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Drivers of Artificial Intelligence in Banking Service Sectors

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***Abstract*:** Artificial intelligence (AI) has been a subject of interest in the research field for the past few years. It has now been brought closer to commercial use due to recent technological advances and speedier data accessibility. Its relevance to global business models is underlined by the significant investments in it made by Internet powerhouses including Google, YouTube, Amazon and Facebook. In the banking sector where data is of substantial value, AI has been incorporated in pilot projects but its true applications have yet to see the light of day. In this study, the drivers and barriers to successful AI implementation in the banking sector is analyzed using a panel data of 28 semi-structured interviews with AI experts in the field of banking and finance. AI-oriented role models and process capabilities were revealed to be essential prior to having the trained algorithms reach the level whereby the AI applications can run devoid of human involvement and moral trepidations.

Keywords: *Artificial Intelligence, Banking, Technology Adoption, Sri Lanka*

I.   INTRODUCTION

The digital transformations in various industries have mainly been driven by the development of artificial intelligence (AI) [1]. Over the past four years, there has been a tremendous growth in AI investments worldwide. The 2016 report by Gartner revealed that the actual deployment of AI technology had been undertaken by a mere 9% of organizations, but the number increased to 25% three years later in 2019 with the Enterprise Digital Research projecting the growth rate to double in the subsequent five years. Also, it is now the number one strategic technology for organizations. Digital transformations now rely on AI riding on the developments in networking and greater data processing [2].

AI is considered as a crucial business solution and basis for capabilities in all types of organizations [3]. The economic growth of various nations is also driven by AI as it provides ample business opportunities. AI applications can improve organizational performance and create competitive advantage [4]. Banks that have adopted AI technology have demonstrated a boost in interest incomes, lower costs and enhanced customer satisfaction. [5]. Despite the benefits generated by its greater computational data power, AI has yet to be conventionally adopted. Many organizations are still at the infancy stage with AI adoption including those in

Sri Lanka. They are still trying to determine the business case for AI applications as well as the needed skills for evaluating, building and deploying AI solutions [6].

Internet giants like Amazon, Google, YouTube and Facebook are constantly issuing their AI libraries making them accessible to developers in general. Additionally, AI tools are now made available by many prominent software vendors including IBM Watson, Azure Machine Learning and Infosys Nia for the use of organizations [7]. With such developments, AI now permeates all industries including banking and finance.

AI is a direct solution to capturing the value of the ever growing prevalence of big data. AI enables autonomous pattern recognition and smarter data usage, making it easier to capture information about customer and market needs, leading to improved competitive advantage [8]. The potentiality of AI is apparent for the banking service sectors where customer and transaction data as the main resource is constantly collected, sorted, processed and linked [9]. Most banking services are now launching chatbots in their mobile apps and social media.

Principally, the business models of banking services can be fully digitized. The current banking sector is now feeling the pressure of the rise of financial technology firms (FinTechs) and increasing customer demands. Hence, this study intends to determine how Sri Lanka's banking service sectors adapt and adopt AI and how they cope with the challenges that come along with it. In answering that question, empirical data was gathered by conducting semi-structured interviews with a panel of Sri Lankan banking AI experts from major software provider companies including IBM, Infosys, Microsoft and Salesforce, supported by interviews with CxO level experts. The study is guided by the TOE framework. After analyzing the key challenges that come with AI implementation, each challenge was addressed using a corresponding guideline i.e. the second tier in this inquiry. The findings reveal the significance of AI in creating competitive advantage for banks who in turn need to resolve the challenges of conservative organizational structures and poor service mindsets in order to reap the full benefits of AI implementation.

II. ARTIFICIAL INTELLIGENCE IN BANKING SERVICE SECTOR

Banks are constantly forced to transform their operations in order to stay relevant in a complex and competitive sector. To do so, the key is in maintaining customer loyalty which includes addressing the aspects of customer trust, satisfaction, commitment and perceived value [10].

