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Artificial Intelligence in the Banking Sector of Bangladesh: Applicability and the Challenges

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Foreword

As part of ongoing dissemination of BIBM research outputs, the present roundtable discussion keynote paper contains the findings of the research topic “Artificial Intelligence in the Banking Sector of Bangladesh: Applicability and the Challenges”. The study was conducted in 2020 and the paper was presented in an online roundtable discussion on March 2, 2021 through Zoom platform.

To meet customers’ rising expectations and beat competitive threats in the AI-powered digital era, the first movers AI-endowed banks will offer innovative services, products and dependable experiences that are intelligent, personalized, and truly Omni channel and blend banking capabilities with relevant products and services beyond banking. Over the last few years, the financial services sector of Bangladesh has undergone intense technological advancements. Top level executives have shown their interest on investing AI based products and services. Many executives believe that AI will bring a massive change in the way banks and financial service providers are giving services to their customers. To meet up the increasing customer expectation, there is no alternative of having advance and modern information systems.

Bangladesh Government and Bangladesh Bank have taken number of initiatives to promote AI applications in providing secured, faster, cost minimizing and real-time reliable services in the banking sector. As part of the initiatives, Bangladesh Government has published a draft national strategy for AI. Bangladesh Bank has also published a circular about the use of AI in Banks.

It gives me immense pleasure, on behalf of BIBM, to offer this important resource of academic inputs to the practitioners of the banks and financial institutions, regulatory agencies, policy makers as well as to the academics and common readers. I hope, this roundtable keynote paper will be a valuable resource especially for the policy makers and practitioners to understand the importance of AI adoption in banks and its challenges.

We do encourage feedback from our esteemed readers on this issue which certainly would help us improve upon our research activities in the coming years.

Md. Akhtaruzzaman, Ph.D.
Director General, BIBM

Acknowledgement

Bangladesh: Applicability and the Challenges” has been completed with immense support from numerous individuals and organizations.

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Finally, our honest appreciation goes to Papon Tabassum, Research Officer, BIBM, Arnab Humayun, Research Assistant of this project and Md. Awalad Hossain, Computer Operator, BIBM for their support.

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Abbreviations

AGI	Artificial General Intelligence
AI	Artificial Intelligence
AML	Anti-Money Laundering
ANN	Artificial Neural Network
API	Application Programming Interface
ATM	Automated Teller Machine
BNI	Bank Negara Indonesia
CART	Classification and Regression Tree
CFT	Combating the Financing of Terrorism
CIB	Credit Information Bureau
CRM	Credit Risk Management
DMZ	Demilitarized Zone
DSS	Decision Support Systems
e-CRM	Electronic Customer Relationship Management
ESS	Executive Support Systems
ETF	Exchange-Traded Funds
FinTech	Financial Technology
IoT	Internet of Things
IT	Information Technology
JPMC	JPMorgan Chase and Co.
KYC	Know Your Customer
ML	Machine Learning
NLP	Natural language Processing
RPA	Robotic Process Automation
SBI	State Bank of India
SME	Small and Medium Enterprise
TAT	Turnaround Time
VAR	Vector Auto Regressive Method
VC	Venture Capital

Executive Summary

Banks and financial services institutions are always looking for ways to improve efficiency and service speed by incorporating cutting-edge technology into their operations. In recent years, there have been numerous advancements in information technology. The rise of Artificial Intelligence (AI) is particularly noteworthy among these.

The financial services industry has seen significant technological advancements in recent years. Executives at the highest levels have expressed their interest in investing AI-based products and services. Many executives believe that Artificial Intelligence (AI) will revolutionize the way banks and financial service providers provide services to their customers. There is no alternative to having advanced and modern information systems to meet rising customer expectations. Artificial Intelligence (AI) will assist businesses in meeting rising customer demand.

Bangladesh Government has already published a draft national strategy for AI. Indeed, Bangladesh is embracing AI for the digitalization of the nation. Bangladesh Bank (BB) is proactively monitoring the innovative activities of banking and financial institutions of Bangladesh. Information Systems Development and Support Department of Bangladesh Bank published a circular dated on June 16, 2020, about the use of AI in Banking. According to the national strategy for AI, there are some scopes of using AI in the financial sector which are AI-Based Credit Management System for Fraud Detection & Prevention, Credit Decision to Reduce Risk in Loan Sanction Process, AI-Based Risk Management Solutions, Personalized Banking Solutions, Financial Process Automation, Virtual Customer Support Assistance, and Shell Banking Monitoring.

On the above background, this study examines the potential of AI in the banking context and demonstrates the status of AI adoption and its associated challenges in the banks of Bangladesh. The research paper also recommends some suggestions to improve the readiness of AI-driven digital banking in Bangladesh. Both primary and secondary data are being used for analysis. Primary data were collected using a semi-structured questionnaire. The secondary data were collected from the website, published articles, newspapers, and the internet. The online interview method was also used for data collection and validation.

From the survey data, it was found that 29 percent of banks use AI-based solutions in some contexts. The use of AI is not sufficient in the banking sector of our country, although there is huge scope of using AI-based solutions.

Very few banks (19%) are using RPA in various banking areas, while the majority (81%) do not use RPA for service development. Banks are using RPA solutions in cash counting, vault management, data center management, KYC assessment, etc. RPA can eliminate many repetitive tasks done by a human being to improve productivity and reduce operating cost. However, Banks plan to introduce RPA or AI in most functional areas by the end of 2021, and in the remaining areas by 2022 and 2023.

IT Management, including CIO, CTO, CISO, Heads of different ICT wings/sections, has a high level of awareness about the importance of AI compared to other groups. It is also seen that BoDs and Executive Management have a good level of awareness compared to mid-level business development and operation management. Proper initiatives should be taken to increase the awareness level of BoDs and Executive Management for AI adoption in banks so that banks can get active support and close monitoring of top management and also sufficient budget allocations.

Banks are generating a massive amount of data from different touch points. Big Data Analytics and AI can help analyze that vast volume of data. The study found that no banks used the application of Big Data Analytics with AI for analyzing data.

The biggest challenge of handling AI in financial services is the scarcity of trained and skilled human resources. 67 percent of the respondent banks agreed that lack of skilled manpower is a major concern for properly maintaining AI platform in Banks. That's why, specialists also have emphasized the need for more skilled engineers to drive the segment. The banking industry needs to work with research and training academy like BIBM and also universities in producing skilled data scientists as well as develop internal training programs to train employees for enhancing skill on data science.

Data is the lifeblood of AI, and any weakness or security holes arising from unverified information is a serious anxiety for businesses. Due to incorrect sources of data, serious risks might arise from AI-based KYC compliance systems or fraud recognition and prevention system without having the right kind of data. Banks must ensure structured process or mechanisms for assembling, authenticating, standardizing, correlating, archiving and dispensing AI relevant data to ensure reliable and secured operation of RPA/AI driven banking system. Now the banks should have concentration on Data Acquisition System (DAS).

The bulk adoption of AI may result in joblessness in the sector. Due to the risk of unemployment or job losses, this is a challenge all countries will have to face at some point with the fourth-generation industrial revolution (Industry 4.0). There is no alternative but to adopt the AI/ML technology to be competitive in the global market. Therefore, government and private sector must work together to come up with an innovative approach that will harness the power of AI and at the same time create sufficient new job opportunities in various sectors.

Data privacy and appropriate privileges of data access are the central aspects of any AI functionality in e-banking system. Introduction of data privacy regulations will be of paramount importance in these aspects. BB can play a vital role so that the government can take proper initiatives to formulate a Data Privacy Act for AI driven system. Bangladesh Bank may provide effective policy and necessary guidelines for the development and implementation of AI-based platforms in the Banking and Financial sector. Both the Government and BB can take necessary initiatives to ensure the availability of infrastructural resources for the reliable AI-driven financial services. BB may form an AI Advisory Committee to understand the development of AI, and address the potential growth, restructuring, or other necessary changes.

Government and BB should encourage and give preference to local software companies to be able to build robust and cost-effective AI-based solutions for the banks. Government can give special incentives or tax reductions for the local AI solutions that banks would like to use.

Artificial Intelligence in the Banking Sector of Bangladesh: Applicability and the Challenges

1.0 Introduction

Andrew Ng has compared the revolutionary impact of AI to that of electricity, saying “Just as electricity transformed almost everything 100 years ago, today I actually have a hard time thinking of an industry that I don’t think AI will transform in the next several years” (Lynch, 2017).

Huge advancement in computer hardware, software, and internet technologies has irrefutably changed our societies. It is nearly impossible to imagine a society without computers, the internet, and mobile devices. IT introduces new products or improves existing ones, and increases efficiency in a relatively short period. On the other hand, if organizations miss out on the current IT trend, they may face survival challenges in near future (DBR, 2019).

Banks and financial services institutions always try to enhance efficiency and service speed by adopting innovative technologies in their process. A number of advancements in information technology have occurred in recent years. Among these, the growth in Artificial Intelligence (AI) is particularly noteworthy. In a nutshell, Artificial Intelligence (AI) refers to “computers that have cognitive abilities similar to humans, which could result in massive efficiency improvements for both organizations and their clients.” Bank is one of the early alchemists with AI technologies. So, it is critical to investigate the possible role of AI in banks’ digital transformation (DBR, 2019). In terms of gaining and applying knowledge and expertise, AI is the capability to mimic something natural. This ability to copy is now performed by a computer or a machine. So, a machine started thinking itself and mimic human mind is known as artificial intelligence.

Information technologies are linking billions of users and enabling the deployment of low-cost connected devices across all industries. The present generation has grown up in a digital world and, as a result, expects services and goods to satisfy contemporary digital technology standards. Further,

investments into digital technologies and businesses have risen and are rewarded by the public markets (PWC Editorial, 2016). AI is one of the parts of this development, and the banking sector is hereby deemed to see a major impact (Accenture, 2016).

According to Accenture's recent report, "83 percent of Indian bankers believe that AI will work alongside humans in the next two years - a higher than the global average of 79 percent."

Over the last few years, the financial services sector has undergone intense technological advancements. Top level executives have shown their interest on investing AI bases products and services. Many executives believe that AI will bring a massive change in the way banks and financial service providers are giving services to their customers. To meet up the increasing customer expectation, there is no alternative of having advance and modern information systems. AI is going to support organizations to meet the growing demand of customers.

The Bangladesh Government has already published a draft national strategy for AI. Indeed, Bangladesh is embracing AI for the digitalization of the nation. Although the digitization process started a decade earlier. AI would work now as an accelerator. Future technologies like artificial intelligence, robotics, big data, blockchain, and IoT will be widespread. Technology is a necessity. The future depends on it. Bangladesh is committed to walking through the path.

