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Breaking Down the Barriers: How Bangladeshi Banks Can Overcome Obstacles to Automation

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Breaking Down the Barriers: How Bangladeshi Banks Can Overcome Obstacles to Automation

By

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January 30, 2024

Attestation

I hereby attest that the work presented in this research paper is the result of my original research and analysis. The ideas, concepts, and findings presented in this paper are the product of my independent thinking, supported by the literature review and data analysis conducted during the research process.

Throughout this research, I have made every effort to ensure the originality and integrity of my work. All sources, including scholarly articles, books, reports, and other relevant materials, have been appropriately cited and referenced in accordance with academic standards and guidelines. The literature review conducted in this paper serves to provide a comprehensive overview of the existing knowledge and research in the field.

The primary data collected for this research, including surveys, interviews, or observations, is the result of my own efforts and has been accurately documented and analyzed. Any insights or conclusions drawn from the analysis of the data are based on my interpretation and understanding of the findings.

I have adhered to ethical principles throughout the research process, ensuring confidentiality and anonymity when required, and obtaining necessary permissions and approvals for data collection and analysis. The research methodology employed in this study has been carefully designed and executed to ensure rigor and validity.

_____ _____

Signature Date

_____

Name

Acknowledgement

I would like to express my deepest gratitude and appreciation to all those who have contributed to the completion of this research paper.

First and foremost, I would like to thank my supervisor [Supervisor's Name] for their guidance, support, and valuable insights throughout the research process. Their expertise and encouragement have been instrumental in shaping the direction and quality of this paper.

I am also thankful to the faculty members of [Your University/Institution] for providing a conducive academic environment and resources that have facilitated the execution of this research. Their knowledge and expertise have greatly enriched my understanding of the subject matter.

I extend my sincere appreciation to the participants who took part in the data collection process and generously shared their experiences and perspectives. Their contribution has been invaluable in providing insights and data for analysis.

I would like to express my gratitude to the authors and researchers whose works were referenced in this paper. Their scholarly contributions have provided a solid foundation for the literature review and have helped shape the arguments and discussions presented in this research.

I am indebted to my friends and family for their unwavering support and encouragement throughout this journey. Their understanding, patience, and words of encouragement have been a constant source of motivation.

Lastly, I would like to acknowledge the support and contributions of all those who have directly or indirectly played a part in the completion of this research. Your assistance, feedback, and encouragement have been instrumental in the successful completion of this paper.

While it is not possible to mention everyone individually, please know that your support and contribution have been deeply appreciated.

Thank you all for being a part of this research endeavor.

Letter of Transmittal

Subject: Letter of Transmittal for Research Paper

Dear Sir/ Madam,

I am pleased to submit the attached research paper titled "Breaking Down the Barriers: How Bangladeshi Banks Can Overcome Obstacles to Automation" for your review and consideration. This paper represents the culmination of my efforts and research conducted in partial fulfillment of the requirements for Software Engineering Project at Your University.

The purpose of this research paper is to analyze the challenges and opportunities associated with the adoption of automation in the banking sector of Bangladesh. It delves into the various aspects of automation, including technological influences, business and financial problems, and the impact on banking security. The paper also proposes potential solutions and recommendations to address the identified challenges and maximize the benefits of automation.

The research methodology employed for this study involved a comprehensive literature review of relevant academic papers, industry reports, and publications, as well as the analysis of primary and secondary data. Primary data collection was conducted through surveys, interviews, and observations, while secondary data was gathered from reputable sources such as scholarly databases and official publications.

The research findings and analysis presented in this paper offer valuable insights into the current state of the banking sector in Bangladesh and provide recommendations for financial institutions to navigate the automation landscape effectively. It is my hope that this research contributes to the existing body of knowledge on automation in the banking sector and serves as a resource for further exploration and decision-making in this field.

I would like to express my sincere appreciation to my supervisor, [Supervisor's Name], for their invaluable guidance, support, and expertise throughout the research process. Their

mentorship and feedback have been instrumental in shaping the quality and direction of this research.

I am grateful for the opportunity to undertake this research, and I would like to acknowledge the support and contributions of all those who have assisted me along the way. Their insights, assistance, and encouragement have been greatly appreciated.

I trust that this research paper will meet the standards and expectations set forth by [Recipient's Organization] and contribute to the ongoing discourse in the field of automation in the banking sector. I am available to provide any further information or clarification as required.

Thank you for your time and consideration. I look forward to your feedback and recommendations.

Yours sincerely,

Golam Rakib Milky, Anaz Bin Mannan, Arif Moin Uddin, Md.Baharul Alam

Evaluation Committee

Supervision Panel

.....	.....
Supervisor	Co-supervisor

External Examiners

.....	.....
External Examiner 1	External Examiner 2

Office Use

.....	.....
Program Coordinator	Head of the Department

.....

Director Graduate Studies, Research and Industry Relations

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Chapter 1

Introduction

1.1 Overview

The banking sector in Bangladesh has faced numerous challenges, necessitating a shift towards automation. Factors such as increasing competition, consumer demands, rising expenses, profitability concerns, outdated legacy systems, and cybersecurity risks have prompted financial institutions to explore automation frameworks, digital banking, mobile banking, and technology impact analyses. However, while these solutions offer potential benefits, banks must also consider the potential job losses, reduced client interaction, and the required investments and training. Therefore, careful consideration of the proposed remedies and their consequences is crucial.

1.2 Contribution of the thesis

This thesis contributes to the understanding of automation in the banking sector of Bangladesh by conducting a comprehensive analysis of the challenges and opportunities associated with banking software. It aims to provide insights for financial institutions on maximizing the benefits of automation in their operations. By examining the role of banking software, the implementation challenges and opportunities, and strategies for optimizing its use, this research offers practical recommendations and implications for the industry. The findings of this thesis contribute to the existing literature on automation in the banking sector and provide a specific focus on the context of Bangladesh.

1.3 Organization of the thesis

The thesis is organized into the following chapters to provide a systematic exploration of the topic. Chapter 1 introduces the research, providing an overview of the thesis, highlighting the contribution, and outlining the organization of the document.

Chapter 2 presents a comprehensive review of the literature related to automation in the banking sector, including key concepts, theories, and previous studies. Chapter 3 describes the methodology employed in the research, including data collection methods, sources, and analysis techniques. Chapter 4 presents the empirical findings, including a detailed analysis of the challenges and opportunities identified. Chapter 5 discusses the implications of the findings and proposes strategies for financial institutions to maximize the benefits of automation. Finally, Chapter 6 concludes the thesis, summarizing the key findings, discussing limitations, and suggesting areas for future research.

1.4 Thesis project management

1.4.1 WBS

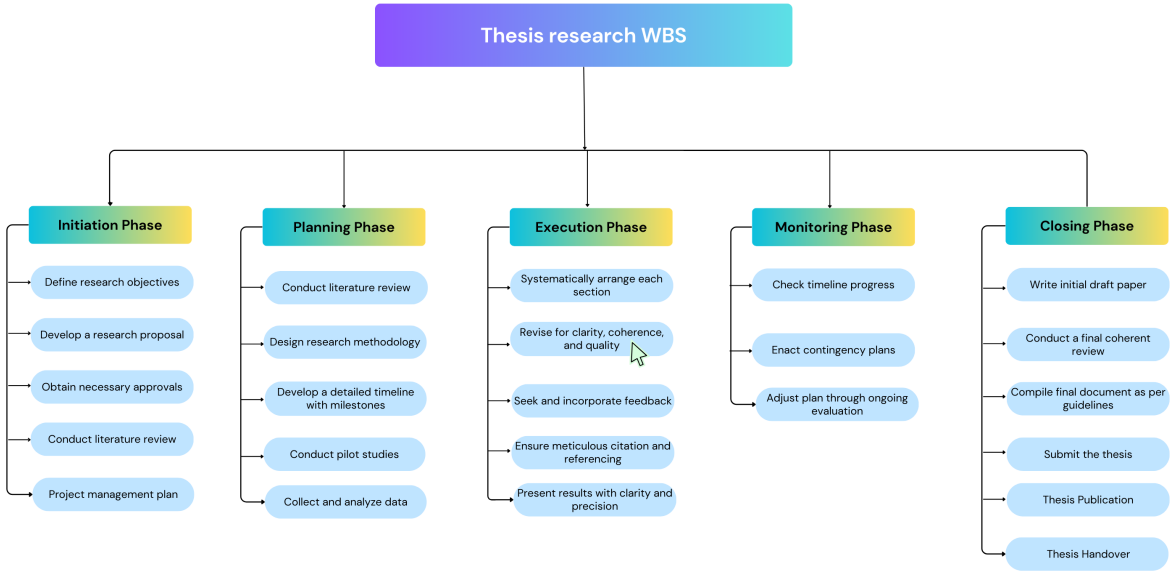


Figure 1.1: WBS

1.4.2 Gantt Chart

Task Name	Start Date	End Date	Duration(Days)
Breaking Down the Barriers: How Bangladeshi Banks Can Overcome Obstacles to Automation	15-Feb-2022	22-Mar-2023	401
Specify research aims and recognize gaps in existing literature	15-Feb-2022	28-Mar-2022	41
Construct a research plan	28-Mar-2022	20-Apr-2022	23
Devise a plan to structure, gather data, and choose research methodologies	20-Apr-2022	10-Jun-2022	51
Execute data gathering and conduct analysis of results	10-Jun-2022	15-Aug-2022	66
Secure approval for the thesis and formulate conclusions	15-Aug-2022	15-Sep-2022	31
Compose the preliminary version	15-Sep-2022	3-Nov-2022	50
Conduct a thorough review and make necessary updates	3-Nov-2022	5-Dec-2022	33
Submit the conclusive version for publication	5-Dec-2022	1-Jan-2023	28
Response to Reviewer Comments	1-Jan-2023	25-Jan-2023	25
Conduct a review and resubmit the revised version	25-Jan-2023	24-Feb-2023	26
Paper approved and officially published	24-Feb-2023	22-Mar-2023	27

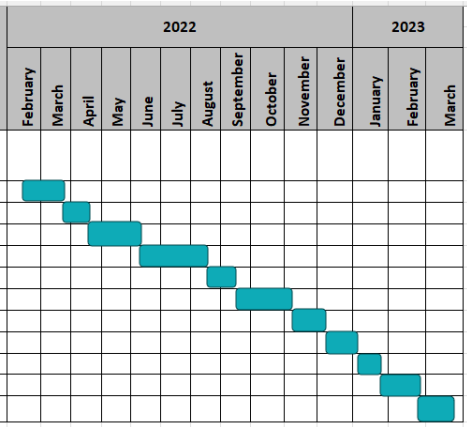


Figure 1.2: Gantt Chart

Chapter 2

Literature Review

2.1 Literature Review of Papers

The literature review critically examines relevant research papers that have explored the challenges and opportunities associated with automation in the banking sector. The reviewed papers contribute to the understanding of automation's impact on financial institutions and provide insights into maximizing its benefits.

(Khan,2019) [1] conducted an empirical study on the technological influences on employment and unemployment in the banking sector of Bangladesh. The research highlighted the need for automation to streamline operations and improve efficiency while considering the potential impact on employment.

In their exploratory study, (Saidul Hasan, 2010) [2] investigated the adoption of e-banking in Bangladesh. The research emphasized the benefits of e-banking, such as convenience and accessibility for customers, and highlighted the need for seamless user experiences to drive adoption.