Constant improvements on customer service and the use of advanced technologies can redefine the processes of banking services as proven by Google and Facebook. Yet, many conventional banking services providers fail to provide the needed flexibility and innovative capabilities. Hence, FinTechs are deemed as the more viable breakthrough to conventional banking service sectors [11]. FinTechs skip on legacy architectures and instead use advanced technologies along with lean and agile procedures to produce improved customer positioning, reduced costs and accelerated innovations speeds. They have catalyzed major innovations in diverse areas including wealth management, payment, lending and crowdfunding [11] as well

as stimulated AI and machine learning adoption in banking services [12]. The highly customer-oriented FinTech organizations have spurred traditional banking services to transform. The incessant prevalence of computed data between customers and banks demonstrate a huge prospect for assessments, analysis and product endorsements. Conversational interfaces are now being reshaped from a rigid and complex form-based communication to a conversation-oriented communication due to the redesigning of digital experiences; in short, AI enables a more natural communication between consumers and banks via writing, conversations and gestures [13]. Additionally, the digital natives i.e. the customer segment from 1995 forwards [14] want the banking service providers to give them similar experiences with that offered by Microsoft, Facebook and other digital suppliers including user-friendly financial products, refined information organization, enhanced procedures with shorter throughput, and product/service customization pre- and post-purchase [14].

Based on the interviews with banks software vendors in this study, an emphasis was clear on the accretion of customer-based AI application. We found that most of the banking systems are developing initial AI prototypes that are yet being implemented by the banking service sectors. Prototypes are typically built in an experimental setting for internal use so as to determine and test their prospective usages examples of which include front office applications such as transactions, credit scoring and client chatbots. Chatbots are virtual assistants which are one of the usages of AI interfaces already employed by banks. Nevertheless, many have complained about and expressed disappointment with the existing chatbots' simplicity, which corroborates the financial stability report which states that existing chatbots are too simple with provision of too general policy information or basic answers [12]. Technology industry experts particularly their subgroups have emphasized on the significance of operations-driven appliances because back-end operations and risk management often run on inefficient human support. Improved cost savings and greater productivity are among the benefits of AI technology due to smart process automation and automated customer services. The faster response times and personalized offerings lead to improved customer experience and engagement, and ultimately higher interest and profits. Conventional banking sectors will hence need to gradually employ the use of AI to retain public trust and remain competitive.

The definition of AI encompasses numerous sub-fields with various emphases based on the corresponding historical and technical origins [8]. This study defines artificial intelligence as how to make computers do things at which, at the moment, people are better [7]. Adaptability to environments and behaviours remains a particular human quality, but it is now gradually being substituted by machine learning [8]. machine learning entails the capability of systems or applications to learn minus any explicit programming [15].

III.   THEORETICAL FRAMEWORK

The Theoretical Framework of this study is drawn based on Technology-Organization-Environment Framework (TOE) [16] to gain a complete picture of the challenges in adopting

AI in the context of the Sri Lankan banking service sectors [16]. This organization-level theory entails the dimensions of technology, organization and environment that influence the adoption and implementation of technology in banks and of which had been empirically proven to be suitable for analyzing innovation [17]. The dimension of technology entails bank-related internal and external technologies whereby the former refers to the bank's current technologies which establish the pace and scope of technological transformations that banks can take on, whilst the latter refers to new technologies available in the market.

The dimension of organization is characterized, amongst others, by the bank's size, managerial structures and human resources [19]. The dimension of environment refers to the structures and regulatory environments of the industry in which the bank operates including its competition, customers, the government and the community. This study focuses on the relatively under-researched banking sectors in relation to AI implementation. A recent investigation used the TOE framework to study the value-driven adoption of big data analytics i.e., a field closely linked to AI [20]. The said study frames the major reasons for the non-implementation of big data analysis via the same approach used in this current study. Hence, the TOE framework is considered as a suitable theoretical basis for examining the challenges in adopting AI in the banking service sectors.

