A General Profile of Artificial Intelligence Adoption in Banking Sector: A Survey of Banks in Afyonkarahisar Province of Turkey

Rezan Öztürk[a], Veysel Kula[b,*]

[a] Afyon Kocatepe University
[b] Faculty of Economics and Administrative Sciences, Afyon Kocatepe University

A B S T R A C T

Artificial Intelligence (AI) is rapidly transforming the global financial services industry. The new digitalization model is powered by artificial intelligence technology, and AI has the potential to disrupt and refine the existing financial services industry. The increasing amount of data in banking has revealed the need for fast and reliable service. Banks are financial service organizations that have used AI effectively in recent years. This paper reveals the general profile of artificial intelligence adoption by banks. Based on the evidence from all 17 banks operating in the Afyonkarahisar province of Turkey, it is concluded that AI technologies are applied in almost every area of the banking sector to improve the overall service offered. Moreover, the use of AI is evaluated as a potential that provides ease of use and reduces costs. As for the operations in future, the participants think AI will provide high levels of benefit to banks in their financial services in the incoming years. Given no similar study, this study appears to provide an original contribution to the literature regarding the use of AI in banking services within the Turkish context.

1. INTRODUCTION

Charles Babbage is known to have created the first mechanical computer in the first half of the 19th century. However, the first programmable, electronic, general-purpose digital computer, ENIAC (Electronic Numerical Integrator and Computer), was made in 1945 (Kaplan and Haenlein, 2020). Nevertheless, in the 1950s, developments in computer sciences witnessed the birth of Artificial Intelligence. In the first year of that decade, Alan Turing (1950), often considered the father of modern computer science, proposed, in his first sentence of his article "Computing Machinery and Intelligence" in the Mind Journal, to consider the question "Can machines think?". Not long after that, the term 'Artificial Intelligence (AI) was coined in 1956 by John McCarthy at the first conference on the subject at Dartmouth College in Hanover, New Hampshire (Lewis, 2014).

AI has nowadays penetrated the daily routines of business life, progressively taking up the tasks ordinarily performed by human beings. Having strong proponents, it is, however, exposed to severe

criticisms. Harari (2019), for example, considers Artificial Intelligence among the existential dangers humanity faces. Inventor Elon Musk (2018) is much cited for having called AI far "more dangerous than nukes", while acclaimed physicist Steven Hawking (2017) warned that the advent of true AI could be the "worst event in the history of our civilization". On the other hand, Andrew Ng (2017) called AI the 'new electricity' and went on claiming that "just as electricity transformed many industries roughly one hundred years ago, AI will also now change every major industry".

Artificial Intelligence is defined in the Oxford English Dictionary (2021) 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." Similarly, Gottfredson (1997) describes AI as "a very general mental capability that, among other things, involves the ability to reason, plan, solve problems, think abstractly, comprehend complex ideas, learn quickly and learn from experience. It is not merely book learning, a narrow academic skill, or test-taking smarts. Rather, it reflects a broader and deeper capability for comprehending our surroundings—'catching on', 'making sense of things', or 'figuring out what to do'."

The rapid and continuous advancement in AI have permeated important aspects of human behaviour. According to Ahmad et al. (2021), AI systems were available in 1964 for understanding algebra problems, 1976 for medical treatments, 1994 for military logistic programming, and 2014 for fast translation. Indeed, Lauterbach (2019) and Samala et al. (2020) underlined that since artificial intelligence technology entered our lives, they have advanced quite quickly in numerous domains. Artificial intelligence has lately acquired popularity, according to Fernandez (2019), owing to the large amount of digital data available, enhanced data storage and computational processing capability at a reduced cost, and advances in the algorithms used. Research by McKinsey Global Institute (2017) on 14 sectors over ten countries across Europe, North America, and Asia highlighted the potential of AI in sourcing, optimizing operations, targeting marketing, improving pricing and improving customer experience. As Wamba-Taguimdje et al. (2020) state, artificial intelligence technologies are used in several sectors in machine learning, deep learning, chatbot, neural network, and virtual assistance for companies. Ahmad et al. (2021) assert that AI techniques in the energy industry outperform traditional models in controllability, big data handling, cyberattack prevention, smart grid, robotics, energy efficiency optimization, predictive maintenance control, and computational efficiency. The tourism sector is another sector that uses artificial intelligence technologies in facial recognition, virtual reality applications, chatbots, google maps, language translators, and audio tours that help deliver a novel experience to the customers (Samala et al., 2020).