Bangladesh Bank is proactively monitoring the innovative activities of banking and financial institutions of Bangladesh. Information Systems Development and Support Department of Bangladesh Bank published a circular dated June 16, 2020, about the use of AI in Banking. According to the national strategy for AI, there are some scopes of using AI in the financial sector which are AI-Based Credit Management System for Fraud Detection & Prevention, Credit Decision to Reduce Risk in Loan Sanction Process, AI-Based Risk Management Solutions, Personalized Banking Solutions, Financial Process Automation, Virtual Customer Support Assistance, and Shell Banking Monitoring. With the above background,

BIBM has prepared this roundtable discussion paper with the following objectives.

1.1 Objectives of the Study

This paper will examine the potential of AI in the banking context. The specific objectives of this paper are: *one*, discussing the conceptual issues of AI and RPA; *two*, identifying global scenario of AI and its application in the banks and financial institutions; *three*, showing the status of AI adoption and its associated challenges in the banks of Bangladesh, and finally putting forward some suggestions and recommendations with a view to improving the readiness of AI-driven digital banking in Bangladesh.

1.2 Methodology

This report used both primary and secondary data. Primary data were collected using a semi-structured questionnaire sent to the IT department of banks. The questionnaire was sent to all banks in Bangladesh, of which 30 banks (Appendix-1) responded. Among them, there were 4 SOCBs, 1 SB, 22 PCBs, and 3 FCBs. The secondary data were collected from the website, published articles, newspapers, and the internet. The online interview method was also used for data collection and validation.

1.3 Organization of the Paper

The paper is organized into five sections. The *first* section describes the introduction, objectives, methodology, and limitations of the study; section *two* reviews the literature and conceptual issues on Artificial Intelligence; section *three* shares the global Artificial Intelligence scenario and its applications in the banks; section *four* presents an in-depth analysis of surveyed data related to the possible uses, challenges and opportunities of Artificial Intelligence in Banks of Bangladesh, and finally, section *five* gives some suggestions and recommendations.

1.4 Limitations of the Study

The paper could not adequately cover some aspects of AI implementation in banks due to some obstacles – Technology readiness and robust cyber security strategy for AI. Due to government restrictions for Covid-19 pandemic, we could not able to conduct Focus Group Discussion (FGD)

physically with the concern respondents of banks. Many bankers were not willing to share information due to confidentiality issues. Every bank has its own secrecy that is not revealed to someone outside. Many banks were reluctant to provide responses to the questionnaire. This study's findings are limited to Bangladeshi banks and do not apply to other sectors of the economy.

2.0 Literature Review and Conceptual Issues

Mathematician Claude E. Shannon wrote a scientific article about the development and programming of a chess-playing machine in 1950 which was the beginning of AI research (Shannon, 1950). Jewandah (2018) studied the areas in which Machine Intelligence is being launched in the banks and applications of AI in principal commercial banks in India. Traditional banking is progressing, and banks are increasingly incorporating creative technologies such as AI, blockchain, and cloud computing. However, banks have yet to reach the stage of AI revolution, and human touch is still crucial.

Waltz and David L AI (1997) argued that “credit card providers, telephone companies, mortgage lenders, banks, and the U.S. Government employ AI systems to detect fraud and expedite financial transactions, with daily transaction volumes in the billions. These systems first use learning algorithms to construct profiles of customer usage patterns. Electronic money transfers and their distribution channels such as ATM and online/mobile banking have been grown in the last decades. The number of ATMs has had a rising trend since the ATM is cost-effective when compared with a bank branch.”

Adrian Lee Maclean's (2017) stated that customer service using AI, AI-driven real-time fraud prevention, and risk management might be used for industry disruption. Fourie and Bennett (2019) opined that cost reduction, compliance handling, improving customer services are some of the major applications of AI for financial services providers.

The concept of AI is not new, computer scientist John McCarthy gave the first formal definition of AI in 1955 Dartmouth Conference: *“Every aspect of learning, or any other feature of intelligence, can in principle be so precisely described that a machine can be made to simulate it. An attempt*

will be made to find how machines use language, form abstractions and concepts, solve all kinds of problems now reserved for humans, and improve themselves". This provided a practical way for subsequent AI research efforts and created huge anticipation in computer science. Table-1 shows the evolution of AI.

Table 1: Evaluation of AI

Time	Changes
1951	The first neural net machine SNARC was built.
1956	The term 'artificial intelligence is coined'
1963	Machine learning theory is expounded
1965	Chatbot ELIZA is demonstrated
1975-1980	'The winter of AI'
1982	Neural Network Theory gains in popularity
1997	IBM's Deep blue beats world champion at chess.
2000s	AI-based algorithms begin to be used in many vertical markets
2005	Introduction of Web-based recommendations
2011	IBM's Watson wins US gamshow Jeopardy!
	Launch of Digital Assistants Siri, Cortana and Google Now
2012	Google Brain recognizes a picture of a cat
2014	Google Brain recognizes a scene in a picture.
	Google acquires DeepMind. Baidu opens an AI lab. Skype provides instant spoken translation.
2016	Speech recognition reaches human parity. Launch of a GPU and TPU units for AI. Translation. AI develops own intra-lingua virtual world for AI to learn in.
	DeepMind's AlphaGo Beats Go champion
2017	AlphaGo Zero teaches itself to play Go. Use of ML in medical diagnosis. Pix2pix outputs images from drawings

Source: Innovation Observatory

It is important to distinguish between artificial intelligence and brute force computing. AI basically infers, whereas brute force computing applies a set of rules sometimes a large set of rules as input and in return gets an answer. Today's growing AI largely depends on foundational technologies like computing power, data, and algorithms, most notably machine learning and language manipulation (Celent, 2018).

The terms "artificial intelligence," "machine learning," and "deep learning" have numerous definitions; however, the incongruities in the literature are

still unresolved¹. The Oxford Dictionary defines AI as “The theory and development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages.”² Expert System is one of the ways to develop AI. In this system, it is essential to build a database of knowledge from human experts and apply that for decision making (Wall, 2018).

Another method of applying AI is to have the computer learn directly from the data. In 1959, Arthur Samuel defined “machine learning as the field of study that gives computers the ability to learn without being explicitly programmed”.³

To overcome some challenges of machine learning, experts have developed methods based on the working of the human brain to allow machines to learn for themselves. These methods are called “deep learning”, defined as “a subfield of machine learning concerned with algorithms inspired by the structure and function of the brain called artificial neural networks.”⁴

Rule based and non-rule based are the two computation approaches which help mimicking human intelligence.

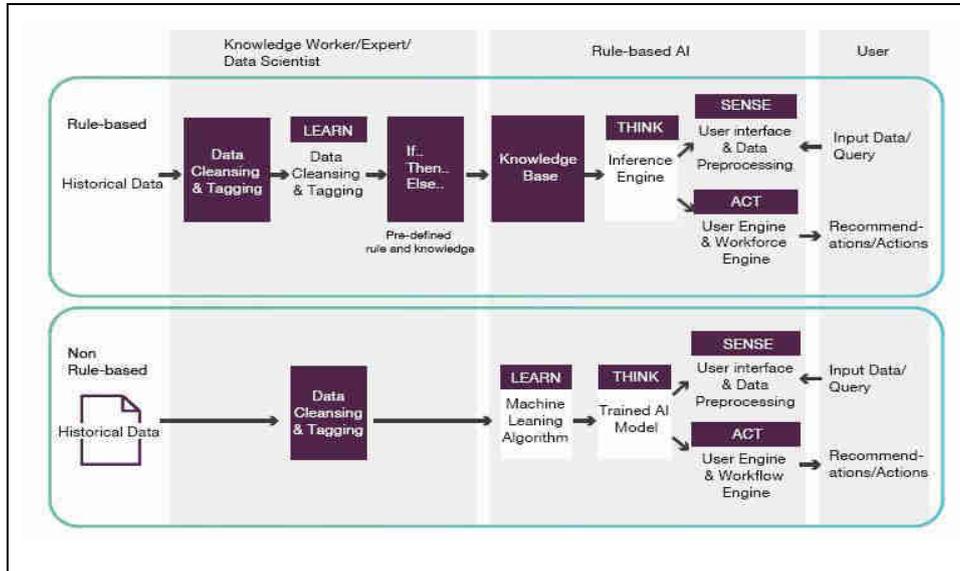
¹ “Artificial intelligence also can be divided into narrow (or weak) AI and strong AI (or Artificial General Intelligence, AGI). As with other terms associated with AI, there is not a single universally accepted definition of these terms. The Future of Life Institute defines narrow AI as AI that is designed to perform a narrow task but that AGI would outperform humans at nearly every cognitive task. This study focuses exclusively on currently available techniques, that is to say that all of the discussion relates to narrow AI. If AGI is developed, it will have a far more profound impact on the financial system and human society than the technologies discussed in this paper. The Future of Life Institute definitions are available at <https://futureoflife.org/background/benefits-risks-ofartificial-intelligence/>.”

² “See https://en.oxforddictionaries.com/definition/artificial_intelligence. An alternative definition from one of the original pioneers of AI, John McCarthy in 2007, is that artificial intelligence is: the science and engineering of making intelligent machines.... He followed up this by defining intelligence as Intelligence is the computational part of the ability to achieve goals in the world... (See <http://www-formal.stanford.edu/jmc/whatisai/node1.html>) I prefer the Oxford Dictionary definition because of its relative clarity.”

³ “Arthur Samuel is widely attributed to having given this definition in 1959. For example, see <https://www.coursera.org/learn/machine-learning/lecture/Ujm7v/what-is-machine-learning>.”

⁴ “This definition comes from Brownlee (2016).”

Figure 1: Rule-based and Non-Rule-Based AI



Source: PwC

The simplest and the most common type of AI is expert system, also known as rule-based decision-making. Almost all financial institutions use expert system in various applications. It comprises interpreting a fixed set of pre-defined rules and knowledge. On the other hand, non-rule-based AI not only reacts and makes decisions according to a pre-defined set of rules, but it can also derive extra, meaningful insights by ‘learning’ automatically from its inputs.

Robotic Automation is the technology that liberates human minds to engage in creative and intelligent work by letting software robots take care of boring, repetitive tasks. RPA robots can mimic human actions within digital systems. It is said that a software robot never sleeps, makes zero mistakes, and costs a lot less than an employee.