IV. METHOD, ANALYSIS AND FINDINGS OF THE STUDY

4.1 Method

This study employed qualitative approach using interviews to gather insight about the challenges faced by banks in Sri Lanka in adopting AI and subsequently offer guidelines on how to address the identified challenges. Firstly, the data collected was analyzed to identify the major challenges. Secondly, the guidelines were developed based on the interview findings and comprehensive literature review. There were three dimensions studied based on the TOE framework and built up according to the experts' statements namely technology, organization and environment. The TOE framework was found to be a suitable theoretical basis as it covers all the bank-relevant dimensions.

4.2. Findings

4.2.1 Drivers of AI Adoption

Technological Drivers for AI Adoption:

Some of the interviewed experts state AI adoption is inhibited by the non-availability and poor quality of training data. Poor data quality inhibits one inherent characteristic of AI i.e. its algorithm learns from being exposed to input and output data samples, rendering its need for large quantities of training data. Based on insights gathered from the interviews, there is an inadequate amount of digital data to enable the proper training of an AI system, those that are available are protected by data privacy policies. This lack of digital AI training data is also caused by the analogical set-up of many banking service providers; in short, they still rely on paper. Some of the experts' point to poor market overview as the inhibitor to data quality improvement, which is a surprising revelation as AI engines are now being offered by

all major software providers including Amazon, IBM Watson and Microsoft Azure. Many of the providers in turn enjoy the same market visibility as the start-ups.

Another key challenge in the adoption of AI is the achievement of quality assurance despite the crucial need for transparent and coherent AI outcomes including in the calculations, projections, and processes/decisions. Although the purpose of an AI system is programmed, the process to fulfill it is trained; hence, the products and processes in the AI components will act inversely over time. This renders certain risks such as training data bias. An AI solution relies on its previous training. Since training data bias causes undesirable results, any defect in data quality must be promptly recognized and removed. Outputs that do not conform to ethical standards may also be generated by the AI, the training data or the user. This incessant poor AI quality level can be described by comparing the non-transparent decision-making process to a black box. Proper control mechanisms are hence needed for monitoring the AI's behavior and its adherence to prevailing standards and regulations. Ultimately, the main challenge for banking sector is in ensuring that the AI solutions are reliable and transparent so as to realize its overall potentials. Resultantly, the technological barriers to AI adoption are that banks need to provide adequate levels of data quantity and quality required by the AI system so as to generate value for them, the lack of market transparency and unavailability of providers of technology hinder the adoption of AI among the banking services, the need to maintain the existing IT architectures slows down innovation speed and limits financial and personal resources and poor transparency of the AI black box causes doubts and hence slows down the transition to AI.

Organizational Drivers for AI Adoption:

The experts emphasized the stark gap in digital knowledge and skills among the employees of banks which are severely lacking in data scientists' requirement engineers. Most of the experts also highlighted the greater importance of change in mentality and employees' willingness to change over the need for hard skills. Hence, the challenge thereby lies in enabling employees to gradually focus on problem-solving and activity implementations. According to the experts, digitization acceleration signifies the greater demand for process competencies transformation. Such operational transformations are evident in these potential areas for AI implementation namely: recognition of situation, support of decisions, and forecasting and development. These categorically-defined routine activities will cease to be relevant in the labor markets with the adoption of AI. new customer tasks or standard advices will also emerge as digital assistants enable automated customer interface.

The gap between legacy and digital operations present another challenge for banks as legacy operations obstruct valuable investments in digital operations [21]. This issue needs to be addressed at the cultural level in order to create value via AI. Company structure will remain unchanged whilst new technologies will continue to be resisted by old mentalities if there is no support from the top management, which is an important element in driving AI implementation success.

