: BIU->CS,CL	0.68	68.52	0.00	Supported
H2: PU->CS,CL	0.49	125.3	0.00	Supported
H3: PSQ->CS,CL	0.48	56.3	0.00	Supported

H4: BIU->PU,PSQ	0.70	75.6	0.00	Supported

The structural model predicted that usage of bank innovation positively influenced customer satisfaction and customer loyalty (H1). This was shown to hold true as there was a significant value for the test statistic (t = 68.52). This reveals that bank technologies are significant in influencing the level of customer satisfaction and loyalty.

The model further hypothesized that the perceived usefulness of the banking technologies positively influenced customer satisfaction and loyalty. The findings supported this hypothesis (β = 0.49, t = 125.3) thus indicating the customers who find banking technologies to be useful derive high levels of satisfaction and are loyal to the banks.

The third hypothesis predicted that the perceived service quality factors such as convenience, accessibility, ease of use, and cost savings were positively associated with customer satisfaction and loyalty. The model shows a good fit (β = 0.48, t = 56.3) thus indicating that customers who found the banking technologies to be of high quality were satisfied and subsequently had high levels of customer loyalty.

Finally, the model predicted that customer satisfaction was positively associated with customer loyalty. Correlation analysis reveals a significant positive association between customer satisfaction and loyalty. Furthermore, the structural model shows significant statistical values (β = 0.70, t = 75.6) thus demonstrating that satisfied bank customers are equally loyal.

4.4. Interview Findings

4.4.1. Overview of the interview procedure

After the questionnaire set was confirmed, the interviewees were identified at each bank. While identifying the interviewees, two major criteria were taken into consideration. First, the interviewee had to be either at branch operation level or at senior management level. The reason for this selection was that the Branch operation level person could give day-to-day experience while Senior management level persons could give bank-wide impact information. Second, there had to be a balanced mixture of operation and senior management at each leading bank in Myanmar.

The questionnaire was sent in advance to identified personnel so that he/she could prepare the answers in advance. On the actual face-to-face interview, it generally took 45-60 minutes per interview. The format of interview included four segments. The first segment was an introduction and the information on the purpose of interview from interviewer. The second segment was a brief and overall background of technology innovation, impact and day-to-day experience from the interviewee. The third segment involved the open-ended questions where the interviewer followed up with adds-on questions on the spot to ensure the questions were being answered correctly. Finally, the interview involved a conclusion from interviewer with summary of answers so that both interviewee and interviewer were on same page of understanding.

All the interviewees had at least a Bachelor's degree in their respective fields. From each bank, a male and a female respondent were interviewed giving a total of eight respondents. Most of the respondents had worked in their banks for over five years with only two having worked in their banks for 1-5 years. Therefore, the respondents were well-informed about the operations of their banking institutions.

Table 14: Demographic profiles of the interviewees

Original Questions	**KBZ Bank**	
Gender	M	F
Number of years of working in the bank	1-5 years	Over 10 years
Highest level of education	Bachelor's degree	Bachelor's degree
Position in the bank	Head of Learning & Recruitment	Territory Manager
	AYA Bank	
Gender	M	F
Number of years of working in the bank	5-10 years	5-10 years
Highest level of education	Bachelor's degree	Bachelor's degree
Position in the bank	Senior General Manager, International Banking	Senior Manager, Treasury
	Cooperative Bank	
Gender	M	F
Number of years of working in the bank	5-10 years	Over 10 years
Highest level of education	Master's degree	Bachelor's degree
Position in the bank	Senior Advisor	Branch Manager
	Yoma Bank	
Gender	M	F
Number of years of working in the bank	1-5 years	Over 10 years
Highest level of education	Master's degree	Bachelor's degree
Position in the bank	Head of Learning & Development	Branch Manager

4.4.2. Landscape of the Myanmar Banking Sector

4.4.2.1. State-owned banks (SOBs)

The banking sector in Myanmar comprise of three categories of banks: state-owned, domestic private, and foreign-owned bank branches. In total, there are 44 banks operating in the

country. State-owned banks comprise of four banks controlled by the government of Myanmar. Although the state-owned banks continue to play an important role in the banking sector, they have faced stiff competition from local private and foreign banks in the recent past. The market share of state-owned banks has reduced from 60% in 2015 to 34% in December 2017. Similarly, the total deposits controlled by state-owned banks have reduced from 44% of total bank deposits in 2015 to 26% in 2017. The continued loss in market share of state-owned banks could be attributed to the growing public trust in private banks. In terms of size, the Myanma Economic Bank (MEB) is the largest state-owned bank (SOB) with an asset size of MMK 7,576,196.22 million. The MEB also has the widest branch network among the state owned banks with 308 branches across Myanmar. The bank has been operational since its inception in 1976. The MEB is also the second largest bank in the country behind the market leader KBZ. The MEB offers subsidized loans to other government-owned banks as well as cooperatives and enterprises.

The Myanma Agricultural Development Bank (MADB) is the second largest state-owned bank in terms of the number of branches and loans distribution with total loans of MMK 1,311,012.96 million extended in 2017 and 208 operational branches. However, the bank has a relatively small asset base of Myanmar Kyat (MMK) 1,397,940.4 million compared to its peers. Formerly known as the State Agricultural Bank, the bank was established in 1953 with the aim of supporting agricultural financing activities. Today, the bank remains the major source of financing for farmers in Myanmar. MADB offers short-term loans for crop cultivation as well as term loans for financing long-term projects such as farm equipment and machinery acquisition. Table 16 below shows an overview of the state-owned banks in Myanmar.

Table 15: Overview of State-Owned Banks

	Myanma Economic Bank (MEB)	Myanma Agricultural Development Bank (MADB)	Myanma Investment and Commercial Bank (MICB)	Myanma Foreign Trade Bank (MFTB)
Total Assets	1,397,940.40	7,576,196.22	3,387,507.02	3,831,914.92
Total Loans extended	1,311,012.96	2,426,834.72	28,278.15	240,361.48
Total Deposits	12,843.52	5,552,789.61	563,386.30	2,893,793.94
Number of branches	208	308	2	1

The Myanma Investment and Commercial Bank (MICB) is a smaller bank with an asset base of MMK 3.4 trillion. The bank was established in 1990 with the mandate of offering financial services for stimulating the growth of industry in Myanmar. The bank also offers commercial and international banking services. In 2018, MICB distributed only MMK 28 billion, accounting for less than 0.2% of the total bank loans in the country. As of 2017, the bank had only two branches in Myanmar.

The Myanma Foreign Trade Bank (MFTB) is a state-owned bank that specializes with international banking. While it has a single branch in Myanmar, it operates over 263 correspondent banks in 54 countries. In Myanmar, the bank is the main deposit acceptor for foreign exchange accounts. The MFTB has the second largest deposits among the SOBs after MEB with MMK 2.89 trillion deposits in 2017.

State-owned banks continue to experience higher operating margins compared to their private counterparts primarily due to high overhead costs. In Myanmar, SOBs face various challenges including lack of modern IT infrastructure, lack of new technologies, and operational inefficiency. These banks also struggle with weak corporate governance and poor customer service. For instance, the largest state-owned bank, MOB, has made losses since 1988.

4.4.2.2. Domestic Private Banks

Private Banks dominate the banking industry in Myanmar today. The growth of the private banks sector has been meteoric. During the military regime, private banks were not allowed to operate and the ban was only lifted in 1992. Since then, the private banks have increased their presence within the banking sector. Between 2012 and 2017, the assets held by domestic private banks increased by more than six times. Similarly, between 2015 and 2017, the assets held under private banks grew by 32% while the assets held by state-owned banks remained the same during the period. As of November 2018, Myanmar had 27 domestic private banks. The private banks have been the key drivers of growth and innovation within the Myanmar's banking industry.

Despite the strong growth in the domestic private banks' sector, asset concentration remains very high among the private banks. The three largest banks hold about two thirds of all the banking assets within the private banks sector while the six largest private banks control 82% of all banking assets in the country. The largest bank in the country, Kanbawza Bank Ltd (KBZ), holds 41% of all bank deposits while Ayeyarwady Bank Ltd (AYA), and Co-operative Bank Ltd (CB) hold 17% and 11% market share of total banking deposits, respectively. Other large private banks are Myanmar Apex Bank Ltd (MAB), Yoma Bank Ltd (Yoma), and Myawaddy Bank Ltd (MWB) with each controlling 6% market share of the

total banking deposits in the country. Figure 7 below shows the market shares of total deposits of domestic private banks in Myanmar.

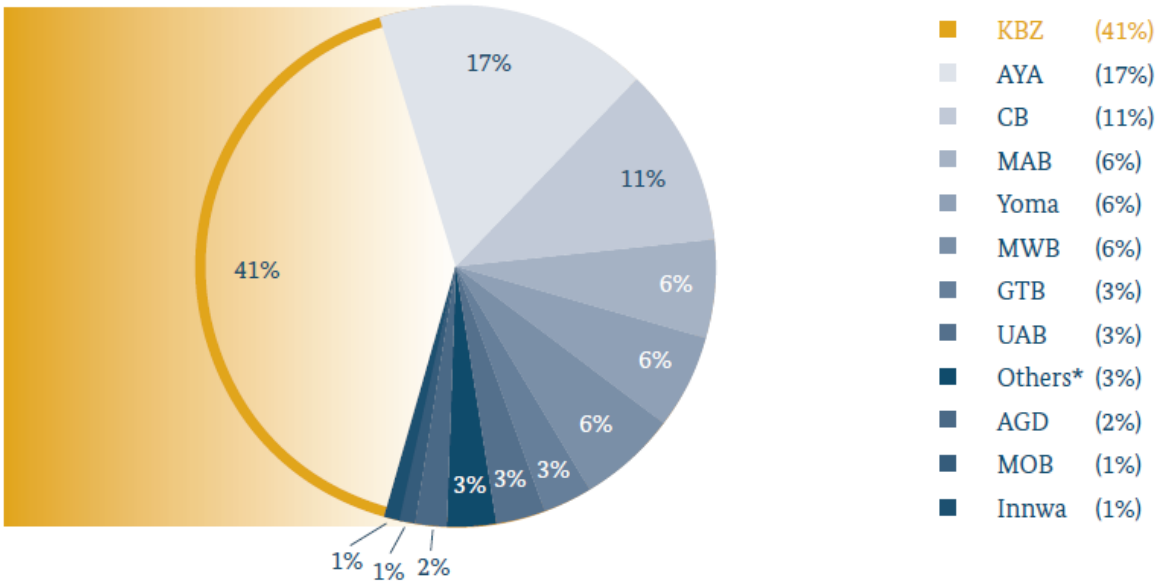


Figure 7: Market shares of total deposits among domestic private banks in Myanmar in 2017 (Source: GIZ 2018)

*Others: All banks with less than 1% market shares

In terms of the branch network, the domestic private banks also dominate the banking sector with high concentration among the largest banks. In 2017, for instance, Kanbawza Bank, Ayeyarwady Bank, and the Co-operative Bank operated 819 out of the total 1,513 bank branches or 54% market share in Myanmar. However, the bank network in Myanmar is uneven across regions with the rural areas largely unserved by the private banks.

The private banks also dominate the market share in terms of the total assets holding. The domestic private banks currently hold bank assets worth MMK 48.5 trillion or 67% of all banking assets in the country. Moreover, the top six largest banks in Myanmar hold an estimated 82% of all banking assets in the sector. As of the end of 2017, Kanbawza held assets worth MMK 11.3 trillion, accounting for 15.6% market share. Similarly, Kanbawza

has the widest branch network of 430 bank branches. The top ten private banks in Myanmar have a combined asset value of MMK 25.6 billion or 35% of the total banking assets. Table 17 below shows the top ten private banks in Myanmar and their asset values and number of branches for the fiscal year ending 2017.

Table 16: The asset base and number of branches of the leading banks in Myanmar

Name of the bank	Assets held (MMK millions)	Number of branches
Kanbawza (KBZ)	11,309,440	430
Ayeyarwady Bank Ltd. (AYA)	4,173,888	206
Co-operative Bank Ltd. (CB)	2,713,104	183
Myawaddy Bank Ltd. (MWB)	1,664,990	49
Myanmar Apex Bank Ltd. (MAB)	1,592,427	86
Yoma Bank Ltd.	1,535,028	69
United Amara Bank Ltd.	866,604	74
Global Treasure Bank Ltd.	706,194	130
Asia Green Development Bank Ltd.	560,216	56
Nay Pyi Taw Sinbin Bank Ltd.	445,487	6
Total	25,567,378	1289

The private banks also account for the largest portion of loans extended to customers in Myanmar. In 2017, private banks offered a total of MMK 18.5 trillion compared to MMK 4 trillion offered by state-owned banks. The amounts of loans provided by private banks have increased by seven times between March 2012 and March 2017. The trading sector attracts the largest share of private banks' loans with 37% of all loans being offered in the sector followed by construction (18%), and services (14%).

Despite their significant contributions to lending activities, private banks still face numerous challenges that limit their lending potential. First, the banking industry in Myanmar has a

fixed interest rate environment and therefore banks have limited options of pricing the loans according to clients' risk profiles. Instead, banks tend to over-rely on collateral while clients with no collateral have limited access to loans. The over-reliance on collateral to secure loans exposes the banks to huge losses in case of property values' devaluation. In addition, the practice makes it difficult for private households and SMEs to access bank loans.

Table 17: Market shares of private banks in Myanmar

Bank	**Aug-14**	**Aug-14**	**Mar 16**	**Mar 16**	**2017**
KBZ	4144.97	39%	8693	45%	41%
AYA	1200	11%	2913	15%	17%
CB	1180.7	11%	2061	11%	11%
Myawaddy	1028.1	10%	1305	7%	6%
MAB	721.2	7%	1194	6%	6%
Global Treasure	588.9	6%	657	3%	3%
Yoma	506	5%	1191	6%	6%
UAB	505	5%	662	3%	3%
AGD	463.1	4%	448	2%	2%
MOB	238.9	2%	320	2%	1%
Others	-	-	-	-	3%
Innwa	-	-	-	-	1%
	10576.87	**100%**	**19444**	**100%**	**100%**

4.4.2.3. Foreign Banks

Prior to 1990, foreign banks were not allowed to operate in Myanmar. However, the number of foreign banks has grown steadily over the years since the government allowed the operations of foreign banks in 1990. Currently, there are 13 foreign banks licensed to operate in Myanmar in addition to 49 representative offices of foreign banks. According to 2017 estimates, foreign banks have a market share of about 10% in terms of assets. The Industrial and Commercial Bank of China (ICBC) is the largest foreign bank in Myanma, controlling about 25% of all the bank assets held by foreign banks.

The foreign banks in Myanmar are mainly dominated by Asian banks including the Japan's Sumitomo Mitsui Banking Corporation, and Bank of Tokyo-Mitsubishi UFJ Ltd, and Mizuho

Bank Limited. The foreign banks from Singapore operating in Myanmar include the United Overseas Bank Limited, Shinhan Bank, and the Oversea-Chinese Banking Corporation Ltd (OCBC) while the Chinese-owned bank is the Industrial and Commercial Bank of China. Others are Taiwan-based E.Sun Commercial Bank Limited, Malaysia's Malayan Banking Berhad, India's State Bank Of India, Thailand's Bangkok Bank Public Company Limited, Vietnam's Joint Stock Commercial Bank for Investment and Development of Vietnam (BIDV), and Australian-based Australia and New Zealand Banking Group Limited (ANA).

The requirements for operating a foreign bank in Myanmar include a reserve deposit of USD 45 million with the central bank. Foreign banks operating in Myanmar also face several restrictions. For instance, the foreign banks cannot operate more than one branch. In addition, foreign banks are disallowed from accepting immovable property such as land and buildings as collateral. Moreover, foreign banks cannot offer retail-banking services such as money transfers, card services, and personal savings accounts.

4.4.3. Case study banks

The interviews were held with senior managers and territory managers drawn from three private and one semi-government banks. The case study banks were Kanbawza Bank, Ayarwaddy Bank, Co-operative Bank, and Yoma Bank Ltd. The four banks are the leading banking institutions in Myanmar in terms of market share. The interviews conducted with the senior managers of these banks revealed that their popularity with the customers was mainly attributable to the adoption of technology. In addition, the wide branch network was also noted as one of the factors that drew the customers to these banks.

4.4.3.1. Kanbawza Bank

KBZ is the leading private bank in Myanmar. The bank derives its name from Kanbawza, which is a traditional name referring to the Shan State. The bank was founded in July 1994

with an initial focus on provision of banking services to the local population in Taungyi. KBZ embarked on an expansion program in 1999 and in the following year, it relocated its headquarters to Yangon, Myanmar's business capital. Today, the bank has the largest market share in the banking sector with 41% of all deposits. KBZ also has the leading market share in terms of the total assets and the amount of loans. The bank has over 491 bank branches spread across the country and 980 ATMs. In addition, KBZ operates over 190 currency exchange counters. The bank used to be led by locals but recently, the bank's management has changed with more expatriates being brought to the top management. In addition, the bank has focused more on technology adoption.

When asked why KBZ has remained the number one bank in Myanmar, the respondents cited several reasons. First, the bank has the widest branch network in Myanmar thus making it accessible to a large number of customers. The managers say that the bank has over 508 branches. In addition, the interviewees attributed the bank's current position to its adoption of technology, particularly KBZ Pay. KBZ Pay was established in collaboration with Huawei Technology was the bank's mobile wallet. KBZ Pay enabled the bank to reach almost 2 million customers within 8 months. KBZ intends to cut down on the number of branches and instead focus more on digital platforms.

4.4.3.2. Ayarwaddy Bank

The AYA Bank was licensed in July 2010 and commenced operations in August 2010 when it opened its head office in Nay Pyi Taw. The bank was licensed to operate as an investment and development bank for the local market. Since its inception, AYA Bank has seen rapid expansion. As of January 2019, the bank had 242 branches spread across the country. As of December 2017, AYA Bank was the second largest bank in Myanmar with an asset base of MMK 4.17 trillion. In terms of customer deposits, the AYA Bank currently controls 17%

market share behind the market leader KBZ. Today, AYA Bank has over 1.4 million customers and Kyat 4.7 trillion in customer deposits. In addition, the bank has a total shareholders' equity of Kyat 150 billion as of September 2017 (AYA Bank, 2019). The bank enjoys a strong public confidence with top 100 depositors representing only 6% of the bank's total deposits.