3.0 Global AI Landscape

AI is being researched and deployed in a variety of fields. However, due to measurement constraints, quantifying its adoption is a challenging task. Indeed, organizations may use AI to improve process efficiency, which is not readily observable for analysis. Furthermore, distinguishing between more basic IT solutions and single AI applications might be challenging at

times. To partly overcome these drawbacks, information on Venture Capital (VC) investments in AI start-up firms may be useful. In 2018, AI start-ups received a staggering USD 24 billion globally, up from less than USD 2 billion in 2013. Growth in VC investments over the past two to three years has been particularly strong. AI firms have also increasingly become acquisition targets. Over the last 20 years, a total of 434 companies in the AI sector have been acquired, 220 of which since 2016 alone (DBR, 2019)

In 2018, about USD 15 billion in total VC volume went to AI start-ups in the United States, with another USD 6.5 billion to Chinese firms. The number of venture capital deals remained relatively stable in 2017 and 2018. Nonetheless, the average volume of VC investments increased, indicating that VC is moving into more mature AI enterprises with bigger financial demands than usual seed-stage start-ups, for example, SenseTime Group, a computer vision, and deep learning technology company in China, raised USD 1.6 billion in VC funding in 2018. With the new funding, the company's worth increased to more than USD 6 billion, making it the world's most valuable AI upstart. Meanwhile, in the US, it is primarily large tech firms that invest in AI start-ups. (DBR, 2019)

AI appears to VC investors to be a truly transformational technology with considerable promise, similar to the internet and mobile revolutions in previous decades. How do AI start-ups spend the money they get? According to observation, they hire additional AI expertise (which proves to be expensive and difficult to locate) and expand their services. Investors might, therefore need, to wait a while before they see meaningful returns on their investments.

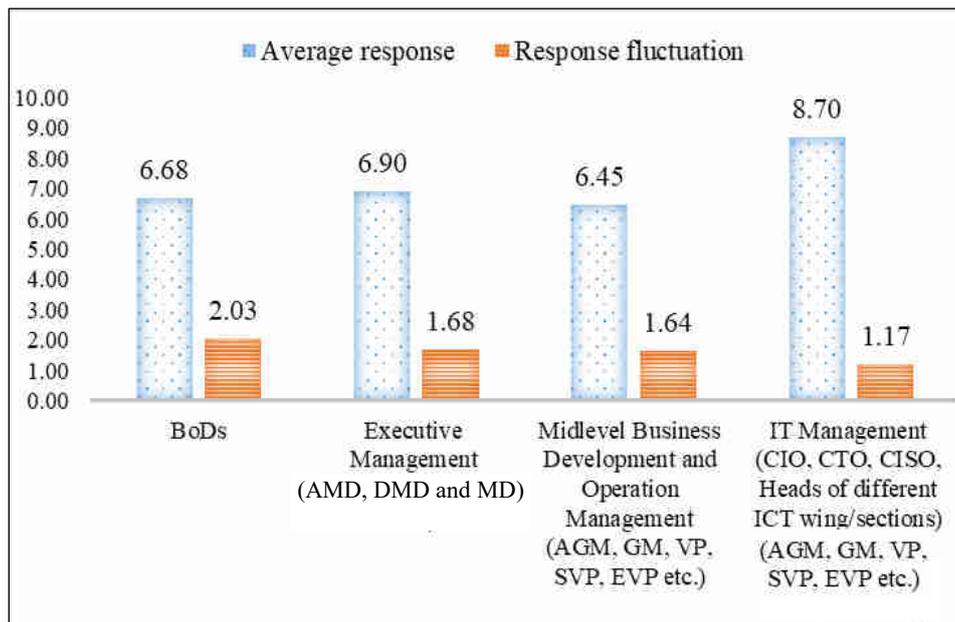
Some success cases related to the use of AI in banking have been shown in Appendix-2. JPMorgan Chase & Co., BNI, SBI, HSBC, and other banks have already started using AI in different functions.

4.0 Analysis and Findings

4.1 Awareness Level of the Bank Executives about Implementing AI in Banks

Figure-2 shows the awareness level related to the importance of adopting AI in banks. IT Management, including CIO, CTO, CISO, Heads of different ICT wings/ sections, has a high level of awareness about AI compared to other groups. It is also seen that BoDs have a good level of awareness compared to mid-level business development and operation management, although the response fluctuation is higher among them. It is essential to increase the awareness level of BoDs and Executive Management for AI adoption in banks. IT Management has a satisfactory level of awareness in terms of AI adoption in banks with a lower level of response fluctuation.

Figure 2: Awareness Level of the Executives about Implementing AI in Banks in Bangladesh



Source: BIBM Survey

4.2 Use of AI in Banks

The research shows that 29 percent of banks use AI-based solutions in some contexts. Table-2 shows the areas where banks use AI-based products or solutions. 24 percent and 19 percent of banks use AI-based solutions in cyber/ IT risk analysis and cyber fraud detection and prevention respectively. It clearly indicates that cyber security is a broader domain where AI can be widely used. Also, banks are using AI-based solutions for regulatory compliance and reporting purposes. Although the use of AI is not sufficiently high in the banking sector of our country, there is huge scope of using AI-based solutions.

Table 2: Functional Areas of Using AI in Banks

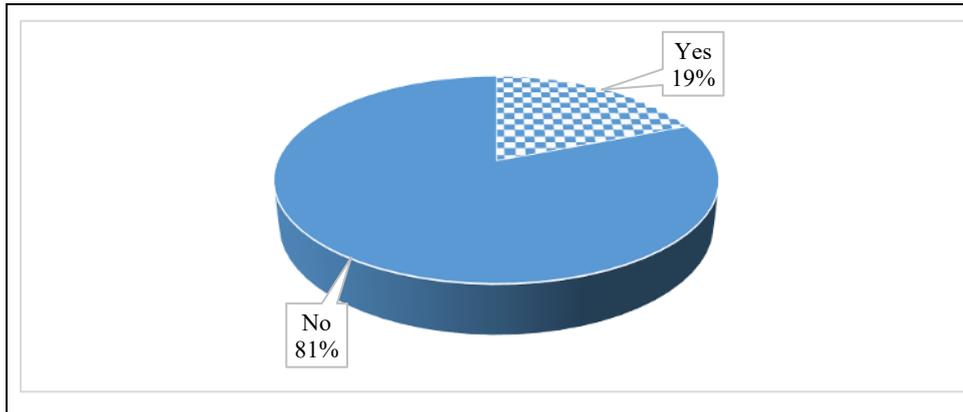
Name of Functional Areas where Banks Use AI	Name of Products	% of Banks Using AI
Business Analytics	No Product	0%
ESS and DSS for the quick and right decision making of Top Management	- Selenium - Pubali Monitoring System (PMS)	5%
Business Operation	ROBO2, NID and Face Verification for A/C Opening, Cloud Vision API from Google	10%
ADCs Operations/Services	- ADC Apps - ATM Switching Software	10%
AML and CFT Issue	- 3S - Transaction Monitoring Software - Pubali Monitoring System (PMS)	10%
Financial Risk Analysis	Risk Analysis	5%
Cyber/IT Risk Analysis	- SIEM - Check Point Next Generation Firewall - Securex	24%
Cyber Fraud Detection and Prevention	- McAfee – FIM (file integrity monitoring) - NGFW - IBM Qradar SIEM - Securex	19%
e-CRM (Customer Satisfaction, Relationship and Retention Plan)	No Product	0%
Regulatory Compliance/Reporting	- Selenium - goAML and CIB - Transaction Monitoring Software	14%

Source: BIBM Survey

4.3 Use of RPA in Banks

Figure-3 shows the use of RPA in our banks. Very few banks (19%) are using RPA in various banking areas, while the majority (81%) do not use RPA for service development. RPA can eliminate many repetitive tasks done by a human being. Banks are using RPA solutions in cash counting, vault management, data center management, KYC assessment, etc. In addition, bank can use RPA for many other purposes like credit management, report automation, customer service, account opening, etc.

Figure 3: Use of RPA in Banks



Source: BIBM Survey

Table 3: Use of Robotics Process Automation in Banks

Name of Functional Areas	Name of RPA Products
Central Bank reporting: Monthly Return	Selenium
Top Management Report Generation for the quick and right decision making	Selenium
Business Operation	CellFin
Vault Security	Intruder Alert System
e-Govt. Procurement (e-GP)	Selenium
DC Environment Monitoring System (EMS)	EMS (Auto Notification for DC environment control)
Account Opening Process	The product is not mentioned by the bank
Cash Counting	Cash Counting Machine with AI Intelligence
Data Center Humidity Control	Precision Air Cooler

Name of Functional Areas	Name of RPA Products
Data Center Tape Library Management System of Storage	IBM Tivoli Storage Manager
A/C Verification	Artificially Intelligent Workforce (AIW) (FernTech Solution Ltd.)
NID Verification	
e-KYC	ERA eKYC

Source: BIBM Survey

Table-3 focuses on the RPA products under the functional areas of banks where the banks tend to use the RPA products to increase the efficiency of the functions. For each type of function like Central Bank reporting: Monthly Return, Top Management Report Generation for the quick and right decision making, Business Operation, Vault Security, e-Govt. Procurement (e-GP), D.C. Environment Monitoring System (EMS), Account Opening Process, Cash Counting, etc. the banks are using different RPA products like Selenium, CellFin, Intruder Alert System, EMS (Auto Notification for D.C. environment control), Developed by partner, Cash Counting Machine with AI Intelligence. These products bear the proof of AI technology and hold the future of AI in the banking sector.

4.4 Plan and Scopes of Using AI for Innovative Banking Services

The survey found that 71 percent of banks are not using any kind of AI-based solutions. However, many banks have a plan to initiate AI-based solutions soon. Table-4 shows a list of functional areas where banks have plan to use RPA or AI-based solutions within the next three years (Due to confidentiality issues, we are not sharing the bank name and name of the solutions). Banks plan to introduce RPA or AI in most functional areas by the end of 2021, and in the remaining areas by 2022 and 2023.

