**Journal of Trends and Challenges in Artificial Intelligence**

ASPUR PUBLISHING

**Vol. 01, No. 01 (2024) 33-38, doi: 10.61552/JAI.2024.01.004 - http://jai.aspur.rs**

# ARTIFICIAL INTELLIGENCE INTEGRATION ASSESSMENT IN BANKS THROUGH FINANCIAL REPORTING: CASE STUDY OF ARMENIA

Henrik H. Manukyan [1]
Suren H. Parsyan

Received 07.02.2024.
Revised 11.03.2024.
Accepted 25.03.2024.

Keywords:

*Artificial intelligence, Banking, IT expenses, Intangible assets, Digitalization.*

**Original research**

A B S T R A C T

*In the dynamic intersection of finance and technology, the integration of artificial intelligence (AI) within the banking sector can mark a pivotal shift towards operational efficiency and enhanced customer service. This study, performed with the case of Armenian banking sector, employs a dual-analytical lens, focusing on the ratio of intangible assets to total assets (IA/TA) and IT-related costs in operational expenses (OPEX) to infer the extent of AI adoption through digital maturity. Despite the anticipation that these financial ratios would directly reflect a bank's digital transformation efforts, our findings illustrate a more complex reality, where such co-movement of the two ratios is not necessarily consistent over time within the sector. This deviation underscores the nuanced interplay between financial investment in digital technologies and the actual deployment of AI, revealing the need for a holistic approach that combines quantitative financial metrics with qualitative insights.*



## 1. INTRODUCTION

In today's world, technologies, particularly artificial intelligence (AI), are becoming increasingly prevalent in finance (Golic, 2019). The banking system, a cornerstone of the financial sector, stands at the forefront of technological innovation, leveraging new technologies to attract new customers and enhance operational efficiency (Oyegbade et al., 2022). In the digital era, we either transform or we die (Skinner ,2020).

Banks are facing several long-term challenges: the digitalization of competitors, the competition with non-bank entities specialized in technologies and climate change (Jameaba, 2022). The threat of becoming obsolete comes from both external and internal market forces. On one hand, major international banks or organizations are actively undergoing consumer-centered digital transformations and will be able to enter new potential (especially smaller countries') financial markets with their technological adeptness, appealing to both current bank customers and the "unbanked" population. On the other hand, local banks are also undergoing digital transformations to gain a competitive edge over their rivals and increase their market share (Hadi & Hmood, 2020). Thus, digital transformation is a vital endeavor for banks.

Implementation of digital technologies within banks typically encompasses four main directions: Artificial Intelligence (AI), Application Programming Interfaces (APIs), cloud computing, and Digital Ledger Technologies (DLT) (Ehrentraud et al. 2020). This article focuses on measuring the application of artificial intelligence. AI is defined as an algorithm-driven computer program that performs tasks requiring human intelligence (Lazaroiu et al., 2022). As illustrated in Figure 1, machine learning, an AI branch, autonomously

1 Corresponding author: Henrik H. Manukyan
Email: henrik.manukyan.h@gmail.com

solves problems with minimal human oversight, using self-improving algorithms based on training experiences, thereby embodying the principle: learn from experience "E" to accomplish task "T," evaluated by performance "P".