AYA Bank became the second largest bank in Myanmar within a short period of its inception and overtook older banks within a seven-year period. Along with three other banks, Asia Green Development Bank (no.9), Myanmar Apex Bank (no.5) and United Amara Bank (no.8), AYA Bank has witnessed strong growth within a very short period. The interviewees attributed the bank's strong growth to its adoption of new technologies particularly the core banking. AYA was the first bank in Myanmar to implement the Centralized Core Banking System. The bank has continued to invest in state-of-the-art technologies including digital banking, core banking, and Fintech platforms. AYA Bank has a multi-channel platform that allows customers to access bank services with ease and convenience. AYA Bank overtook the Co-operative Bank to become the number 2 bank in Myanmar mainly due to its ability to leverage on technology on expanding its customer base. In addition, the bank has strong corporate governance and is the only bank to prepare its financial statements in accordance with the IFRS.

4.4.3.3. Co-operative Bank

The Co-operative Bank traces its history to August 1992 when it was incorporated under the Company Act. In 2004, Cooperative Bank merged with two smaller cooperative banks, the Co-operative Promoter Bank and Co-operative Farmers Bank. Under the new structure, the Co-operative Bank established itself as a public company and was awarded a license to operate as an investment and commercial bank. The Co-operative Bank has a strong emphasis

on cooperatives and SACCOs but also provides banking services to other customer segments. The bank has made several key milestones in the Myanmar's financial sector. In 2012, for instance, CB Bank was one of the first banks that were selected as agents for Western Union. In the same year, CB Bank along with two other Myanmar banks signed licensing agreement with Visa, Inc. to support card transactions. Still in 2012, Cooperative Bank signed licensing agreements with MasterCard as well as an MOU with Japan-based Bank of Tokyo-Mitsubishi for technical assistance to CB Bank. Today, the company operates as a 100% privately owned bank. The Co-operative Bank now operates more than 220 bank branches across Myanmar. As of December 2017, the Cooperative Bank has an asset base of MMK 2.7 trillion and a market share of 11% of the total bank deposits in Myanmar.

Like KBZ and AYA, CB Bank's popularity in Myanmar could be attributed to its adoption of modern technologies. The Co-operative Bank has been at the forefront in technology adoption and implementation of banking innovations. The CB was the first bank in Myanmar to introduce the automated teller machines. The bank has also focused its energies on the digitization of its banking platforms. However, the Cooperative Bank used to be number 2 in Myanmar but that position has since been taken by AYA Bank and CB Bank is now number three in terms of market share.

4.4.3.4. Yoma Bank

Two of the interviews were drawn from the Yoma Bank Ltd. Yoma Bank is one of the largest domestic private banks in Myanmar. Serge Pun founded the bank in 1993 and the first branch was opened in Yangon in July 1993. Yoma Bank enjoyed significant growth over the years and in 2003, it was one of the biggest banks in the country with 41 branches spread across 24 cities. Today, Yoma Bank is the sixth largest bank in Myanmar in terms of asset size with an asset base of MMK 1.535 trillion. In terms of the market share of deposits, Yoma is the

fourth largest bank with a 6% market share of the total bank deposits in the country. The bank currently operates 79 branches and has over 3,000 employees.

Yoma Bank's strong growth is attributable to its focus on its key strategic priorities of people, technology, and corporate governance. The bank has made heavy investments in technology in efforts to optimize its branch network operations. Yoma Bank was the first bank in Myanmar to adopt a computerized accounting system. In addition, Yoma was among the early adopters of wireless banking communications. Yoma Bank has also benefited from technical assistance provided by the German development agency, GIZ. In 2015, the bank formed a strategic alliance with Telenor to facilitate the development of digital financial services culminating in the formation of the mobile financial services platform Wave Money. Therefore, Yoma became what it is today because of technology.

While Yoma has achieved significant growth due to its focus on technology, it still suffers major limitations compared with its peers. First, Yoma does not have its own ATMs. Instead, the bank lets the customers to use other banks ATMs and Yoma bears the cost. Their strategy is to have no ATM as a method of minimizing investment costs but instead have more focus on SME businesses. After the Myanmar banking crisis in 2003, Yoma Bank's license was limited, stopping the bank from accepting deposits or issuing loans. In August 2012, the Central Bank of Myanmar reinstated Yoma Bank with a full banking license and this was the key event in their history. Yoma got full license back in 2012 after new 4 banks, AYA, AGD, MAB, and UAB, came into market. Yoma still has a lot to do in order to catch up with its competitors in terms of products and human resource development. In addition, the Bank has a lot to do in order to introduce new blood to key senior management positions.

4.4.4. Respondents' Demographic Characteristics

This study involved interviews with eight bank managers drawn from three private banks and one semi-government bank in Myanmar. The interviewees were drawn from Kanbawza Bank, Ayarwaddy Bank, Co-operative Bank, and Yoma Bank Ltd. Kanbawza Bank, Ayarwaddy Bank, and Co-operative Bank are the three largest banks in terms of market share with 2017 statistics indicating that the three controlled 41%, 17%, and 11% market shares, respectively. KBZ, AYA, and Co-operative Bank have a combined market share of 69%. Two of the respondents came from Yoma Bank Ltd, which is a middle-sized private banking institution with a market share of 6% according to 2017 statistics.

In terms of gender, the respondents were fairly distributed with half of the interviewees being male and the other half being female. The interviewees had a wealth of banking experience with a majority of them having worked with the current banks for more than five years. Three of the respondents had worked with their banks for 5-10 years. Three other managers had over 10 years of experience with their present banks while only two had worked for one to five years with their present banks. Even those who had worked for 1-5 years in their present banks indicated that they had previously worked in other banking institutions before. The many years of experience among these managers along with their managerial positions made them ideal for obtaining rich information on the impacts of technological innovations on bank performance.

In terms of education, all the respondents had at least a minimum qualification of a Bachelor's degree. Six of the respondents indicated that their highest level of academic qualification was a Bachelor's degree. The other two interviewees had pursued post-graduate education with each having a master's degree.

The managers interviewed in this study performed diverse managerial duties and this enhanced the richness of the information from the interviews. The respondents comprised of senior managers and territory managers from each of the four banks. The interviews from KBZ include the Head of Learning and Recruitment and a Territory manager while the interviews from the AYA Bank included a senior manager in charge of treasury and another senior manager in charge of international banking. The respondents from the Co-operative Bank included a Senior Advisor and a Branch Manager. Similarly, the interviewee from Yoma Bank included a Branch Manager and the bank's Head of Learning and Development.

4.4.5. Major banking innovations in Myanmar

The respondents interviewed in this study were asked to identify the major banking innovations in their banks and which they believed had the greatest impacts on the banks' performance. Four dominant themes emerged from interview discussions: core banking, mobile banking, ATMs, and smart accounts. The respondents were of the opinions that these four technologies were the most useful in enabling the banks achieve their customer and financial performance results. Core banking was cited as an important technology by the respondents from Yoma Bank, Co-operative Bank, and AYA Bank. Moreover, nearly all the respondents viewed mobile banking and the ATM technologies as important contributors to banks performance.

Core banking

The Centralized Online Real-time Electronic (CORE) banking technology was cited as one of the major banking technologies adopted by banks in Myanmar. Core banking refers to a system of electronic banking where bank branches are networked and integrated to allow the bank customers access their funds and perform banking transactions from any branch within the network. The core banking technology emerged in the 1970s and has since been a

dominant component of banking technology. In the last decades, core-banking solutions have become advanced to allow greater mobility of services, integration with multichannel banking platforms, and achievement of real time processing. Core banking solutions allow bank branches to offer deposit, withdrawals, cards, and loans services among others through an access to centralized customer data. Through core banking, bank branches have a single view of all customer data thus facilitating integrated customer service (Kreća & Barać, 2015).

A majority of the respondents who cited core banking as one of the most important banking innovations were of the opinion that core banking was useful to the bank due to simplification of operational processes. A senior manager at AYA Bank made the following remarks:

> "Our bank was the first one in Myanmar to adopt a Centralized Core Banking System. This has helped the bank streamline its business processes by making them more efficient. With core banking, frontline staff can easily access and manage customer data and automatically update customer records after each transaction. This has made it possible to reduce the number of staff by automating most of the manual processes." Respondent A2

Another respondent observed that the incidences of errors in transactions have reduced since the introduction of the core banking system. Since all transactions are processed automatically, the chances of manual errors occurring have reduced. Moreover, greater benefits of the core banking technology were seen from the customer satisfaction perspective. The respondents interviewed in this study believed that the core banking system had played a key role in attracting and retaining customers as explained by one of the senior managers at AYA Bank.

> "With core banking, our customers are able to access banking services from any of 242 branches. Gone are the days when a customer had to travel to his or her branch in order to do simple transactions such as cash withdrawals. Our integrated branch network systems ensure that customers are served in the best way possible. We make frequent updates of our core banking systems to ensure that we obtain new functionalities and tools for service to our customers. This, I believe, is the reason why we continue to have a growing pool of customers because we have agreed to leverage on technology." Respondent A2

Other respondents believed that the core banking system had a positive impact in lowering the banks' operational and support costs. One of the interviewees from Yoma Bank observed that the core banking system enabled the banks to handle a greater volume of customers using less human and physical resources. In addition, the system was viewed positively in light of its ability to enhance the effectiveness of accounting and reconciliation processes. According to a senior manager interviewed in the study, "Core banking makes the banking processes very cost-efficient by eliminating unnecessary processes and enhancing the productivity of employees."

Mobile banking/Mobile Wallet

Mobile banking emerged as one of the dominant technologies adopted by banks in Myanmar. Nearly all the respondents interviewed in this study were of the opinion that mobile banking was one of the most critical technologies that had shaped the banking services of their banks. The potential for mobile banking in Myanmar is high because of high mobile phones penetration in the country estimated at 95%. The Central Bank of Myanmar regulations allow banks to operate mobile financial services under a bank-led model. In this model, banks may operate mobile banking services on their own or in partnership with another services

provider. Mobile banking services have facilitated numerous banking transactions such as domestic and international remittances, payments between individuals and businesses, government payments to individuals, payments between businesses, as well as payments for loans and insurance premiums among others. The bank-led mobile banking services have a transaction limit of Kyat 500,000 per transaction and Kyat 1 million per day.

The leading mobile banking services in Myanmar today are KBZ Pay (Kanbawza Bank), CB Pay (Co-operative Bank), AYA mBanking (AYA Bank), Yoma Pay (Yoma Bank), and the AGD Pay run by the Asia Green Development Bank. These e-banking platforms are linked to the customer bank accounts and therefore enable customers to move cash within the account, access remittance services, conduct mobile top-up, and perform bill payments directly from the bank accounts.

In addition to the bank-led mobile banking services, the Central Bank allows the establishment of Mobile Financial Services Providers (MFSPs). These include mobile network operators and non-bank financial institutions. Where banks are involved in MFSPs, they only act as deposit-taking institutions to offer cash and liquidity services. One of the leading MFSPs in Myanmar is Wave Money, which is owned by Telenor, Yoma Bank, and the First Myanmar Investment. Other MFSPs in Myanmar include M-Pitesan and OK Dollar.

The respondents who were interviewed in this study were of the opinion that mobile banking enhanced financial inclusion by reaching out to customers who would not have otherwise been able to access mainstream banking services. For instance, one of the bank managers interviewed in this study noted that KBZ Pay had been able to reach close to 2 million customers within 8 months of its introduction. Similar sentiments were shared by another manager from the Co-operative Bank who attributed the bank's customer growth in recent years to the adoption of mobile banking technology.

> "From where I sit, I would say that mobile banking is the most important technology for the banking sector. With mobile banking, CB Bank has been able to reach out to millions of customers who have access to mobile devices. CB Pay makes it easier for customers to access bank services such as account balance inquiries and bills payments without having to visit the bank. This has greatly improved the bank's perception among customers and I would confidently say that CB Pay has been critical to the bank's success."

Customer convenience in access to bank services also emerged as one of the primary reasons for the popularity of mobile banking in Myanmar. The respondents interviewed in this study generally agreed that mobile banking enabled the customers to access banking services more efficiently and therefore had the overall impact of enhancing customer satisfaction and loyalty. A senior manager at KBZ made the following remarks on the convenience of KBZ, the mobile wallet operated by Kanbawza Bank:

> "KBZ is one of the most innovative mobile wallets in the market today. With KBZ Pay, customers can pay merchants and bills using their mobile phones. In addition, KBZ Pay allows the customer to send and receive money to and from other users instantly. Moreover, users can top up their mobile phones with airtime of all the major telecos in Myanmar using KBZ Pay. The mobile wallet reduces the need to make frequent visits to the bank by a huge proportion." (Respondent K1)

Mobile banking services were also cited as being a driver of financial performance among the sampled banks. One of the respondents observed that mobile banking enabled the banks to cut down on their operational costs while serving a greater customer base. With adoption of mobile banking, banks in Myanmar have been able to lower their investment in physical

branches. Kanbawza Bank, for instance, has plans to reduce the number of branches to 500 in order to focus on digital banking platforms while reducing the operational costs.

Automated teller machines

The theme of automated teller machines featured prominently in the interview discussions. A majority of the respondents agreed that the ATM technology had a significant impact on the banks' operations and performance. The respondents explained that the ATM technology was a major source of competitiveness as it brought services closer to the customers. The major benefit of the ATM technology is that it enables customers to access cash from their accounts on a 24-hour basis using debit or credit cards. Customers in Myanmar can also withdraw cash from the ATM machines using their mobile phones.

The usage of the ATM technology in Myanmar is fairly recent. The Myanmar Mayflower Bank was the first banking institution to introduce the ATM technology in Myanmar when it installed 11 ATMs in 2002. However, the expansion of the ATM and other electronic payments came to a halt in 2003 due to the banking crisis. By 2011, Myanmar did not have a single operational ATM machine. The Co-operative Bank launched the first ATM machine in November 2011. Since the Co-operative Bank launched its first ATM in 2011, the ATM technology has taken shape in Myanmar. The past eight years have witnessed strong growth of the ATM technology. Today, the country has over 1,000 ATMs and numerous point of sale machines. In 2017, Kanbawza Bank alone had 980 operational ATMs. ATM machines in Myanmar are located outside the banks as well as in convenient locations such as retail stores. The ATMs in Myanmar have an international card acceptance since the introduction of Visa and MasterCard services in 2012.

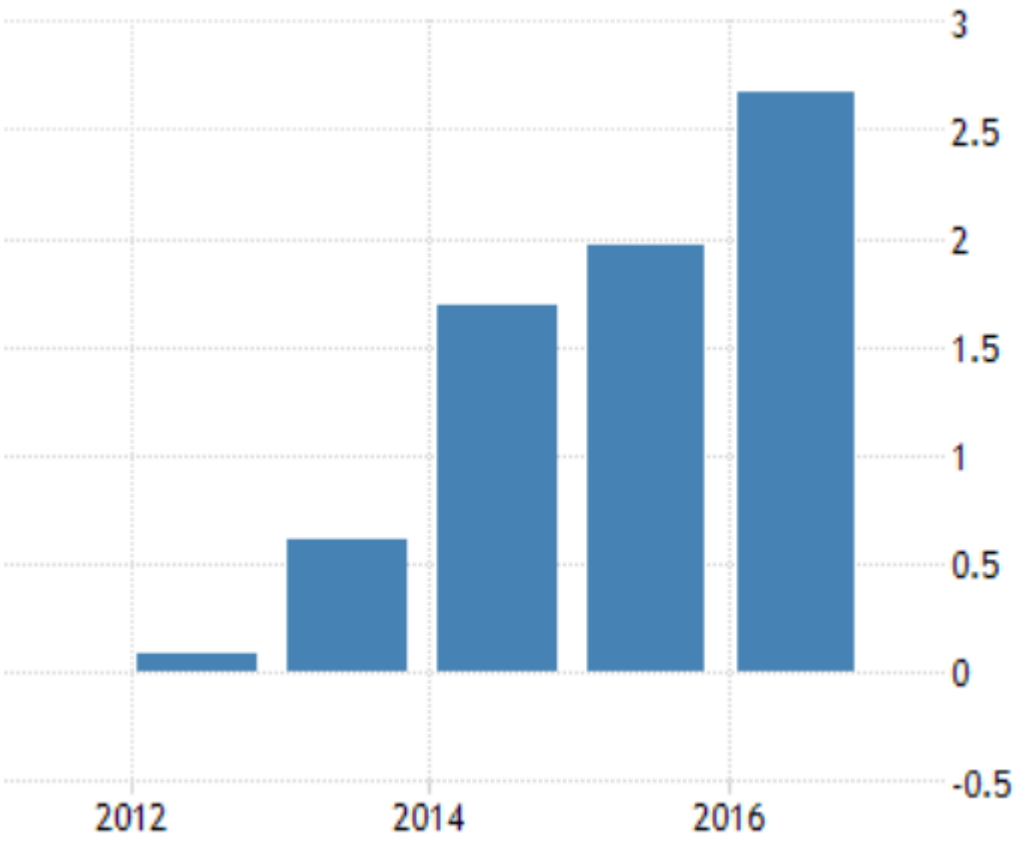


Figure 8: Automated teller machines in Myanmar per 100,000 adults

The respondents interviewed in this study had a positive perception of the role of ATMs in enhancing the financial and operational performance of banking institutions. The respondents believed that the ATM technology was beneficial in promoting customer satisfaction, which subsequently led to improvements in financial metrics. Through the ATM technology, customers are able to access banking services conveniently as observed by the respondents. One of the respondents observed that the ATM technology along with the mobile banking technology were the most important technologies in today's environment.

> "The battle for the customers today is significantly shaped by the ATM network. Customers want to access their cash at any time without having to queue at the bank and the ATM technology has really promoted this convenience. It is not surprising that banks with wider ATM networks are also the leading banks in terms of market

> share. CB Bank was the first bank to re-introduce the ATM technology in 2011 and this really fueled the bank's growth. In my opinion, the ATM technology contributed significantly to the bank's early success." Respondent C2

Another respondent, a territory manager at KBZ explained the bank's ATM systems as follows:

> KBZ Bank has over 980 ATMs spread across the country with the network coverage conveniently located on tourism hotspots, supermarkets, airports, shopping centers, hotels, and all KBZ bank branches. The bank also runs the KBZ On The Move program where KBZ branded buses are located at major events with ATM and currency exchange services. KBZ Bank ATMs accept all major international cards including Visa, MasterCard, Union Pay, and JCB. Customers can withdraw up to MMK 1 million per day from KBZ ATMs. The convenience afforded by the KBZ bank branches and ATMs is one of the major reasons why the KBZ is number one in Myanmar. (Respondent K1)

The ATM technology was also considered important because it enabled banks to cut down on operational costs. As one of the respondents explained, most customers now prefer banking through digital and electronic platforms and this enables the banks to reduce the costs of running a physical branch and hiring employees. A senior manager at Kanbawza Bank explained the rationale as follows:

> "The automated teller can serve multiple customers with minimal human resource or running costs. This is beneficial to the customer because there is no longer a need to go to the branch to access money but also to the bank, which now has less staffing needs. At KBZ, the long-term strategy is to reduce the branch network and instead focus on bringing the services closer to the customer through electronic and digital

platforms. This way, the bank will be able to serve more customers while minimizing on operational costs."