(P.X.Q.et al,2016) [3] focused on the challenges of implementing Core Banking Software (CBS) in e-banking operations in Bangladeshi banks. The study identified the challenges faced during implementation and emphasized the importance of overcoming them to maximize the benefits of automation.

(Bangladesh Bank, 2023) [4] provided statistics on ATM, POS, CDM, and CRM usage in the banking sector. These statistics highlight the increasing adoption of automation technologies in the industry and their impact on banking operations.

The issued cards and transaction statistics presented by (Bangladesh Bank, 2023) [5] demonstrate the growth and significance of digital payment methods in the banking sector. These statistics underscore the increasing reliance on automation for financial transactions.

(Sarker, 2018) [6] focused on the security of web servers in e-banking. The research highlighted the use of encryption algorithms for secure data transmission and emphasized

the importance of data security in the automation of banking processes.

(R. D., 2016) [7] explored the use of Know Your Customer (KYC) information in online banking for transaction authorization. The study emphasized the role of KYC in ensuring secure transactions and minimizing fraud risks.(Humayun Kabir, 2020) [8]

Green banking practices in Bangladesh were discussed by (P. C. D., 2013) [9]. The research highlighted the initiatives taken by banks to promote eco-friendly practices such as green financing and digital banking, contributing to sustainable development in the sector.

In a study on customer satisfaction in online banking, (I. J. M., 2021) [10] employed machine learning techniques to predict satisfaction levels. The research emphasized the importance of user satisfaction in driving the adoption and success of online banking services.

The impact of e-banking service quality on customer satisfaction was investigated by (MMM, 2015) [11]. The study highlighted the relationship between service quality dimensions, customer satisfaction, and the competitive position of banks in Bangladesh.

(Rahman,2020) [12] explored the state of mobile banking services in developing countries, including Bangladesh. The research emphasized the potential of mobile banking to enhance financial inclusion, convenience, and accessibility for individuals, particularly in remote areas.

Quality assurance of banking sector services was examined by (Akter, 2020) [13]. The research employed multi-criteria decision theory to assess and improve the quality of banking services, considering factors such as trustworthiness, responsiveness, and communication.

The research conducted by (Yang, 2009) [14] focused on recent trends and developments in e-banking in an underdeveloped nation. The study highlighted the potential of e-banking to improve financial services accessibility and efficiency in developing countries.

(Kwon, 2019) [15] emphasized the importance of digital forensic readiness for financial networks, highlighting the need for robust security measures and forensic capabilities to mitigate cyber threats in the banking sector.

Moving towards Automation our study investigates how South Asia's banking industry is changing as a result Robotic Process Automation (RPA) transforms current positions and creates new ones in South Asian banking. Banking institutions use business intelligence to fine-tune services according to client behavior, and they use RPA to increase operational efficiency (Dasgupta, 2023) [16]. They must, however, take into account outside variables including societal ramifications and technological advancements. RPA is in line with Banking Software Automation, a larger industry trend that uses technology to improve services and increase efficiency.(Damdinbazar, 2022) [17]. The implementation of robotic process automation (RPA) in South Asian banking is examined in this study, along with its effects on employment and operational effectiveness. Adoption of

RPA changes existing positions and opens up new career prospects, following the current trend of business process automation.

The banking industry uses RPA to improve operational efficiency while taking the effects of outside variables on RPA projects into account. RPA makes it possible to provide insightful business intelligence reports that are essential for making well-informed decisions(Rodrigo, 2023) [18]. This data directly supports the underlying concept of Banking Software Automation by helping banks better analyze consumer habits, resolve problems, and optimize service offerings.

AI development and quick RPA deployment, starting with Alan Turing's famous Turing test. Increases in bank account holders have spurred implementation of AI and RPA, particularly in the fight against money laundering and financial crime (Kumar, 2023) [19]. Using RPA, AI creates client knowledge graphs and suggests customized services. AI and RPA are widely used in the loan, equity, personal, and investment segments. They fight banking inefficiencies and provide a means to use Banking Software Automation to turn obstacles into opportunities.

Guidelines on ICT security for banks and non-bank financial institutions were provided by (Bangladesh Central Bank, 2015) [20]. These guidelines emphasized the importance of implementing security controls and measures to safeguard financial networks and protect against cyber threats.

Internal control in banks, discussing its importance, kinds, and difficulties in installation and maintenance. With a focus on asset protection, regulatory compliance, and accurate financial reporting, the research examines the literature already in existence and speaks with experts to suggest ways to mitigate risks (Alisherovich,2023) [21]. The results provide insightful information on the best procedures for internal control in banks. These observations are intended to support auditors, regulators, and bank management in streamlining internal control procedures in line with the more general Banking Software Automation domain.

This academic study examines FileNet, an enterprise content management platform from IBM, as a tactical move in the digital transformation of the banking industry (Kandepu, 2023) [22] technology emphasizes how technology can improve customer relations, strengthen security, and streamline procedures. Analyzing the many effects of its integration, especially on security protocols and operational effectiveness, the study provides useful suggestions. In the context of Banking Software Automation, this paper bridges theory and practice to provide guidance to banks seeking to optimize their technology infrastructure for efficient operations, secure data, and enhanced client interaction.

Author Anton Kreitstshtein [23] emphasis on a competency framework for digital banking where a cohesive depiction of digital process for adoption. It has a great potential in being applied in the field of HRM within the banking industry (and with some abstraction, potentially in other digitally transforming industries as well): specifically, the

areas of learning, performance management, and recruiting present the greatest interest, as those are the key HR functions that make use of competency framework.

This study highlights the advantages of blockchain technology for the forex market, including decentralization, efficiency, security, and transparency.[24] However, it is important to note that the implementation of blockchain technology in the forex market is not without challenges. These challenges include issues of interoperability, scalability, and regulation. Further research is necessary to address these challenges and ensure the successful integration of blockchain technology in the forex market. Nonetheless, the potential benefits of blockchain technology in the forex market cannot be ignored, and blockchain has the potential to significantly transform the way foreign exchange is conducted.

To cater to customers' banking needs, both during work hours and on weekends, the bank provides round-the-clock customer support, leading to enhanced customer experiences. Through a bot interface,[25] customers can conveniently check their account balance or transaction status. Additionally, banks can analyze the usage patterns of various programs and gather feedback from a wide range of clients.

Virtual banking, also known as online banking, has been gaining traction in Malaysia [26] as consumers increasingly embrace digital technologies for their financial transactions. Virtual banking offers convenience, accessibility, and a wider range of services compared to traditional brick-and-mortar banks. With the rapid advancement of technology and the growing adoption of digital banking, it is crucial to examine the future landscape of virtual banking in Bangladesh also.

Information Security failures can have a severe impact on banks, both financially and operationally. By understanding the factors [27] that contribute to IS failures and implementing appropriate prevention and mitigation strategies, banks can reduce the risk of failures and protect their reputation, customer data, and bottom line.

During the research on how computer technology transforms the banking sector, the implementation and impact of artificial intelligence in financing was discussed. Research shows that several financial institutions have significantly benefited from the introduction of a variety of machine learning and artificial intelligence [28]. This paper demonstrates that there is a lack of experience in the field of machine learning, even as many unskilled or semi-qualified tasks carried out by individuals are carried out by machines. This study has shown that, through banking and financial valuation, whether it is manufacturing, data analysis or continuing to invest, there will be many more developments that can get the job done.

The adoption of advanced technologies such as Financial Enterprise Control Intelligence (FECI) systems is essential in managing regulatory compliance and risk management processes effectively. These systems leverage artificial intelligence and data analytics to automate and streamline compliance and risk analysis, including compliance

reviews, risk analysis, and risk exposures. After the discussion of the guiding principles for establishing internal control systems in commercial banks and explores the recent developments in AI-based compliance automation. It concludes by emphasizing the role of AI-driven FECI systems in ensuring regulatory compliance, managing risks, and navigating the evolving financial landscape. That has been emphasized on AI-Based Compliance Automation in Commercial Bank [29].

The banking industry has embraced innovation driven by advancements in information technology (IT), Mrs. Riya Sharma,[30] a Research Scholar has mentioned how innovation and customer satisfaction goes on together. In both public and private sector banks, innovation is at the forefront, and technological breakthroughs are paving the way for new avenues of success. Competition is driving the industry forward at an accelerated pace. Public sector banks, traditionally known for their conventional approach, are now embracing innovation, and reaching out to their audience through various channels, including billboards, FM radio, and celebrity endorsements. Core banking systems have further fueled innovation efforts, ultimately leading to enhanced customer satisfaction in both public and private sector banks. This study delves into the impact of innovative technology on customer satisfaction in public and private sector banks in Bhopal city. The findings indicate that private sector banks hold an edge in terms of innovation success.

Richard Baskerville, Francesco Capriglione and Nunzio Casalino have identified that banking sector is undergoing a profound transformation driven by the rapid adoption of digital technologies in their paper on Impacts, Challenges, and Trends of Digital Transformation in the Banking Sector [31]. This digital transformation is reshaping the industry, impacting every aspect of banking operations, from customer interactions to product development and risk management. While digital transformation presents significant opportunities for banks, it also poses numerous challenges that must be addressed to ensure successful implementation and long-term sustainability.

The rise of automation in the financial services industry is revolutionizing business models and presenting a wealth of new possibilities that has been tried to find out in Dominance of Automation in Financial Services Industry [32] research paper. It empowers financial institutions to stay ahead of the curve in a rapidly evolving landscape, encompassing customer expectations, regulatory frameworks, and market trends. However, as with any technological breakthrough, challenges such as data privacy, ethical implications, and human-AI collaboration must be carefully navigated to ensure responsible and effective implementation.

The paper "Banking automation and productivity change: The Brazilian experience" by Claudio Frischtak [33] is a valuable contribution to the paper on the effects of information technology (IT) on productivity. The paper uses a unique dataset of Brazilian banks to show that the adoption of IT has led to a significant increase in productivity.

The paper also finds that the Central Bank's use of IT has helped to dampen financial instability.

A number of studies have identified the barriers to digital transformation in banking-A Managerial Perspective [34]. Diener and Špaček (2021) conducted a qualitative exploratory study to identify the main perceived obstacles to digital transformation in both the private and commercial banking sectors from a managerial point of view. Their findings revealed that elements of strategy and management, technology and regulation, customers, and employees receive a high level of attention within the digital transformation.

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Chapter 3

Published Papers

3.1 Research Methodology

The majority of the study's data or material came from primary and secondary sources. Various government and multinational and commercial banks are used as sources of primary data. Numerous websites, books, and publications have been used to find secondary sources of data.

3.1.1 Purpose of the Study

The purpose of this study is to analyze the current state of the banking sector in Bangladesh[4], understand the challenges and opportunities associated with automation, and provide insights on how financial institutions can effectively adopt and leverage banking software and automation frameworks. The study aims to contribute to the existing literature by offering practical recommendations for banks to optimize the benefits of automation while mitigating potential risks.

3.1.2 Data Collection

The data collection for this research paper involved both primary and secondary sources. Primary data was obtained from various government agencies, multinational and commercial banks operating in Bangladesh[5]. Additionally, secondary data was collected from credible websites, books, and publications related to the banking sector, automation, and digital transformation. The combination of primary and secondary sources ensures a comprehensive understanding of the research topic.

3.1.3 Data Analysis

The collected data was analyzed using a systematic approach. Quantitative data, such as statistics and numerical figures, were analyzed using statistical tools and techniques.