Table 4: Plan of Using RPA or AI within Next Three Years

Name of Functional Areas	Year of Launching the Products
Customer On boarding, NID Verification, Liveness detection system using eKYC Solution	2021
Business/Data Analytics	2021
Web Application Firewall (WAF) for Cyber Threat Detection	2021
Log Monitoring using SIEM	2021
Privilege Access Management (PAM)	2021
CIB and Credit rating of clients	2022

Name of Functional Areas	Year of Launching the Products
'AML360' integrated AML & CFT solution by monitoring real-time transactions of channel partners including agents, distributors, merchants and aggregators.	2021
Cash Recycle Machine (CRM) / Intelligent cash recycling ATM	2021
AI-based Chat Bot of Conversational App	2021/2022
RegTech Solution	2021
Automation of account opening process using RPA solution	2021
Automated Loan Processing System	2022
Regulatory Compliance/ Reporting	2023
Internet Banking Web	2022
Mobile Application App	2022
Data input at core banking system	2021
Retail Sales	2021
Automated CIB Verification of Clients	2021
Automated Credit Rating of Clients	2022
Data Analysis and Automated Input at Core Banking System using RPA solution of UniPath	2021
Auto Reconciliation	2021

Source: BIBM Survey

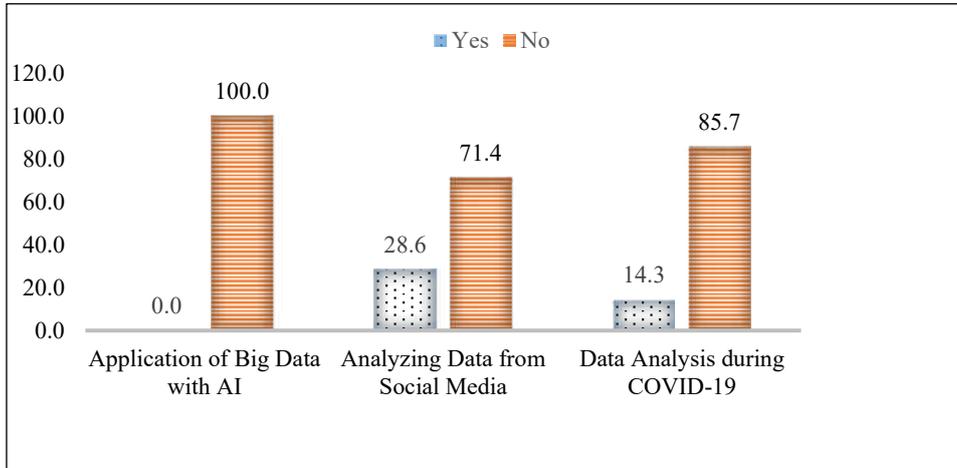
4.5 Budget for AI-Based Solutions

AI and RPA are proliferating. Unfortunately, our banking sector does not give much attention for developing AI and RPA based solutions. However, some banks have taken commendable steps for the development of AI and RPA. For developing such solutions, banks need to invest a lot; however, only 24 percent of banks have a separate budget for adopting AI-based solutions.

4.6 Big Data Analytics and AI for Data Analysis

Banks are generating a massive amount of data from different touch points. Big Data Analytics and AI can help analyze that vast volume of data. The study found that no banks used the application of Big Data Analytics with AI for analyzing data. However, some banks (28%) analyze data from social media. Banks can analyze data from social media to find various patterns and offer customized products for customers. Only 14.3 percent of banks analyzed data during the COVID-19 pandemic to understand the business trends.

Figure 4: Data Analysis Using Big Data and AI

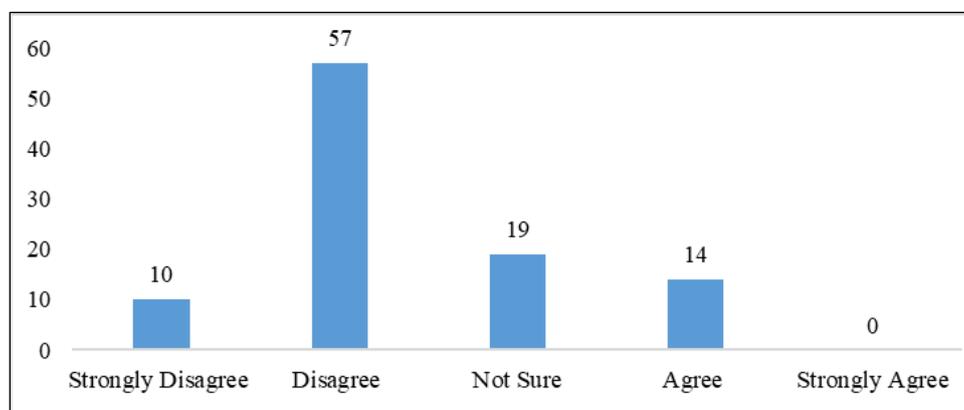


Source: BIBM Survey

4.7 Unemployment and AI

A survey conducted by Deloitte about the use of cognitive technologies to learn their goals for AI initiatives found that only 22 percent believed that reducing headcount is one of the goals of AI (Ronanki, 2019). Figure 5 shows a somewhat similar picture -- 57 percent and 10 percent of the respondents somehow disagreed and strongly disagreed respectively with the statement that AI solution will be a threat to unemployment, although 14 percent believed that jobs will be lost due to AI.

Figure 5: Perception of Unemployment and AI in Banks



Source: BIBM Survey

Box-1 shows the reasons why AI solutions will not be a threat to unemployment.

Box 1: Plan of Using AI within Next Three Years

- Banking tasks that are monotonous and repeated can be automated using AI and Machine Learning. Human Resources working behind monotonous and repetitive tasks can be relocated to other innovative and influential work/tasks (business development, Financial Analysis, Marketing strategy, Customer Relation, etc.) where more involvement of digitally skilled human resources is necessary.
- AI and Big data will allow the business to explore new business areas and create innovative business opportunities, which will require even more people to manage and run.
- AI solution will help developing more efficient human resources for the banking industry.
- A skilled workforce combined with AI will open a new era to the future banking industry.
- Process automation will eventually help Human Resources to automate their tasks, which will enable them to work more efficiently. Thus, the workload will reduce, and workforce efficiency will be increased.
- Machine learning frees the IT team as a result they can focus on other IT infrastructure related issues. At the same time they can help facilitating business processes rather than dealing with manual processing.
- This will create a higher opportunity to grow business and hence, resources can be used to manage this increasing growth.

Source: BIBM Survey

4.8 Skilled Human Resources and Infrastructure for Supporting AI Solution

The survey found that 62 percent of the respondents agreed, and 19 percent strongly agreed about the shortage of skilled workforce in the industry to support AI solutions. Together, the percentage was 81, which indicates a considerable deficit of skilled workforce in this fast-growing industry. However, 14 percent of the respondents were not sure about the insufficiency of skilled human resources in the industry to support AI solutions. Over one-half (52%) of the respondents believed that there is no necessary infrastructure in Bangladesh to implement AI solutions in the banking sector. Box-2 shows the necessary infrastructure required to support AI-based solutions in Bangladesh.

Box 2: Infrastructure Required for Supporting AI Based Solution

- High Computing Capacity
 - High Storage Capacity
 - Networking Infrastructure
 - Adaptive Security
 - Cost-effective AI Solutions/ Software
 - Data Repository and Availability of Accurate Data for Full Automation Process using RPA/ AI/ ML.
 - R&D/ Innovation Center for the development of AI/ ML-based business operations and financial services
 - Next-Generation and Software-Defined Data Center (SDDC)
 - Reliable High-speed Internet Connectivity with cheap rate
 - Highly Available and Reliable Cloud Computing Services/Infrastructure
 - Sufficient AI-skilled Manpower
 - Sufficient Awareness/ Training Program on RPA/ IPA/ AI/ ML/ DL
 - Incorporate/Emphasis on courses/ subjects of AI/ML in the Bachelor/Master's degree program of University/ Colleges to generate AI-skilled graduate students.
- And this will be a significant source of AI talent for the country

Source: BIBM Survey

4.9 Benefits of Using AI Solution in Banks

According to the survey, 62 percent agreed and 33 percent strongly agreed that banks can be benefited from utilizing AI solutions. The survey result indicated that AI has immense potentiality in the banking sector. Banks can use AI solutions in various domains, which will accelerate the performance of banking activities. Table-5 shows the major benefits of using AI in banks. Half (50%) of the respondents believed that one of the major benefits is improved customer service and trust through chatbots and automated voice assistants. Other benefits reported were customer profiling and customer behavior analysis, increasing employee productivity and efficiency, dislocating entry-level/ front-office jobs, trend analysis, etc.

Table 5: Key Benefits of Using AI in Banks

The Main/ Key Beneficial Factors of Using AI in Banks	% of Banks
Better/ Improved customer service and trust through chatbots and automated voice assistants	50%
Customer profiling and Customer behavior analysis	25%
AI assistants to make investment decisions (Robo Advisor)	10%
Automated Loan Application Processing	10%

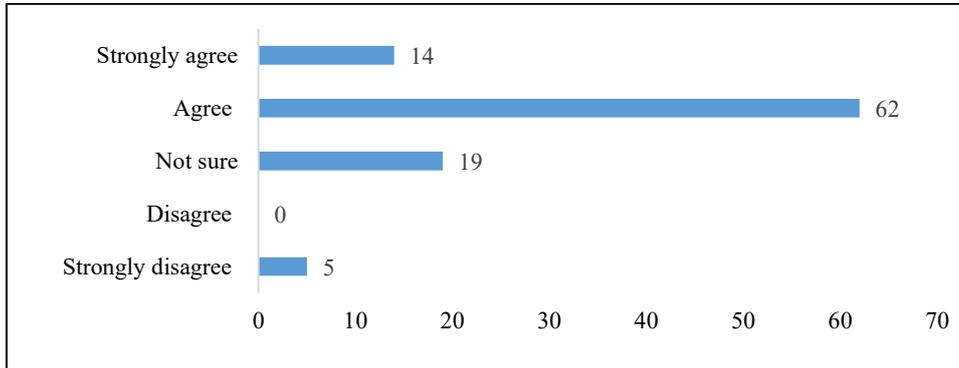
The Main/ Key Beneficial Factors of Using AI in Banks	% of Banks
Reduction in operation cost	10%
Reduced workloads	12%
Proactive Regulatory compliance	15%
Operational efficiency	20%
Employee productivity & efficiency will be increased and Reduce human error	25%
The entry-level/ front-office jobs will now be dislocated by AI.	35%
Future Business/ Market Trend analysis and Portfolio analysis using Advanced data analytics	25%
Prompt and Better decision-making	15%
Advancements in Fraud detection and prevention: Preventing Money Laundering, IT Security threats can be defended instantaneously.	50%
AI-driven risk management. Risks will be properly addressed and mitigated	10%
Simplify account opening process	5%
Revenue will be increased through Cost & Time Minimization in process & operation	15%
Extensive data analysis capability through Big Data will enable Banks to explore new business areas and increase customer base and revenue.	5%
Reduce Turnaround Time (TAT)	5%
Customer churn analysis	5%
Social Media Analysis	5%
Better Branding & Marketing	5%
More accurate projections	5%
Introduction of new lucrative packages	5%
Innovative product design	5%

Source: BIBM Survey

4.10 Implementation of AI to Reduce Operational Cost

Reducing operational costs is a big challenge for banks. Figure-6 shows the respondents' perception about minimizing operational costs by implementing AI. 62 percent of respondents agreed that banks can minimize operational costs. Moreover, 90 percent of the respondents believed that AI has a substantial impact on the performance of the banking sector. AI can collect data from various sources and analyze it for decision-making. Many back-office and front-line jobs can be transformed by using AI in banks.