Some respondents, mainly from the Yoma Bank, saw the investment in ATM technology as less important in driving their strategic agendas. Those who viewed the ATM technology negatively believed that the ATM had heavy investment and operational costs that made little economic sense. Instead, these respondents saw other digital platforms such as mobile banking as more promising. For instance, Yoma Bank has not invested in ATM installation despite its significant market share. Instead, the bank rides on the ATMs of other banks to allow its customers to access ATM services conveniently. This way, the bank minimizes its investment costs while focusing its energies on other digital platforms.

SMART Account

The theme of smart accounts featured prominently among interviewees from the Yoma Bank. The managers interviewed from Yoma Bank identified the smart account as one of the innovations they considered most important to the bank. Smart is a digital channel launched by Yoma Bank in 2017. The channel allows the bank to offer services to its customers even without immediate access to Yoma Bank branches. Smart also allow customers to open bank accounts through an online application process. With Smart, customers are able to download the account opening application form and begin the process before visiting Yoma Bank branches to complete the process. Since its inception, Smart has been able to reach over 120,000 customers. Smart account customers can access the bank services through the Myanmar Payment Union (MPU) network of over 3,000 ATMs as well as over 30,000 Wave Agents.

SMART allow customers of MPU Debit Card to access cash services at no costs or maintenance fees. Customers may apply for SMART online and collect customized SMART

MPU Debit Card from any Yoma Bank branch locations within two working days. The SMART account customers may access cash withdrawal services from 3,000 MPU branded ATMs across the country. ATM withdrawals from these ATM do not include additional transaction fees. Therefore, Smart account saves money in addition to offering convenience to the customers. Furthermore, the SMART MPU Debit Card may be used for online and offline shopping at POS terminals.

The SMART platform also enables the Yoma Bank customers to manage their accounts conveniently at any time and place. This is afforded by the account's 24/7 accessibility through online channels and the Yoma Bank mobile banking application. Customers may send money from their SMART account to another SMART account free of charge. According to one of the respondents, "the SMART account has the additional benefit to customers of giving a mobile top-up discount when users top up their mobile phones on mobile operators such as Telenor, and Ooredoo." In addition, SMART users benefit from the ability to access the Wave Money account features. Yoma's SMART account is therefore a popular product among customers and could be attributed to the bank's top position among the private banks in Myanmar. Although Yoma Bank does not operate its own ATMs, the access to over 3,000 MPU ATMs makes it possible for Yoma Bank customers to access ATM services conveniently. Therefore, Yoma Bank is able to compete with its major competitors such as AYA, KBZ, and CB Bank on ATM accessibility.

Yoma Bank has enhanced the Smart Account by introducing additional features such as Smart Salary Advance and Smart Payroll. The SMART Payroll service enables Myanmar employers to conveniently manage the salary payment for their employees. With SMART Payroll, employers can manage the monthly payrolls of their employees through the Yoma Ban account. The SMART Payroll schedules the payment processes to ensure that employees are paid on time by crediting their salaries directly to their SMART accounts. The SMART

Payroll also enhances the process of cash flow management as well as reducing the burden of dealing with monthly payroll processes through automated payment systems. Furthermore, employers who use the SMART accounts can now obtain salary advancement through the SMART Salary Advance service. Users may request and receive the salary advance instantly through their mobile phones. The bank has also announced plans to introduce the Smart Credit product, which will enable Yoma Bank customers to access credit services conveniently through digital platforms (Yoma Bank, 2019).

4.4.6. Impacts of technological innovations on financial performance

The interview questions sought to assess the extent to which technological innovations in the banking sector in Myanmar affected financial performance. A bank is considered to have desirable financial performance when its earnings exceed its expenses (Bassett & Brady, 2011). The bulk of a bank's profit derives from the fees it charges for its services as well as the interests it earns on loans. On the other hand, the bank's main expense is the interest paid on customer deposits. A bank's main assets are the securities held and the loans extended to individuals, companies and other organizations, while the major liabilities are the customers' deposits and borrowed money (Collier et al., 2015). Measures of after-tax returns such as net income, return on assets, and return on equity are frequently used to assess the profitability of banking institutions.

Innovations in the financial services sector have enabled the banks to enhance their financial performance. Information Technology has facilitated the development of new markets, products, and services such as mobile banking and internet banking. In addition, IT has enabled the banking industry to come up with efficient delivery channels. Information Technology has been the foundation of major reforms in the financial services sector in addition to expanding the speed and reliability of the services within the banking sector. This

had led to higher quality of financial services tasks and activities to fortify the financial segment thus lessening the costs of funds transfer. With data innovation revolution, banks are progressively interconnecting their computer systems over branches across cities and other geographical locations due to the high speed network infrastructure. In the present study, interviewees were asked to explain their perceptions of the role of banking innovations on net income, revenue, return on assets, return on equity, customer deposits, and shareholders' wealth.

Net income

Net income is one of the key determinants of the financial performance of a banking institution. The net income is derived from the net of revenues after deducting operating expenses, administrative expenses, selling costs, and taxes. A bank's net income is one of the clearest indicators of the institution's financial health. Banks in Myanmar have faced a challenging business environment that lowered their earnings abilities. However, the past few years have seen a significant growth in the earnings of most banks as the population embraces bank services. In the current study, the impact of technological innovations on the incomes of banks was analyzed through the lens of the bank managers.

A majority of the respondents who were interviewed in the present study were of the opinion that banking technologies such as ATM, mobile banking, Smart accounts, and core banking had a direct positive impact on net income of Myanmar banks. A majority of the respondents believed that technological innovations increased the transactions volume and subsequently increased the revenues derived from banking services. However, the increase in transactions volume was not directly associated with an increase in transactional costs. Therefore, technological innovations enabled the banks to increase their earnings without necessarily increasing the costs of operations. One of the respondents interviewed in this study observed

that the technologies had increased the revenues through online transactions. The respondent stated that, "Yes. Many in-branch transactions become online payments which (a) increase transactions and in turn increase revenue and (b) reduce branch operation cost. Thus overall EBITDA improved" (Respondent K1). The deployment of technology was seen as a boost to the amount of revenue as well as a decrease in the operational costs. Another respondent observed that the need to run physical branches would reduce in future as more customers move towards mobile technologies. This would reduce the costs of doing business for the banks and subsequently result in income growth.

Some respondents believed that the adoption of technology led to operational efficiency and therefore helped the banks to increase their profitability. According to one of the respondents, "With technology adoption, the bank was able to transformed from a traditional bank to a more technologically advanced bank and thus able to maintain the bank's profitability" (Respondent C1). Another respondent observed that, "Yes, majority transactions are online. There are 200,000 Smart accounts within 1 year of roll out" (Respondent Y1). The general perception of the respondents was that technological innovations had transformed the banks from traditional, inefficient institutions to modern cost-effective organizations. This transformation came with cost reduction and therefore a boost to profitability. The banks were able to increase their revenues with improvements in transaction volumes while their operating costs did not increase with the same magnitudes.

Technological innovations were also viewed as a key contributor to overall financial performance of the banks. One of the respondents attributed the bank's rise to the second position in the sector to the deployment of technology. The respondent stated that, "Yes, the bank started in 2012 and has been deploying technology. And these innovations have been crucial in moving the bank to be 2nd largest by Asset today" (Respondent A1). The four leading banks in terms of financial performance in Myanmar have high levels of technology

deployment and this could be one of the major reasons why the banks remain popular among customers. A common observation for the top banks is that they all have a wide ATM network that allow customers to access cash withdrawal and payment services from numerous convenient locations. Yoma Bank, for instance, enables its customers to access banking services from over 3,000 MPU ATMs and over 30,000 Wave Agents while customers of KBZ can access cash withdrawal services from close to 1,000 KBZ ATMs. In addition, the top banks are characterized by well-developed mobile banking platforms that have further enhanced the banking services accessibility.

One of the respondents observed that the banking technologies contributed to overall profitability of the bank by providing the bank with tools of managing the cash position. The Senior Manager in charge of Treasury at AYA Bank stated that bank technologies enhanced profitability of the bank because "core banking improved visibility on the bank's cash position and therefore enabled the bank to act accordingly when faced with liquidity issues" (Respondent A2). With core banking, senior bank managers are able to have a real-time view of the cash position at the bank and where liquidity challenges are detected, the managers can act accordingly and obtain cash from other banks. This helps to avert potential crisis and loss of public confidence. Managers particularly in the Treasury departments find the core banking system extremely useful in managing the banks' liquidity.

While most of the respondents believed that the net income was positively affected by technological innovations, others were unable to make an assessment because they did not have knowledge about their banks' financial performance. However, the general perception among the respondents was that technological innovations contributed to improved financial performance of the banks.

Revenue

The managers of Myanmar banks interviewed in this study were asked to explain their perceptions of the impacts of technological innovations on the revenues of their banks. The overriding theme from the interview discussions with the bank managers was that the deployment of modern technologies helped to increase the transaction volumes of the banks. Banks that adopted modern technologies such as electronic banking and mobile banking were able to reach a wider customer base and therefore had an expanded portfolio of fees and charges. For instance, Kanbawza Bank had seen a significant growth in customer base since it introduced its mobile banking platform KBZ Pay. Since the amount of revenue generated by banks is directly dependent on the volume of transactions, the modern banking technologies help to drive revenue growth through increase in the volume of transactions. One of the respondents interviewed in this study noted that the deployment of online banking technologies had helped to "increase transactions and in turn increase revenue" for Kanbawza Bank. A senior manager at Kanbawza made the following observations with respect to the role of the deployment of technology in boosting bank revenues: "New accounts through mobile wallet have reached almost 2 million in 8 months. Previously, it took more than 5 years to increase 1 million new bank accounts" (Respondent K1). With growth in the bank accounts as a result of new technologies, KBZ was able to grow its revenues due to the increase in the amount of charges and fees on these additional accounts.

The growth in transaction volume among Myanmar banks adopting modern technologies was observed among all the banks studied in the present study. One of the managers interviewed in the present study, a senior manager at Yoma Bank, noted that, *"Transaction volume improved 5 folds compared to traditional banking and it definitely has impacted bank's revenue"* (Respondent Y1). The growth in transaction volume was seen as being driven by the ability of the banks to server a greater customer base than was the case in traditional

banking channels. Moreover, the growth in transaction volume was attributable to the increased frequency of transactions conducted through electronic channels. Even where the bank did not achieve a significant growth in its customer base, the present customers were able to access banking services more frequently due to the convenience afforded by modern technologies and this ultimately helped to boost the banks' revenues.

Some of the respondents interviewed in the present study were of the opinion that the banks' current position within the financial services sector was directly attributable to the adoption of technology. For instance, a Senior Advisor at KBZ Bank noted that the bank's current position as the second largest bank in terms of asset base and market share was attributable to the bank's strategy of technology adoption. He observed that, "The bank was able to maintain its position in the market due to early technology adoption and thus maintain its top line although there was a fierce competition in the market" (Respondent C1). The Co-operative Bank was one of the earliest adopters of technology in Myanmar having re-introduced the ATMs in 2011. This led to an increase in the confidence of the customers towards the bank.

Revenue growth due to deployment of technologies was noted to occur not only at the bank level but also at the branch level. Territorial and branch managers interviewed in this study observed that they had witnessed revenue growth in their branches or departments due to technology adoption. For instance, one of the respondents, a branch manager at KBZ, noted that the branch revenues had increased as a result of deployment of modern technologies. Another respondent, A senior manager at the Treasury department of AYA Bank observed that "In recent years, the revenue in my department increased 3 times compared to last 5 years ago" (Respondent A1). The growth in branch revenues led to an overall increment in the revenues of the entire banking organization. Another respondent, a territory manager at Yoma Bank, noted that, "From branch perspective, the revenue has increased over past 2-3 years" (Respondent Y2).

The case of Wave Money revenue growth demonstrates the role that technology plays in boosting the revenues of banking institutions. The Yoma Bank-owned Wave Money platform has witnessed one of the fastest growths in revenues in the banking sector. Between January 2017 and January 2018, Wave Money achieved a monthly growth in revenue of 22%. In addition, the platform achieved a 30% growth in transaction volume within the same period. Wave Money has also seen its agent network expand from 5,000 in early 2017 to about 33,000 by end of 2018. Wave Money has wide network coverage of over 33,000 agents spread across the country and this has been a key factor in its ability to reach more customers. Recently, Wave Money has been offering unsecured loans to small and medium enterprises and this has helped to drive the revenues of its parent organization, Yoma Bank. Today, Wave Money boasts of over 2 million customers in Myanmar (GIZ, 2018).

Return on assets

The return on assets (ROA) shows how effective a company is in generating income from the use of its assets. Banks use their assets to generate revenue and earnings in form of fees and charges. Within the banking sector, the ROA is an important determinant of the financial performance of a bank because it shows the efficiency of earnings generation. In the present study, the respondents were asked to describe their perceptions on how technological innovations had influenced the banks' performance in terms of return on assets. One of the major themes that emerged from the interview discussions was that technological innovations helped to boost the banks' return on assets. The majority of the interviewees who responded to the query on the impact of technology on ROA believed that investments in technology generated good returns for the banking institutions.

One of the respondents, a senior manager at KBZ Bank, best captured the relationship between technological innovations and ROA as follows: "*The ROA is significant. Previously,*

to collect new customers, a new branch had to open and CAPEX for a new branch is high. But with technology, acquiring new customers and running operations become more scalable" (Respondent K1). As the respondent noted, the costs of acquiring new customers using the traditional banking channels were very high due to the need to open new branches. However, the new technologies made it possible for banking institutions to reach out to a large customer base with minimal investments thus increasing the bank's ROA. With modern channels such as mobile banking and online banking, banks are able to recruit new customers without the need for running expensive branches. All that is needed for banks to reach out to millions of unbanked customers is an online system and an e-banking platform.

Core banking was also seen as a favorable technology in boosting the bank's return on assets. Banks with core banking systems were able to lower their operational costs through better branch linkage and therefore, the overall returns for the banks have improved. One of the respondents stated that, “With Core banking, we are able to link up all the branches and it reduces other un-necessary CAPEX costs to manage large branch network" (Respondent K1). Moreover, core banking enable banks to reduce their investments in assets and physical branches because all bank operations are integrated into one seamless system.

The deployment of new technologies within the banking sector was also seen as beneficial to improvement of banks' ROA in that it facilitated the efficiency of banking services. Banks that deploy new technologies are able to handle operational activities more efficiently and therefore have greater capacity to make better use of their assets. According to one of the respondents, "With the aids from technology, transactions can be done quicker and that definitely makes better use of assets" (Respondent A2). As the interviewee noted, investments modern banking technologies such as ATM, mobile banking, online banking, and core banking have made the delivery of banking services in Myanmar highly efficient and this generally implies better utilization of bank assets in earnings generation.

Another respondent explained how the transformation of his bank from a traditional to a technologically advanced modern bank had improved all the financial fundamentals of the bank. The respondent, a senior advisor at the Co-operative Bank stated that, "When transformed from traditional bank, the revenue, loans and deposits are maintained while cost had been reduced to have improved ROA" (Respondent C1). This implies that the deployment of technology helped to mobilize loans and deposits, which subsequently led to greater revenues and net incomes for the bank. While revenues and earnings increased, the banks did not experience a proportionate growth in operational costs due to the efficiency afforded by the banking technologies. The overall impact of the technologies is therefore a boost in the banks' return on assets.

Return on equity

Another important measure of the financial performance of a banking institution is the bank's return on equity. Technological innovations require a significant investment in capital, which is usually in form of equity. Bank owners invest their funds in a bank with the hopes of generating some returns. The return on equity (ROE) shows how well a bank uses its equity investments in generating earnings. The respondents were asked to explain their perceptions on whether they believed that technological innovations were positively associated with return on equity.

The major observation from the interviews was that banking technologies had a direct and positive impact on the banks' return on equity. Most of the respondents were of the opinion that deployment of banking technologies such as core banking, ATMs, and mobile banking generated high returns on investments. This was mainly due to the role of these technologies in generating higher revenues and incomes compared with the associated costs of operations. When banks invest their funds in deploying new technologies, they are able to achieve two

major financial goals: increase earnings and reduce operating costs. Therefore, the return on investments for modern technological innovations is very high in Myanmar particularly due to the high market potential. For instance, the investments by the Co-operative Banks on ATMs in 2011 paid off with high earnings and returns from the investments.

Further evidence from the interviews show that banking technologies generate high returns on investment by lowering the investments on physical bank branches. With modern electronic banking technologies, the need for opening additional bank branches has reduced. Some banks such as KBZ Bank have announced plans to scale down their branch networks in order to focus on digital channels, which have high returns on investments. In addition, banking technologies lower the operating costs of existing bank branches and therefore help to boost the overall returns on investments. According to one of the respondents interviewed in this study, technologies such as core banking reduce the costs of running bank branches by eliminating unnecessary CAPEX costs and therefore enable the banks to improve on their overall profitability.

While some of the interviews expressed a positive perception of the impact of technological innovations on return on equity, others failed to answer the question citing a lack of understanding on the matter or lack of privy information. This was expected because the financial performance data of most Myanmar banks is hard to come by. Moreover, some of the major banks have been operational for a few years and therefore a proper understanding of the underlying financial history may be lacking. Nevertheless, all the respondents who answered the question believed that the banks' ROA and ROE had improved as a result of technology adoption.

Customer deposits

Customer deposits are among the most important determinants of the financial performance of a banking institution. In Myanmar, private banks dominate the banking market with the highest proportion of customer deposits. According to 2017 estimates, Kanbawza Bank, AYA Bank, the Co-operative Bank, and Yoma Bank are the market leaders in terms of market share for customer deposits with 41%, 17%, 11%, and 6% market shares, respectively (GIZ, 2018). The dominance of private banks in the deposits market is mainly attributable to the wide branch networks of the private banks. In the current study, respondents were asked to explain their perceptions of how technological innovations had affected customer deposits.

One of the major themes that emerged from interviews with managers of Myanmar banks was role of technological innovations in deposit mobilization. A majority of the respondents interviewed in this study generally agreed that new banking technologies helped to mobilize customer deposits. With a significant majority of the population being unbanked, new innovations that reach out to these segments of the population helps to mobilize savings into deposits. Mobile banking was seen as the most important technology in deposit mobilization. Customers using mobile banking could now deposit even the smallest amounts of money directly into their bank accounts. Such customers would ordinarily shy away from making such small deposits through the branch. In addition, the convenience afforded by mobile banking encouraged more people to transact frequently in their bank accounts.