Overall, organizational readiness and top management support are identified as the main drivers of innovation adoption based on the TOE framework, which are strongly reinforced in the field of AI. Skills and technological knowledge are the most significant yet most complex elements in ensuring AI implementation success. Companies will need to figure out how their employees can assume higher quality tasks since certain employees will become obsolete when computers take over their existing jobs. The employees' willingness to change and process competencies transformations present a further challenge as the workforce needs to leave behind their familiar environments, learn to collaborate with other departments, and work with and AI system. Higher agility and speedier adaptability are a necessity for the banks in general and the employees in particular as processes become faster, trainings become more incessant, and risks become more rampant. However, the needed agility and adaptability mentioned above could be hindered by hierarchical organizational structures and lack of top-management support in the implementation of AI technology.

Environmental Drivers for AI Adoption:

The substantial amount of data analysis required by AI can only be realized by decentralizing the data in centers known as the cloud. The experts indicated that the banking service sector is wary about not being able to control their data which represents their businesses' core value. Additionally, elements that would negatively affect the AI system's output such as security breaches, data leaks and unauthorized data access must be prevented. Hence, data protection is also recognized as a main challenge in the adoption of AI in the banking sectors. Meanwhile, market interruptions due to the rise of FinTechs have accelerated AI adoption in the banking sectors. Banking service providers are driven to transform their services because FinTechs rely on lean, agile and innovative products [11]. In the context of the banking sector, FinTechs drive the optimization of their products, systems and processes. The interviewed experts further state that conventional banking service providers have to comply with numerous regulatory requirements which limit personal and financial resources. Since banking service providers need to invest significantly on documentation and regulatory reports, only a very small allocation of their budget is left for digital transformation projects including that of AI. Apart from that, moral concerns and uncertainties also hinder AI adoption which hence underlines the significance of having moral and ethical frameworks in place. There is a need to ease the apprehensions among the society about embracing new technological innovations.

The environmental context as the third key TOE dimension for innovation adoption is supported by past studies. In the aftermath of the global financial crisis, there is an increase in risks awareness, regulatory requirements and intervention in the banking service landscape [9]. E-banking adoption is significantly driven by governmental regulations [18]. Likewise, the findings of this current study state the same with regards to AI adoption. Conventional data protection is part of the banking sector's core business. The rise of FinTechs had motivated the transformation of conventional banking service providers. The regulatory requirements, amongst others, had limited the financial and personal resources of banking

sectors, whilst governmental regulations provide opportunities for new market participants and AI adoption is hindered by moral apprehensions.

4.2.2 What Factors should banks look at?

Technological Factors:

In terms of the technological AI characteristics, this study recommends quality assurance for the black box functionality. In addition, banks need to make their system trustworthy and justifiable, which leads to a particular form of AI control and governance. The identified risk complex requires for an AI-adapted risk management. Poor data quantity and quality as a highly underestimated key challenge in the implementation of AI in the banking sector. The realization of the AI system's benefits is primarily dependent on its prior training which requires data input and output, and an adequate amount of training data. The adequacy in question relies on several factors including data complexity, task type and others [22]. Banks must ensure the digital availability of the needed data as well as the sufficiency of its quality in deriving value-added decisions. Utilization of micro services as opposed to monolithic IT architectures as the former has been proven to provide flexibility. Micro services are single software modules with a single function [23], which require the organization and the infrastructure to be highly agile. Such changes entail a two-speed IT with regards to the company's overall IT infrastructure. The continued operations of the conventional IT infrastructure are designated to ensure the stability and security of the banking system's core, supplemented by an additional infrastructure that is designated to support the development and implementation of the application in a speedy and flexible manner.

Meanwhile, the set compliance requirements must be satisfied particularly for live operating systems and direct customer interactions such as for avoiding known ethical breaches. Once the current level of the technological and data-based training has reached its threshold, organizational structures i.e. human intervention is needed; the solution to this, hence, needs to be managed at the organizational level. [18] recommends that in order to adopt AI, banks should ascertain adequate training data with no biases and inconsistencies in its structure, attain an extensive market overview of AI providers such as via consultations, modernize IT architectures and deploy micro services and develop systems of quality assurance.