Figure 6: AI to Reduce Operational Cost

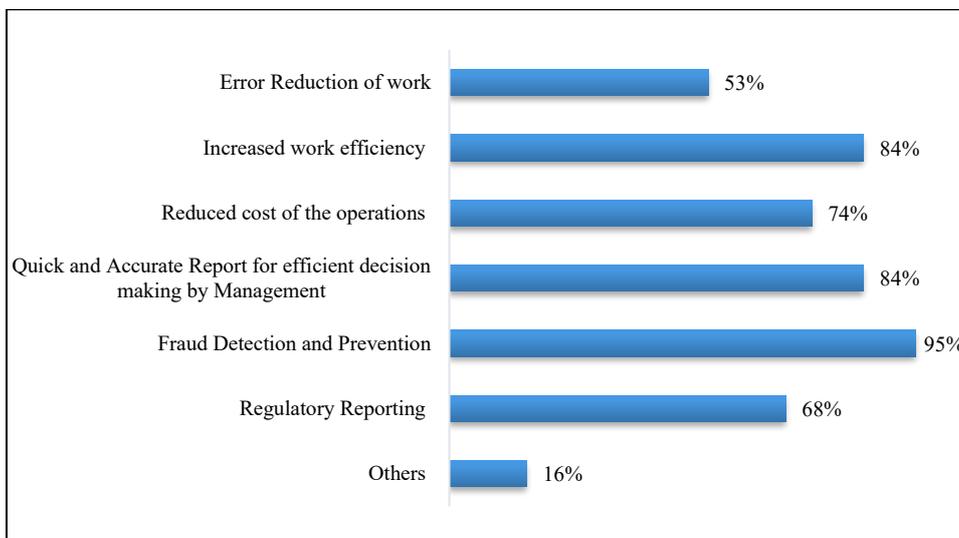


Source: BIBM Survey

4.11 Factors behind the Adoption of AI in Banks

Figure-7 shows the factors which have been encouraging the banks to adopt AI. 95 percent of the respondents believed that fraud detection and prevention are critical factors for adopting AI. Another 84 percent of the respondents agreed that increased work efficiency and quick and accurate reports for efficient decision-making by management are two essential factors for AI adoption. In addition, reducing operational cost, regulatory reporting, and reducing errors in work are some of the reasons behind the adoption of AI in banks.

Figure 7: Factors behind the Adoption of AI in Banks



Source: BIBM Survey

4.12 AI Solutions for the Future Banking Industry

Box-3 shows various AI based solutions for future banking industry such as for improving operational efficiency, preventing cyber-attacks, improving customer experience, achieving competitive advantage.

Box 3: AI Solutions for the Future Banking Industry

- AI solutions can be used to improve operational efficiency by automating mundane tasks, risk analysis, and compliance activities. Analyzing and understanding customer demands and customer behavior is key to success in the current market, and AI can significantly help in this regard.
- AI may help banks predicting future results and trends. Fraud detection, money laundering prevention and for customer recommendations AI can broadly help bank.
- Banking Industry is now facing cybersecurity problems, so cope-up with this demand we need to adopt AI
- The AI-based decision can ultimately help banks expedite workflow, reduce the volume of customer calls coming into the call center, and improve customer service.
- AI-like chatbots are coming to the normal.
- AI in business can be used to increase competitive advantage and improve efficiency.
- We think that through automation, repetitive tasks can be managed more efficiently and effectively. Operational efficiency will be increased, and customers will be better served. Extensive data analysis capability through Big Data will enable Banks to explore new business areas and increase customer base and revenue.
- Enhanced customer experience. If we adopt AI in our banking industry, it will be more acceptable than before. Using AI, if we can incorporate personal financial assistance for a customer in their Mobile apps, their lives will be easier and happier.
- Automating and optimizing routine processes which helps saving time and money.
- Increase revenue by identifying and maximizing sales opportunities.
- Ensuring Cyber Defense (Intelligent Fraud Detection and Prevention Method)
- Fast and Accurate Delivery of Regulatory Reporting
- Cognitive process automation, Realistic interactive interfaces, & Better Branding & Marketing
- Cost and time minimization in process and operation

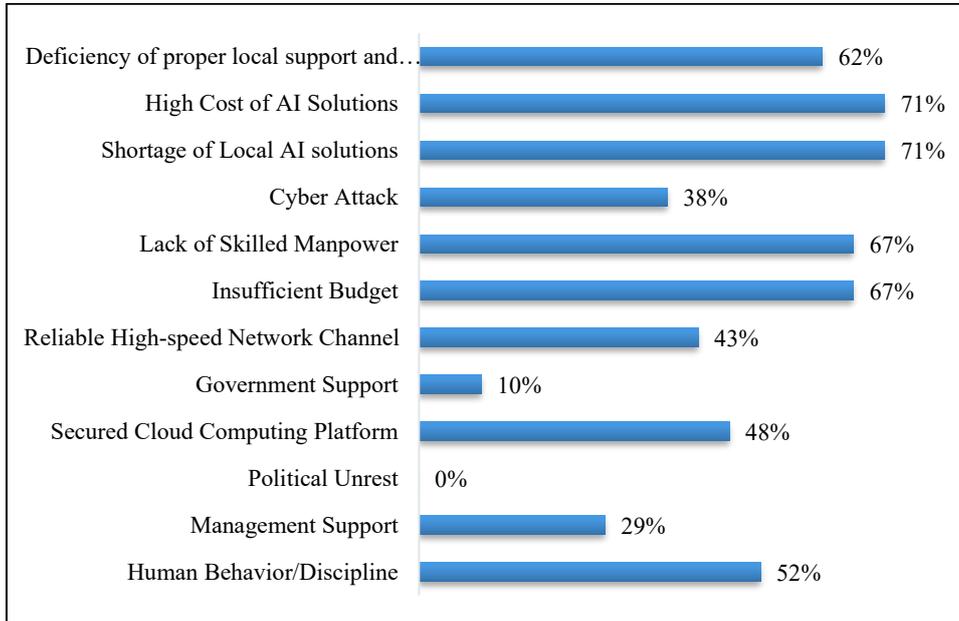
- Indeed AI is the way forward. We need to make use of our data more intelligently and analyze our business processes with the aid of AI to create more value, increase security, and better customer experience.
- AI can significantly assist us in transaction fraud reduction, customized financial products and services based on customers' transaction patterns, and build automated credit risk scoring. The potential is unlimited.
- AI technologies can help boosting the revenue through increased personalization of services to the customers (and employees).
- The current Standard Operating Procedure (SOP) of banks is full of trivial and repetitive manual labor. This hinders the time to serve a customer and is harmful to the environment as much paperwork is piling up every day. The storage and archival process of all this paperwork bear a considerable cost for the banks. Customers also want a one-stop service for all of their requirements. AI solutions would be a giant leap forward to address these issues.

Source: BIBM Survey

4.13 AI Implementation Challenges

Banks face many challenges in implementing AI solutions (Figure-8). 71 percent of the respondents believed that the high cost of AI solutions and shortage of local and cost-effective AI solutions are the biggest challenges of implementing AI solutions in banks. However, 67 percent of the respondents noted that lack of skilled workforce and insufficient budget also hinder the execution of AI in banks. Some other challenges are deficiency of local support and service, human behavior, secure cloud computing platform, and reliable high-speed network channel.

Figure 8: Implementation Challenges of AI in Banks

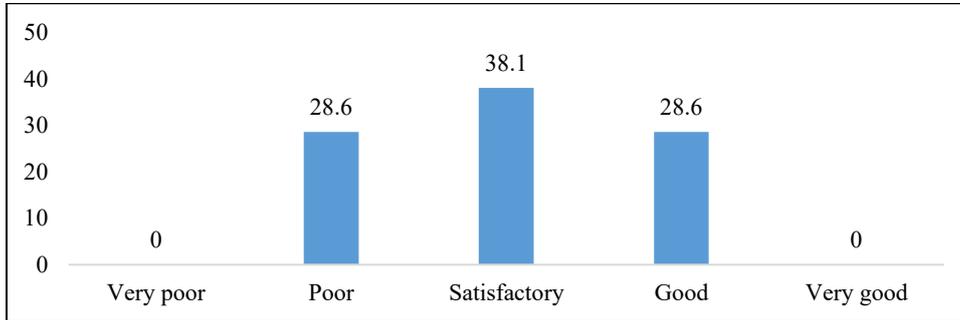


Source: BIBM Survey

4.14 Readiness of Banks to Handle Fully AI-based and Machine-driven Banking

About two-fifths (38%) of the respondents agreed that the banks were ready to handle AI-based and machine-driven banking issues satisfactorily (Figure-9). However, only 28.6 percent of the respondents feel that banks are performing better to handle AI-based and machine-driven banking. About 67 percent banks feel that they are in poor and satisfactory level to handle AI-driven business. These responses show (Figure-9) that there are scopes to improve the banks' readiness for AI management.