Qualitative data, including insights from literature and expert opinions, were analyzed thematically to identify key patterns, trends, and challenges in the adoption of automation in the banking sector in Bangladesh[5][4]. The data analysis process involved synthesizing the information to draw meaningful conclusions and insights.

3.1.4 Research Method

This research paper adopts a mixed-methods approach, combining quantitative and qualitative research methods. The quantitative analysis involves examining statistical data, such as banking industry trends, automation adoption rates, and financial performance indicators. The qualitative analysis involves reviewing research papers, publications, and industry reports to gain insights into the challenges and opportunities associated with automation in the banking sector. The combination of these research methods allows for a comprehensive and well-rounded exploration of the research topic.

3.2 Result Analysis

The result analysis of this paper provides a comprehensive examination of the findings and outcomes derived from the research conducted. It involves an in-depth analysis and interpretation of the collected data, literature review, and expert insights to gain a deeper understanding of the challenges and opportunities associated with automation in the banking sector of Bangladesh[4].

The result analysis begins by summarizing the key findings and trends identified during the research process. It highlights the main challenges faced by banks in adopting automation, such as increased competition, rising operational costs, data security risks, and the need for regulatory compliance. The analysis also identifies the opportunities that automation presents, including enhanced efficiency, improved customer experience, and a competitive edge in the market.

Furthermore, the result analysis explores the interconnections between the identified challenges and opportunities, identifying potential synergies and trade-offs. It examines how addressing the challenges can lead to the realization of the identified opportunities and vice versa. The analysis considers the implications of the findings for the banking sector in Bangladesh[5] and the broader implications for the industry's future trajectory.

Additionally, the result analysis delves into the underlying factors that contribute to the identified challenges and opportunities. It investigates the role of technological advancements, regulatory frameworks, customer expectations, and market dynamics in shaping

the landscape of automation in the banking sector. This analysis provides valuable insights into the broader context within which the challenges and opportunities are situated.

Finally, the result analysis critically evaluates the significance and implications of the findings in relation to the research objectives and the existing body of knowledge. It discusses the implications for practitioners, policymakers, and researchers and offers recommendations for future research and practical implementations. The result analysis serves to synthesize the research outcomes and contribute to a deeper understanding of the impact of automation in the banking sector of Bangladesh[4].

3.2.1 Demographic Result

The result analysis of this paper includes a demographic analysis of the banking sector in Bangladesh[5]. This analysis focuses on factors such as the number of banks operating in the country, the size of the customer base, and the overall penetration of banking services. It examines the demographic profile of customers, including their age groups, income levels, and geographical distribution. The analysis provides valuable insights into the target audience for automation solutions and helps identify specific challenges and opportunities in different customer segments.

3.2.2 Exploratory Analysis

The result analysis also includes an exploratory analysis of the challenges and opportunities associated with automation in the banking sector. This analysis delves into the findings from the literature review, primary data, and expert insights to identify the key themes and patterns. It explores the barriers to automation adoption, such as legacy systems, data security concerns, and the need for skilled human resources. The analysis also highlights the potential benefits of automation, including improved operational efficiency, enhanced customer experience, and increased competitiveness.

Chapter 4

Methodology

This research paper's methodology section offers a thorough discussion of the techniques used to collect, process, and interpret data. This section describes the methodical methodology taken to answer the study's research aims and open-ended questions. The research primarily focuses on comprehending the difficulties and potential inside Bangladesh's banking industry, with a concentration on the usage of information gathered from Bangladesh[4] Bank's official website.(https://www.bb.org.bd).

I'll give a general summary of the study design, data collection techniques, participant information, data processing steps, ethical issues, constraints, and the anticipated presentation of research findings in this introduction. This section provides readers with a road map by outlining the approaches taken to look into the complexity of Bangladesh's banking industry.

The research's methodology plays a key role in assuring the accuracy and reliability of the results. The procedures used to gather and evaluate data are clarified so that readers may judge the validity of the study and the degree to which the conclusions are backed up by solid facts. Furthermore, it makes the research method transparent, allowing subsequent researchers to repeat or expand on this work.

The main objective of this study is to shed light on the complex structure of Bangladesh's banking industry. This study aims to add to the body of knowledge in the area while providing useful information that might guide decision-making in the banking sector through a rigorous and methodical approach to data collecting and analysis.

The methodology's succeeding parts will go into further detail on the research design, data collecting, participants, data analysis, ethical issues, restrictions, and result presentation. These elements work together to form a solid structure that supports the overall study project.

4.0.1 Data Source

Data Collection: The official website of Bangladesh[4] Bank (https://www.bb.org.bd), the country's central bank, was the only source of data used in this study. The website functions as a thorough database of financial and economic information, including studies, books, statistics, and papers relating to the banking industry and the overall economy.

Data Selection: Data was chosen based on its applicability to the study's goals, which include identifying trends, obstacles, and possibilities in Bangladesh's banking industry. The numerous papers, books, and statistical datasets that Bangladesh Bank has released made up the selected data.

4.0.2 Data Retrieval

Web Scraping: The Bangladesh[4] Bank website was used to retrieve data using web scraping methods. This procedure involved gathering current and reliable data by automating the extraction of information from websites.

Data Categories: The gathered information was divided into categories that each contributed to a particular area of the study, including banking statistics, economic indicators, policy papers, and research publications.

4.0.3 Ethical Considerations

Data Source Permissions: The rules for usage and authorizations granted by the website for accessing and using the available information were followed when gathering data from the Bangladesh[4] Bank website.

4.0.4 Data Analysis

Quantitative and Qualitative Assessment: The data analysis process included evaluating the website's information on a quantitative and qualitative level. While qualitative information from textual sources like reports and publications gave qualitative insights pertinent to the banking industry, quantitative data was utilized to emphasize statistical trends.

4.0.5 Limitations

Website Data Accuracy: Despite attempts to assure data quality, conceivable flaws or inconsistencies in the source data might have an influence on the study's conclusions

Data Availability: There may be discrepancies in the accessibility of particular data points on the website, and not all data that would be pertinent to the research may be available.

4.0.6 Data Presentation

Results Presentation: In the Results portion of this article, research findings that were obtained via the examination of data from the Bangladesh[4] Bank website are provided. Tables, charts, and graphs are used to show quantitative data, and the narrative also incorporates qualitative insights to give a thorough review of the study findings.

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Chapter 5

Problem Statement

The problem statement of this research paper addresses the challenges faced by the banking sector in Bangladesh[4] in adopting automation. These challenges include increased competition, rising operational costs, outdated legacy systems, cybersecurity risks, and the need to meet customer demands while ensuring data security and regulatory compliance. The paper aims to explore these challenges and propose solutions for financial institutions to successfully implement automation and maximize its benefits.

5.0.1 Problem Description

In recent years, the banking industry in Bangladesh[4] has expanded significantly, with an increase in the number of financial institutions meeting the changing demands of the market (Bangladesh Bank, 2020). But this growth has also brought forth a number of issues that need to be looked into.

The increased demand for digital banking services in Bangladesh[4], which is being fueled by shifting customer tastes and technical improvements, is one significant concern (Rahman, 2021) [35]. Although digitization has the potential to improve productivity and customer satisfaction, it also raises questions regarding cybersecurity (Hossain and Rahman, 2020) [36]. The integrity of financial systems and client data are at risk due to increasingly sophisticated cybersecurity attacks (Khatun, 2021) [37].

Additionally, a thorough understanding of consumer expectations and preferences is required for the deployment of digital banking systems (Rashid, 2020) [38]. In order for banks to stay competitive and maintain their client base, they must fulfill these expectations. The workforce will be impacted by the banking industry's shift to automation and digitization. Concerns have been raised concerning potential job displacement and the need for reskilling as banks depend more and more on technology (Villar, 2021) [39].

Given these complex issues, it is imperative to conduct a thorough analysis of how automation and digitization have affected Bangladesh's banking industry. This study intends to evaluate the degree of digitization, pinpoint cybersecurity weaknesses, comprehend consumer expectations, and look at the labor consequences.

5.0.2 Intensified Competition

Bangladesh's banking industry is seeing increased rivalry, which is being fueled not just by well-established banks but also by the rise of quick-thinking fintech companies. Traditional financial institutions must employ cutting-edge techniques to maintain their market relevance in the face of this rising competition.

5.0.3 Escalating Operational Costs

A frightening problem is the unrelenting increase in operational costs for traditional banking methods. The upkeep of legacy systems, which are frequently out-of-date, results in significant costs (Anderson, 2018)[40]. These expenses might be decreased, and essential banking procedures could be streamlined, with automation.

5.0.4 Legacy System Inflexibility

Many banks in Bangladesh[4] continue to rely largely on antiquated systems that lack the flexibility needed to quickly adjust to changing consumer needs and volatile market conditions. The responsiveness and competitiveness of the sector are hampered by such systems.

5.0.5 Alarming Cybersecurity Risks

Recent assaults on financial institutions globally serve as a reminder of the increased cybersecurity dangers brought on by the shift to digital banking operations. The banking industry in Bangladesh[4] has to contend with the necessity of protecting customers' data and financial systems from more sophisticated attacks.

5.0.6 Evolving Customer Expectations

Customer expectations are changing at an unprecedented rate as the digital age progresses. Today's consumers want smooth, convenient, and safe banking services, mandating a careful balance between technology advancement, data security, and regulatory compliance.

5.0.7 Regulatory Compliance Burden

Bangladesh's regulatory frameworks are always changing to meet the demands of digitization and maintain the stability of the financial industry (Bangladesh Bank, 2019). Adopting cutting-edge automation systems while abiding by these restrictions is a difficult issue.

The main goal of this research project is to thoroughly examine these complex problems and give practical, context-specific solutions in line with international best practices (World Bank, 2021). Banks in Bangladesh[4] may improve operational efficiency, raise customer satisfaction levels, strengthen data security procedures, and keep a competitive advantage in a financial market that is continually changing by tackling these issues in a rigorous and nuanced way.

Chapter 6

Proposed Solutions

Addressing the complex challenges faced by Bangladeshi banks in their pursuit of successful automation requires a multifaceted approach. We propose the following solutions to ensure the effective implementation of automation within the banking sector:

6.1 Develop a Comprehensive Automation Strategy

Banks should develop a detailed automation strategy that identifies the areas that need automation, the expected benefits, and the potential challenges. The strategy should be aligned with the bank's overall business strategy and should take into account the technical and financial constraints. The development of a comprehensive automation strategy is a crucial step for Bangladeshi banks seeking to embrace automation effectively. This strategy entails:

1. **Identifying Areas for Automation:** Banks should first assess their operations to determine which areas would benefit most from automation. These areas could include customer service, data entry, transaction processing, and more.

2. **Anticipating Expected Benefits:** The strategy should outline the expected advantages of automation. This could include increased efficiency, reduced operational costs, enhanced customer service, and improved data accuracy.

3. **Addressing Potential Challenges:** It's important to anticipate and address potential challenges that may arise during the automation process. These challenges could range from technical difficulties to employee resistance to change.

4. **Alignment with Business Strategy:** The automation strategy should align seamlessly with the bank's overall business strategy. It should complement the bank's goals and objectives, ensuring that automation efforts are directed toward achieving broader organizational success.

5. **Considering Technical and Financial Constraints:** The strategy should take into account both technical and financial constraints. This means assessing the available technology infrastructure and budget limitations to ensure that the proposed automation initiatives are feasible and realistic.