It also emerged from the interview discussions that technological innovations such as mobile banking and smart accounts had contributed to growth in the volumes of customer deposits among the studied banks. A senior manager at KBZ Bank observed that, *"Yes, it does. In fact, we have largest customer deposit in Myanmar and with technology innovation, we are maintaining our no.1 position over past 5 years"* (Respondent K1). The manager attributed the bank's rise to the number one position within a relatively short period to the adoption of

modern technologies. The respondent further observed that the deployment of technology not only helped the bank to reach the first position in Myanmar but was also crucial in ensuring that the bank retained the position. Similar sentiments were shared by another senior manager at AYA Bank who attributed the bank's significant growth in customer deposits to technology adoption. The manager stated that, *"The bank deposits growth from Zero to 5T MMK today is contributed by being technology early adopter"* (Respondent A1). AYA Bank had been able to grow its deposits from zero to MMK 5 trillion within a short period of time thanks to its early adoption of technology. These banks were able to leverage on technology to grow their customer deposits.

A senior manager at Yoma Bank explained the bank's growth in customer deposits as follows, *"With 5 times increased in transaction and 200,000 new accounts, the deposit has increased making Yoma to be one of the top 5 banks in Myanmar"* (Respondent Y1). The manager attributed the meteoric rise in Yoma Bank's growth from a small bank to the fifth largest bank by customer deposits to technology adoption. Specifically, the manager made reference to the SMART account technology and mobile banking as some of the technologies that had driven the bank's growth. With Smart account, for instance, the process of opening a bank account at Yoma Bank had been simplified and this encouraged more customers to open bank accounts.

With high competition in the banking sector, some respondents agreed that technology adoption helped to withstand the competition for customer deposits. With about 44 banks operating in Myanmar, the competition for new and existing customers is high. Technologically advanced banks have been able to win the competition war by providing competitive services to the customers. For instance, a senior manager at the Co-operative Bank stated that, "*With technology and fierce competitions, the deposits of the bank are able to maintain and grow according to market growth*" (Respondent C1). This observation is

consistent with the current reality within the Myanmar banking sector. State-owned banks have been losing their market share of customer deposits over the years while the private banks have seen a huge growth in market share. This is mainly attributable to the ability of private banks to innovate and adopt modern technologies. Private banks have been at the forefront in introducing modern technologies in the Myanmar banking sector and this could be the major reason for their market share growth.

The role of technology in mobilizing deposits and fueling the growth of customer deposits was also recognized by managers at the branch level. The branch managers interviewed in this study were in general agreement that technological innovations had helped to boost deposits growth at their branches. For instance, a branch manager at Yoma Bank noted that customer deposits at her branch had increased significantly. Similar sentiments were shared by other branch managers interviewed from the Co-operative Bank and KBZ Bank. The major reason for the growth in customer deposit at the branch level was mainly due to the ability of new technologies to encourage off-branch customer deposits. With new technologies, customers are able to make deposits without having to visit the bank branch.

Shareholders' wealth

Shareholder wealth maximization is the primary goal of every organization. This goal also applies for banking institutions. Banks hire managers to maximize their wealth in the company as measured by the value of the company in terms of price of the shares or value of assets. When the stock price of a company increases, then the value of the firm increases and ultimately the shareholders wealth is increased. Shareholder wealth maximization looks at the long-term growth of the firm. The banks studied in this study have achieved a significant long-term growth, which is primarily fueled by technological innovations. The four banks have become the top market leaders with the highest market shares of customer deposits and

the largest customer bases within a short period of time. For instance, Kanbawza Bank has become number one bank in Myanmar despite being established in 1994. On the other hand, AYA Bank was established in 2010 and currently holds the number two position in terms of customer deposits in Myanmar having overtaken older and well-established banks. In these banks, the shareholders' wealth has growth significantly as profitability grows.

In the present study, managers of Myanmar banks were asked their opinions on the role of technological innovations in improving shareholders' wealth. The general feeling among the respondents was that the deployment of technology helped to enhance shareholders' wealth by promoting overall growth of the bank business. A senior manager at KBZ Bank stated that the impact of technology on wealth maximization was significant. The respondent stated that, the impact is "*Significant. Thus, now management has put focus to deploy more technological innovations in the bank*" (Respondent K1). Similarly, another respondent observed that technology was the key driver of growth in the bank. The respondent representing AYA Bank stated that, "*Since the bank started, technology has been in the center of its growth*" (Respondent A1). The managers interviewed in this study perceived technological innovations as a driver of long-term financial growth of the banking institutions, which subsequently led to growth in shareholders' wealth. Investments in technological innovations take time before significant returns can be realized. In Myanmar, technological investments made in the past ten years have begun to pay off with dividends to the investors.

One of the respondents, a senior manager at Co-operative Bank, observed that the company's management saw technology as the driver of growth in the bank's future. According to him, "*The BoD of the banks and shareholders see the impact of technology adoption and had mandated for more innovations over the years*" (Respondent C1). This implies that the managers are not just having a historical view of technological innovations but also a forward-looking approach of how technology can be a driver of future growth.

Other drivers of the growth in shareholder's wealth due to technological innovations are the growth in revenue and reduction in costs of operations. As banks adopt new technologies, they are able to boost transactions volume and therefore increase the amount of revenues derived from fees and charges as noted by one respondent "*Transaction volume improved 5 folds compared to traditional banking and it definitely has impacted bank's revenue*." Another respondent observed "*The bank phenomenal growth from Zero to 2nd largest bank by Asset is mainly contributed by technology adoptions*." As technology drives revenue growth, the banks' overall profitability grows, which in turn helps towards the goal of profit maximization. Similarly, technological innovations help to cut down the costs of doing business for the banks and therefore the profits attributable to shareholders grows substantially.

4.4.7. Impacts of technological innovations on operational efficiency

Operational efficiency is concerned with the efficacy of resource utilization and transformation into useful products. It is also associated with the extent to which an organization is able to achieve predetermined goals. Within the service industry, operational performance entails three performance factors: quality, speed, and dependability. A service provider is considered to have operational efficiency if it is able to deliver its services promptly (speed), with high levels of dependability, and high quality. Therefore, the operational performance of an organization may be assessed using other criteria such as quick delivery compared to the competitors, costs relative to those of competitors, customer satisfaction, and overall productivity (Rahman et al., 2010). Within the banking sector, technological innovations are the key drivers of operational efficiency of banks due to their capacity to enhance service delivery to the customers. Technological innovations such as mobile banking, automated tellers, and online banking enhances the operational management of commercial banks by enabling customers to access banking services without having to

visit the bank. Modern technologies also facilitate the operational efficiency of banks by facilitating the banks to reach the unbanked populations through agency banking systems and mobile systems. Therefore, the present study focused on the assessment of how technological innovations adopted by Myanmar banks contributed to operational efficiency of the banks.

In the present study, operational efficiency was measured in terms of the quality of service, dependability of service, and speed of service delivery. In addition, the efficiency of the banking operations was assessed through an evaluation of the impact of the technologies on operating cost, cost savings, employee productivity, and wastage reduction. Overall, the findings show a positive role of technological innovations in enhancing the operational efficiency of the banks as evident from interviews with senior and territory managers of four leading private banks in Myanmar.

Quality of service

The quality of service is one of the key determinants of the operational efficiency of a bank. Banks with high quality of services are able to attract and retain customers and therefore have overall improvement in their performance. The managers interviewed in the present study were asked to express their opinions on the role that they believed technological innovations played on the quality of service. One of the major themes that emerged from the interview discussions was that technological innovations actually helped to enhance the quality of service. A majority of the respondents believed that technologies such as core banking and mobile banking helped the bank to offer higher-quality of services. One of the respondents from Yoma Bank cited the bank's new technology, SMART, which he explained had helped to enhance the quality of banking services. Through SMART, Yoma Bank customers could access high quality banking services conveniently without having to visit the bank. Similar sentiments were shared by other respondents who believed that the quality of banking

services had improved since the adoption of modern technologies. Another respondent noted that core banking had enabled the banking institutions to offer high-quality services due to the system's ability to support real-time transactions. Core banking was cited as one of the essential banking systems that ensured that banks provided banking services to customers with minimal exposure to errors.

Another dominant theme that emerged from the interview discussions with Myanmar bank managers was the positive role of technological innovations in promoting customer satisfaction. According to the respondents, the quality of service of was best measured in terms of customer satisfaction. Since the level of customer satisfaction had improved following the adoption of technological innovations, it was generally assumed that the quality of bank services had improved. The following responses from the interviewees generally reflect the general theme of customer satisfaction:

> "Improved. It becomes easier to train staffs and it in turn improved customer satisfaction (Respondent K1).
>
> Significantly better. With technology, customer care can be done even in advance. (Respondent K2)
>
> With technology, the bank can set a quality standard above other banks in that market at that time (Respondent A1)
>
> It improved in customer satisfaction (Respondent A2)
>
> Due to technology adoption, the bank has been seen as one of the best customer service bank in Myanmar (Respondent C1)
>
> Can set a certain standard on customer service to improve customer satisfaction (Respondent C2)"

A majority of the respondents interviewed in the current study believed that the high quality of service derived from the utilization of modern technologies helped to boost overall customer satisfaction in the banks. As one of the respondents noted, banks are now able to use modern technologies to engage in customer care activities. With platforms such as mobile banking and online banking, customers are able to forward queries to the bank officials. Moreover, mobile apps such as KBZ Pay and CB Pay have self-service features that further enhance advance customer care. Customers are able to access frequently asked questions (FAQs) on these platforms and resolve most issues without having to go to the bank. Moreover, the interviewees revealed that the technological innovations had enabled the Myanmar banks to establish standards of customer service and the quality of service. As banks continue to innovate, the focus within the banking sector is now on how banks can outcompete each other in terms of the quality of services offered. This competition has been healthy because it has improved the standards of bank services in Myanmar.

Other respondents felt that the deployment of modern technologies enhanced the quality of service by promoting interactions with the customers. Modern technologies such as mobile banking help banks to be more active in engagement with customers. This ultimately helps to improve the quality of service since banks are able to obtain customer feedback and act on the feedback to promote the quality of service. One of the respondents interviewed in this study stated that, *"The quality of service is significantly improved. There are more interactions with clients, which makes quality of service improved"* (Respondent Y1). As noted by the respondent, banks are now in a better position to engage with their customers through modern channels of communication. The enhanced communication provides banks with a better platform for learning from past experiences, identifying emerging customer needs, and resolving current challenges thus enabling the banks to have better quality of service.

Furthermore, it also emerged from the interview discussions that technological innovations helped the banks to improve the banks' ability to deliver high quality services and at times fulfill the needs that customers may be unaware of. One of the respondent, a manager at Yoma Bank, best captured this concept in the following statement, *"Technology helps us improve service delivery. We can offer additional services to our customer with help of technology and fulfill needs that are usually unaware by customers"* (Respondent Y2). As the respondent observed, banks frequently introduced new services through innovations, which helped to meet previously unmet customer needs. For instance, the SMART service offered by Yoma Bank has enabled the bank to introduce new services in the banking sector.

Speed of service delivery

The theme of the speed of service delivery was given prominence in the present study. Respondents were asked to give their opinion on whether the deployment of modern technologies within the banking sector helped to speed up the pace of service delivery. All the respondents agreed that technological innovations had improved the speed of service delivery. One of the respondents observed that the use of technology had made the process of service delivery fast. Another respondent noted that, "Yes, we are one of the fastest service provider in Myanmar" (Respondent C1). The general feeling among the managers interviewed in the study was that the use of technology had enabled the banks to be faster in their service delivery. One of the senior managers interviewed in this study gave the example of core banking as one of the technologies that had greatly enhanced the speed of service delivery. With core banking, banking staff could access customer information from the central database in real time. Therefore, customers do not need to wait for long to access services. The core banking system has given Myanmar banks an opportunity for establishing an integrated branch network where information is readily accessible for faster service delivery.

One of the managers interviewed in the study stated that, "The bank service has been recognized by customers as one of the fastest in the market" (Respondent A1). Similarly, another respondent noted that customer service at her bank, "became faster and this really helps customers" (Respondent Y2). In general, the respondents attributed the speed of their customer service to technology adoption. There was a direct association between deployment of technology and the speed of service delivery as seen from the interview discussions. Those who made this assertion believed that technology in itself offered faster systems of service delivery compared with traditional methods. For instance, the SMART accounts operated by Yoma Bank allow bank customers to request salary advance and access it within a short period of time through their mobile banks. Previously, the process of applying for a salary advance through the bank would take several days but with the new technology, the entire process of applying for a salary advance may take a few hours. Similarly, the process of opening bank accounts at Yoma Bank has now been simplified and made faster with the bank's SMART technology where customers can download accounts opening application forms online, fill them and send them for approval to the bank.

In addition to ensuring that customers were served faster, technological innovations have also enabled banks to be more responsive to customer needs. This theme emerged during the interview discussions with the managers who noted that the new technologies had enabled them to respond to customer issues more rapidly and in a better manner. One of the respondents from the KBZ Bank stated that with the new technologies, they were "Able to respond to customer needs quickly" (Respondent K2). Another respondent who noted that, "Instantaneous respond features on platforms like Facebook messenger and Instagram make speed of service real time" (Respondent CY1), shared similar sentiments. With new features from modern technologies, banks are more responsive to customer needs as they can respond to complaints and suggestions within a shorter period of time. With the emergence of social

media and other instant messaging platforms, companies are able to respond to customer issues in real time. Myanmar banks seem not to have been left behind in taking advantage of the capabilities of modern technologies. A senior manager at the Co-operative Bank summarized the role of technological innovations in ensuring that banks are more responsive to customer needs as follows: "We now can now have quicker response to our customers" (Respondent C2).

Another theme that emerged from the interview discussions was that the deployment of modern technologies within the banking sector had led to improvement in the speed of communication between customers and the bank. Myanmar banks are now in a position to communicate more rapidly with their customers through modern channels of communication such as Facebook. On the other hand, customers are no longer required to visit bank branches or send letters to the bank in order to resolve issues with their accounts. Applications such as Facebook and Instagram are now efficiently used in fostering instant two-way communication between banks and their customers.

Further discussions with the bank managers revealed that technological innovations helped to improve the speed of job performance among bank staff. Some respondents noted that the new technologies had helped the bank staff to perform job-related tasks more efficiently and with ease. With faster performance of job-related tasks on the part of bank staff, the overall speed of service delivery to customers improved. One of the branch managers interviewed in the study noted that, "*This is the most improved in my line of work. With aids from technology, I can deliver better offers and quotes to my clients*" (Respondent A2). As the respondent noted, deployment of technology within the banking sector made it possible for the performance of bank duties to become easier thus translating the benefits to customers in form of faster service delivery.

Dependability of Service

In the present study, the bank managers who participated in the interviews were asked to express their opinions on the role of technological innovations in promoting the dependability of banking services. Rahman et al. (2010) consider the dependability of service as one of the key determinants of the operational efficiency within the service industry. In general, the respondents were all in agreement that the dependability of bank services within their banks was better with the use of technologies. The respondents believed that technological innovations had made the services offered by the banks more reliable and this had boosted the general trust among members of the public towards the bank. Previously, the confidence of the public towards the private sector had been eroded after the 2003-banking crisis. However, the deployment of efficient bank systems had won back the public trust among the private banking institutions in Myanmar.

One of the major themes that emerged from the interview discussions was that deployment of technological innovations had enhanced accountability within the banking sector. Due to the sensitivity of the banking sector, customers have a greater demand for accountability. New technologies make accountability easier for banks because the customer can view the history of their transactions in real time. This transparency enhances the customer confidence in the banking sector. One of the respondents noted that, "*It is more accountable as with technological innovations since all transactions and communications are recorded and traceable*" (Respondent K1). Therefore, customers had greater trust with the service delivered by bank staff since the transactions were verifiable and traceable. The dependability of service with automated systems was considered higher because there was little chance of system manipulation when the systems are fully automated. In contrast, traditional manual systems may not be dependable because of the possibility of human manipulation. Similar sentiments were shared by another respondent who observed that, "*Technology made me*

more confident in my offerings to my client thus customers see the bank is more accountable" (Respondent A2).

The traceability of transactions on the automated systems was seen as one of the key factors that enhanced the dependability of the bank services with technology deployment. Sentiments by one of the bank managers interviewed in this study best capture the idea as follows, "*Ability to view history and transaction records make improvement in dependability*" (Respondent Y1). When customers transact on automated systems such as mobile banking and ATM machines, they have confidence that the transactions can be traced and the history of the records retrieved. The dependability of bank services due to technology adoption is not only viewed from the customer's perspective but also from the managers' perspectives. The managers explained that the deployment of modern technologies give them confidence in the outputs of the bank systems. One of the respondents noted that "Technology enabled us tracing and tracking of transactions for each customer and this definitely enhance dependability of our services" (Respondent A1). The managers have greater confidence in the banking systems because they can trace and tracking the customer transactions unlike in the manual systems where traceability is difficult to achieve.

It also emerged from the interview discussions that the deployment of modern technologies within the banking sector helped to minimize the occurrence of errors. One of the respondents stated that the deployment of technology ensured that banks had, "*Less errors and customer trust becomes improved*" (Respondent K2). Automated systems have high accuracy rates since they are not subject to human limitations. Therefore, the systems are highly efficient and almost considered error-free unless manipulated by human beings. The reduction of error rates with new technologies enhances the dependability of service and the customer trust in banking institutions. The minimization of errors further helps to enhance accountability and dependability as noted by a senior manager at Co-operative Bank, "*the*

Bank has always put accountability and dependability as key priority and when new technologies are adopted, these have to maintain such key matrix checked" (Respondent C1).

By enhancing the dependability of service, technological innovations therefore help to boost the overall customer confidence in the systems of the bank. A branch manager interviewed in this study stated that banking innovations "*always help the operation teams to ensure customer confidence in our service*" (Respondent C2). Similarly, another respondent made reference to the commitment of the bank to the dependability of the bank services, "*Our bank maintained highest quality of dependability of our customers and with or without technology, we will always ensure this*" (Respondent Y2).

The managers interviewed in this study were confident that the technological innovations installed in their banking institutions were dependable and reliable. These technologies give the managers the confidence that the outputs of their systems including the employees are reliable. The managers in turn place controls to ensure that the systems are not manipulated. On their part, bank customers in Myanmar have developed high confidence of the accuracy and reliability of banking systems. They are confident that their accounts cannot be manipulated without their knowledge.

Operational cost savings

The theme of cost reduction featured prominently in the interview discussions. Operating costs are the major source of bank expenditure for Myanmar banks. As noted in the interview discussions, the major source of operating costs for Myanmar banks are employee costs and on-branch activities. With technological innovations, banks are able to lower their operating costs by eliminating unnecessary expenditure on operating activities and reducing the number of employees.