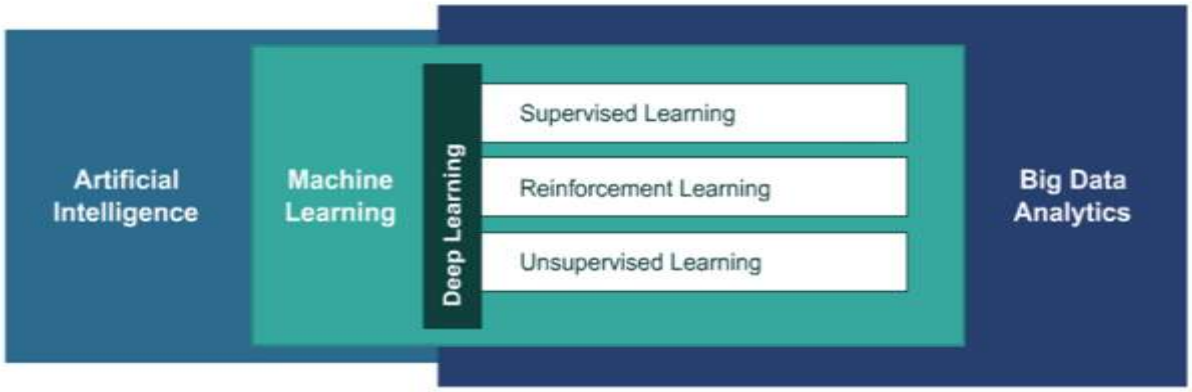


**Figure 1**. The Interrelation of Artificial Intelligence, Machine Learning, and Data Analysis (Financial Stability Board. 2017)

In the banking system, the application of artificial intelligence, along with machine learning and data analytics, simplifies the processing of big and unstructured data (so-called alternative data, as opposed to previously used customers' standardized financial data) (Nguyen et al., 2023). With enhanced precision and efficiency, AI has the ability to uncover not only explicit but also implicit (especially non-linear) relationships between observed variables (Salimi et al., 2016).

AI in banking is categorized into four main domains: customer service, operational optimization, investment activities, and regulatory compliance (RegTech). Customer service, for example, utilizes AI for credit risk assessment through machine learning and the integration of vast, alternative data sources, offering personalized services and marketing tailored to customer preferences.

Assessing the effectiveness of AI integration in banking operations poses a challenge for independent researchers due to each bank's unique approach to tracking AI implementation progress. Moreover, such information is highly confidential and is almost never published. Thus, the article aims to serve as a predictive tool for customers, providing insights into the current and future digital capabilities of banks, potentially influencing their choice of the desired bank. When choosing a bank, customers prioritize long-term convenience and the assurance of responsible data usage by the bank's AI systems, highlighting the importance of trust in a bank's capacity to employ AI effectively and ethically.

A significant hurdle in using alternative data through AI is ensuring data accuracy and validity, avoiding the "garbage in, garbage out" dilemma. Apart from the mentioned challenges, the application of AI in banking necessitates profound knowledge and extensive experience in that AI field.

Thus, this article aims to assess the capabilities of banks in utilizing AI by analyzing available financial data within the banking system. This assessment is crucial for financial information users to gauge how effectively a bank can leverage AI in its operations, thereby influencing their choice of bank based on the derived digital maturity rating.

## 2. METHODS AND DATA

Artificial Intelligence (AI) holds considerable interest in the context of this article for several compelling reasons. First, the utilization of Distributed Ledger Technology (DLT) within banks is still in its initial phases (ECB 2023), making it challenging to assess banks' efficiency in terms of data accessibility. Evaluating the level of Application Programming Interface (API) implementation can be better informed by the country's regulatory frameworks, specifically whether banks are obligated to share data with each other, and the practical assessment of the APIs in use. Both DLT and API implementations largely exceed the scope of financial disclosures. Cloud computing's adoption, regulated nationally, supports essential functions like data storage or analytics vital for AI applications, ensuring necessary computational analytics power. Lastly, it's important to highlight AI's potential transformative impact on banking services, particularly for "unbanked" populations. This application could significantly broaden the bank's customer base, a direction that has been extensively explored in the academic world (Leo et al., 2019). These perspectives underscore AI's pivotal role in advancing the digital transformation of banks, enhancing operational efficiencies, and fostering financial inclusion.

Given the absence of direct indicators to measure the application of AI in banks, this article proposes the use of general digital transformation indicators as proxies for AI utilization within banks. The two indicators under consideration were previously applied to banks in the EU (Can & Huizinga, 2021). The first one (asset ratio) is the ratio of intangible assets(IASB, IAS 38, 2024) (IA) to total assets (TA), which reflects the bank's investment in technology and digital capabilities, and the cost ration

which is the share of Information and communication (ICT) and other IT-related costs of the year in operational expenses (OPEX) (Dadoukis et al., 2021). Higher ratios suggest greater technological and digital transformation commitment, thus implying AI adoption. These indicators, foundational for our analysis, recognize AI implementation in banking as a gradual, design-to-improvement process, inherently linked to the bank's overall IT infrastructure and digital transformation progress. Successful AI integration often requires years and is closely tied to the bank's overall IT capabilities. The development of these IT capabilities is, in turn, linked to the bank's progress in digital transformation. Having two indicators gives us the opportunity also to conclude whether the indicators behave similarly across banks, in other words, are both indicators moving in the same direction compared to other banks or not. Thus, it will reveal the consistency of the indicators.