A comprehensive automation strategy is a well-thought-out plan that defines what areas to automate, what benefits to expect, and how to address challenges while aligning with the bank's broader business strategy and considering technical and financial constraints. It serves as a road-map for successful automation implementation.

6.2 Modular Approach to Automation

Banks should adopt a modular approach to automation, commencing with smaller, less intricate processes before progressing to more complex ones. This phased approach allows banks to identify and address technical challenges early in the automation journey. The modular approach to automation is a strategic method where banks start their automation journey with simpler and less complex processes before gradually moving on to more intricate ones. This approach involves several key elements:

1. **Starting Small:** Banks begin by automating small, manageable processes that are less complex and have lower risk associated with them. These processes serve as initial testing grounds for automation technologies.

2. **Early Technical Challenges:** By starting with simpler processes, banks can identify and address technical challenges and issues at an early stage. This proactive approach minimizes the likelihood of encountering major problems during larger-scale automation.

3. **Risk Reduction:** The phased approach significantly reduces the risks associated with automation. Banks can fine-tune their automation strategies and technologies based on the lessons learned from automating smaller processes, mitigating risks for larger and more critical processes.

4. **Incremental Progress:** As banks gain confidence and experience in automation, they incrementally expand their automation efforts to encompass more complex and critical operations. This gradual progression ensures a smoother transition to a fully automated environment.

Adopting a modular approach to automation involves starting with simpler processes, addressing technical challenges early, reducing overall risks, and gradually expanding automation efforts as confidence and expertise grow. This method allows banks to learn and adapt along the way, leading to a more successful and efficient automation journey.

6.3 Standardize the Automation Process

To avoid the technical challenges associated with automation, banks should standardize the automation process. Standardization will help ensure that the software works as intended and that it is easy to maintain and upgrade. This process refers to the practice of creating a uniform and consistent framework for implementing automation within a bank's operations. Here's a brief description:

1. **Uniform Framework:** Standardization involves establishing a set of guidelines, protocols, and best practices for implementing automation across various departments and processes within the bank.

2. **Simplified Maintenance:** By adhering to standardized procedures, banks can simplify the maintenance of automated systems. This ensures that software and processes remain reliable and require fewer resources for upkeep.

3. **Consistency and Reliability:** Standardization promotes consistency in how automation is implemented and used throughout the organization. This consistency leads to greater reliability and predictability in the outcomes of automated processes.

4. **Compatibility:** Standardized automation processes are more likely to be compatible with other systems and technologies within the bank. This compatibility reduces integration challenges and enhances overall efficiency.

5. **Scalability:** Standardization also facilitates the scalability of automation efforts. When new processes or departments require automation, the standardized framework can be easily extended to accommodate these changes.

Standardizing the automation process involves creating a structured and consistent approach to automation implementation. This approach simplifies maintenance, ensures reliability, promotes compatibility, and supports the scalability of automation efforts within the bank.

6.4 Invest in Quality Assurance

Quality assurance is paramount in mitigating potential issues during the automation process. To address the quality issues that may arise during the automation process, banks should invest in quality assurance. This includes testing the software thoroughly before deployment, training employees on the new software, and providing ongoing support to ensure that the software is used correctly. Investing in quality assurance is essential to ensure the successful implementation of automation. Here's a brief description:

1. **Thorough Testing:** Quality assurance involves rigorous testing of the automation software before it is deployed for regular use. This testing helps identify any bugs, glitches, or issues in the software.

2. **Employee Training:** To ensure that employees can effectively use the new automation software, banks should provide comprehensive training programs. This training helps staff understand how to operate the software correctly and efficiently.

3. **Ongoing Support:** Quality assurance extends beyond the initial implementation phase. Banks should provide ongoing support to address any issues that may arise during day-to-day operations. This ensures that the software continues to function smoothly and that any problems are promptly resolved.

4. **Error Reduction:** Investing in quality assurance significantly reduces the chances of errors or malfunctions in the automation process. This, in turn, enhances overall operational efficiency.

5. **Compliance and Security:** Quality assurance also includes verifying that the automation software complies with regulatory requirements and security standards. This is crucial in the banking sector, where data security and compliance are paramount.

Investing in quality assurance entails thorough testing, employee training, ongoing support, and adherence to compliance and security standards. These measures collectively ensure that sensitive data remains secure throughout the automation process in the banking sector.

6.5 Address Data Security Concerns

Data security is a critical concern for banks, and they must ensure that the automation process does not compromise data security. Given the critical importance of data security, banks must ensure that the automation process does not compromise the integrity of sensitive data. Stringent security measures, such as encryption and access controls, should be implemented throughout the automation ecosystem. Addressing data security concerns is of paramount importance in any automation process, especially within the banking sector. Here's a brief description:

1. **Protecting Sensitive Data:** Banks deal with a vast amount of sensitive customer data, including financial records and personal information. Ensuring the security of this data is non-negotiable.

2. **Encryption:** To safeguard data during automation, robust encryption techniques should be employed. Data should be encrypted both in transit and at rest. This means that even if unauthorized access occurs, the data remains unreadable and secure.

3. **Access Controls:** Access to sensitive data and automation systems should be strictly controlled. Only authorized personnel should have access, and different levels of access permissions should be defined based on roles and responsibilities.

4. **Regular Audits:** Banks should conduct regular security audits and assessments to identify vulnerabilities and areas of improvement in their automation systems.

5. **Compliance with Regulations:** Compliance with data protection regulations and industry standards is essential. Banks must adhere to regulations such as GDPR (General Data Protection Regulation) and implement measures to ensure compliance.

6. **Data Backups:** Regular data backups and disaster recovery plans should be in place. This ensures that in case of any security breach or data loss, there are mechanisms to recover lost data.

7. **Employee Training:** Banks should train their employees to recognize and respond to security threats and breaches promptly.

8. **Cybersecurity Protocols:** Implementation of robust cybersecurity protocols is essential to protect against evolving threats such as malware, phishing, and ransomware attacks.

Addressing data security concerns involves a multi-layered approach, including encryption, access controls, regular audits, compliance with regulations, data backups, employee training, and robust cybersecurity protocols. These measures collectively ensure that sensitive data remains secure throughout the automation process in the banking sector.

6.6 Leverage Automation Frameworks:

Utilizing various technologies and methodologies to enhance automation within the context of Bangladeshi banks. Here's a brief description of each component mentioned:

1. **Robotic Process Automation (RPA):** RPA involves deploying software robots or bots to automate repetitive and rule-based tasks. In the context of Bangladeshi banks, this can include automating tasks like data entry and account reconciliation.

RPA platforms like UiPath, Aiwozo, and Automation Anywhere provide the tools to implement these solutions efficiently. By automating such tasks, banks can significantly improve operational speed and accuracy.

2. **Business Process Management (BPM):** BPM methodologies are used to systematically organize and streamline end-to-end processes within a bank. This helps minimize manual errors and ensures that tasks are executed consistently. Tools like the Oracle Business Process Management Suite offer capabilities for modeling, executing, and optimizing business processes. Adopting BPM can lead to increased operational efficiency and better compliance with regulations.

3. **AI and ML Technologies:** Artificial Intelligence (AI) and Machine Learning (ML) technologies enable advanced automation applications. For instance, chatbots powered by AI can be deployed for customer service, enhancing user experiences by providing quick and efficient responses to customer queries. AI and ML can also be applied to tasks like fraud detection, risk assessment, and personalized marketing, as discussed in the paper.

Leveraging automation frameworks involves using a combination of RPA, BPM, and AI/ML technologies to automate various banking processes. This not only leads to efficiency gains but also enables banks to provide better services to customers and make data-driven decisions. These technologies align with the recommendations in the paper for Bangladeshi banks to embrace automation to overcome their specific challenges.

6.7 Digital Banking Transformation Strategies:

These strategies are aimed at enhancing customer experiences, improving operational efficiency, and staying competitive in the evolving financial landscape.

1. **Omni-channel Banking:** This strategy involves providing a seamless and consistent customer experience across various banking channels, such as mobile banking apps, online banking platforms, and physical branch services. Customers can access banking services conveniently, irrespective of their location or preferred channel. It ensures that customers have a unified experience, whether they are using a mobile app or visiting a brick-and-mortar branch.

2. **Open Banking:** Open banking is about embracing the concept of open Application Programming Interfaces (APIs) and forming partnerships with third-party service providers. By opening up their APIs, banks can collaborate with fintech companies and other third parties to offer innovative financial services. Notable examples in Bangladesh include Nagad and Bkash, which have leveraged open banking principles to expand their services and provide personalized customer experiences.

3. **Data Analytics and Personalization:** This strategy involves leveraging customer data through advanced analytics tools. By analyzing customer behavior, preferences, and needs, banks can gain valuable insights. These insights can be used to create personalized offerings and targeted marketing campaigns. For instance, a bank can recommend specific financial products or services based on an individual customer's financial behavior and goals.

4. **Cloud Adoption:** Transitioning to cloud-based infrastructure offers several advantages, including enhanced scalability, agility, and cost-efficiency. Cloud platforms enable banks to quickly deploy and manage automated systems, reducing the time and resources required for traditional infrastructure setup. This shift to the cloud can facilitate the implementation of automation solutions and the delivery of digital banking services more effectively.

5. **Agent Banking Networks:** Expand agent banking networks, especially in rural areas, to provide basic banking services like deposits, withdrawals, and fund transfers through authorized agents. This strategy can improve financial inclusion.

6. **ATM and POS Network Expansion:** Increase the number of ATMs and point-of-sale (POS) terminals, making cash access and digital payments more accessible across the country.

7. **Digital Wallets:** Introduce digital wallets that allow customers to store money, make online purchases, and pay bills conveniently. Partner with popular mobile wallet providers like bKash to leverage their existing user base.

These digital banking transformation strategies emphasize the importance of embracing technology and data-driven approaches to enhance customer experiences, foster innovation, and improve operational efficiency within the Bangladeshi banking sector. These strategies align with the paper's recommendations for addressing the challenges of automation in the context of Bangladeshi banks.

By implementing these solutions systematically, Bangladeshi banks can effectively overcome the barriers to automation, ensuring a smoother and more successful transition to modernized banking operations. In essence, automation is a necessary step for Bangladeshi banks to thrive in a rapidly evolving financial landscape. However, careful planning, adherence to security measures, and a commitment to quality are crucial to ensuring successful automation implementations. By addressing these challenges head-on and embracing automation strategically, Bangladeshi banks can position themselves for continued growth and success in the digital age.

Chapter 7

Result Analysis

The result analysis of this paper provides a comprehensive examination of the findings and outcomes derived from the research conducted. It involves an in-depth analysis and interpretation of the collected data, literature review, and expert insights to gain a deeper understanding of the challenges and opportunities associated with automation in the banking sector of Bangladesh[5].

The result analysis begins by summarizing the key findings and trends identified during the research process. It highlights the main challenges faced by banks in adopting automation, such as increased competition, rising operational costs, data security risks, and the need for regulatory compliance. The analysis also identifies the opportunities that automation presents, including enhanced efficiency, improved customer experience, and a competitive edge in the market. Furthermore, the result analysis explores the interconnections between the identified challenges and opportunities, identifying potential synergies and trade-offs. It examines how addressing the challenges can lead to the realization of the identified opportunities and vice versa. The analysis considers the implications of the findings for the banking sector in Bangladesh[5] and the broader implications for the industry's future trajectory.