A majority of the respondents were of the opinion that the deployment of technology within their banks had helped to lower the costs of doing business. According to one manager interviewed in this study, the bank had achieved significant cost savings from technology, estimated at nearly 20%. The respondent stated that, "*If we look at per branch operational costs, it reduced to 10-20%*" (Respondent C1). The major reason for the reduction in branch operational costs was mainly due to the technology's empowerment of the customers to conduct banking services on their own. According to some respondents, customers had become empowered to access banking services without having to visit the bank branches through electronic systems such as the ATM and mobile banking. One senior manager best captured the scenario as follows: "*Reduced. Many processes can now be done from customer end via mobile wallet that in turn reduce Opex*" (Respondent K1). With modern technology, therefore, the operating costs at the branch level had reduced substantially since there were few customers to serve. Some banks such as KBZ have considered reducing their branch network in order to concentrate on the delivery of banking services through the digital channels, which are more cost-effective.

The general perception among the respondents was that technological innovations help to reduce banks' operating expenses (Opex). One of the respondents stated that, "*Opex can be controlled and maintained with technology adoption*" (Respondent A1). The management of operating expenses seemed to be a major focus among banks in Myanmar. Technology helped to reduce operating expenses through reduction in number of on-branch activities. With technologies such as mobile banking at ATMs, customer visits to the bank branches reduced and subsequently led to overall reduction in the cost-consuming activities at the branch. Customers only visit the bank branch for major transactions that require signing of documents or issues that may not be resolved online. In addition, one respondent believed that technology helped to save on time thus enabling the bank to reduce operational expenses.

Another respondent believed that electricity costs reduced due to deployment of modern technologies thus reducing the overall expenditure at the branch.

Another important sub-theme identified in this study was that deployment of technology led to employee cost savings. Most respondents were of the opinion that modern technologies had lowered the demand for workers in the banking sector and therefore led to operational cost savings by eliminating the need to hire many employees. Automated systems such as the ATM, online banking, and mobile banking substantially reduce the number of employees required to attend to the customers. One of the branch managers interviewed in this study noted that, "*there are cost savings in terms of employees' OT time, fuel saving on travelling to customer, Electricity savings*" (Respondent K2). Similar sentiments were shared by another respondent who observed that, "*Cost saving mainly due to improvement in productivity, can hire less people as many processes become automated*" (Respondent C2). Banks with highly automated systems hire less number of employees because customers can engage in self-service by accessing banking services without the assistance of bank tellers. In addition, bank staff no longer need to travel to long distances to meet the clients since modern communication methods ease the process of communication. The role of technology in employee cost saving was best captured in the response given by a branch manager at Yoma Bank who stated that "*Cost savings is always on our agenda and compared to traditional banking days, technology helps improved cost saving in many areas such as HR cost, Time, Management etc*" (Respondent Y2)

Finally, operational costs reduced due to the deployment of technology because they helped to ease the process of communication. Inefficient communication was noted as one of the major contributors of huge operational costs within the banking sector. However, modern communication tools such as Facebook had not only made the communication process faster but also cheap to implement. One senior manager made the following observations with

respect to lowering of communication costs "*Reduced. With workplace features from Facebook, interactions, discussion become real time and eliminates delays in communication, and also other operating costs*" (Respondent Y1). With instant messaging applications, banks' spending on communication may have reduced substantially. In addition, indirect costs of inefficient communications may also be eliminated with modern communication tools thus lowering the overall operational costs.

Economies of Scale

The adoption of technological innovations within the banking sector in Myanmar was seen to be beneficial in that it helped the banks to enjoy economies of scale. Most of the respondents interviewed in this study were of the opinion that deployment of technology in the banking sector helped in expanding the coverage of bank services over a large customer base thus facilitating better economies of scale. Within the banking sector, economies of scale arise when the bank uses some fixed amount of resources to serve a large number of customers. In the present study, there was consensus among the respondents that technological innovations helped to improve the economies of scale of the banks. However, the respondents gave a variety of reasons on why they saw a positive association between economies of scale and technological innovations.

One of the reasons put forward by the respondents as contributing to the economies of scale was the ability to conduct automated updates on customer files with minimal effort and costs. One of the senior managers interviewed in this study stated that the impact of technology on economies of scale was very high. The respondent observed that, "*The impact is very high. Now, all the updates across 500 branches, 1.8 millions customer can be done at one click*" (Respondent K1). At KBZ Bank, it was possible to conduct automatic updates of customer files across the over 500 branches at the click of one button. Therefore, the cost of conducting

updates was no longer dependent on the number of customers and this helped the bank to lower its costs of operations. AT the branch level, similar economies of scale were enjoyed in files management as noted by a branch manager interviewed in the study who stated that "*in the branch, the only economy of scale improvement is in transferring of files at the end of each day*" (Respondent K2). The respondents argued that new technologies had enabled banks to automate operational procedures such that multiple customer accounts could be serviced simultaneously in real time. This was contrasted with the traditional manual methods where files management costs would be dependent on the volumes of files and transactions.

One of the senior managers interviewed in the study noted that the use of modern technologies helped the banks to offer seamless services with greater responsiveness to customer needs. The manager noted that, "*The bank was able to provide seamless services across various regions and branches and that enabled the bank to make swift responses to market conditions*" (Respondent A1). The overall impact on the seamless service delivery was an improvement in the bank's economies of scale. In contrast, another respondent believed that technological innovations promoted the economies of scale within the banking sector by enhancing collaboration and communication among the key stakeholders. The respondent stated that "*Yes, it helps us collaborating better among team members and thus can work much larger transactions*" (Respondent A2). Through better collaboration and communication, the manager believed that the bank achieved economies of scale since the number of transactions conducted would increase without necessarily increasing the operating costs. Therefore, the fixed costs of employee costs helped to generate higher output with the deployment of modern technology.

Another major concept that emerged from the interview discussions was that the deployment of technologies in the banking sector helped to achieve economies of scale in new products rollouts. Some respondents believed that technological innovations helped to achieve the

economies of scale during products development and rollouts because the products could be delivered to the market with ease and with minimal costs. One of the managers interviewed in the study expressed his ideas as follows: "*Certainly very high. Without, technology innovations, the bank will not be able to achieve major product roll outs, fast service delivery etc*." (Respondent C1). Similar sentiments were shared by another respondent who noted the beneficial role of technology in mass market roll out. The respondent stated that technology helped to achieve "*More visibility, real time communication, mass market roll out possibility, financial inclusion. The impact is massive*" (Respondent Y1). Myanmar banks engage in frequent roll outs of new products and services. The use of modern technologies makes the process of product delivery to the market easier particularly through systems such as mobile banks. Technological innovations were seen as being beneficial not only to new product roll outs but also to delivery of bank-wide services to the customers. A branch manager interviewed in this study described how modern technologies help in bank-wide services roll out. The manager stated that "*From my branch, I can talk with other branch and HQ and this really helps when we have bank-wide services roll out*" (Respondent Y2). As observed by the respondent, the roll out of new services such as updates on banking systems can be done efficiently with automated systems.

Employee Productivity

The theme of employee productivity in the present study was explored by asking the respondents to make an assessment on whether technological innovations had an impact on employee productivity in their banks. The respondents were in general consensus that modern technologies had a significant impact on employee productivity. With the adoption of modern technologies, the respondents believed that the productivity of the employees had increased. One of the respondents believed that the performance of all employees was easily traceable with modern technologies and this helped to determine the overall productivity. According to

him, "*It improves productivity as employee can now focus more on service delivery and can track their performance*" (Respondent K1). Technologies such as core banking helps the bank staff to have greater focus on the services delivered to the customers because of the seamless functions within the system. One of the respondents stated that the productivity of the bank employees had increased by up to 35% as a result of technology adoption. The respondent stated that, "*Being transformed from traditional bank to technology friendly bank, per branch employee productivity improved between 25-35%"* (Respondent C1). With such a significant growth in employee productivity, it was evident from the interview discussions that technology was an important predictor of employee performance.

One of the major reasons that respondents attributed to the improvement of employee productivity as a result of technology deployment was the role of the modern technologies in reducing the time and effort required to engage in job-related activities. As one of the respondents noted, "*As mentioned above, with technology, employees are able to complete their tasks in shorter time which improved their productivity*" (Respondent K2). Similar sentiments were shared by another manager who noted that "*With instantaneous respond features on platforms like Facebook messenger and Instagram, it makes speed of service real time."* Employees who use modern technologies such as core banking are able to offer services at a faster pace and therefore the overall productivity increases since one employee can serve a larger number of customers. A branch manager interviewed in the study reflected how the introduction of the Flexcube core banking system at the bank helped to reduce the amount of time spent on handling customer service issues. With the core banking system, the manager noted, customer service representatives could easily access all customer data from the central database and therefore resolve customer issues rapidly unlike in the previous systems where come customer issues had to be resolved through perusal of physical files.

Core banking was also noted to have reduced the amount of time that tellers spent in serving customers and therefore the daily productivity had increased substantially.

While the role of technology in enhancing employee productivity was viewed positively by most of the respondents, some thought that modern technologies had negatively affected employee productivity by acting as a source of distraction on-the job. Some managers complained that some employees spent significant portion of their time on non-productive activities such as chatting on Facebook instead of using the tools to engage in job activities. The few managers who felt that some technological innovations had lowered employee productivity, however appreciated the positive role of these tools in enhancing customer service delivery. Therefore, the overall benefits of modern technological tools were seen to outweigh the costs and limitations associated with the technologies.

Reduced wastage

The theme of reduced wastage featured prominently in the interview discussions. In the context of this thesis, reduced wastage was presumed to mean reduction in the wastage of resources and unnecessary costs. A majority of the respondents were of the view that the deployment of technology within the banking sector had helped the banks to minimize certain wastages in their operations. Those who held this view believed that the operational efficiency derived from the use of modern technologies was crucial in helping the banking organizations to minimize wastage in banking operations. Reduction in wastage was not only seen from the perspective of better utilization of physical resources but also on the reduction of unnecessary costs. One territory manager interviewed in the study stated that, "*There are cost savings in terms of employees' OT time, fuel saving on travelling to customer, Electricity savings*." According to the territory manager, wastage was reduced in terms of minimizing employee time wastage, reducing unnecessary fuel consumption, and reducing electricity

consumption. Similar sentiments were shared by another respondent who observed that, "*Cost savings is always on our agenda and compared to traditional banking days, technology helps improved cost saving in many areas such as HR cost, Time, Management etc*." The theme of reduced wastage was therefore viewed from a broader perspective among the respondents who considered both material and non-material resources such as time, money, and managerial expertise.

Some of the respondents interviewed in this study believed that there was significant wastage reduction due to technological adoption. The deployment of online systems was seen as a particularly useful channel of reducing wastage because of less requirements for employee time and paper documents. One of the respondents stated that, "*Yes, as many processes can now be done via online.*" Another respondent argued that with online systems there was less demand for paper and other office consumables. The manager stated that, "*I guess so, less consumption of papers, power, time etc.*" This was similar to the observations made by other managers who saw technology as a major method of saving on time. With savings on time, paper, electricity and other consumables, the banks have an overall benefit of achieving greater cost savings. A senior manager at one of the banks studied reflected how his office had saved on paper consumption by moving most tasks online. According to the manager, the bank had made significant cuts in its spending on consumables in his office as all he needed was a laptop computer on his desk.

The savings on time was further emphasized by another respondent who stated that, "*Yes, no more papers, no more phones, less physically presented meetings*." According to the respondent, the modern technologies had removed the need to be physically present at all meetings since managers and other bank staff could participate in meetings through modern communication channels such as instant messaging applications. In addition, there was less demand for paper as most documents were stored in computer files. Subsequently, the need

for files management workers was limited and this further helped the banks to lower their operational costs.

However, while a majority of the respondents believed that technological innovations had helped to achieve significant wastage reduction, others felt that these technologies had no major impact on reducing wastage. One territory manager interviewed in the study expressed her assessment as follows: "*Yes, reduced. But not that significant*." Her sentiments were shared by another branch manager who noted that, "*I do not see significant reduction in wastage at my level*." At the branch level, the reduction of wastage due to technology was therefore less visible. Nevertheless, there was general consensus that technological innovations had helped to save on time, costs, electricity, paper, and other resources.

Human Resource Management

When the respondents were asked to describe the other aspects of banking operations that were affected by technological innovations in their organizations, three major themes emerged from the responses: human resource management, enhanced communication, and enhanced KYC practices. One of the dominant themes that emerged from the interview discussions was the role of technological innovations in enhancing human resource management. A majority of the respondents mentioned various aspects of human resource management as being significantly influenced by technology. This was not unexpected since most technological functions are implemented by bank employees and therefore have a direct or indirect impact on various aspects of personnel management. According to the respondents, modern technologies helped to improve the process of managing the bank employees through the utilization of tools for engaging the employees. With modern tools, branch managers are in a better position to coordinate all employee activities including scheduling of job activities. This enhances the overall ability to manage the employee

functions. One of the respondents interviewed in the study best summarized the role of technology in human resource management as follows:

> “Branch managers usually have to take care of basic HR at branch level. So, with aids of technology, they can minimize unnecessary long work hours for different teams and in term improved HR management at branch level. E.g. every day, the branch and HQ has to do closing on all accounts and they were unable to go home until all the branches accounts are reconciled at HQ. With KBZ having lots of branches, this process becomes cumbersome and with technology, there is significant improvement in how this can be done with proper scheduling."

In addition to facilitating the conduct of basic HR functions, the technologies adopted by Myanmar banks also helped to enhance training and development as noted by some respondents in this study. Some managers were of the opinion that modern technologies adopted by the banks played an essential role in facilitating the training of employees and overall development of their skills and competencies. Tools such as Facebook were identified as some of the methods that managers used in training their staff. The managers who participated in the interviews agreed to have used these communication tools to share materials that enhanced the employees learning. Others had used the messaging platforms to offer advice, consulting, and mentorship to junior employees. The automation of training was seen as the major benefit of modern technology in employee training and development. One of the respondents explained the role of the technologies in employee training as follows:

> “Since processes are automated, the trainings on these new processes become easier and standardized across the whole bank. If there is necessity to introduce new products e.g. updates in interest rates for different saving accounts, with technology,

there is less error due to miscommunication and most calculations are done via system across all branches."

In addition, the ability to track employee performance using the automated banking tools was seen as a major contributor to employee skills development. One of the branch managers interviewed in the study observed that her bank's core system had tools that tracked each employee's daily performance. The output of the core system was used as the basis of employee recognition and rewards. Therefore, the overall motivation and morale among the bank staff had increased substantially because of this recognition and feedback mechanism.

Enhanced communication

Another significant theme that emerged from the interview discussions was the role of technology in enhancing communication within the bank. Most of the respondents interviewed in this study believed that modern technologies had a direct impact on the ability of banks to communicate more efficiently with customers. In addition, the managers believed that modern technologies helped to enhance communication among the staff members within the bank. One of the respondents noted that modern technology tools helped to minimize miscommunication and misunderstanding. The respondent stated that "*From Branch level, it really helpful in reducing miscommunication. And also collaboration between branch and HQ as some instances can become near real time."* These sentiments were shared by other managers who viewed technology as an indispensable component of the modern banking practice. One of the respondents observed that it was difficult to imagine how the banks would operate without some modern tools such as instant messaging platforms.

In addition to improving the quality of communication, technological innovations were shown to enhance collaboration within the banking organization. According to some respondents, the use of modern communication tools such as Facebook messenger and

WhatsApp enabled the banking staff to establish chat groups where members of the organization could communicate and obtain feedback within a short time. With these communication tools, bank staff could also engage in greater collaboration with other staff from other departments. For instance, come managers noted that collaboration between departments had improved as a result of the adoption of new communication tools. One manager observed that modern tools promoted "*Culture, Relations and Collaboration with colleagues from other banks, Sales & Marketing*." Another respondent noted that there was better "*communication collaboration*" between members of a department as well as with members of other departments. This collaboration helped to enhance the corporate culture within the banking institutions. Similarly, another respondent described how communication and collaboration had improved across departments as follows:

> *"same marketing messages are easily delivered across all the branches. With technology, all the branches can offer same services and customers do not need to go to just this branch and that branch to do their relevant banking needs. E.g. last time, customers are required to go back to the branch that they opened to do certain banking transactions, but now it is much improved, as customer can go into any branches to receive services across the board."*

The quality and speed of communication between the bank and the customers was noted to have improved due to the adoption of modern communication tools. With the deployment of modern technological tools, banks were able to respond to customer issues within a relatively short period of time. In some cases, information exchange between banks and the customers was observed to be instant as noted by one respondent who stated that "*With instantaneous respond features on platforms like Facebook messenger and Instagram makes speed of service real time.*" In addition to offering instant response to customer queries, the deployment of modern technology has also helped banks in Myanmar to collect feedback

from their customers. Banks are now able to obtain feedback on the quality of services offered and this helps the bank in improving the quality of services.

Improvement in KYC practices

The Central Bank of Myanmar requires banks to be at the forefront in the anti-money laundering program. Banks that fail to establish strict anti-money laundering strategies risk being used as conduits of criminal activities and face severe regulatory sanctions. One of the regulatory requirements for Myanmar banks is to have in place appropriate "Know your customer" (KYC) mechanisms. The major objective of KYC regulations is to prevent Myanmar banks from being used by criminals in money laundering activities. KYC mechanisms enable banks to have a better understanding of their customers and their financial dealings. Banks in Myanmar are required to have detailed profiles of their customers prior to opening bank accounts. In addition, banks are required to monitor and report unusual transactions or those exceeding prescribed thresholds. Some of the respondents interviewed in this study were of the opinion that technological innovations had made the process of complying with the KYC guidelines effective. With new modern automated systems, banks are able to have greater control mechanisms that facilitate faster identification of unusual transactions. For instance, the core banking system adopted by banks in Myanmar has an integrated branch network system that enable bank staff from one branch have real time access to transactions effected in another branch thus enhancing the effectiveness of monitoring controls.

Modern communication tools enhance KYC compliance by enabling bank branches to communicate quickly with the headquarters and the Central Bank of Myanmar. In addition, one respondent noted that digitization helped to enhance the process of information collection from the customers. The respondent stated that,

"*Last time, record keepings, debit notes, credit notes, ledgers were all done by papers, so when with technology, all these become digitized. Similarly, KYC-AML processes were troublesome. Now, with one stroke of photo taking + facial recognition, basic KYC was done quickly. Large transactions have to report to HQ and Central Bank of Myanmar for AML tracking, now with technology, these are done much quicker in report, tracking and complying with AML*."