While banks may employ a variety of Key Performance Indicators (KPIs) internally to assess the effectiveness of their AI implementations, such metrics are typically proprietary and seldom shared publicly. Furthermore, even if banks were to disclose these indicators, there's no guarantee of uniformity in the methodologies applied across different institutions, unless standardized by regulatory mandates. Consequently, in the absence of a comprehensive set of publicly accessible financial indicators, we have identified two primary indicators as the most informative proxies to deduce a bank's digitalization and AI application levels.

The first indicator, the evolution of the ratio of intangible assets to total assets (IA/TA), serves as a barometer for a bank's investment in software and technological infrastructure which are essential components for deploying AI. An ascending ratio suggests a heightened focus on digital and technological assets, indicating a commitment towards digital transformation.

The second indicator, the proportion of IT-related costs in annual operational expenses, reflects the bank's financial dedication to technological and digital initiatives. An increased allocation of resources towards IT expenses denotes a prioritization of technological enhancements and digitalization efforts, including investments in AI technologies and capabilities.

Although these indicators have their limitations, they provide insights into a bank's journey towards digital transformation and its engagement in AI implementation. They are especially valuable in contexts where direct measurements of AI applications are unavailable, offering a broader perspective on a bank's digitalization endeavors and its potential for successful AI integration.

As already mentioned, for the analysis we take the case of Armenia. Given Armenia's characteristics as a small, open economy with open capital flows and a banking sector constituting a large portion of the country's financial market (with assets comprising more than 80% of the market (Central Bank of Armenia, 2023), analyzing the digital transformation within this sector provides valuable insights. Although the banks in Armenia are somewhat differentiated, all 18 banks (as of the end of 2023) can be described as universal banks. Nearly half of the banking sector's assets are concentrated within the four largest banks.

The data for 2021-2022 utilized in the analysis stem from the banks' annual financial statements with unqualified (clean) audit opinions. The figures for 2023 were extracted from the banks' published interim (unaudited) financial statements for the fourth quarter of 2023. Prepared in accordance with International Financial Reporting Standards (IFRS), this data ensures comparability and appropriateness for our examination (Sahut et al., 2011).

## 3. RESULTS AND DISCUSSION

The outcomes of the analytical examination are illustrated in Figures 2 and 3, showcasing the evolution of two financial ratios across Armenian banks. These ratios, initially posited as indicative of banks' digitalization trajectories, exhibit a lack of synchrony. Specifically, an augmentation in the asset ratio (IA/TA) does not invariably coincide with an elevation in the operational expense ratio (IT-related costs/OPEX), notwithstanding the anticipation of concurrent increases in the wake of intensified digitalization efforts.

Notwithstanding the expectation, the financial analysis fails to yield unequivocal conclusions regarding the Armenian banking sector's digitalization progression, and by extension, AI utilization. This observation underscores the necessity for additional data to bridge the analytical gap, thus facilitating a comprehensive evaluation based on financial metrics. Consequently, we propose several refinements to the financial ratios alongside requisite supplementary information for a more nuanced assessment of AI deployment among banks.

The analysis has heretofore relied upon aggregated financial figures. A disaggregated approach, enabling the extraction of more pertinent financial proxies, is advocated to refine the evaluation framework.