Figure 9: Readiness of Banks to Handle Fully AI-based and Machine-driven Banking

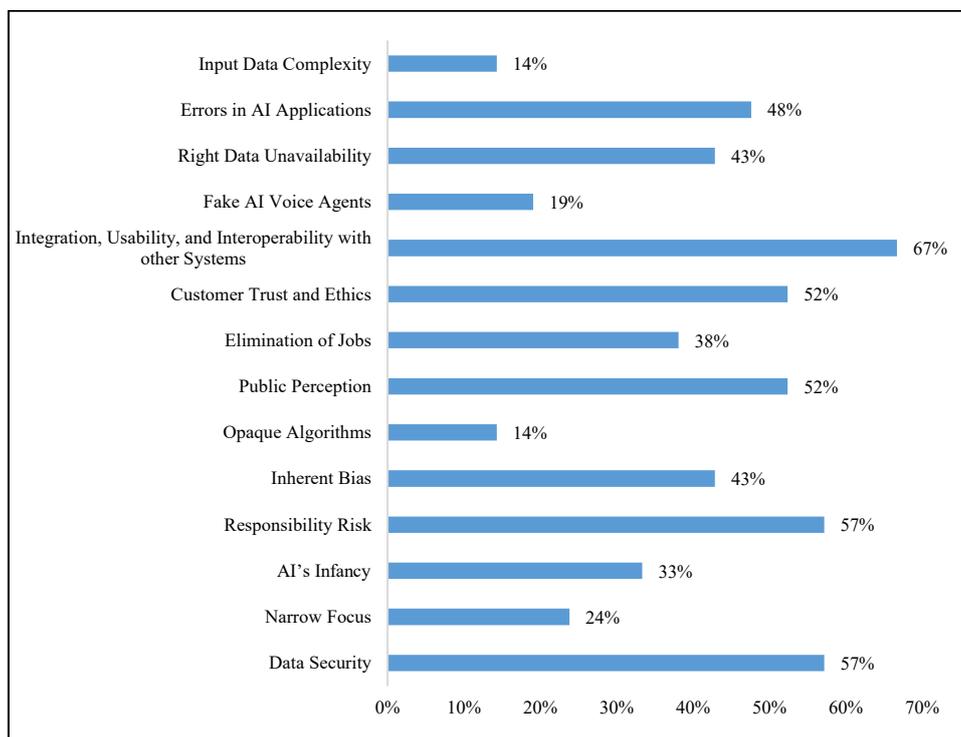


Source: BIBM Survey

4.15 Major Threats of Using AI in Banks

Apart from challenges, there are some threats of AI in the banks. 67 percent of the respondents agreed that Integration, Usability, and Interoperability with other Systems were the major threats for the banks in improving AI bases solutions (Figure-10). However, 57 percent pointed out the banks' data security and responsibility risk issues while developing AI in the banking systems. Further, customer trust, public perception of AI, errors in the AI applications were other probable challenges/ threats reported by the respondents related to introduction of AI.

Figure 10: Threats of Implementing AI



Source: BIBM Survey

4.16 Strategies and Initiatives to Overcome Challenges of AI

Box-4 gives a synopsis of the strategies that the banks should undertake to counter the threats and challenges of AI and trigger the efficiency and productivity of banks with the help of AI.

Box 4: Probable Strategies to Overcome AI Challenges for the Banks

- Deployment of AI solutions in the banking sector is very costly. But it would be cost-effective if more than one bank or all the banks leading/supported by Bangladesh bank take an effective initiative to deploy AI solution and share the data to bank through a secure channel.
- AI lacks the human judgment that is driven by emotional and empathy intelligence, which is a significant key issue in providing better customer service. For banks, AI's Infancy requires attention since its inherent level of uncertainty could be catastrophic if not handled with care and caution.
- Banks should take the initiative to introduce AI-based systems in customer services as well as banking processes to provide better and efficient services.

- Bangladesh Bank can provide effective policy and necessary guidelines for developing and implementing AI-based platforms in the Banking and Financial sector.
- Bangladesh Bank should introduce newer, more minor, and simplified requirements for banking processes. For example, an account opening form with 10+ pages requiring a physical signature prevents banks from investing or planning in digital transformation because the restrictive policies are the bar to the journey of digital transformation. Although recently, with e-KYC, the digitalization journey has begun, there are still many more banking processes that can do with improved and smaller requirements fit for the current digital age.
- The Government can take the initiative to ensure the availability of infrastructural resources for the Financial Institutions. Both government and companies should take proper steps to create more positive awareness and benefits of AI to common people.
- B.B. & Govt. should ensure that "data-driven banking" is in place if local banks are to join with global digital trends. To ensure that govt. Should allow easy access to data for banks from various sources, within reason, of course. A special incentive should be provided to the banks, encouraging them to shift to digital operations from existing manual processes.
- Govt. should launch any AI drives service for public access and to grow positive perception.
- Govt./ B.B. may take initiatives to set up and maintain an AI/ RPA based full Pilot Project hiring AI skilled workforce/experts.
- Local software companies should be given more emphasis to be able to build AI-based solutions for the Banks. The government can give special incentives or tax reductions for the AI solutions that Bank would like to use. This way, Banks will be encouraged to invest that Tax rebate in the costly AI solution.
- Proper Training on AI and Robotic processes must produce a skilled workforce for developing and maintaining AI and Machine driven automated banking/ financial services and operations.
- Conduction of an adequate awareness program is necessary to educate employees, customers, and stakeholders to remove the perception gap of AI-based services.
- AI skillset should be built, and AI should be included in the curriculum at the early stage of university education. This will bring new AI-skilled resources in the market to be able to use by the corporates and Banks.
- Follow global best practices in terms of implementing AI/RPA solutions in banks/ F.I.s.
- Organizations' culture must embrace change and the active practice of innovation. This cultural shift will put banks on the road for growth.

- Generally AI technologies are very expensive. The biggest challenge for AI implementation is data acquisition and storage. So it is essential to ensure clean data. High-performance infrastructure and a network is vital for AI.
- Banks can overcome AI challenges by taking the following initiatives: Prioritize organization alignment, establish a realistic scope, and Take a solution-focused approach.
- Establish R&D in banks to develop a skilled workforce for developing and maintaining RPA/ AI-based solutions, processes, and services.
- BIBM & B.B. may enforce few mandatory models of AI
- The country needs to come up with a robust regulatory framework that enables and empowers banks to use global technology partners who have the necessary tools and resource pools to make AI work, as it requires a lot of investments and a talent pool.
- There has to be knowledge development both in the public and private sector horizontally and vertically. Only AI engineering capabilities won't get us much far if the decision-makers are not aligned and convinced of the potential opportunity and risk of getting lag. Countries' top education and research institutions and big enterprises must deploy financial and human resources with a clear strategy to create job opportunities and AI-based economic growth. This can only work if the government regulatory framework and financial impetus are there.
- Due to the risk of unemployment or job losses, as a result of AI deployment, this is a challenge all countries will have to face at some point with the fourth generation industrial revolution. There is no alternative but to adopt the technology to be competitive in the global market. Therefore, government and private sector must work together to come up with an innovative approach that will harness the power of AI and at the same time create job opportunities in various sectors.
- We can overcome the challenges with skilled manpower and with the help of local and reputable software firms which are well-equipped to handle such kind of AI and machine-driven automated services. People's awareness is a vital issue here. Proper awareness will increase the trust and reliability of the overall service-based system.
- Incorporate AI as part of daily tasks
- The most common impediment to banks' efforts to adopt AI technologies is a lack of a clear AI strategy. Many banks have two additional challenges: first, a lack of core technology and data backbone, and second, an outdated operating model and talent strategy.

Source: BIBM Survey

4.17 Some Threats/ Challenges at Different Levels or Aspects of Banking Services where Banks should Avoid the Adoption of AI/ Robotics in Banking Operation

Box 5: Threats/ Challenges at Different Levels or Aspects of Banking Services where Banks should Avoid the Adoption of AI/ Robotics in Banking Operation

- The bank should avoid adopting AI/ robotics beyond the regulatory boundaries, even though the adoption of AI/ robotics could have yielded better results. Banks also must think about the long-term ROI of AI/ robotics.
- When the bank's resources are not capable enough to utilize the capacities of AI / robotics at the fullest, the bank should not invest in AI/ robotics. Instead they should first invest in human resources development. Because without placing the right resources at the right places, entire automation can fail no matter how robust it is.
- There are numerous hazards and risks associated with Artificial Intelligence in the banking industry, ranging from its difficulty in interpretation to its bias nature, narrow focus, and usability issues with other systems, which banks must evaluate if they decide to use AI in their systems. Banks should begin with the least crucial system and work their way up.
- Bank should not avoid or perish this AI adoption. We believe Banks can be benefited from AI and Big Data solutions with proper use of application.
- If AI-based solutions are not secured, or if information regarding customers as well as banking processes are not ensured with proper confidentiality, the adoption of AI/Robotics in banking operation/services should be avoided or perished.
- The production and maintenance of AI require high costs as it requires very costly and complex machines. The procedure to restore the system and recover lost may require huge time and cost. So, before implementing AI in the banking industry, banks should have insight (deep thought) about this challenging issue. Because if banks cannot recover from critical AI failure to start banking operation for a long time, it will bring us catastrophic damage in business.
- Despite having tremendous benefits of AI adoption in banks/F.I.s, but there are some reasons/scenario explained below where bank may avoid for implementing AI:
 - Highly Expensive: Because artificial intelligence is extremely complicated, they necessitate exorbitant production and maintenance costs. AI also consists of powerful software programs that must be updated on a regular basis to match the changing needs of the environment.

- Wrong Judgment Calls: Although artificial intelligence can learn and grow, it cannot make decisions like human. In specific circumstances and judgment calls only humans can take decision which something AI may never be able to achieve. Replacing adaptive human behavior with AI may result in illogical behavior within human-thing ecosystems.
- Risk and takes control away from humans: There is a perpetual concern of AI supplanting or supplanting humans. Artificial intelligence can give a lot of power to the few people who control it. As a result, AI poses the potential of taking authority away from humans while demeaning behaviors in a variety of ways.

Source: BIBM Survey

5.0 Summary of Observations and Recommendations

One, Awareness of Executives about Implementing AI in Banks

Executive awareness is the key to boost AI adoption in any industry, specially banks and FIs. The study shows that IT management has higher level of awareness about the benefits of AI implementation compared to other groups of management (BoDs, Executive Management and Midlevel Business Development Management). It is very undesirable to have any knowledge or perception gap of Innovative technology by Bank management (Specially engaged in decision making of digital transformation process).

Banks (in joint collaboration with BIBM and BB) should frequently conduct effective awareness development programs in the form of workshop, roundtable discussion, virtual focused group discussion, etc. to develop their knowledge and to reduce perception gap about the importance of adopting AI in developing banking business.

Two, Use of RPA and AI in Banks

Very few banks (19 %) used some sort of RPA in various functional areas of banking system and only 29 percent of banks used AI-based solutions in a very limited scale of operations.

But to take e full advantage of these innovative and automated technologies in the era of digital transformation, banks should apply AI and RPA in both the front-end and back-end workflows/ processes in different functional

areas related to improved and personalized services for tech-savvy customers, regulatory reporting and compliance, fraud detection and prevention, and risk analysis.

Three, Future Plan of Banks and Budget Allocation to Implement AI and RPA

71 percent of banks were not using any kind of AI-based solutions. However, many banks plan to initiate AI-based solutions in near future (within 2021 to 2023). AI and RPA are growing very rapidly. Unfortunately, our banking sector does not give much attention for deploying these solutions. The production and maintenance of AI involves high cost as it requires very costly and complex machines. Very few banks have a separate budget for adopting RPA and AI-based solutions. 67 percent of the respondents agreed that insufficient budget also hinder the execution of AI in banks.