Additionally, the result analysis delves into the underlying factors that contribute to the identified challenges and opportunities. It investigates the role of technological advancements, regulatory frameworks, customer expectations, and market dynamics in shaping the landscape of automation in the banking sector. This analysis provides valuable insights into the broader context within which the challenges and opportunities are situated.

Finally, the result analysis critically evaluates the significance and implications of the findings in relation to the research objectives and the existing body of knowledge. It discusses the implications for practitioners, policymakers, and researchers and offers recommendations for future research and practical implementations. The result analysis serves to synthesize the research outcomes and contribute to a deeper understanding of the impact of automation in the banking sector of Bangladesh[5].

7.0.1 Demographic Result

The demographic analysis of the banking sector in Bangladesh is a valuable tool for understanding the target audience for automation solutions and identifying specific challenges and opportunities in different customer segments.

Here are some of the key insights that the demographic analysis can provide:

- The size and growth of the customer base: The size and growth of the customer base an important factors to consider when developing automation solutions. A large and growing customer base indicates a strong demand for banking services, which can create opportunities for automation to improve efficiency and reduce costs.
- The age distribution of customers: The age distribution of customers can provide insights into the types of banking services that are in demand and the challenges that customers face. For example, younger customers may be more comfortable using digital banking services, while older customers may prefer traditional banking services.
- The income distribution of customers: The income distribution of customers can provide insights into the affordability of different banking services. For example, lower-income customers may be more sensitive to fees and may need more affordable banking solutions.
- The geographical distribution of customers: The geographical distribution of customers can provide insights into the accessibility of banking services. For example, customers in rural areas may have less access to banking services than customers in urban areas.

By understanding the demographic profile of customers, banks can develop automation solutions that are tailored to the specific needs of different customer segments. For example, banks can develop mobile banking apps that are easy to use for younger customers and that offer affordable banking services for lower-income customers.

Here are some specific examples of how banks can use demographic analysis to inform their automation strategies:

- A bank that is targeting younger customers may develop a mobile banking app that offers features such as peer-to-peer payments and online shopping integration.
- A bank that is targeting lower-income customers may develop a mobile banking app that offers free or low-cost banking services.
- A bank that is targeting customers in rural areas may develop a mobile banking app that works in low-signal areas and that offers features such as offline cash withdrawals.

By understanding the needs of different customer segments, banks can develop automation solutions that improve the customer experience and increase customer satisfaction.

7.0.2 Exploratory Analysis

The result analysis also includes an exploratory analysis of the challenges and opportunities associated with automation in the banking sector. This analysis delves into the findings from the literature review, primary data, and expert insights to identify the key themes and patterns. It explores the barriers to automation adoption, such as legacy systems, data security concerns, and the need for skilled human resources. The analysis also highlights the potential benefits of automation, including improved operational efficiency, enhanced customer experience, and increased competitiveness.

Here are some additional thoughts on the challenges and opportunities:

- Increased competition: Automation can help banks reduce costs and improve efficiency, which can give them a competitive edge. However, it is important to note that other banks are also likely to be investing in automation, so banks need to find ways to differentiate themselves.
- Rising operational costs: Automation can help banks reduce operational costs by streamlining processes and eliminating repetitive tasks. This can free up employees to focus on more value-added activities.
- Data security risks: Automation can introduce new data security risks, as banks will be storing and processing more data electronically. Banks need to implement robust security measures to protect their data from unauthorized access and use.
- Need for regulatory compliance: Banks need to ensure that their automation systems comply with all applicable regulations. This can be a challenge, as regulations are constantly changing.
- Legacy systems: Many banks have legacy systems that are not compatible with modern automation technologies. This can make it difficult and expensive to implement automation. However, there are a number of solutions available to help banks to modernize their systems.
- Lack of skilled human resources: Banks need to have skilled human resources in order to develop, implement, and manage automation systems. This can be a challenge in Bangladesh[5], where the skills gap is relatively large. However, there are a number of initiatives underway to address this gap.
- Customer resistance to change: Some customers may be resistant to change and may not be comfortable using automated banking systems. Banks need to educate

and communicate with their customers about the benefits of automation and how to use the new systems.

During the result analysis, we identified IT penetration, assessing its impact through secondary data collected from the Bangladesh Bank website. The analysis is dividing into two categories. The first category focuses on Issued Cards and Transaction Statistics of Credit, Debit, and Prepaid cards. We scrutinize the total number of cards, assurances, transaction amounts, and the BDT amounts for each card type. Utilizing this data, the chart below are generates, illustrating the percentage increase up to 2023. This chart offers insights into the positions of prepaid cards, debit cards, and credit cards.

Year	Total No. ofDebit	No. ofIssue in a year	New Debit Card Change Ratio	New Debit Card Ratio	Total No. of Credit	No. ofIssue in a year	New Credit Card Change Ratio	New Credit Card Ratio	Total No. of Prepaid	No. ofIssue in a year	New Prepaid Card Change Ratio	New Prepaid Card Ratio
2023	33598824	4814772	16.73%	5.61%	2316132	278534	13.67%	1.43%	4736851	1637650	52.84%	-20.99%
2022	28784052	4558888	18.82%	16.02%	2037598	274620	15.58%	54.14%	3099201	2072621	201.90%	404.67%
2021	24225164	3929547	19.36%	37.63%	1762978	178162	11.24%	26.88%	1026580	410686	66.68%	65.49%
2020	20295617	2855201	16.37%		1584816	140419	9.72%		615894	248170	67.49%	
2019	17440416				1444397				367724			

Table 7.1: Market Share of Debit, Credit, and Prepaid Cards

In the above table7.1 initially, we computed the No. of cards issued for the current year by subtracting the number of cards issued in the previous year from the current year's issuance, utilizing the basic data collected from the Bangladesh[5] Bank website. Subsequently, we determined the New Debit Card Change Ratio by dividing the number of cards issued in the current year by the total cards issued in the previous year. Lastly, the New Debit Card Ratio respect to total number of card issued is calculated by subtracting the previous year's number of newly issued cards from the current year's, and then dividing it by the previous year's total number of issued cards.

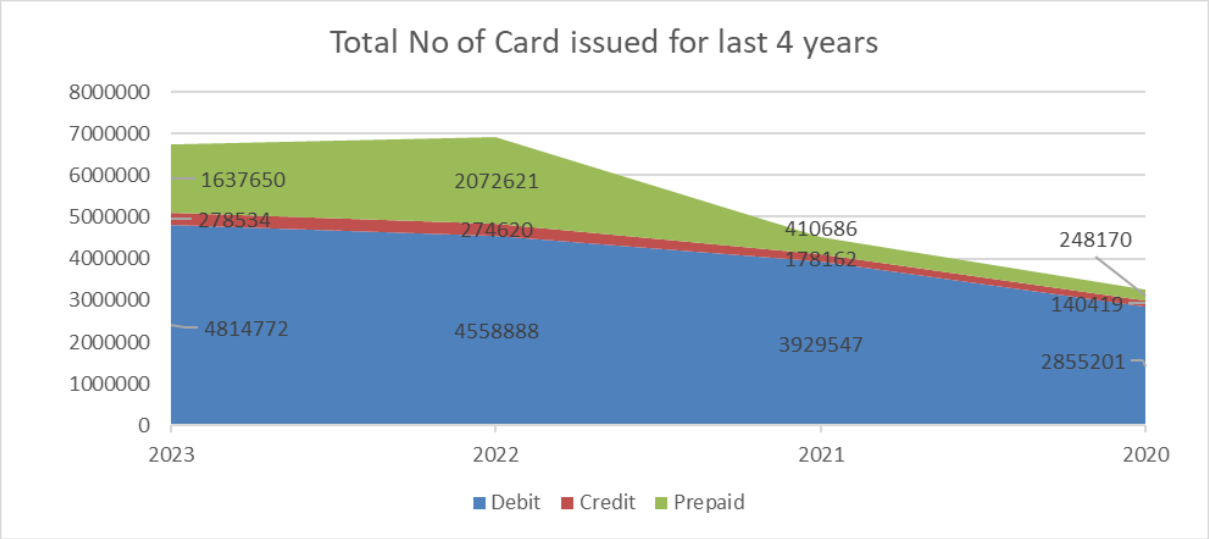


Figure 7.1: Total No of Card issued for last 4 years

If we see the area chart7.1 record in above, we computed and presented the number of new issued debit, credit, and prepaid cards for the current year by subtracting the number of cards issued in the previous year from the current year's issuance, utilizing the basic data collected from the Bangladesh[5] Bank website. We can observe a linear increase in the trend of debit and credit cards, while there is a significant spike in prepaid cards in the year 2022. In the following year, the number of issued prepaid cards remains very similar, with a slight decrease compared to the previous year.

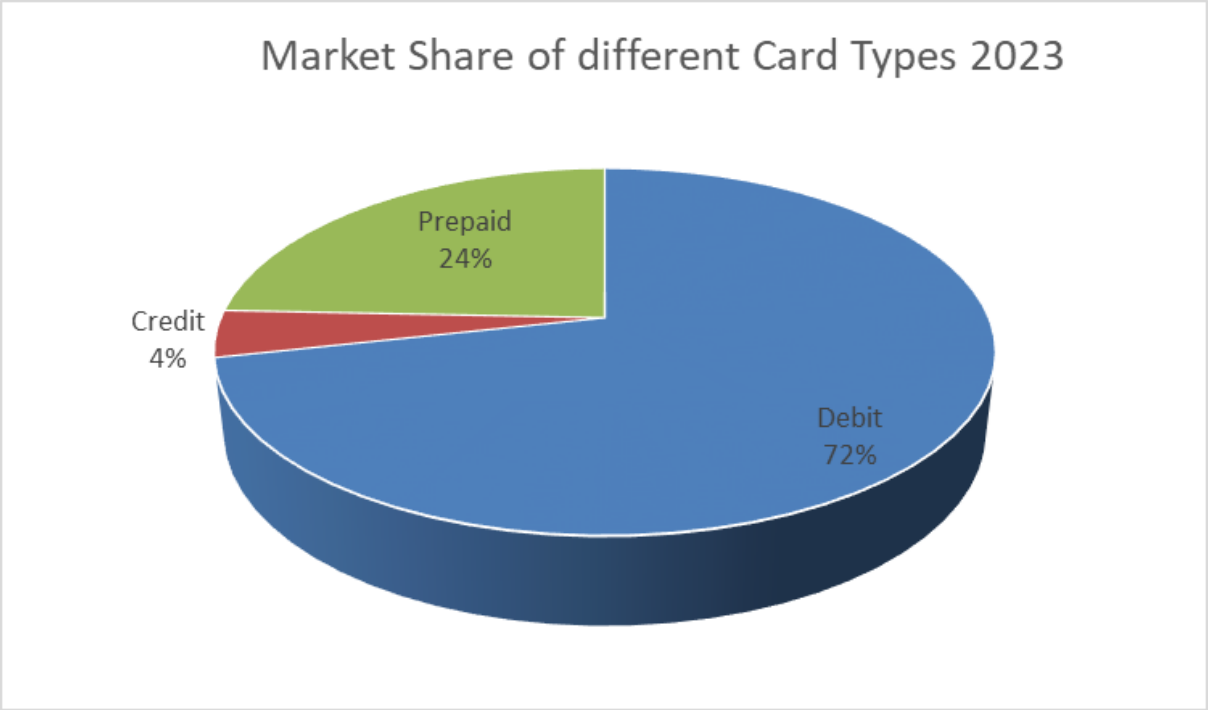


Figure 7.2: Market Share of different Card Types 2023

The pie chart7.2 above, based on data collected from Bangladesh Bank, indicates the market share in 2023. It reveals that debit cards constitute 72