Organizational factors

The development of technological know-how among their current employees can ensure the success of their AI adoption. But recruiting more AI proficient employees is also a proper measure. In the prevailing top-down hierarchy, non-conventional and novel stakeholders are often ignored whilst employees are not encouraged to change [21]. This study highly recommends that banks retain employees with AI proficiencies. Hence, the companies are recommended to use constellations like the innovation management-based incubator model of which usage is likely to increase throughout the AI implementation. This model is also known as Digital Units, which combine various functions and proficiencies including legal, IT, business and data privacy. Employees are not pressured to meet deadlines and achieve certain outcomes, but rather focus on the development of innovation and solutions. Improving

the algorithms (depending on prior training) could solve the problem of the AI black box characteristic. The following are recommended by [18]: creating awareness amongst the top management to provide sufficient budget for business modernization and digitization, creating a proper working environment for the new recruits and current employees, which drives technological innovation and tackles hierarchical structures and promoting agility to facilitate financial, technical and human resources adaptations.

With the independent-learning ability of AI, its systematic flaws like its intuitiveness or unpredictability will be short-lived with the work function transformations implemented by humans within the multitask business processes. Human judgment is even more needed in more complex decision-making situations. Hence, the main precondition for an AI-oriented work setting is not only for promoting AI, but also for driving human intelligence. To ensure the success of the human-machine interaction, the banks and the society must make significant investments in digital education and information literacy as well as be bold enough to make multi-level judgments and decisions in meeting the demands of the changing process competencies.

Focusing on the organizational changing process competencies and in ascertaining the AI training algorithms' data quality, most of the interviewed experts recommended the involvement of an AI Trainer in developing and improving the ongoing AI system. Since AI is the only technology of its kind that fulfills its purpose by training instead of via programming, an innovative position within IT is made possible. In addressing the AI black box issue, the AI Trainer may potentially improve government and risk management and thus drive the trustworthiness of AI. This study also found that banks which employ AI technology in their processes will undergo accelerated business processes and/or lifecycles due to greater automation. Banks and their employees must have higher agility and greater adaptability due to the accelerated processes, incessant training and associated AI risks. For instance, e-mails typically do not receive prompt responses as compared to chats. AI-based chatbots could be helpful, but eventually all organizational processes need to be accelerated or else, the value-addedness would have less of an impact causing disappointment to the customers or users.

Additionally, awareness creation is also recommended to gain top management support to enable the modernization and digitization of the banks' business operations. The chief digital officer plays a significant role in this instance. The role extension of the AI-Trainer to chief artificial intelligence officer is progressively being deliberated by many banks that intend to associate and improve current operations with new digital technologies including machine learning, build AI-related strategies, and transform unutilized data into AI applications [8]. The solution for the technological challenges is the creation of new roles at the workplace such as an AI Trainer. AI capabilities do not exist on their own, but rather together with the development of all the other technological innovations which necessitate agility and processing speed. Awareness need to be created to initiate top management support for the modernization and digitization of the banks' business such as via consultations or development of the chief digital officer or a chief artificial intelligence officer.

Environmental factors

AI is often associated with fictional misconceptions like mass unemployment and malicious AI chatbots. However, since AI algorithms have the capability of learning independently from massive amounts of prevailing data, things can occasionally go wrong as demonstrated in the case of Microsoft Tay, a chatbot that was exposed to the social networking sites' community to undergo training without being controlled by its owners. In merely one day, Microsoft Tay had to be immediately taken off the Internet for posting sexist and radical right-wing statements [8]. Hence, apprehensions about AI are not at all groundless. This study recommends the establishment of an AI code of conduct as a measure to address suspicions towards the technology. The study participants highlighted that the initial stages of the development of an AI code of conduct is already on the way.