The management should have farsightedness about the future prospects of AI in the financial industry and allocate sufficient budget for efficiently implementing AI and RPA solutions.

Four, Skilled Workforce to Handle AI-based Banking Services

The biggest challenge of handling AI in financial services is the scarcity of trained and skilled human resources. 67 percent of the respondent banks agreed that lack of skilled manpower is a major concern for properly maintaining AI platform in Banks. The existing workforce of our banking sector is unfamiliar with up-to-date tools and applications related to RPA and AI. Another important challenge faced by the banking industry is lack of people with the right skills of data science. That's why specialists also have emphasized the need for more skilled engineers to drive the segment.

The banking industry needs to work with Research and Training Academy like BIBM and also universities to advance in producing skilled data scientists as well as develop internal training programs to train employees for enhancing skill on data science. Also, identification of right use cases for AI implementation with the help of domain experts and data scientists can help banks and FIs in successful execution of AI technology for banking

operations and financial transactions. The bank management should give adequate attention to this.

Five, Availability of Right Data for AI

Digitization and automation in back-office processing is a vital application of AI in banks. Capturing data from official documents using OCR, and then, using ML/ AI to generate accurate and intuitive understanding from the text data can greatly reduce the processing time of back-office operations and cost. But, the availability of quality data is the key challenge. Data is the lifeblood of AI, and any weakness or security holes arising from unverified information is a serious anxiety for businesses. Due to incorrect sources of data, serious risks might arise from AI-based KYC compliance systems or fraud recognition and prevention system without having the right kind of data.

Banks must ensure structured process or mechanisms for assembling, authenticating, standardizing, correlating, archiving and dispensing AI relevant data to ensure reliable and secured operation of RPA/ AI driven banking system. Now the banks should have concentration on Data Acquisition System (DAS). Banks should ensure that the data used by banks for AI models are clean and KYC compliant. Immense data infrastructure is required for leveraging AI. Proper inspection of data for accuracy is also needed before using such innovative technologies in the public domain.

Six, Should Banks Buy or Build Conversational AI?

Whether banks should buy an AI platform from a vendor or build their own AI tools? If banks want to build internally, it requires time and dedicated data science talent and the final product will be tailored to the bank's needs. Third-party solution can be faster and cheaper, but the product may not be fully compatible with the bank's processes and data. Creating new processes and mapping data to make it compatible with the system is also a matter of rigorous effort. About 71 percent of the respondents believe that the high cost of AI solutions and shortage of local AI solutions are the biggest challenges for developing and maintaining AI solutions in banks.

It may be intelligent decision for banks to go for a hybrid approach in implementing AI. Banks can work with local or foreign vendors to build customized solutions, like HSBC did with Ayasdi. This will faster the AI implementation process, while still creating a product tailored to the bank's needs. Eventually, a bank may choose to develop a product in-house, using its own data scientists, application developers and research players. Any of two paths may be chosen by the banks. Therefore, banks should invest in AI to better deal with compliance, fraud and cyber risk management.

Seven, Facing the Challenges of Unemployment Risk

AI is an immense threat to redundant employees in the banking sector. AI and RPA can replace tellers, officials or executives related to customer service, loan processing, and compliance and even finance managers. The bulk adoption of AI may result in joblessness in the sector. Due to the risk of unemployment or job losses, this is a challenge all countries will have to face at some point with the fourth-generation industrial revolution (Industry 4.0). There is no alternative but to adopt the AI/ ML technology to be competitive in the global market.

Therefore, government and private sector must work together to come up with an innovative approach that will harness the power of AI and at the same time create sufficient new job opportunities in various sectors. Banks should have proper strategy or plan to utilize the jobless but competent employees in business development works like financial data and trend analysis, marketing strategy, good borrower selection, loan recovery, CRM, etc.

Eight, Handling the Challenges of AI's Infancy, Narrow Focus, Opacity of Processes and Responsibility Risk

AI lacks the human judgment that is driven by emotive and sympathy intelligence, which is a key issue in delivering better customer service. One of the significant threats exposed by AI to banking is that it is still in its embryonic stage. It is difficult to predict just how clever or efficient it will be in the near future. Another significant issue for regulators is about how AI systems are working and how they give decisions. With deep learning and neural networks, a lot of these models are trained with historical data,

and it is obviously challenging for FIs to understand why they are giving the results they deliver and try to explain that to regulators. Adoption of AI poses some obstacle or difficulties in liability. In case of errors and losses by the intelligent agent, who will be responsible for these losses?

Human judgment and continuous observation are required to ensure that front-end AI tools (AI Assistant, Chatbot, etc.) provide customer services smoothly. For banks, AI's infancy requires attention since its inherent level of uncertainty could result in major problems if not handled with special care and wisdom by expert/skilled workforce. AI systems cannot be left without proper supervision and follow-up. Due to opaque algorithm of AI, it requires human regulatory analysis in the future to avoid biased decisions or manipulation. Perception gap of both bank customers and employees is another major concern. In this regard, banking management should have insights and complete transparency to avoid reputational risk.

Nine, Role of Central Bank (BB) and Improving AI Readiness of Banks

- Data privacy and appropriate privileges of data access are the central aspects of any AI functionality in e-banking system. Introduction of data privacy regulations will be of paramount importance in these aspects. Our banking sector will have to build AI systems considering in mind our own as well as global Data Privacy Regulations/ Act like GDPR (General Data Protection Regulation) in Europe and FDPA (U.S. Federal Data Protection Act). BB can play a vital role so that the government can take proper initiatives to formulate a Data Privacy Act for AI driven system.
- Bangladesh Bank may provide effective policy and necessary guidelines for the development and implementation of AI-based platforms in the Banking and Financial sector.
- Bangladesh Bank should introduce newer, smaller, and simplified requirements for banking processes, because the restrictive policies (for example, an account opening form with 10+ pages) may act as hindrances in the journey of digital transformation.

- Both the Government and BB can take necessary initiatives to ensure the availability of infrastructural resources for the reliable AI-driven financial services.
- Government and BB should ensure that “data-driven banking” is in place.
- Deployment of AI solutions in the banking sector is very costly. However, it would be cost-effective, if more than one bank or all the banks (with the proper guidance/ support by Bangladesh Bank) take effective initiative to deploy AI solution.
- Government and BB should encourage and give preference to local software companies to be able to build robust and cost-effective AI-based solutions for the banks. The government can give special incentives or tax reductions for the local AI solutions that banks would like to use.
- Government and BB need to come up with a robust regulatory framework that enables and empowers banks to utilize global technology partners who have the necessary tools and resource pools to make AI works, as it requires a lot of investments and a talent pool.
- BB may form an AI Advisory Committee to understand the development of AI, and address the potential growth, restructuring, or other necessary changes.
- With the proper guidance of BB, BIBM (with the joint collaboration of globally reputed organizations) may arrange special training programs on AI/RPA to build an effective talent pool for the readiness of AI-driven banking.

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Appendix 1: List of Respondent Banks

Sl. No.	Name of the Banks
1	AB Bank Ltd.
2	Agrani Bank Ltd.
3	Al-Arafah Islami Bank Ltd.
4	Bangladesh Commerce Bank Ltd.
5	Bangladesh Krishi Bank
6	Bank Asia Ltd.
7	Dutch-Bangla Bank Ltd.
8	EXIM Bank of Bangladesh Ltd.
9	First Security Islami Bank Ltd.
10	Habib Bank Ltd.
11	The HSBC Bank Ltd.
12	IFIC Bank Ltd.
13	Islami Bank Bangladesh Ltd.
14	Janata Bank Ltd.
15	Meghna Bank Ltd.
16	Mercantile Bank Ltd.
17	Mutual Trust Bank Ltd.
18	NCC Bank Ltd.
19	NRB Bank Ltd.
20	ONE Bank Ltd.
21	Prime Bank Ltd.
22	Pubali Bank Ltd.
23	Rupali Bank Ltd.
24	Shahjalal Islami Bank Ltd.
25	Sonali Bank Ltd.
26	Southeast Bank Ltd.
27	State Bank of India
28	Trust Bank Ltd.
29	United Commercial Bank Ltd.
30	Uttara Bank Ltd.

Appendix 2: Some Success Cases on AI Application in Global Banks/ FIs

Case 1: Case Studies of JPMorgan Chase & Co.

JPMorgan Chase chooses Tableau to enable self-service analytics, keeping up with rapid industry changes.

- Saved thousands of work hours by reducing manual reporting time
- Enabled self-service analytics in a highly regulated space with data governance

JPMorgan Chase & Co. (JPMC), is a leading global financial services firm and one of the largest U.S. banks. The company has grown through mergers and acquisitions with data becoming vital to business operations and strategy—reducing risk, enhancing the customer experience, and offering intelligence to shape future strategy.

JPMC made a shift from IT-owned to business-owned self-service analytics to keep up with rapid industry changes and better optimize for business success. But in a highly-regulated environment, IT needed to first establish enterprise governance that balanced data access and compliance. Championed by the Center of Excellence and with IT as enablers, JPMC adopted Tableau, expanding from 400 Tableau Server users in 2011 and approaching 30,000 today—driving enterprise-wide data accuracy.

Today, over 500 teams use Tableau to make strategic decisions that are important to the bank's health. For example, JPMC's Marketing Operations team analyzes the customer journey, which influences design decisions for the website, promotional materials, and products like the Chase mobile application. Finance and Branch Managers analyze data to support a stronger customer banking experience. And a variety of roles—from Traders, Operations Analysts, Sales, or Risk and Compliance team members—benefit from Tableau's API capabilities, which support a seamless analytics experience with existing business applications.

By allowing analysts across business teams to question data with Tableau, JPMC has also reduced manual reporting time from months to weeks, which saved thousands of hours and created better enterprise-wide decision-making with elevated transparency. Analysts to C-level executives have gained more time and access to think about data's impact on the business, have more capacity to innovate, and have set more consistent definitions of metrics to better understand the journey that customers take with the bank.

Shaping the Customer Experience with Channel-level Marketing Metrics

While business teams reviewed analytics (e.g., measuring account-specific data and retail data), they struggled with viewing the whole customer and their end-to-end journey. Tableau now acts as the front-end for customer analytics and Marketing has built robust data sets tying the line of business relationships like products, marketing,

and service touchpoints with customer data to evaluate overall customer relationship worth.

“We put a Tableau front-end on our robust customer data sets that enable analysts to quickly ask questions like ‘how many customers have a Freedom and a checking account and use the mobile wallet,’” explained Jason. This arms JPMC with insights to improve customer satisfaction while growing its customer base.