4.4.8. Challenges of technological innovations

The final component of the interview discussions explored the challenges that banks in Myanmar face as a result of adopting electronic banking. The respondents were asked to reflect on some of the major challenges that were associated with electronic banking in bank operations. While the respondents agreed that the use of electronic banking and other technological innovations had numerous benefits to the banking sector, some few challenges were noted. However, the respondents were quick to note that the existence of these challenges did not mean that electronic banking was a negative technology. Instead, most noted the need to have proper mechanisms of ensuring that banks take advantage of the opportunities presented by modern technologies.

One of the major challenges that the respondents identified as being associated with technological innovations was difficulties encountered with training older employees. Some of the managers interviewed in this study admitted that it was difficult to develop capacity for technological adoption among the older employees. Others noted that training the older employees on new technologies was a difficult process. The older generation who had been used to the traditional methods of doing things often found it difficult to keep abreast with technological advances while some even opposed certain technological changes. This presented a problem to the management. A senior manager at KBZ Bank noted that it was

"difficult to train older employees to adopt technology changes." Another respondent from the Co-operative Bank made similar sentiments, "Difficulty in developing capacity for older employees." Therefore, implementing technological changes such as electronic banking emerged as a difficult process that requires patience especially with the older employees who may not be technologically savy. However, training for the younger generation was not identified as a problem because most of the young people are tech-savy.

In addition to the difficulties of training older employees, challenges associated with technological innovations as identified by the interviewees were the technical problems associated with the technologies. Most of the respondents identified technical issues with electronic banking as major hindrances to the effective utilization of the technology. One of the technical issues associated with the technologies was breakdowns in telecommunication systems. Some respondents observed that the reliability of modern banking systems is highly dependent on the integrity of telecommunication systems. However, banks often experience challenges of breakdown in telecommunication systems thus denying service to millions of customers. As the respondents noted, the reliability of telecommunication systems was a factor beyond the control of the banks since the services are provided by third parties. One senior manager gave the example of mobile banking, which would be frequently disrupted by breakdowns in telecommunication systems. A territory manager at AYA Bank noted that the bank suffered from poor telecommunication infrastructures particularly in the early 2010s when the banking sector was getting established in Myanmar. The respondent made the following observation with respect to the telecommunication challenges during the nascent years of the bank's technological development:

> *"When AYA bank started introducing Core banking, the telecom infrastructure was not very stable. There was no fiber at most branches and only satellite communication was an option to connect all the branches together. But with satellite, and less stable*

fiber communication, there were many incidents where the link was down and staff members could not access the system etc, which affected the operations."

Another challenge that was associated with technological innovations in the banking sector was the significant time and cost consumed in introducing some technologies. Some respondents felt that the introduction of some major technological innovations was time consuming while others felt that the costs associated with such projects were very high. However, the time and cost consumption are a challenge in the initial stages of technology adoption after which the banks begin enjoying the fruits of operational efficiency, better customer service, and overall improvement in bank performance among others. One of the respondents best captured the challenge of the difficulty in introducing new technologies as follows: *"It is time consuming and difficult to adopt these technology changes at first but after sometimes, it is worth the pains*." The difficulties of time consuming endeavors was most notable in the case of large-scale implementation projects or rapid technologies. Such implementation of large-scale projects was shown to be characterized with difficulties and uncertainties that influenced the employees negatively.

In addition, some respondents noted the need for frequent updates of technological systems as one of the major challenges of new technologies. Such updates often require the adoption of frequent changes in the operational processes of a bank as noted by one of the respondents. Banking systems such as core banking and mobile banking require frequent and continuous updates in order to enhance their security and efficiency. Some respondents noted such frequent updates as problematic due to their disruptive nature. One of the respondents summarized this challenge as follows:

"The bank changes technology step by step, so at one time, there is one change in this aspect of operation, after a while, there is another introduction of new process /

automation in another process, so they have to adapt to these new changes every 6 months or something."

4.5. Conclusion

In summary, this chapter provided the findings of the quantitative survey with bank customers as well as the interviews with bank managers of four Myanmar banks. KBZ, Bank, AYA Bank, Co-operative Bank, and Yoma Bank remain the most preferred banks among bank customers in Myanmar. The automated teller machine and mobile banking emerged as the most popular banking innovations among Myanmar banks' customers. The findings of the survey suggest that bank customers in Myanmar have high satisfaction from the usage of the banking technologies. The most commonly cited factors for the popularity of these banking innovations are convenience, accessibility, ease of use, and the associated cost savings. A correlation analysis of the survey data revealed that there was a strong positive correlation between the usage of technological innovations and the levels of customer satisfaction and loyalty among bank customers in Myanmar. A correlation between the usage of various banking technologies such as ATM, mobile banking, internet banking, electronic funds transfer, and credit and debit cards was shown to exist with various measures of customer loyalty and satisfaction. Overall, the survey findings suggest that technological innovations adopted within the banking sector are beneficial to the customers. However, the customers noted several challenges associated with the technologies such privacy and security concerns, complexity, and lack of personal interactions.

In addition to the survey, in-depth interviews were held with 8 managers of four banks namely, KBZ Bank, Co-operative Bank, AYA Bank, and Yoma Bank. The interviews sought to determine the role of technological innovations within the Myanmar's banking sector on the overall financial performance and the operational efficiency of the banks. The results of

these interviews revealed that the technologies have had a significant impact on banks' financial performance primarily through increase in revenue due to growth in the volumes of transactions and the reduction in the costs of doing business, which in turn drives the profitability of banks. The interviews further revealed that banks enjoyed improvements in operational efficiency measures such as service quality, service dependability, speed of services, employee productivity, reduced wastage, economies of scale, better HR management, improved communication, and better compliance with regulatory requirements. However, the respondents identified a few challenges associated with technological innovations such as technical issues, difficulties in training older people, and the complexities of large-scale technological introductions. The next chapter will focus on the discussion of these results in detail.

CHAPTER FIVE

DISCUSSION

5.1. Introduction

The aim of this study was to determine the impact of technological innovation with products and processes on banking in Myanmar. Through a mixed methods study approach, this study was able to develop an understanding of how technological innovations in Myanmar's banking sector influences the economic performance, operational efficiency, and customer loyalty and satisfaction among banks in Myanmar. This chapter provides a discussion of the findings of the study that are detailed in the previous chapter. The discussion chapter focuses on interpretation of the results in the context of the extant literature and theoretical frameworks relevant to the study. Through comparison of the current study's findings with those of previous studies in literature, the chapter places the study findings in the broader context of scholarly works on the topic of technological innovations in the banking sector. Section 5.2 provides a discussion and interpretation of the results on the impacts of technological innovations on customer loyalty and satisfaction. Section 5.3 dwells on the impacts of technological innovations on bank financial performance while section 5.3 provides a detailed discussion of the impacts of technological innovations on operational efficiency of banks in Myanmar. Section 5.4 evaluates the challenges of electronic banking while the last section concludes with an assessment of the link between quantitative and qualitative survey findings.

5.2. Impacts of technological innovations on financial performance

5.2.1. Impacts on revenues and net incomes

The impact of technological innovations on financial performance was assessed through in-depth interviews conducted with senior managers of four banks in Myanmar. In general, the findings of this study show that banking technologies and innovations have a positive effect on the financial performance of banks in Myanmar. One of the themes that emerged from this study was the role of the banking technologies in expanding the revenues of banks. The adoption of banking technologies was also shown to have a positive impact on the net revenues of banks. The key observation was that the deployment of banking technologies helped to increase the transaction volumes of the banks thus increasing the revenues derived from fees and other commissions on services offered. In some cases, the deployment of modern technologies was reported to have increased the transaction volumes of some banks by more than five times. Since banks with modern technologies such as ATM and mobile banking are able to server a wider customer base, they are able to generate higher revenues compared to traditional banking.

Consequently, the growth in revenues due to the adoption of banking technologies led to increase in net incomes for the innovative banks. A majority of the respondents believed that technological innovations directly improved the volume of transactions thus increasing the amount of revenues of the banks. Banking technologies such as mobile banking and internet banking increase the revenues of the bank without necessarily increasing the operational costs thus resulting in an overall increase in profitability. Therefore, the net income improvement comes from the growth in revenue and decline in operational costs. The increase in net income was also seen to be emanating from the improvement in operational efficiency of banks and cost savings due to technology adoption. Technology-based products, services and

processes give banks immense cost saving advantages that ultimately result in increase in profitability. Akhisar et al. (2015) notes that the cost of a transaction conducted at the ATM or a bank website could reduce by as much as between 40% and 80% compared to the same transaction conducted at the branch. Digital and electronic bank channels offer banking organizations an opportunity to serve a wider audience of customers while at the same time enjoying significant cost savings. However, the cost savings may not be significant in the short-term primarily due to the heavy IT costs required in the initial deployment of technology.

The findings of the present study corroborate previous findings in literature that show a beneficial economic impact of ICT adoption in the banking sector. De Young and Rice (2004), for instance, have documented a significant growth in revenues and net incomes of banks in the United States made possible by new lines of business created by the advances in information technology. Scott et al. (2017) notes that the economic benefits of ICT innovations in the banking sector emanate primarily from the cost reductions that banks enjoy from automations. In addition, banks enjoy increases in efficiency of service delivery. However, in contrast to the findings of the present study, Scott et al. (2017) observes that there is less economic benefits from growth in revenue streams. Business organizations enjoy a range of benefits from ICT adoption including improvements in business processes, operational savings, creation of new markets, and higher sales turnover, which ultimately results in increases in profitability (Scott et al., 2017; Currie and Parikh, 2006). New technologies and innovations in the banking sector have been shown to increase revenues due to creation of new business lines and revenue sources. Furthermore, the increase in profitability experienced by banks adopting modern technologies could also be attributed to the value creation of these technologies. Technological innovations create value and benefits

to customers, thus enhancing the long-term competitiveness of the organization in the market and ultimately enhancing the sales turnover and profits (Scott et al., 2017).

5.2.2. Impacts on return on assets and return on equity

In addition to the positive role of technological innovations on income and revenues of the banks, it also emerged that the technological innovations had a positive impact on the return on assets and return on investments for the innovative banks. A majority of the bank managers interviewed in this study believed that investments in technology generated good returns for the banking institutions. The deployment of new technologies within the banking sector was considered beneficial in improving the banks' ROA because the innovations facilitated the efficiency of banking services in addition to lowering the banks' operating costs. Furthermore, the deployment of modern technologies in Myanmar's banking sector was seen to generate high returns on investments. Managers of Myanmar banks believe that the high return on equity generated from banking innovations are a result of the low capital investments demanded by these technologies compared to the returns. With development of digital banking channels, banks no longer need to invest in the costly physical branches. Indeed, some banks in Myanmar have laid out plans to scale down investments on physical bank branches in order to focus on digital channels.

The positive association between bank technologies and measures of profitability such as net income, return on assets and return on equity is consistent with the expectations of the Schumpeter's theory of innovation. According to the Schumpeter's theory of innovation, the primary driver of innovation is the pursuit of profits by innovators. Innovators and business organizations are driven by pursuits of economic opportunities and exploration of value generating activities (Schumpeter, 1939). The theory postulates that innovation creates a situation where technological advances override pre-existing market conditions such that

firms introduce new products, services, and processes. Subsequently, innovative firms gain market shares at the expense of their non-innovating competitors resulting in a gradual increase in competitive position and profitability. Within the context of Myanmar's banking sector, the innovative abilities of the private banking institutions through adoption of technologies such as ATM and mobile banking could be the reason behind the popularity of these banks compared to government-owned banks. Cooperative Bank, for instance, was the first bank to install an ATM machine in Myanmar and its innovativeness has paid off gradually as the bank is now one of the largest in the country in terms of customer base.

The investments in electronic banking systems have generally been shown to result in improvements in returns on assets and return on equity of banks. Gust and Marquez (2004), for instance, analyzed data from 13 OECD countries for the period 1993 to 2000 to understand the economic impacts of ICT investment in the banking sector. The results revealed that ICT expenditure led to higher growth in productivity. In South Korea, Jun (2008) has established that a positive association exists between ICT investments and return on assets of firms in the financial services sector. In addition, Scott et al. (2017) have established a strong positive association between the adoption of SWIT technology and the return on assets and return on equity of European and American banks.

However, some previous have reported negative relationships between technological innovations and ROA and ROE in banks in the short-term. For instance, Beccalli (2007) reported negative short-term profitability in terms of return on assets and return on equity following the adoption of ICT in banks. Nevertheless, the long-term impact of the IT investments on profitability was beneficial. In Turkey, Onay and Ozsoz (2013) reported insignificant impacts of electronic banking adoption on bank profitability. In another study, Arnaboldi and Claeys (2010) reported negative correlations between internet banking adoption and financial performance within the European context. However, these studies

suffer the limitations of focusing of specific elements of technological innovations or short-term benefits. Moreover, the micro-economic challenges of electronic banking could crowd out the economic benefits of these technologies. While conducting a system-wide analysis of electronic banking, Akhisar et al. (2015) reported strong positive correlations between return on assets (ROA) and return on equity (ROE) of banks in different parts of the world and the adoption of electronic banking. Therefore, the general concept in literature is the positive role of IT investments on banks particularly in the long-term.

5.2.3. Impacts on customer deposits

Another theme evident from the study findings was that the adoption of technological innovations in Myanmar's banking sector led to a growth in customer deposits. A majority of the interviewees believed that technological innovations such as digital banking channels led to greater deposit mobilization. Since Myanmar has large unbanked populations, the modern technologies present a good opportunity for banks to reach out to the populations for growing their customer deposits. This observation is consistent with the fact that the more technologically advanced private banks have increased their customer deposits market shares at the expense of state-owned banks. These findings are consistent with those of Kashmari et al. (2016) who have established the existence of a positive correlation between electronic banking innovations and bank deposits in Iran. The deployment of electronic banking innovations creates a competitive advantage on the innovative bank thus attracting higher deposits in the market (Kashmari et al., 2017). In contrast, Kahveci and Wolfs (2018) while investigating the impacts of digital banking on bank deposits in Turkey has reported no significant role of these technologies in mobilizing bank deposits. However, Kahveci and Wolfs (2018) notes that investment in digital banking is important in preserving the competitive and strategic positions of the banks thus suggesting a potential beneficial role on long-term market share of bank deposits. Therefore, the growth in deposits associated with

technological innovations in Myanmar could be attributed to a) greater reach to unbaked populations and, b) increased competitiveness of the banks, which ultimately attracts customers from other banks.

5.2.4. Impacts on shareholders' wealth

Finally, the study findings reveal a positive role of technological innovations on shareholders' wealth. From a long-term perspective, banking innovations contribute to the improvement in the shareholders' wealth and overall economic benefits. This is primarily due to the growth in profitability, return on equity, and return on investments associated with ICT investments in the banking sector. The increase in net incomes and profits associated with the deployment of technologies in banks are ultimately passed over to owners and investors in the banking sector. Overall, the findings of this study imply that the adoption of technological innovations have long-term economic benefits to the banks adopting such innovations.

5.3. Impacts of technological innovations on operational efficiency

The impacts of technological innovations on operational efficiency were assessed through interviews with managers of four banking institutions in Myanmar. Operational efficiency was assessed along three constructs: quality of service, dependability of service, and speed of service delivery. The findings generally revealed that technological innovations contributed to operational efficiency of the banks. With respect to the quality of service, the managers were of the general opinion that technological innovations enhanced the quality of services offered by the banks. Technological innovations were seen to improve the quality of service through facilitating greater interaction with customers, which subsequently enhanced the generation of customer feedback. Moreover, automated systems are more effective and almost error-free compared to manual processes. The high quality of service ultimately results in increase in customer satisfaction. In addition to improvement in quality, the

deployment of technologies in the banking operations was seen to improve the speed of service delivery. Scott et al. (2017) observe that digital banking technologies help to improve the quality and speed of service delivery. The SWIFT technology, for instance, helps banking organizations to automate communication between banks by using machine-readable encrypted messaging standards that facilitate sending of funds electronically with increased speed and security.

Another key benefit that was seen to emerge from the deployment of technology was the improvement in service delivery. At the branch level, bank staff could offer services faster due to the capabilities of core banking that enable real time access to customer data. Away from the bank, customers could access banking services faster without having to visit the bank branch thanks to services such as mobile banking and internet banking. New technologies were also seen to improve service delivery through improved communication through instant messaging systems that enable banks to resolve customer concerns within a short time. This is consistent with the findings of Scott et al. (2017) who have established a beneficial role of modern technologies on improvement in communication between banks for enhanced service delivery.

Furthermore, the deployment of modern technologies in the banking sector in Myanmar has led to improvement in the dependability of services. Having gone through a difficult period characterized by political and economic turmoil, the Myanmar's banking sector had experienced strong mistrust among customers. However, the deployment of modern technologies had improved the dependability, transparency, and accountability of banking services thus winning back the trust of customers. The traceability of transactions on automated systems further improved the dependability of bank services with technology deployment. Moreover, technologies helped to minimize errors occurrence thus enhancing

the dependability of services. The dependability of services helped to enhance customer confidence and satisfaction.

The theme of operational cost savings was also prominent in the interview discussions. The deployment of modern technologies such as digital banking helped to reduce costs for the banks on two fronts: employee costs and on-branch activities. Technological innovations enable to minimize their operating costs by eliminating unnecessary expenditure on operating activities and reducing the number of employees. Automated systems such as the ATM, online banking, and mobile banking have a significant impact on employee costs because they substantially reduce the number of employees needed to attend to customers. Some respondents estimated that operational costs had reduced by up to 20% due to deployment of technologies. The costs of communication between members of the banks as well as between the bank staff and customers also reduced because of technology deployment.

Other benefits of technological innovations identified in this study included facilitating economies of scale, reduced wastage, increase in employee productivity, improvement in human resource management, enhanced communication, and enhanced KYC practices. Economies of scale emanated from the use of automated systems of numerous customers with minimal effort and costs. Furthermore, interview discussions revealed that banking technologies such as core banking helped to improve employee productivity by reducing the time and effort required for service delivery. In addition, technological innovations were seen as critical in minimizing wastage within the banking operational environment primarily by facilitating better utilization of physical resources as well as reducing unnecessary costs. For instance, unnecessary travel and costs could be saved through use of instant messaging systems while the amount of paperwork was reduced substantially through digital banking. The trend towards moving to paperless banking has led to significant reductions in resource wastage among banks. From a human resource perspective, modern technologies were seen

as beneficial in improving the processes of managing the bank employees through the utilization of tools for engaging the employees and coordination of employee activities.

Furthermore, the operational efficiency of Myanmar's banks were seen through enhanced communication as a result of deployment of modern technologies. Modern communication technologies such as instant messaging helped banks to engage in faster and quality communication both internally and externally. Finally, the theme of improvement in "know your customer" (KYC) practices was evident from the interview discussions. Bank managers interviewed in this study noted that KYC compliance was an important operational requirement, which had been made possible by digitization of bank services. Overall, the evidence derived from this study shows that technological innovations adopted by Myanmar’s banks play a critical role in enhancing the operational efficiency of the banks.