With a clear mix of public enthusiasm and hesitation towards AI, the successful adoption of this technology can only be achieved by properly guiding societal anticipations about both its potential implications and risks, and not just either one. Equally, the whole society including employees, managers, politicians and organizations need to understand that conventional behaviors, habits and structures are the result of previous experiences; hence, evolution is an indispensable part of the process. Regulations have already been imposed upon AI in light of the lack of consensus to what the technology entails and can possibly do. Banks have invested substantially on documentation and regulatory reports amidst the continuous debates about AI and the certainty of further regulatory requirements. Banks need to make room for innovation in their work setting regardless of all the governmental regulations because once their ability to innovate is suppressed they will lose their competitive advantage to other areas of the economy. It is advised that banks should address moral concerns by promoting the trustworthiness, justification and value of AI whilst politicians should address the definition of ethical standards and drive digital education and regulatory requirements should allow adequate room for innovation within banks. Excessive regulations limit financial resources leading to sluggishness to innovate.

V. DISCUSSION AND CONCLUSION

AI does not incite transformations solely on its own. As demonstrated in this study, AI adoption still meets opposition from banking sectors. By structuring the findings to the research model, it is revealed that AI adoption is driven by several factors primarily the continuous digitization of banking operations and the structural change of existing banks. The proposed guidelines highlight the crucial need for employees and banks to be able to utilize AI technologies properly and effectively. As shown by this study, AI is transforming banking service by breaking the historical bonds that have long held banking sectors together, and is now forming an axis where past and current competences are being conjoined in novel ways. Each factor and their corresponding guidelines that were identified based on the three dimensions of technology, organization and environment.

In the dimension of technology, the study participants highlighted implementation complexity and quality assurance as the main hindrances to AI adoption in banks as these

industries place great emphasis on system stability and reliability. The deployment of AI applications is rendered difficult with the prevailing outdated IT architectures. In the organizational dimension, the dearth of AI-proficient employees and poor support from the top management were identified as the key hindrances to AI adoption. Banks are not agile and fast enough in meeting the requirements of AI applications due to their hierarchical structures. In the environmental dimension, AI adoption is found to be slowed down by moral apprehensions and market regulations.

The running theme for all the identified challenges and proposed guidelines is related to data issues particularly customer and transaction data that had been gathered, processed and stored in the banking service sectors. It was found that most conventional banking sectors in particular do not know how to utilize this highly valuable asset and are still confined within the analogical realm. To leverage on AI applications, AI-supported roles such as an AI trainer need to be made introduced to current IT job descriptions. Meanwhile, the utilization of the more flexible cloud solution is hindered by moral apprehensions. AI governance namely AI risk and compliance management alleviate concerns related to the black box phenomena. As indicated by some of the study participants, the numerous financial regulations have made the banks feel safer remaining in their conventional structures instead of venturing into the endless potentials of the digitized world.

The move by banks with many AI start-ups are indications that AI will potentially transform the banking service sectors in the near future. Banks that refuse to adapt and adopt may experience significant losses in terms of turnaround time, cost and market share. The mixed public reactions of eagerness and hesitation towards AI are mainly due to the perceived potentials and risks that are associated with it. The future of AI in the banking sector depends on the sector's speed and capability in addressing the identified challenges. Banks can integrate their values and traditions into this high-tech development and solidify their position in the newly digitized marketplace. As with other works of research, there are several limitations to this study. The findings were derived from only 28 interview participants in the banking sector; a higher number of participants and a focus on other sectors could present even more comprehensive findings and a higher validity. However, it should be accepted that the Sri Lankan banking sector will not be an adequate sample to produce generalizable findings as it is a smaller market in Asia. Further research could investigate other case studies or transform our qualitative findings to carry out suitable quantitative inquiries.

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