When launching campaigns, the Marketing team analyzes population data in Tableau to determine optimal targeting. And the operations side looks at customer journey analytics to understand process breaks. It’s important to see why and where customers abandon an action with the bank or where there are key volumes on channels so product improvements can be made. “There are call center metrics. There is website analytics. Everything you can think of from a customer experience where we’re trying to improve customer satisfaction” added Steven. The outcome is quick wins versus putting items on a roadmap to eventually be addressed.

Marketing also supports JPMC’s retail branches with Tableau dashboards to better understand their market. For instance, certain dashboards help better prospect small businesses. And they’re delivering greater detail on home sales and realtor activity to inform select programs and customer targeting. There’s now a piloted rollout of Tableau to branch staff such as Private Client Bankers and Home Lending Advisors that will eventually include all 5,300+ branches.

“Allowing self-service in one of the most highly regulated spaces – having the standard platform, the right data controls, and the right governance in the tool that captures metadata and provides lineage of it in Tableau – users love it because they don’t have to wait for IT and IT loves it because they have happy users,” stated Sriram Belur, Head of Business Intelligence Delivery Center.

Source: Tableau.com

Case 2: Case Studies of Bank Negara Indonesia

Bank Negara Indonesia consolidates data across 16 regional offices serving millions of customers worldwide

- Increased speed to insight by at least 85 percent
- Single source of truth across 16 regional offices
- In-depth customer profiling for more strategic promotions

Bank Negara Indonesia (BNI) is a state-owned enterprise bank that conducts commercial and consumer banking services, with global offices in Singapore, Tokyo, London, New

York City, and more. Tableau plays an important role in their analytics, profiling, and information delivery. The head office uses Tableau to disseminate information and reports to 16 regional offices, 200 branches and 1,000 sub-branches across Indonesia.

Assistant Vice President of BNI's Information Delivery Group, Firman Taufik, shares how BNI uses Tableau to monitor financial performance on a regional and branch level, as well as customer activities such as opening and closing of accounts, or their usage of Internet and mobile banking services. By monitoring these activities and profiling customers with Tableau, BNI can plan more targeted promotions to improve acquisition and retention.

A single source of truth boosts accuracy and depth of data

For the past five years, BNI has been on a journey moving from traditional to modern analytics with Tableau as their visual reporting and analytics tool, growing the number of Tableau users by more than tenfold. Tech consulting company Cybertrend partnered with BNI and provided close support in their initial stages of planning and Tableau implementation.

With 40,000 employees serving millions of customers worldwide, BNI was working with big data of 30 terabytes and growing, without a central depository that management at all levels could refer to. Before Tableau, managers had to rely on reports issued from the head office, which were only summaries of data that lacked detail. For example, data on account openings did not include the names and demographic information of customers, so it was very difficult to track progress and targets or make strategic decisions based on insights.

Tableau helped BNI's head office consolidate a single source of truth and get a bird's eye view across all offices and branches, with the ability to drill down and analyze data at different levels of the business. Up to 250 workbooks and 750 views have been created in Tableau, used daily by managers across the country to monitor branch performance and motivate their employees to hit targets. With more transparency and access to accurate and in-depth insights, it is easier to execute management decisions and strategies effectively on the ground.

Getting users "addicted" to the power of data

Moving forward, BNI plans to build self-service analytics capabilities across the enterprise by training more "Tableau Champions" across different divisions, eventually expanding Tableau's data exploration capabilities to all regional branches and front-line managers to elevate the quality and efficiency of BNI's work as a banking enterprise.

"In the future, we hope to create a self-service data-driven culture so that our users get addicted to the power of having data in their hands," shares Firman.

Source: Tableau.com

Case 3: Case Studies on AI Technology in Five Leading Commercial Banks in India

SBI

SBI, which is India's largest public-sector bank with 420 million customers and is embarking on its AI journey from the point of view of both employees and customers. SBI is currently using an AI-based solution developed by Chapdex. From a customer chatbot perspective, SBI has launched SIA, an AI-powered chat assistant that addresses customer inquiries instantly and helps them with everyday banking tasks just like a bank representative told Emerj, the company's own press release for said SAI launch appears to be unavailable due to a website issue, as of Dec 27, 2017. SIA was developed by Payjo, a start-up based in Silicon Valley and Bengaluru. According to Payjo, since its launch, the chatbot has responded to millions of queries from thousands of customers. SIA is set up to handle nearly 10,000 inquiries per second or 864 million in a day. That is nearly 25 percent of the queries processed by Google every day. Currently, SAI can address inquiries on banking products and services. It is trained with a large set of past customer questions and is said to aptly handle frequently asked questions.

HDFC

HDFC Bank has developed an AI-based chatbot, "Eva", built by Bengaluru-based Senseforth AI Research. Since its launch in March this year, Eva which stands Electronic Virtual Assistant has addressed over 2.7 million customer queries, interacted with over 530,000 unique users, and held 1.2 million conversations. Eva can assimilate knowledge from thousands of sources and provide simple answers in less than 0.4 seconds Eva has answered more than 100,000 queries from thousands of customers from 17 countries across the globe. With the launch of Eva, the bank's customers can get information on its products and services instantaneously. It removes the need to search, browse or call. Eva also becomes smarter as it learns through its customer interactions. Currently, they have introduced IRA 2.0 that will interact with customers, answer bank-related queries, frequently asked questions, and guide them inside the branch with voice-based navigation.

ICICI

ICICI Bank, India's second-largest private sector bank has deployed software robotics in over 200 business processes across various functions of the company. The bank has created the software robotics platform mostly in-house, leveraging AI features such as facial and voice recognition, natural language processing, machine learning, and bots among others. I believe that the implementation of software robotics will herald a transformational change in the Indian banking industry. In February this year, ICICI Bank launched its AI-based chatbot, named iPal. Since its launch, the chatbot has interacted with 3.1 million customers, answering about 6 million queries, with a 90 percent accuracy rate.

Axis Bank

It is India's third-largest private sector bank, launched an innovation lab called Thought Factory last year to accelerate the development of innovative AI technology solutions for the banking sector. The innovation hub located in Bengaluru has an in-house innovation. Recently, Axis Bank launched an AI & NLP (Natural Language Processing) enabled app, Conversational Banking, to help consumers with financial and non-financial transactions, answer and get in touch with the bank for loan other products. Currently, robotic process automation (RPA) is complete for most processes, including account maintenance and servicing, loan disbursements, bulk transaction processes, and ATM support.

HSBC

HSBC is one of the world's largest banking and financial services organizations, serving around 38 million customers across 67 countries through its 3,900 offices worldwide. HSBC Technology is a function within the Bank that builds and maintains its information technology systems. Technology teams draw on insights from HSBC's vast global network and combine them with cutting-edge financial technology to deliver an unrivaled global banking experience to its customers. HSBC is currently using AI-based robots to help spot money laundering, fraud & also predict how a customer might redeem their credit card points.

Source: Sindhu, Renee Namratha, 2019

Case 4: HSBC Combats Money Laundering Using AI

HSBC has partnered with Ayasdi, a machine learning software company, to develop an AI-powered anti-money laundering (AML) solution.

The software was collaboratively developed by HSBC's internal IT team and Ayasdi's data scientists to identify patterns in historical data that suggest money laundering. When fed current payment data, it can identify fraudulent patterns and alert staff to block these payments. The software analyzes the source and destination of payments, among other factors, to identify deviations from normal behavior.

HSBC's IT staff helped Ayasdi understand internal AML data and HSBC's modeling team helped Ayasdi create accurate customer behavior models. This collaboration meant that HSBC could easily use and integrate Ayasdi's models to their own business practices, thereby overcoming a common challenge of plugging in a vendor product.

Traditional rules-based detection systems often produce false positive alerts where innocent transactions are mistakenly flagged as suspicious. Investigating these alerts is time intensive for staff. Ayasdi claims that their software has helped HSBC reduce false positive investigations by 20 percent without relaxing compliance standards.

Source: Shroff, 2020

Case 5: Cybersecurity: JPMorgan Chase Develops Early Warning System for Phishing and Malware

Researchers at JPMorgan Chase have used deep learning and other AI techniques to develop an “early warning” system that detects malware, Trojans and phishing campaigns. This detection system allegedly identifies suspicious behavior long before phishing emails are actually sent to employees.

Deep learning techniques for anomaly detection can learn what constitutes normal behavior and identify abnormal activity that hasn’t been seen before. The researchers say that it takes normally around 101 days for a Trojan to compromise company networks. An early detection system would provide ample warning before the actual attack takes place.

The system can reportedly identify mass phishing campaigns created through domain generation algorithms. It can also identify malicious URLs by comparing them with known suspicious traffic patterns, jumbled URLs and spelling mistakes characteristic of phishing campaigns.

While the system was trained using public datasets of phishing URLs, the researchers claim in a paper that its deep learning algorithms enable it to detect threats better than traditional security systems. It can also alert the bank’s cybersecurity team as hackers prepare to send phishing emails to employees with malware to infect the network.

Source: Shroff, 2020

Case 6: Fraud Detection: Danske Bank Uses Deep Learning to Combat Fraud

Danske Bank, Denmark’s largest bank, partnered with analytics firm Teradata to implement a deep learning-based fraud detection system.

According to a case study by Teradata, Danske Bank’s old rules-based fraud detection system only had a 40 percent success rate and generated 1,200 false positives per day. What’s more, 99.5 percent of suspicious cases the bank investigated turned out to be not fraudulent. These dead-end investigations require time and resources that could have been used to combat actual fraud.

Danske Bank worked with Teradata to implement a deep learning tool that increased fraud detection capability by 50 percent and reduced false positives by 60 percent. The system also automated many decisions while routing some cases to human analysts for further inspection.

The case study mentions that the system uses a ‘champion/challenger’ methodology to detect anomalies. Each model (challenger) learns transaction characteristics indicative of fraud and is fed additional data such as customer location to improve accuracy. When a model beats other models, it becomes the ‘champion’ and helps train other models. This process of improvement likely repeats.

Source: Shroff, 2020

As a values-based organization, BRAC Bank invests in building the nation with education and development initiatives that contribute to healthy, sustainable and harmonious economic growth.

It gives us immense pleasure to be affiliated with the Bangladesh Institute of Bank Management (BIBM) for publishing a keynote paper of its roundtable discussion. We believe that the new generation of bankers would get access to a pool of knowledge on key functional areas of the banking industry.

We believe that the book will not only empower the professionals with a better understanding of finance but will also broaden their capabilities and help them contribute more to the country's economic prospects.

Our best wishes to BIBM.



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