The asset ratio's denominator, total assets, presupposes relative stability over time, which is essential for reflecting changes in intangible assets. Nonetheless, a significant augmentation of total assets by approximately 20% in 2022 suggests that even substantive investments (but less than 20%) in digital capabilities may not be accurately captured by this ratio, thus necessitating an adjustment to focus exclusively on computer software assets. Therefore, we suggest excluding the financial assets from the total assets to capture only the long-term and relatively non-volatile part in the denominator. On the other hand, in the nominator, we can adjust the intangible assets by keeping only the computer software assets and ensure exclusion of any IT-unrelated assets.

Similar to the asset ratio, the cost ratio necessitates refinement. By excluding fixed expenses, such as property maintenance costs, from the denominator, we sharpen the focus on IT-related costs, thus more

accurately reflecting management's discretionary spending on digitalization and AI initiatives.

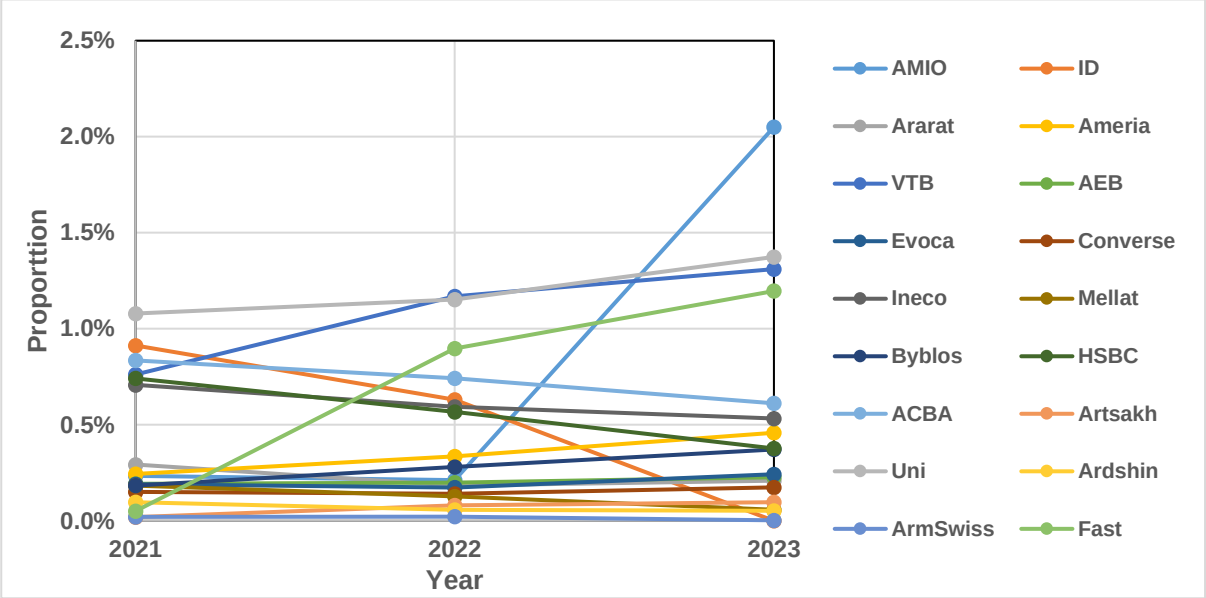


**Figure 2**. The evolution of the IA/TA ratio in Armenian banking sector per bank (Author's calculation)

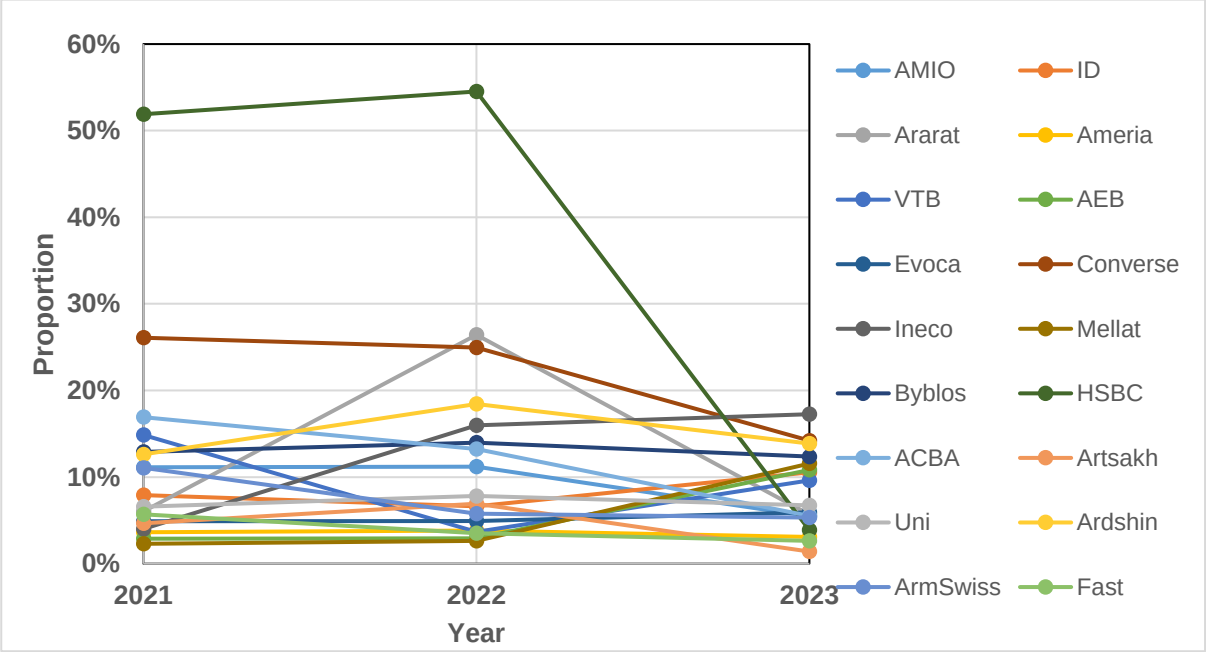


**Figure 3**. The evolution of the IT related costs in Operational expenses ratio in Armenian banking sector per bank (Author's calculation)

Besides improving the financial analysis through adjustments to the ratio components, we suggest complementing the analysis with qualitative information. For instance, HSBC Armenia's outlier status in cost ratio analysis is to be attributed to its costly IT service from the international HSBC Group. Absent bank-specific data, the financial analysis could potentially misrepresent the actual scenario. Furthermore, incorporating technological news, third-party analyses, and other relevant reports can substantiate and contextualize the financial findings.