The findings of this study are consistent with the theoretical foundations of the economic efficiency theory, which explains how innovations affect efficiency of organizations. The economic efficiency theory proposes that the primary goal of innovations is to generate output in a way that minimizes the cost per unit of production (Musara and Fatoki, 2010). Economic efficiency may be separated into technical and allocative efficiency. Technical efficiency emanates from the potential of an innovation to increase output without a corresponding increase in inputs or production costs thus increasing the economies of scale (Matthews, 2010). In the present study, the deployment of modern technologies such as core banking and digital banking was seen to increase the ability of the banks to serve greater number of customers without having a corresponding increase in employee costs and other inputs. Technological innovations in the banking services sector helps in minimizing the resource inputs required to provide services to the customers. Porteous and Hazelhurst (2004), in a study of the South African banking sector have demonstrated that the adoption of electronic banking and mobile banking services increases the technical efficiency of the bank

as evident from the increase in the number of customers served by the automated system compared to those served by conventional banking systems.

The study findings are also consistent with previous findings literature that supports the existence of a positive association between technology adoption and operational efficiency in the banking sector. In a study of the commercial banking sector in Pakistan, for instance, Mustafa and Mehmood (2015) established that the deployment of digital banking technology helped to improve the technical, allocative, and total efficiency of the banking sector. Similarly, Ekwonwune et al. (2017) have demonstrated a positive role of ICT adoption on efficiency in the Nigerian banking system. ICT tools in the banking sector were shown to reduce the number of hours that customers spent on queues.

Kumar et al. (2011) observes that operational efficiency is achieved when a service delivery system achieves speed, dependability of service, and consistent quality. In the present study, technological innovations were shown to improve the speed, quality, and dependability of service thus demonstrating high operational efficiency. In the present study, the role of bank innovations such as ATM, mobile banking, and core banking in improving the operational efficiency of the surveyed banks could be attributed to the ability of these technologies to facilitate greater accessibility of banking services among customers. The automated teller machine (ATM) technology, for instance, has been shown to have high operational efficiency in enabling customers' access to banking services (Kocisova et al., 2018). The operational efficiency of banking technologies could also be attributed to the ability of the banks to minimize wastage and errors service delivery. Moreover, banking technologies have been shown to be a significant driver on employee productivity (Yavas et al., 2015; Obeng et al., 2018). According to Obeng et al. (2018), banks that adopt modern IT technologies have employees who perform their duties efficiently. In addition, IT technologies could have a positive impact on employee satisfaction thus enhancing the overall employee productivity.

5.4. Impacts of technological innovations on customer loyalty and satisfaction

5.4.1. Impacts on customer satisfaction

The findings of this study reveal that customers who use technological innovations, primarily electronic banking, derive high levels of satisfaction with banking services. The study findings show that customers in Myanmar's banking sector derive high satisfaction from the usage of the banking technologies. Overall customer satisfaction level was high with a mean of 2.03 on a 1 to 5 satisfaction scale. Moreover, customer satisfaction with individual banking services including ATM, mobile banking, internet banking, electronic funds transfer, and use of credit and debit cards. Among all the banking services, satisfaction level was highest for mobile banking and ATM and lowest for electronic funds transfer. The differences in satisfaction levels among the various technological innovations could be due to the differences in the usage of these technologies. Generally, bank customers use mobile banking and ATM more frequently compared to the other banking technologies. Nevertheless, the study findings reveal a positive association between banking technologies and customer satisfaction.

Furthermore, survey findings reveal that the high levels of customer satisfaction reported in this study could be attributed to the customers' positive assessment of electronic banking attributes. Most of the respondents surveyed in this study reported that they considered electronic banking to have appropriate accessibility (60%), ease of use (49.3%), convenience (35.6%), and cost savings (23.9%). These findings are consistent with the task technology fit theory, which postulates that users adopt technological innovations when they meet their performance expectations (Goodhue and Thompson, 1995). According to the task technology fit, one of the key factors that influence whether a technology matches the users' needs is ease of use. Evidence from the banking sector shows that task technology fit is an important

determinant of technology adoption and customer satisfaction. Tam and Oliveira (2016), for instance, have demonstrated that task technology fit factors such as ease of use are important in influencing the adoption of mobile banking.

The findings of this study further support the assumptions of the innovations diffusion theory. The theory proposes that innovation acceptance follows a process of customers' development of attitudes towards a product or innovation. One of the factors that influence the customer's attitudes towards a product or innovation is the perceived relative advantage of the innovation (Rogers, 1995). Therefore, customers adopt technologies when they perceive the existence of clear benefits compared to previous technologies (Rogers, 2003). Firdous and Farooqi (2017) have demonstrated that customers adopt internet banking due to its perceived and real benefits such as greater convenience, flexibility, and time saving ability compared to the traditional banking model of conducting transactions at the bank branch.

5.4.2. Impacts on customer loyalty

An analysis of the impact of technological innovations on customer loyalty shows a strong positive association. The adoption of electronic banking was shown to positively influence the level of customer loyalty among respondents surveyed in this study. The level of customer loyalty reported in this study was generally high among the respondents. A majority of the respondents demonstrated strong preponderance for continued use of bank services (mean = 1.98), potential to recommend their banks, strong preference for the bank, and not switching their current banks, thus indicating strong loyalty to current banks. Overall, respondents who used electronic banking were loyal to their banks. These findings are consistent with those of previous studies that show a positive association between customer loyalty and technological innovations in the banking sector. Empirical investigations by Rahi (2015) have revealed that a strong association exists between internet banking and customer

loyalty. Banks that offered internet banking were shown to have more loyal customers than those without the internet banking service. One of the possible reasons for the positive associations between customer loyalty and electronic banking is the potential role of emotional attachment and personal engagement. Continued use of electronic banking services such as mobile banking apps could create a strong personal and relationship commitment and self-brand connections with a product (Kim and Baek, 2018). According to Ding and Chai (2015), continued use of mobile apps could stimulate positive or negative emotions based on the level of satisfaction that ultimately influence continued use. Positive emotions emanate from inherent benefits of the technology thus enhancing customer loyalty. Similarly, Kim and Baek (2018) report that inherent benefits of mobile banking apps such as interactivity, convenience, and compatibility have a positive influence on mobile app engagement that results in strong relationship commitment and loyalty.

5.4.3. Relationship between customer satisfaction and customer loyalty

A positive correlation was further established between customer satisfaction and customer loyalty in this study. Most measures of customer satisfaction had high correlations with customer loyalty measures. For instance, satisfaction with mobile banking was strongly correlated with the probability of continued use of service ($r = 0.66$, $p<0.05$). Overall, the findings of structural equation modeling revealed that customer satisfaction was positively associated with customer loyalty with correlation analysis revealing a significant positive association between all measures of customer satisfaction and loyalty. The structural model shows significant statistical values ($\beta = 0.70$, $t = 75.6$) thus implying that satisfied bank customers are also loyal. This positive association is due to the fact that satisfaction with the products or services of a bank result in positive relationships that cultivate a long-term attachment and loyalty. Kim, Ferrin, and Rao (2009) note that the association between customer satisfaction and loyalty occurs in a sequential manner with loyalty being an

outcome of customer satisfaction. According to Kim et al. (2009), customers purchase products with anticipated performance expectations. Upon use or utilization of a product or services, the customers judge the product or service either positively or negatively. The perceived performance against the original expectations (customer satisfaction) forms the basis of repurchase decisions (customer loyalty) (Kim et al., 2009). In the present study, bank customers who use electronic banking services derive high satisfaction levels due to ease of use, convenience, cost savings, and general perceptions of quality, which ultimately influence the decisions for continued use of bank services.

In the present study, customer loyalty and satisfaction were shown to be influenced by the perceived usefulness of technologies. Similarly, customer loyalty and satisfaction were shown to be influenced by the perceived service quality (PSQ) of the technological innovations as measured by variables such as convenience, accessibility, ease of use, and cost savings. High correlation levels (up to $r = 0.72$, $p<0.05$) between measures of perceived usefulness and perceived usefulness of technological innovation on one hand and customer loyalty and satisfaction on the other hand. A strong, positive correlation between customer satisfaction and service quality was also reported in this study ($r = 0.64$, $p<0.05$). Similarly, satisfaction with individual technological innovations was positively associated with the perceived service quality of electronic banking.

The findings of this study with respect to the impact of technological innovations on customer satisfaction and loyalty are well supported in literature. In a study of Lebanese banking sector, Hammoud et al. (2018) found a positive association between electronic banking usage and customer satisfaction. Hammoud et al. (2018) further established that ease of use, reliability, efficiency, security, and privacy of electronic banking services were the key determinants of the level of customer satisfaction. The findings of this study further shows that the perceived service quality outcomes of electronic banking have a strong impact

on customer satisfaction and loyalty. This is consistent with the findings of Ayo et al. (2016) whose structural equation modeling results showed a strong influence of perceived service quality of electronic banking on customer satisfaction. These findings imply that enhancing the service quality of electronic banking platforms could enhance the level of customer satisfaction.

In this study, perceived service quality and perceived usefulness of banking technologies had a strong influence on customer satisfaction and loyalty. This is consistent with previous studies that report positive association between customer perceptions of technology usefulness and quality on overall satisfaction (Levy & Hino, 2016; Liébana-Cabanillas et al., 2016; van Vuuren et al., 2012). Customer satisfaction occurs when the product or service performance matches the customer's expectations (Roberts-Lombard, 2009). Therefore, customer satisfaction is strongly influenced by customer expectations and perceptions. Satisfaction emanates from a customer’s evaluation of the usefulness and quality of the product or service. In the present study, the services offered through electronic banking channels seem to be consistent with the customers’ expectations of the usefulness of these services.

Overall, the findings of this study reveal that bank technological innovations are important in influencing customer satisfaction and loyalty and, therefore, the long-term competitiveness of banking institutions in Myanmar. Satisfaction with banking technologies is primarily derived from progressive establishment of emotional attachment with banking innovations as well as the perceptions of quality and usefulness of the innovations.

5.5. Challenges of Electronic Banking

While technological innovations were shown to have positive impacts on bank performance in terms of profitability, operational efficiency, customer satisfaction and customer loyalty,

notable challenges were identified. From the customers' perspective, quantitative survey results revealed that customers identified complexities associated with electronic banking, security concerns, privacy issues, and lack of personal interactions with the banks as the major challenges of electronic banking. Studies in other developing countries have reported similar challenges for customers on introduction of electronic banking systems. The concerns on privacy and security are generally expected in online systems due to the perceptions of financial risks that could emanate from these systems. Susanto et al. (2016) note that privacy and security concerns emanate primarily from issues of trust. Most users of online banking services have genuine concerns of potential unauthorized access of personal information, interception, and theft. Investigations by Hoehle et al. (2012) have revealed that security is one of the major factors that influence consumers' intention to use electronic banking systems. According to Goudarzi et al. (2013), the general perspective among most customers is that online financial transactions are risky and dangerous.

From a theoretical perspective, the theory of reasoned action (TRA) and theory of planned behavior helps to explain the customers' concerns on security and privacy of online banking systems. The theory of reasoned action postulates that intention to perform a certain task or purchase a certain product is shaped by cognitive factors such as attitude and subjective norms (Fishbein and Ajzen, 1975). In the consumption of electronic banking products, the attitudes of riskiness of online systems could negatively affect the consumption of these products and manifest itself as a challenge as evident from the present study findings. On the other hand, the theory of planned behavior extends the theory of reasoned action by explaining adoption behavior as the function of attitude and subjective norms as well as the perceived behavioral control (Taylor and Todd, 1995). In the case of electronic banking, the perception of potential loss of control in online banking services could manifest itself as the perception of ease or difficulty of performing certain transactions. This is consistent with the

observation made in this study that complexity of electronic banking systems is a major issue of concern among customers.

The challenges of electronic banking from customers' perspectives were different from those of bank managers. The bank managers perceived the challenges of electronic banking from an operations perspective. Bank managers identified challenges such as the difficulties encountered with training older employees, technical issues of e-banking systems such as breakdown of telecommunication systems, the time and effort needed to deploy the e-banking systems, and the need for frequent updates on technological systems. The understanding of the challenges of electronic banking from the bank managers and customers perspectives were different because bank managers viewed electronic banking systems as tools of service delivery and enhancing bank operations while customers viewed the e-banking systems as tools of serving their personal banking needs. This implies a need for bank managers to evaluate the e-banking systems not just from an operational perspective but also from the customers' perspectives. In consistent with the findings of the present study, Rana and Pandey (2016) note that banks adopting modern innovations and technologies could present operational challenges for banking organizations. However, Romānova and Kudinska (2016) observe that banking innovations and technologies could enhance the operations of the banks through standardization of back office functions. According to Romānova and Kudinska (2016), banking innovations have operational challenges that could be turned into opportunities for better flexibility in banking operations.

5.6. Conclusion

This study relied on a mixed methods research design to examine the impacts of bank technologies and innovations on performance of banks in Myanmar. The evidence from the quantitative survey shows a strong positive association between technological innovations

and customer satisfaction and loyalty. Similarly, qualitative evidence from interviews with bank managers reveals a beneficial role of technological innovations on bank performance in terms of profitability and operational performance. The findings of this study reveal a strong correlation between the quantitative and qualitative results. In general, the qualitative findings from interviews with bank managers support the findings of the survey of bank customers. The survey results, for instance, reveal that bank innovations enhance the customer satisfaction and loyalty. In turn, customer satisfaction and loyalty enhance the strategic positions of innovative banks and therefore enhance the profitability of banks. As bank managers observed, the profitability of Myanmar banks could be attributed to the positive roles of the banking innovations on customer satisfaction and loyalty. On the other hand, the interview findings show that technological innovations contribute to the improvement of the operational efficiency of banks. This in turn reduces the operating costs of the innovative banks as well as the productivity of employees and banking resources. Therefore, operational efficiency directly contributes to increase in profitability through direct cost savings. Operational efficiency derived from technological innovations also enhances customer satisfaction and loyalty thus indirectly resulting in a boost in productivity.

CHAPTER SIX

CONCLUSION

6.1. Introduction

This study was motivated by the technological trends observed in Myanmar's banking sector. The information and communication technology (ICT) has revolutionized the way banking is conducted in Myanmar. However, there is little understanding of the role of these technologies in the performance of banks in Myanmar. The objective of this study was therefore to determine the impacts of technological innovations with products and services on banking in Myanmar in terms of bank financial performance, operational efficiency, and customer satisfaction and loyalty. Using a mixed methods research approach, this study has demonstrated a positive role of banking innovations and technologies on the banking sector in Myanmar. The bank innovations assessed in this study include automated teller machines, mobile banking, internet banking, credit and debit cards, and electronic funds transfer. The financial performance indicators studied include net income, revenues, return on assets, return on equity, shareholders' wealth, and customer deposits. The study's assessment of the impacts of technological innovations on customer satisfaction and loyalty involved two moderating variables namely the perceived quality of service and perceived usefulness of the innovations. This chapter provides an overview of the study findings and conclusions drawn from the study. The chapter further makes recommendations and suggestions for future research.

6.2. Summary of findings

6.2.1. Impact of technological innovation in products and processes on the profitability of banks in Myanmar

This study investigated three major objectives. The first objective of the study was to determine the impacts of technological innovations on financial performance. This role of technological innovations on the financial performance of banks in Myanmar was investigated through in-depth interviews with bank managers of four banks namely Kanbawza Bank, Cooperative Bank, Yoma Bank, and AYA Bank. Evidence from these interviews reveals that technological innovations positively influence various aspects of banks financial performance. The interview data revealed that technological innovations helped to increase bank revenue through expansion of customer reach for the banks particularly by reaching to unbanked populations, increasing revenue streams, and increasing the frequency and volume of transactions. Growth in revenue and reduced operating costs were shown to be the key drivers of increase in incomes for the banks.

Similarly, the technologies were shown to have a positive impact on returns on assets and returns on equity by ensuring that capital and other resources directed towards ICT investments generated good incomes. The innovations were also seen as having a positive impact on customer deposits due to the role of these innovations in deposit mobilization. Mobile banking was seen as specifically crucial in facilitating the growth of bank deposits. Overall, the growth in incomes and returns on investments had a positive impact on shareholders' equity for Myanmar's banks. The findings of this study therefore support the assertion that technological innovations could have a positive impact on financial performance of banks.

6.2.2. Impact of technological innovation in products and processes on the operational efficiency of banks in Myanmar

The second objective of the study was to determine the impacts of technological innovations on operational efficiency. Evidence from interview data shows that technological innovations enhance the operational efficiency of banks in Myanmar. Technological innovations enhance the operational efficiency of banks by facilitating customers to access banking services without having to visit the bank as well as facilitating the banks to reach the unbanked populations through innovations such as agency banking systems and mobile systems. Banking innovations were also shown to improve the quality of banking services by reducing the exposure of bank transactions to errors. Technological innovations were also seen to have a positive role in enhancing the speed of service delivery with some services enabling real-time information retrieval and transactions. Technologies that enable conduct of banking transactions in real time were also seen as playing a key role in enhancing the dependability of services, accountability, and customer confidence. Automated systems were seen as being more dependable because of the diminished chances of human manipulation. Other factors that were attributed to the increase in dependability of services included the traceability of transactions and reduction in occurrence of errors.

Moreover, technological innovations were shown to positively influence the operational efficiency of banks through reduction in operational cost savings. Banks that adopt modern technologies were shown to have lower operational costs on employee expenses, electricity expenditures, and communication costs among other operational costs. Furthermore, this study established that technological innovations helped to boost the economies of scale within the banking sector by facilitating service delivery to a larger customer base with fixed resources. Other positive impacts of technological innovations on operational efficiency of banks included a boost in employee productivity, reduction in wastage levels, enhanced

communication, and facilitating compliance with regulatory requirements such as KYC practices.

6.2.3. Impact of technological innovation in products and processes on customer satisfaction and loyalty among banks in Myanmar

The final objective of this study examined the impacts of technological innovations on customer loyalty and satisfaction among Myanmar banks. Through a survey of 205 bank customers from various banks in Myanmar, this study established the association between the variables under investigations. The findings of this study reveal a high level of satisfaction among users of various bank innovations in Myanmar. Overall, this study establishes a strong positive correlation between usage of bank technologies and customer satisfaction ($r = 0.72$, $p<0.05$). High correlation was also established between customer satisfaction and various bank technologies such as ATM ($r = 0.56$), mobile banking ($r = 0.54$), internet banking ($r = 0.60$), electronic funds transfer ($r = 0.68$), and credit and debit cards ($r = 0.53$).