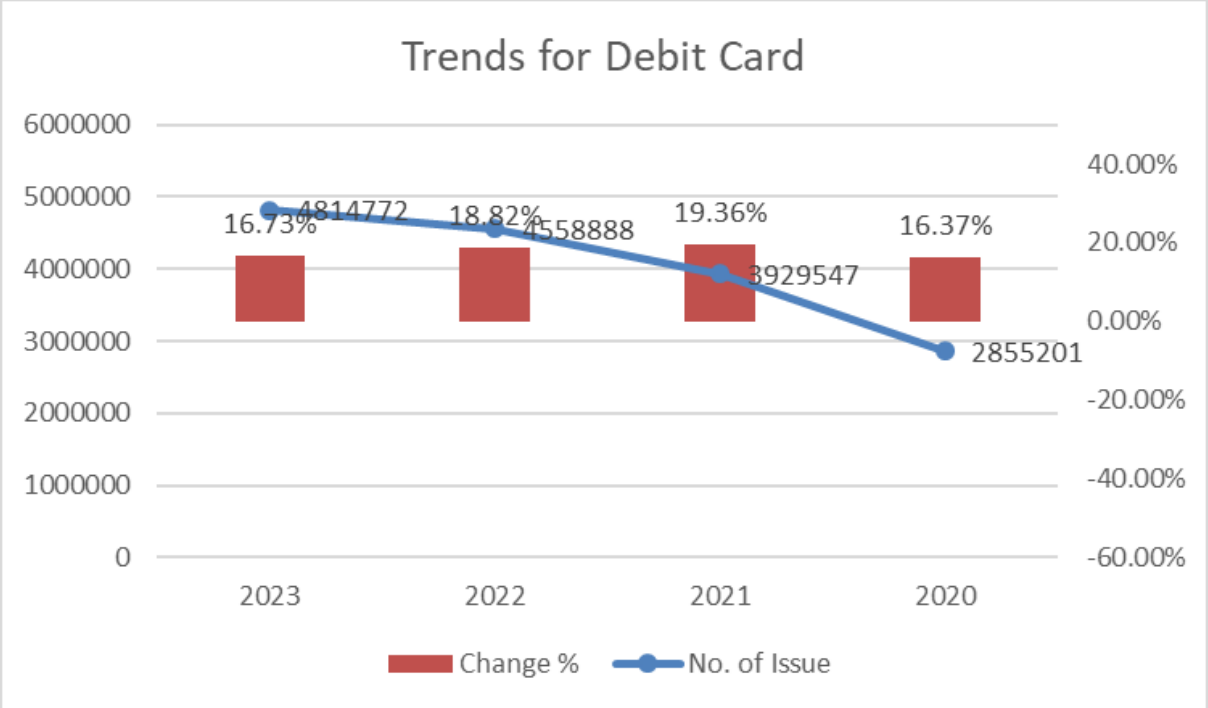


Figure 7.3: Trends for Debit Card

For debit cards, we observe a linear7.3 increase in the total number of issued cards. However, the change relative to the previous year of issuing new number of cards does not indicate significant improvement.

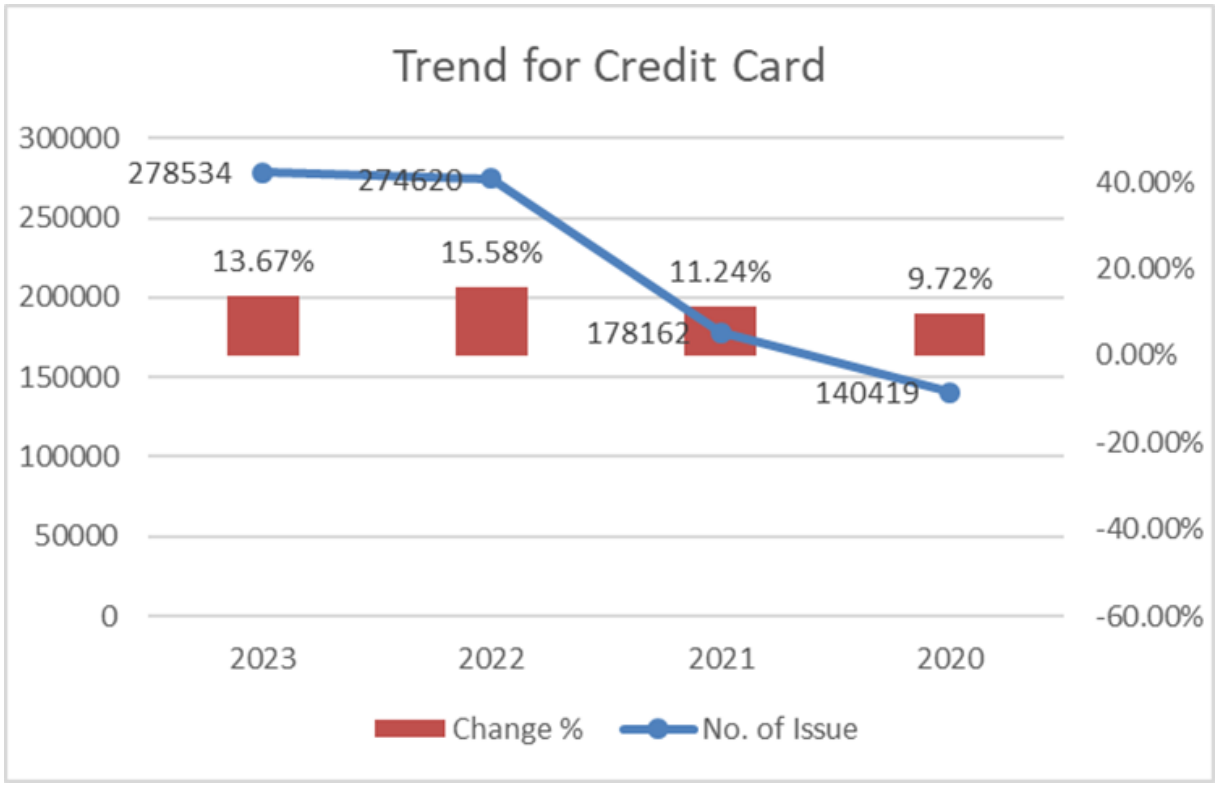


Figure 7.4: Trends for Credit Card

Regarding credit cards, there is an observed rise**??** in the total number of issued cards between 2021 and 2022, attributed to the aftermath of the COVID-19 pandemic as things gradually returned to normal. The change relative to the previous year of issuing new number of cards also indicate positive improvement.

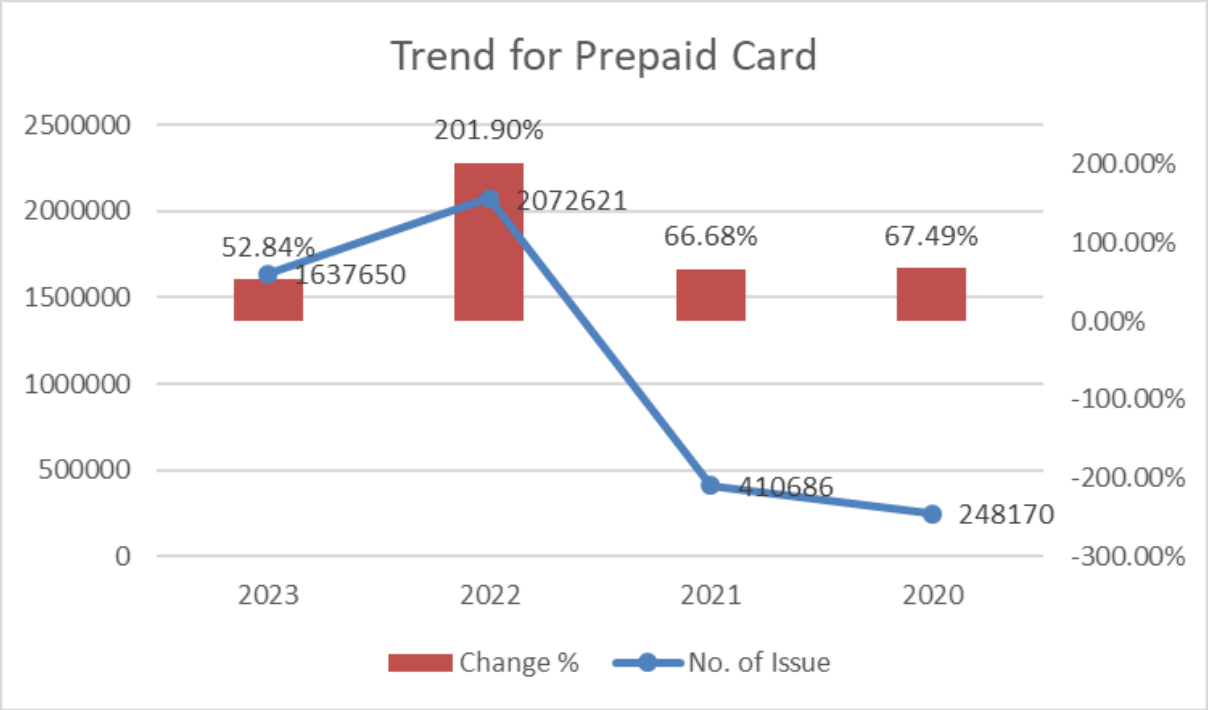


Figure 7.5: Trends for Prepaid Card

For prepaid cards, we observe a linear7.5 increase in the total number of issued cards in the year 2020 and 2021. However, there is a hike in 2022 suspecting the aftermath of the COVID-19 pandemic as things gradually returned to normal. Still, the change relative to the previous year of issuing new number of cards does not indicate significant improvement as it decreased in 2023. The information above helps us understand what's in our dataset and what each part represents.

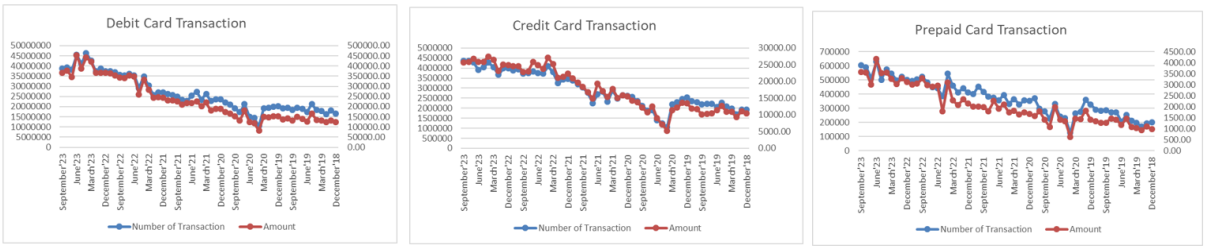


Figure 7.6: Debit, Credit and Prepaid Card Transaction

In the graph7.6 above, "Number of transactions" refers to the total transactions made with debit/ credit/ prepaid cards in a month, while "Amount" represents the total amount spent in BDT (Bangladeshi Taka) during that specific month. Since we have data for each month, we can observe the trends, and both trends show a consistent increase nature

over time, except for March and April 2020. During these particular months, there was a decrease due to the COVID-19 pandemic lockdown.