While the primary outcomes of this study do not definitively gauge AI usage among banks, they highlight the indispensable role of qualitative, bank-specific information and the necessity for refined financial ratios beyond generic measures. This approach underscores the complexity of digital transformation in the banking sector and the critical need for an integrated analytical methodology that encompasses both quantitative and qualitative dimensions.

## 4. CONCLUSION

In this study, we tried to assess AI usage amongst banks through general digitalization ratios that use financial components. The analysis was done with the example of the Armenian banking sector. Our exploration was motivated by the potential interest from the customer side when choosing a reliable and sustainable bank in the digital era.

Employing a methodological framework that juxtaposes the evolution of intangible assets to total assets (IA/TA) and IT-related costs over operational expenses (OPEX), our analysis aimed to unveil the digitalization trajectory of Armenian banks. These indicators, drawn from the financial statements of the banks for the years 2021 to 2023, served as proxies to gauge the level of AI adoption, notwithstanding the absence of direct measures of AI implementation.

The findings of our study reveal a complex picture. The anticipated correlation between the growth in IA/TA and IT-related costs/OPEX ratios, which was hypothesized to reflect a plausible move towards digitalization and by extension, AI adoption, was not uniformly observed across the banks examined. This inconsistency underscores the nuanced reality of digital transformation within the banking sector, challenging the difficulty of assessing digitalization and the effective deployment of AI through only aggregated financial information.

Furthermore, our analysis brought to light the critical importance of augmenting quantitative financial data with qualitative insights to obtain a more accurate and comprehensive understanding of a bank's digital and AI capabilities. The observed high increase in total assets and outlier cost proportions illustrated the potential for misinterpretation when relying solely on financial ratios without considering the broader sectoral and bank-specific context of a bank's technological and digitalization.