Similarly, users of various bank innovations in Myanmar show high levels of loyalty with products and services. Strong positive correlations were reported between usage of banking technologies and various measures of customer loyalty including possibilities of not switching the banks ($r = 0.51$), strong preference for the bank ($r = 0.59$), potential to recommend the bank to other customers ($r = 0.62$), and continued service use ($r = 0.55$). Furthermore, a strong positive correlation was observed between customer satisfaction and customer loyalty. This suggests that satisfied customers were generally loyal to their banks. The findings reveal that bank innovations have a positive impact on customer satisfaction and loyalty.

In addition to the positive impact of technological innovations on customer loyalty and satisfaction, two modifying factors were observed to play a critical role in moderating the

relationship between these variables. The perceived service quality and perceived usefulness of technologies had a positive impact on the level of customer satisfaction and loyalty. Therefore, this study shows that the presence of bank technologies alone cannot result in customer satisfaction or loyalty without the elements of quality of services and perceived usefulness of the innovations among the customers.

6.3. Limitations

This thesis examined the role of technological innovations with products and services on bank performance in Myanmar. One of the major limitations of this study was a lack of financial performance data on Myanmar's banks. Due to its turbulent history, the country's banking sector is still at the nascent stage and, therefore, historical financial records of individual banks are nonexistent. Moreover, the study was limited in scope because it only analyzed a few technological innovations. Furthermore, the present study examined four commercial banks only because of their wider branch network and greater utilization of modern electronic banking systems. Despite these limitations, the study maintained rigorous research methods that ensured that it developed an in-depth understanding of the impact of technological innovations on financial performance, operational efficiency, customer satisfaction, and customer loyalty.

6.4. Recommendations

Based on the findings of this study, several recommendations are proposed for enhancing the utilization of technological innovations in banking. First, there is a need for banks to invest in development of robust electronic banking system in order to remain competitive in the Myanmar's banking sector. The findings of this study demonstrate that investment in technological innovations has attractive returns on investment and is a highly profitable investment. Therefore, banks must continue to invest in IT infrastructure in order to stay

ahead of competition. Second, there is a need for banks in Myanmar to invest in the security of their banking systems. Although bank customers in Myanmar have high acceptance of banking systems, privacy and security concerns among customers remain a major hindrance to e-banking. Banks must ensure that their electronic banking systems are highly secure in order to boost consumer confidence and prevent incidences of fraud. In the era of cybercrime and financial fraud, the security of electronic banking systems remains a key priority area for banks. Failure to have highly secured e-banking systems could spell doom for banks in Myanmar because of potential loss of customer confidence in these technologies.

As demonstrated in this study, the banking sector in Myanmar is slowly shifting from the traditional physical branch banking system to electronic banking systems. Therefore, it is recommendable that banks should focus on investment in IT infrastructure in their expansion efforts rather than opening of new branches. Banks such as KBZ have already started scaling back on physical expansion in order to refocus their energies on electronic banking. Other banks in Myanmar should follow suit in order to take advantage of the financial and strategic opportunities offered by electronic banking.

There is a need for banks in Myanmar to enhance the IT skills of their employees through training. Senior managers interviewed in this study revealed that employees' lack of IT skills, particularly the elderly ones, was of the key limiting factors in technological innovations usage. Therefore, it is important for banks to expand the IT skills of their employees by hiring more IT savvy employees as well as retraining of their current workforce. Banks in Myanmar should have policies for continuous IT training for their employees.

The findings of this study reveal that the perceived usefulness and service quality of electronic banking are important determinants of the impacts of technological innovations on customer satisfaction and loyalty. This suggests the need for banks to develop high quality

electronic banking systems that are easy to use and convenient for customers. Banks in Myanmar should ensure that their banking systems meet the quality expectations of their customers. Furthermore, the customers surveyed in this study further stated that complexity of electronic banking systems is a major challenge for users of e-banking channels. Therefore, developers of electronic banking systems should prioritize of the convenience and ease of use of e-banking systems.

From a government perspective, it is recommended that the Myanmar government develop policies and strategies of supporting technology adoption. The government should initiate frameworks for technology transfers from developed countries in order to facilitate the adoption of technological innovations in the banking sector. The government also needs to come up with laws for regulating electronic banking in order to boost consumer confidence. Such legal frameworks should focus on ways on protecting consumers from online fraud and cybercrime.

6.5. Suggestions for future studies

Due to data limitations, this study assessed the impact of technological innovations on financial performance and operational efficiency through a qualitative approach involving interviews with bank managers. In future when adequate quantitative data is available, there should be quantitative studies to analyze the correlations between bank innovations and various measures of bank performance including revenues, incomes, return on equity, return on assets, and operational efficiency. Such quantitative investigations will help to validate the findings of the present study that indicate the presence of a positive relationship. A quantitative study will help to determine in an objective manner the relationship between variables. The qualitative approach adopted in this study had the limitation of suffering from potential bias because the association between variables was assessed from the perspectives

of managers' personal opinions. Thus, independent examination of data is needed in future in order to accurately determine the impacts of technological studies on bank performance.

The present study assessed the performance of banks in Myanmar using five banking technologies namely ATM, mobile banking, internet banking, electronic funds transfer, and credit and debit cards. However, interview discussions revealed the existence of other technologies in Myanmar such as agency banking and Smart accounts. Future studies should therefore explore the impacts of these additional technologies on bank performance. Moreover, the present study only involved a case study of four privately owned banks in Myanmar. Expanding the sampling procedures to include more private banks and government-owned banks could enrich the findings and the potential generalization of the study.

This study was entirely based on the Myanmar industry experience. Since the economic and social indicators may differ across countries and geographical locations, there is a high possibility that the findings would have substantial differences and disparities if the study was replicated in other countries or geographical regions. Therefore, future studies should involve the simulation of the study in other developing countries. It is also necessary that comparative studies be conducted to compare the experience of Myanmar with other counties in Asia.

Future studies should also involve an expansion of the variables used in assessing the impacts of technological innovations on bank performance. One potential approach is the inclusion of IT expenditure as a model construct for measuring IT innovations. Correlation between IT expenditure and measures of bank profitability could help in understanding the true return on investment in ICT innovations. Other potential variables that may be assessed in future studies include bank liquidity, ratio of performing loans, and capital adequacy among others.

Finally, future studies may combine the structural equation modeling (SEM) adopted in this study with other methodologies such as data envelopment analysis (DEA) in measuring the impact of IT on organizational performance. It is also suggested that machine learning algorithms decision trees and even artificial neural network be employed in predicting the efficiency and performance of banks in future studies.

6.6. Conclusion

In retrospect, this study achieved its objectives by demonstrating the role of technological innovations in Myanmar's banking sector. The banking sector in Myanmar has had a turbulent past that negatively affected its growth and performance. However, the relative economic and political stability in the past decade has made the banking sector back on its feet with a promising future. Banking technologies such as ATM, mobile banking, internet banking, and electronic funds transfer are now widely used in Myanmar. This study therefore sought to determine how these technologies have influenced the performance of banks in Myanmar in terms of profitability and operational efficiency. However, lack of data restricted the ability to conduct quantitative assessments in this study. Nevertheless, interviews with senior managers of four leading banks helped to obtain rich data that show the wider picture of the impacts of technological innovations on banking in Myanmar.

Overall, the current study shows that banking technologies have a positive role on bank performance. These technologies enhance customer satisfaction and loyalty due to the convenience and other benefits of the innovations. Technological innovations further enhance the operational efficiency through enhanced service quality, dependability of services, improvement in economies of scale, and reductions in costs of doing business. Subsequently, the better customer outcomes and operational efficiency of banking innovations enhance the financial performance of banks.

Although the adoption of banking technologies has resulted in positive outcomes for customers and banks, several challenges remain problematic. These include privacy and security concerns, technical challenges, complexity of electronic banking systems, and lack of skills among employees. Therefore, banks need to utilize the findings of this study in coming up with strategies of improving their banking systems.

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APPENDICES

Data Collection Instruments

Interview questions for bank managers

The aim of this study is to investigate the impact of technological innovations with products and services on banks in Myanmar. The study findings will be used for academic purposes only. You are therefore invited to participate in this interview voluntarily. Your opinions and insights are most appreciated. Your privacy and confidentiality are guaranteed.

Part One: Personal details

Please tick appropriately:

1. Gender: Male ( ) Female ( )
2. Name of Bank (Optional) ……
3. For how many years have you worked with the Bank? Tick One

Period	Less than 1 year	1-5 years	5-10 years	Over 10 years
Tick as appropriate				

4. What is your current highest level of education?

High school	Bachelor's degree	Master's degree	PhD

5. Kindly state your current position in the bank __

Part Two: Impact of technological innovations on financial performance in Myanmar Banks

What technological innovations are currently adopted by your bank?

Which technological innovation do you think has had the greatest impact on your bank's financial performance?

In your opinion, have these technological innovations boosted your bank's profitability in terms of net income?

To what extent do you think that electronic banking has had on your bank's revenue?

What is your assessment of the return on assets (ROA) of the technological innovations at your bank?

What is your assessment of the return on equity (ROE) of the technological innovations at your bank?

Do you think that customer deposits have improved since your bank adopted electronic banking technologies?

In your own assessment, what impact has the adoption of electronic banking technologies had on shareholders' wealth?

Part Three: Impact of technological innovations on operational efficiency in Myanmar Banks

To what extent do you think that the adoption of technological innovations has affected operations at your bank in terms of the following?

- Quality of service
- Speed of service delivery
- Dependability of service

To what extent to you think that electronic banking has affected operational costs at your bank.

Has your bank benefited from any cost savings as a result of the adoption of electronic banking?

In your own assessment, to what extent do you think that technological innovations facilitate the enjoyment of economies of scale?

How would you assess the role of technological innovations in improving employee productivity at your bank?

Do you think that the level of wastage has reduced due to the technology adoption?

What other aspects of banking operations do you feel are affected by technological innovations?

What challenges are encountered in banking operations as a result of electronic banking?

Survey Questionnaire for bank customers

This survey seeks to explore the impact of technological innovations on customer satisfaction and loyalty in the Myanmar banking sector. Your participation and honest opinions will be most appreciated.

Part One: Personal details

Please tick appropriately:

1. Gender: Male ( ) Female ( )
2. What is your preferred bank? ……
3. For how many years have you banked with your preferred Bank?

Period	Less than 1 year	1-3 years	3-5 years	Over 5 years
Tick as appropriate	☐	☐	☐	☐

4. What is your current highest level of education?

High school	Bachelor's degree	Master's degree	PhD
☐	☐	☐	☐

5. Which of the following technologies have you used in the past one month?

Technology	Tick One
ATM	☐
Mobile banking	☐
Internet banking	☐
Electronic funds transfer	☐

Credit and debit cards	☐

6. What bank innovation do you find most relevant and useful to you? Tick as many as you find relevant

Technology	Tick One
ATM	☐
Mobile banking	☐
Internet banking	☐
Electronic funds transfer	☐
Credit and debit cards	☐

7. Compared to the traditional branch banking, how satisfied are you with electronic banking?

Totally satisfied	Satisfied	Neutral	Dissatisfied	Totally dissatisfied
☐	☐	☐	☐	☐

8. For each of the following electronic banking services, how would you describe your level of satisfaction?

	Totally satisfied 1	2	3	4	Totally dissatisfied 5
ATM	☐	☐	☐	☐	☐
Mobile banking	☐	☐	☐	☐	☐

Electronic funds transfer	☐	☐	☐	☐	☐
Debit and credit cards	☐	☐	☐	☐	☐

9. Based on your previous experience with the electronic banking service at your bank, how likely are you to make continue using the service?

Very likely	Likely	Neutral	Unlikely	Totally unlikely
☐	☐	☐	☐	☐

10. Which of the following factors do you find most useful in electronic banking?

Convenience	☐
Accessibility	☐
Ease of use	☐
Cost savings	☐
Others (Please explain)	

11. To what extent do you agree or disagree with the following statements?

	Strongly disagree 1	2	3	4	Strongly agree 5
I am satisfied with the current level of service at the bank	☐	☐	☐	☐	☐
I am not considering to switch to another bank in the near future	☐	☐	☐	☐	☐
I have developed a strong preference for the bank due to the banking technologies	☐	☐	☐	☐	☐
I would recommend the service to other customers	☐	☐	☐	☐	☐
I will continue using electronic banking services in future	☐	☐	☐	☐	☐

12. Which of the following do you consider the major challenges of electronic banking?

Security concerns	☐
Privacy issues	☐
Complexity	☐
Lack of personal interactions with the bank	☐
Others (Please explain)	

Participant Information Sheet

Project Details	
Title of Project:	**The Impact of Technological Innovation with Products and Processes on Banking in Myanmar**
Human Research Ethics Approval Number:	H19REA024

Research Team Contact Details	
Principal Investigator Details	**Supervisor Details**
Name	Email:
Email:	Telephone:
Telephone:	Mobile:
Mobile:	

Description

Myanmar's banking sector has achieved a significant growth in the past few decades with technology being a key driver of this growth. This study is therefore aimed at determining how technological innovations with products and services impact the banking sector in Myanmar. Specifically, the study seeks to determine whether technological innovations have significant impacts on the profitability and operational efficiency of banks in Myanmar as well as the potential impacts on customer satisfaction and loyalty. This research project is purely academic as part of the requirements of the University of Southern Queensland.

The research team requests your assistance because [**********]

Participation

You are invited to participate in this research project that seeks to determine the impact of technological innovations on banking in Myanmar. Before deciding to take part in the research project, you are encouraged to take some time to understand the nature and purpose of the research by reading the following information carefully. Your participation will involve participation in an interview that will take approximately 30-45 minutes of your time. The interview will take place at a time and venue that is convenient to you. The inclusion criteria for participation in this study include being of majority age, being bank employee at the time of data collection, experience of working in the Myanmar banking sector, being in a managerial position within a bank operating in Myanmar, knowledge of technology and innovation, and willingness to participate in the study. On the other hand, exclusion criteria include lack of experience in the Myanmar banking sector and lack of knowledge on technological innovations. You have been chosen to participate in this study because of your position as a knowledgeable person in your organization. We believe that your knowledge and experiences will provide useful insights that could be useful to the understanding of the impact of technological innovation in Myanmar's banking sector.

If you decide to take part in this project, you will be asked a series of about 20-25 questions that will help us in understanding your perception of the issues of concern in this research project. The questions will seek to determine your personal profile, your perception of the impacts of technological innovations on financial performance of banks, and your perception of the impacts of technological innovations on operational efficiency of banks. The interviewing procedure will take approximately 30 to 45 minutes.

Participation in this study is absolutely voluntary and decisions not to participate will have no effects on you or our relationship with you in any way. Moreover, you have the option of opting out of the research process at any stage without offering any explanation or having any consequences.

Expected Benefits

It is expected that this will not directly benefit you. However, the participation will be beneficial in that it will give you an opportunity to contribute positively to the generation of knowledge that could be useful in shaping future practices in the banking sector.

Risks

In participating in the interview, the only social risk anticipated in the project is potential exposure of private and personal information of participants. Adequate measures of privacy and confidentiality will be put in place by removing personal identifiers of the participants and replacing them with key codes.

Privacy and Confidentiality

All data collected in this study will be treated with utmost privacy and confidentiality. No part of your personal information will be stored or revealed to third parties. Instead, you will be assigned a personal identifier throughout the study. Interview data will be transcribed and stored in a personal computer. The recorded tapes will be safely secured in a locked desk while computer files will be secured by a password. Only the researcher will have access to this data. Secondary storage will involve an external as well as a Google drive. Moreover, no part of your personal information will be revealed in publications from this study unless you expressly give permission through writing. Participants may request for an access to a

summary of the research findings by writing to the researcher through the primary contact address. The data collected in this study may be available for future research purposes.

Consent to Participate

We would like to ask you to sign a written consent form (enclosed) to confirm your agreement to participate in this project. Please return your signed consent form to a member of the Research Team prior to participating in your interview.

Questions or Further Information about the Project

Please refer to the Research Team Contact Details at the top of the form to have any questions answered or to request further information about this project.

Concerns or Complaints Regarding the Conduct of the Project

If you have any concerns or complaints about the ethical conduct of the project, you may contact the University of Southern Queensland Manager of Research Integrity and Ethics on +61 7 4631 1839 or email researchintegrity@usq.edu.au. The Manager of Research Integrity and Ethics is not connected with the research project and can facilitate a resolution to your concern in an unbiased manner.

Thank you for taking the time to help with this research project. Please keep this sheet for your information.

Consent Form

Project Details	
Title of Project:	**The Impact of Technological Innovation with Products and Processes on Banking in Myanmar**
Human Research Ethics Approval Number:	H19REA024

Research Team Contact Details	
Principal Investigator Details	**Supervisor Details**
Name	Email:
Email:	Telephone:
Telephone:	Mobile:
Mobile:	

Inclusion and exclusion criteria: The inclusion criteria for participation in this study include being a bank employee at the time of data collection, experience of working in the Myanmar banking sector, being in a managerial position within a bank operating in Myanmar, knowledge of technology and innovation, and willingness to participate in the study. The exclusion criteria include lack of experience in the Myanmar banking sector and lack of knowledge on technological innovations.

You are invited to participate in this research project whose aim is to determine the impacts of technological innovations with products and services on the financial performance, operational efficiency, and customer satisfaction of banks in Myanmar. Kindly note that the participation is voluntary and you have the opportunity to opt out of the project at any phase of the research process. You are also free to refuse to answer any question that you may find inappropriate or which you may feel inadequately prepared or knowledgeable about. If you agree to the following, kindly sign the consent and return to the research.

I …… agree to participate in this research project. The details of the research project have been explained to me and I understand my role in the project. I have also received satisfactory answers to all questions and issues that I have raised.

I agree that I have met the inclusion criteria explained to me by the researcher.

I understand that my participation is voluntary. I also understand that I may freely withdraw from the research project at any phase of the research process without having to give an explanation or reason for the same.

I understand that my participation will be anonymous and that the researcher will use anonymous reference to me throughout the research report.

I agree that the information that I may give will be used for academic purposes including the writing of theses, dissertations, and other publications. I understand that the findings of the study may be shared but not my personal information.

I agree that I will participate in an interview process, which may be audio recorded.

I agree to provide truthful information to be best of my knowledge and dedicate at least 30-45 minutes to participation in the interview process.

I agree that I may be called upon by the researcher to offer additional explanations or clarifications on issues discussed in the interviews. I understand that my participation in such a procedure is voluntary.

I understand that the tape-recorded interviews will be safely and securely stored.

Having considered the information provided to me, I consent to participating in this research project

Name: _____

Signature: _____ Date: _____