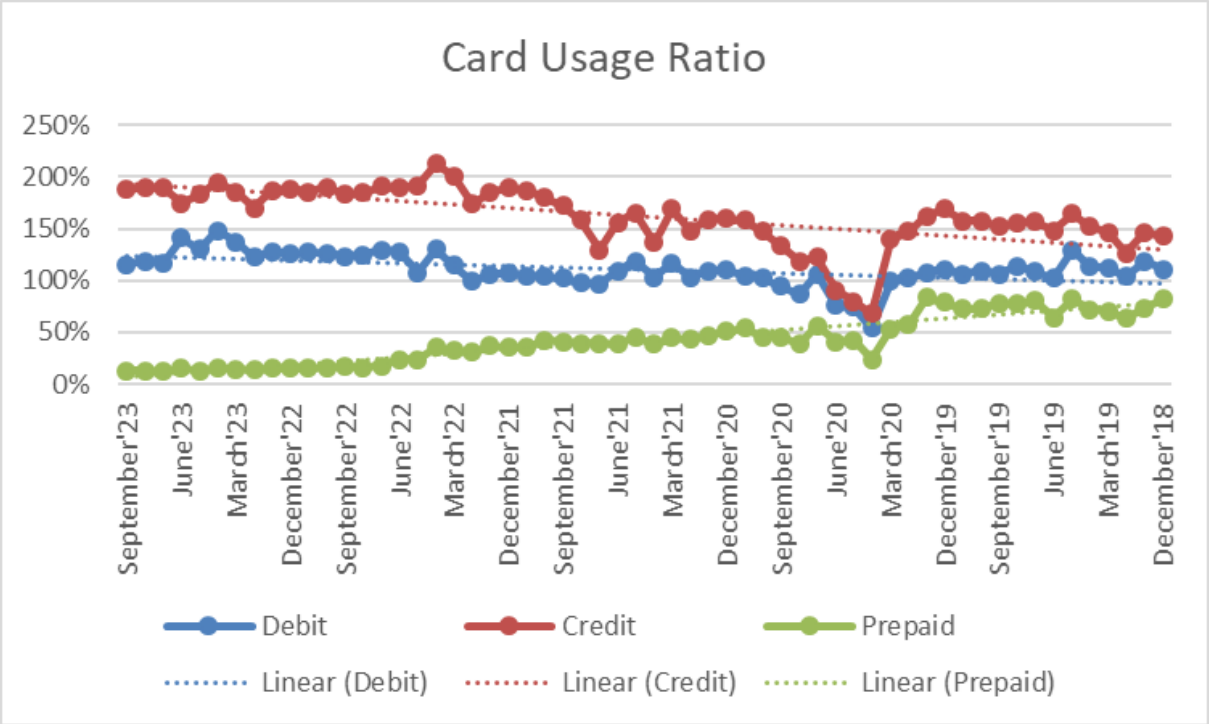


Figure 7.7: Debit, Credit and Prepaid card Usage Ratio

We determined the usage ratio7.7 by dividing the number of card transactions by the number of issued of that type of card. The final result was then converted into a percentage and reflected in the graph. Since we have data for each month, we can observe the trends that show a consistent increase nature over time, except for March and April 2020 for debit and credit card. During these particular months, there was a decrease due to the COVID-19 pandemic lockdown. In case of prepaid card we can observe the trends that show a consistent decrease nature over time. Briefly, the graph represents debit card usage ration is flat, credit card usage increasing and prepaid card usage decreasing.

Device Name	Quentity	Market Share %
ATM Urban	9580	8%
ATM Rural	4043	3%
POS Urban	96883	78%
POS Rural	9568	8%
CDM Urban	268	0.22%
CDM Rural	21	0.02%
CRM Urban	2712	2%
CRM Rural	1005	1%
Total	**124080**	

Table 7.2: 2023 Payment System Device at Urban and Rural place in Bangladesh

The secondary category focuses7.2 on different types of electronic payment system devise including ATM, POS, CDM, CRM E-Commerce Transaction and quantity Statistics.

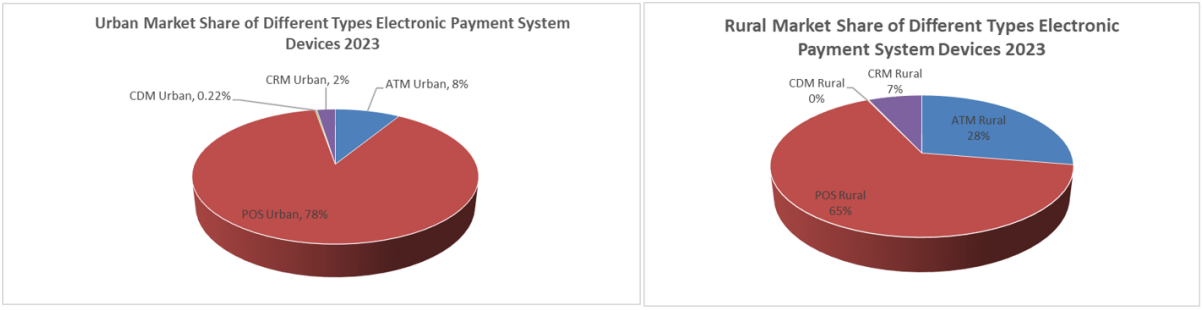


Figure 7.8: Urban and Rural Market Share of Different Types Electronic Payment System Devices 2023

Utilizing the basic data7.8 collected from the Bangladesh Bank website we have plot-

ted above pie chart reflecting, an analysis of the status of our ATM machines, POS systems, CDMs, and CRMs. Above we can see the 2023 market position of different types of electronic payment system devices comparing the position in Urban and Rural place in Bangladesh.

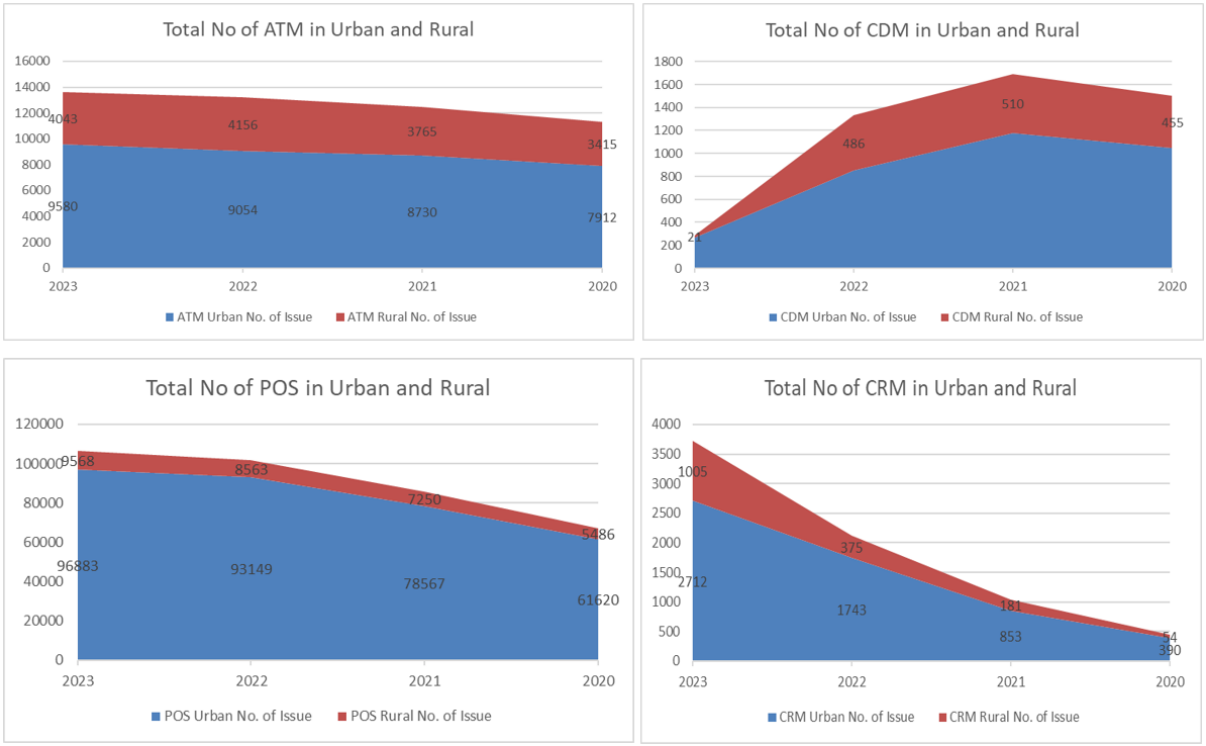


Figure 7.9: Total No of ATM, POS, CDM and CRM in Urban and Rural

If we see the area chart7.9 record in above, we have presented the total number of ATM, POS, CDM and CRM in Urban and Rural, utilizing the basic data collected from the Bangladesh[5] Bank website. We can observe fixed trend in ATM, a linear increase in the trend of POS and CRM and downward trend in case of CDM from year 2020 to 2023.

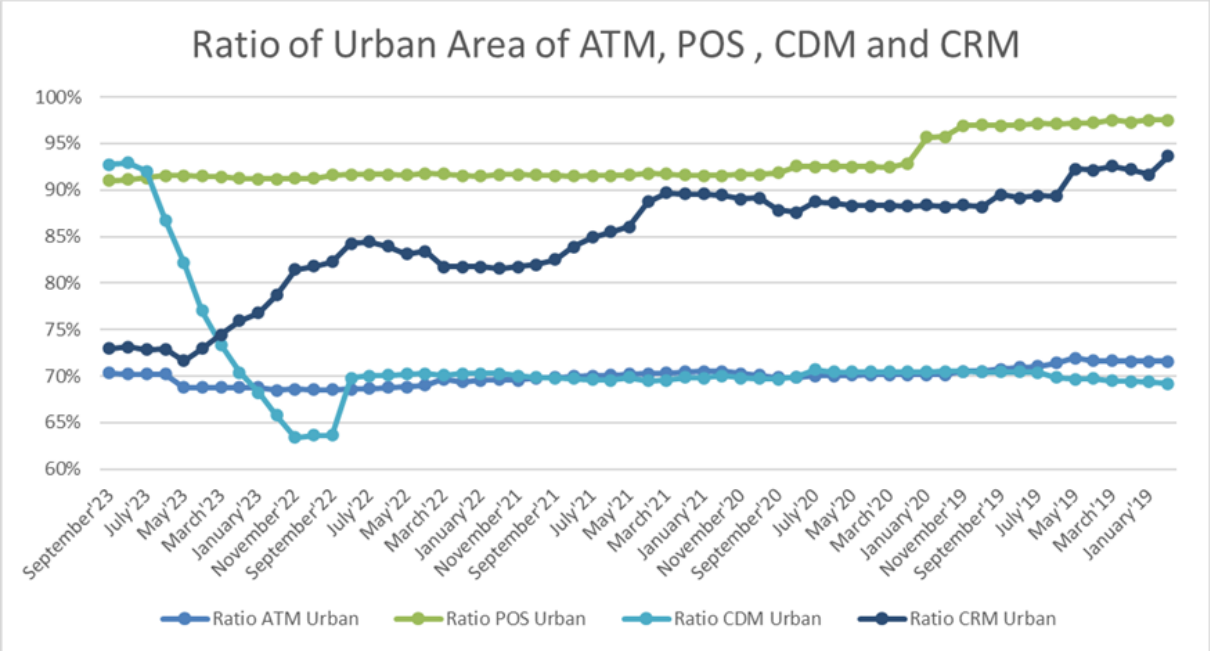


Figure 7.10: Ratio of Urban Area of ATM, POS, CDM and CRM

Since we have data7.10 for each month, we can observe the trends that show a consistent increase nature over time, except for March and April 2020 for POS. During these particular months, there was a decrease due to the COVID-19 pandemic lockdown. In case of CRM we can observe the trends that show a consistent decrease nature over time. Briefly, the graph represents ATM trend is flat, and CRM trend flat from 2019 to July 2022 then a sudden down trend and a sudden uptrend from November 2022 to September 2023.