In conclusion, our study highlights the limitations of financial ratios as the sole indicators of digital maturity and AI usage. The journey towards effective AI integration is multifaceted, necessitating not only financial investment but also strategic vision, technological acumen, and a commitment to continuous improvement. As banks navigate this complex terrain, the insights derived from our study underscore the need for a more nuanced, integrated approach to evaluating digital transformation efforts, blending quantitative analysis with qualitative evaluation to paint a fuller picture of a bank's digital prowess.

## References:

Can, A., & Huizinga, H. (2021). Digital transformation—why do some significant banks fall behind?

Central Bank of Armenia. (2023). Financial stability report. https://www.cba.am

Dadoukis, A., Fiaschetti, M., & Fusi, G. (2021). IT adoption and bank performance during the Covid-19 pandemic. Economics Letters, 204. DOI: 10.1016/j.econlet.2021.109904

Ehrentraud, J., Ocampo, D. G., Garzoni, L., & Piccolo, M. (2020). Policy responses to fintech: a cross-country overview. www.bis.org

European Central Bank (ECB). (2023). Take-aways from the horizontal assessment of the survey on digital transformation and the use of fintech. ECB Banking Supervision. https://www.ecb.europa.eu

Financial Stability Board. (2017). Financial stability implications from FinTech. https://www.fsb.org/

Golic, Z. (2019). Finance and artificial intelligence: The fifth industrial revolution and its impact on the financial sector. *Zbornik radova Ekonomskog fakulteta u Istočnom Sarajevu*, (19), 67-81.

Hadi, A. M., & Hmood, S. J. (2020). Analysis of the role of digital transformation strategies in achieving the edge of financial competition. *International Journal of Innovation, Creativity, and Change*, *10*(11), 19-40.

IASB, IAS 38 (2024). Intangible Assets, https://www.ifrs.org/issued-standards/list-of-standards/ias-38-intangible-assets/

Jameaba, M. S. (2022). Digitalization, Emerging Technologies, and Financial Stability: Challenges and Opportunities for the Indonesian Banking Industry and Beyond. *DOI: https://doi. org/10.32388/CSTTYQ*, *2*.

Lazaroiu, G., Androniceanu, A., Grecu, I., Grecu, G., & Neguriță, O. (2022). Artificial intelligence-based decision-making algorithms, Internet of Things sensing networks, and sustainable cyber-physical management systems in big data-driven cognitive manufacturing. *Oeconomia Copernicana*, *13*(4), 1047-1080.

Leo, M., Sharma, S., & Maddulety, K. (2019). Machine learning in banking risk management: A literature review. Risks, 7(1). https://doi.org/10.3390/risks7010029

Nguyen, D. K., Sermpinis, G., & Stasinakis, C. (2023). Big data, artificial intelligence and machine learning: A transformative symbiosis in favour of financial technology. *European Financial Management*, *29*(2), 517-548.

Oyegbade, I. K., Igwe, A. N., Ofodile, O. C., & Azubuike, C. (2022). Transforming financial institutions with technology and strategic collaboration: Lessons from banking and capital markets. *International Journal of Multidisciplinary Research and Growth Evaluation*, *4*(6), 1118-1127.

Sahut, J. M., Boulerne, S., & Teulon, F. (2011). Do IFRS provide better information about intangibles in Europe? Review of Accounting and Finance, 10(3), 267–290. DOI:10.1108/14757701111155798

Salimi, A., Rostami, J., Moormann, C., & Delisio, A. (2016). Application of non-linear regression analysis and artificial intelligence algorithms for performance prediction of hard rock TBMs. *Tunnelling and Underground Space Technology*, *58*, 236-246.

Skinner, C. (2020). Doing Digital: Lessons from Leaders.

**Henrik H. Manukyan**
Administration Academy of the Republic of Armenia, Yerevan, Armenia
henrik.manukyan.h@gmail.com
**ORCID:** 0009-0004-9328-4483

**Suren H. Parsyan**
Armenian State University of Economics, Yerevan, Armenia,
surenparsyan2017@gmail.com
**ORCID:** 0000-0003-0561-3052