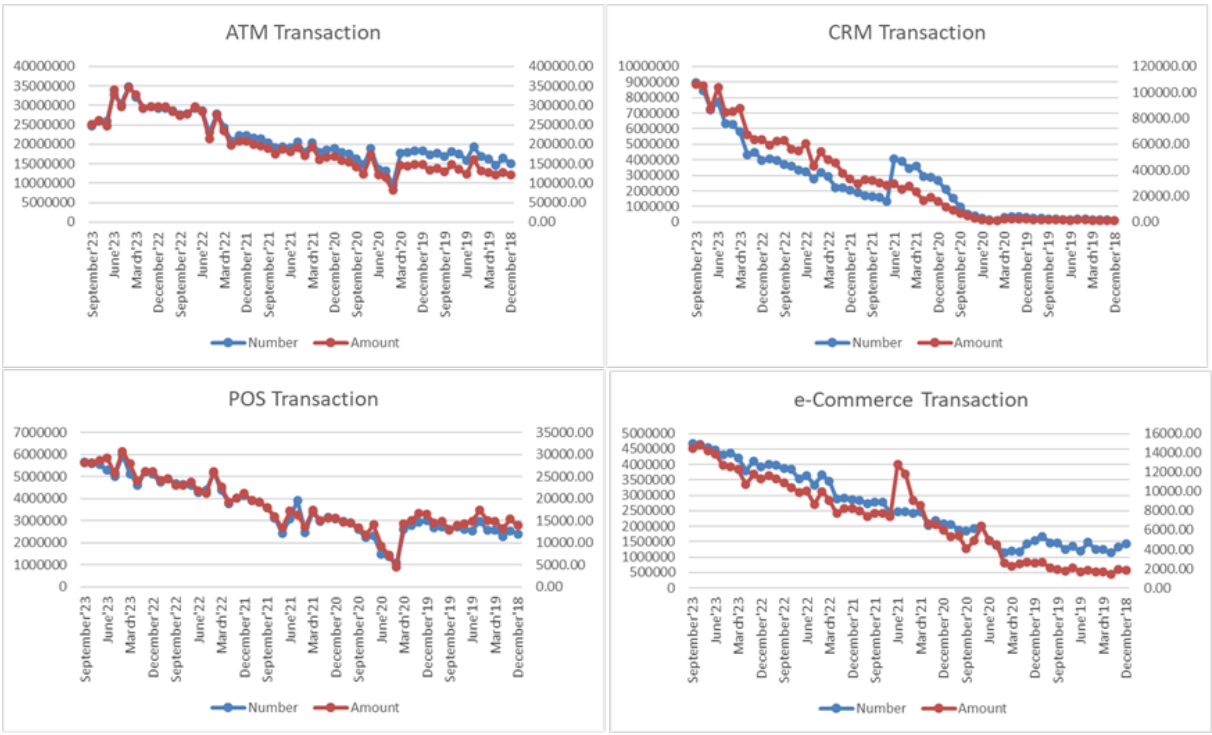


Figure 7.11: ATM, POS, CRM and e-Commerce Transaction

In the graph7.11 above, "Number " refers to the total transactions made with ATM/ POS/ CRM/ e-Commerce in a month, while "Amount" represents the total amount spent in BDT (Bangladeshi Taka) during that specific month. Since we have data for each month, we can observe the trends, and all trends show a consistent increase nature over time.

Chapter 8

Conclusion

In conclusion, this research paper has explored the challenges and opportunities associated with the adoption of automation in the banking sector of Bangladesh[4]. The analysis has highlighted the key challenges faced by banks, including increased competition, rising operational costs, outdated legacy systems, cybersecurity risks, and the need to meet customer demands while ensuring data security and regulatory compliance. On the other hand, the opportunities presented by automation include improved operational efficiency, enhanced customer experience, and increased competitiveness.

Through a thorough literature review and analysis of primary and secondary data, this research has provided valuable insights into the current state of the banking sector in Bangladesh[4] and the implications of automation. The findings emphasize the importance of developing a comprehensive automation strategy, standardizing the automation process, and investing in quality assurance. Addressing data security concerns and adopting automation frameworks such as RPA, BPM, and digital banking transformation strategies have been proposed as solutions to maximize the benefits of automation.

It is crucial for banks to carefully evaluate the proposed solutions and consider their potential impacts before implementing automation. While automation offers numerous benefits, it also poses challenges such as potential job losses, reduced client interaction, and the need for significant investments and training. Banks should approach automation as a strategic decision, weighing the benefits and risks associated with it.

The findings of this research contribute to the existing literature on automation in the banking sector and provide practical recommendations for financial institutions in Bangladesh[4]. By embracing automation and implementing the proposed solutions, banks can enhance their operational efficiency, improve customer satisfaction, and position themselves as innovative leaders in the market. However, they must also be mindful of the potential challenges and proactively address them to ensure a successful automa-

tion implementation.

Overall, the move towards automation in the banking sector of Bangladesh[4] is a necessary step to address the challenges faced by the industry. By leveraging automation effectively, banks can optimize their operations, meet customer expectations, and stay competitive in an evolving market. It is imperative for banks to carefully plan, strategize, and adapt to the changing landscape of automation to reap its benefits while minimizing potential risks.

8.0.1 Demographic Result

The banking services business is changing quickly, and one of the key factors that is changing it is the use of technology. With Bangladesh experiencing a gradual transition to automated banking software, it is critical to understand the complex reactions of various population groups. This section explores the varied perspectives and adoption behaviors of various age groups, educational levels, and geographic areas with regard to the use of automated banking software in Bangladesh[4]. It is impossible to overestimate the importance of demographic insights in comprehending the dynamics of technology adoption in the banking industry. Age, education, and place of residence are examples of demographic characteristics that significantly influence how technological advancements are embraced, used, and met with opposition. Understanding these subtleties is essential for financial institutions trying to modify their tactics to accommodate different consumer segments' requirements and preferences. This section tries to shed insight on the varying patterns of acceptance and fear through a thorough investigation of demographic reactions to banking software automation. This study aims to provide a thorough knowledge of the variables driving Bangladesh's adoption of technology-driven banking solutions by analyzing the various viewpoints held by various demographic groups.

In the context of Bangladesh, the study examined how various age groups viewed and embraced banking software automation.

- Youth (18-25 Years): This group showed a strong preference for automated banking software. Their affinity for simplicity and familiarity with technology resulted in a high preference for digital banking options.
- Middle-aged (26-40 Years): The interest in banking software automation was moderate among participants in this age group. Their involvement fluctuated between concerns about data security and trust in automated systems and the perceived ease of automation (Haque and Khan, 2020) [41].

- Elderly (41-60+ Years): Diverse reactions were noted in this group of people. Due to their lack of technological experience and worries about system reliability, some people showed curiosity and openness to digital banking, while others showed skepticism (Ali et al., 2019) [42].

  The study looked at the relationship between educational attainment and attitudes toward automated banking software.

- Higher Education: Higher educated respondents showed a more positive attitude toward the automation of banking software. They welcomed technologically enabled changes and saw digital solutions as progressive improvements in banking services (Hasan and Islam, 2020) [43].

- Lower Education: People with little formal education showed inconsistent reactions to automation. Their lack of exposure to and comprehension of digital banking systems was the reason for their cautious approach (Kabir and Akhter, 2018) [44].

  Geographical differences had a big impact on how banking software automation was adopted.

- Urban Areas: Higher levels of acceptance and use of automated banking software were seen among urban residents. Having access to a strong digital infrastructure helped this group adopt technology at higher rates (Rahman, 2017) [45].

- Rural Areas: The lower adoption rates in rural areas can be attributed to limited access to digital resources and a general lack of knowledge about digital banking solutions (Khan, 2019) [46].

8.0.2 Feasibility

Software automation is becoming a more important tool for Bangladesh's banking industry as it strives for modernization and increased operational efficiency. This section explores the complex aspects of the viability related to the incorporation of automated banking software into Bangladesh's complex financial system. An extensive assessment of technological readiness, regulatory compliance, infrastructure adequacy, and the socioeconomic context are all included in the feasibility of automating banking software. In order to successfully navigate the difficulties and seize the opportunities presented by the adoption of automated banking systems, this assessment becomes essential. Bangladesh is considering the viability and flexibility of automating banking software in the context of its distinct socioeconomic environment at this pivotal moment. To create a logical path towards a digitally empowered banking ecosystem, it is crucial to comprehend the technological limitations, strategic imperatives, and feasibility issues. This section will

analyze the viability of automating banking software and explain the obstacles, opportunities, and necessary tactics for a long-term and successful changeover. Through a critical analysis of the feasibility factors, this study aims to provide insights that will help make well-informed decisions and open the door for the smooth integration of automated banking software within Bangladeshi banking.

8.0.3 Social and Environmental impact

The introduction of Banking Software Automation has brought about a profound change in Bangladesh's financial environment, bringing with it important considerations as well as amazing opportunities. Customers now have unparalleled access to banking through digital channels, thanks to the digital revolution. Envision isolated communities now possessing mobile banking applications, filling the financial void and providing banking amenities at their fingertips! However, inequities appear in this maelstrom of growth. Inclusive solutions are necessary because some populations, especially the elderly or the economically disadvantaged, find it difficult to traverse this technologically driven landscape. Even though automation promotes productivity, its effects on the environment are still important to consider. Even while the amount of paper used is decreasing, there are sustainability issues with the disposal of old technology and rising energy consumption from automated systems. Therefore, even though Banking Software Automation (BSA) holds great potential for accessibility, it is imperative that social injustices be addressed and the environmental impact of BSA be controlled in order to ensure a sustainable, inclusive, and equitable financial future for Bangladesh.

8.0.4 Ethics

The introduction of Banking Software Automation to Bangladesh[4][5] has sparked a deep conversation on moral issues in the financial sector. This innovation in technology is expected to greatly benefit both clients and institutions by improving efficiency, accessibility, and financial services. However, throughout this life-changing experience, moral conundrums arise. The application of automated decision-making procedures gives rise to questions of accountability, transparency, and bias reduction. Algorithms that control loan approvals or credit evaluations, for example, may have prejudices that support social injustices. Furthermore, although automation offers smooth services, there are hazards associated with it, including cybersecurity dangers and data privacy violations. To negotiate these complications, it becomes essential to have strong ethical frameworks. Maintaining principles of fairness, accountability, openness, and data protection is essential to reducing risks and building consumer confidence in financial institutions. Thus, even if Banking Software Automation is a sign of progress, it is crucial to address moral conundrums in order to fully realize its advantages and protect the rights and interests

of all parties involved in Bangladesh's financial system.

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