As in other sectors, Artificial Intelligence is used effectively in the financial services sector. The use of Artificial Intelligence in financial services has many advantages. An increase in efficiency and productivity through automation and minimizing errors caused by psychological or emotional factors are a few of them (Buchanan, 2019). This study attempts to reveal the AI adoption profile of Turkish

banks by drawing on data obtained from the survey of all 17 banks in the Afyonkarahisar province of Turkey. The next part of the study will provide a literature review on the use of AI in financial services. The methodology and survey results will be presented in the following parts. Finally, the article will end with a conclusion.

2. LITERATURE REVIEW

Artificial Intelligence offers the opportunity to advance the transformation of the financial industry by improving decision making, enhancing analytical capabilities and automating business processes such as fraud detection, customer experience, chatbots, robot-trainer services, and calculation of insider trading (Nobanee and Blooshi, 2020). In the same vein, Buchanan (2019) asserts that AI is changing the direction of the financial services industry, especially in three specific areas, namely, fraud detection, banking chatbots and robot-advice services, and algorithmic trading. Hence, it is predicted that AI will become more pervasive in financial services.

Based on a survey of 151 firms from 33 countries, including both fintech and incumbents, Ryll et al. (2020) depict a global financial services sector undergoing profound digital transformation underpinned by the advancement in AI. The study results reveal an increase in the perceived strategic importance of Artificial Intelligence in key financial services sectors over time. Specifically, the use of AI in market infrastructure and professional services, payments, deposits and lending is expected to be more important in the near future.

Together with sifting through reams of data to spot fraud, banks are increasingly using Artificial Intelligence, a cutting-edge technology once the stuff of science fiction, to answer the questions of individual customers in a fast yet understandable manner (Daks, 2018). Saraswat (2017) indicates that AI is used in the financial sector for virtual assistance via text and speech to respond to user queries. Noonpakdee (2020) examined the adoption of AI for financial investment services using data drawn from a survey of 400 investors in Thailand. Multiple linear regression employed in the study revealed that among the factors affecting the use of Artificial Intelligence for financial investment services are trust, perceived usefulness, and knowledge of using the application.

There are, however, articles, such as Yuan and Jing (2018), stating that risks would emerge in financial services as they go digital. In support of his view that AI in financial services will present new threats, challenges, and new opportunities, Mehrotra (2019) cites an algorithm example used in an artificial intelligence application with bias and discrimination against certain races and gender. In addition, Saraswat (2017) asserts that even if time is saved and productivity is increased by using artificial intelligence technologies, issues such as prejudice, privacy violation, trust, lack of trained staff, and anxiety have been cited as ongoing challenges for AI.

There are mixed expectations regarding the effect of AI on future employment prospects. For example, Wheeler (2020) reports that the banking sector is expected to experience significant job losses, with the

tellers, loan officers, customer service representatives, loan interviewers/processors, and compliance personnel being the jobs anticipated to be impacted the most. However, Mehrotra (2019) puts forward a contradicting view emphasizing that the core component of banks is people rather than an automated platform, requiring warmth and human intervention rather than brief and mechanically formulated interactions. Eventually, due to branch closures and the incorporation of systematic investments into business models stemming from the increasing use of AI, the banking sector is estimated to save $1 trillion by 2030 (Mehrotra, 2019; Wheeler, 2020).

The use of AI in several sectors is becoming increasingly evident in Turkey. AI has been applied in a wide range of fields such as neuropsychiatry (Erol and Erol, 2019), ophthalmology (Keskinbora and Güven, 2020), dairy farming (Akıllı and Atıl, 2014), furniture design (Armağan, 2019), retailing (Gülşen, 2019), water quality assessment (Sengorur et al., 2015), accounting profession (Gacar, 2019), computer engineering and software (Uslu, 2015; Kayaönü, 2000), and predicting the course of Covid-19 (Uslu, 2021).

There are, however, not so many descriptive and empirical studies on artificial intelligence applications in financial services in Turkey. Kömürcüoğlu and Akyazı (2020), for example, investigated the development and possible effects of emerging financial technologies in Turkey, concluding that financial technologies have developed rapidly in Turkey in recent years though not as sufficiently as in other countries. Hancı and Özkoç (2019) explored the security of the use of chatbot applications by banks, asserting that chatbots, which have become a trend in banking, have brought significant advantages to banks in terms of customer relations, while also bringing concerns about security and privacy. The study, nevertheless, emphasizes cost savings arising from the use of AI.

Gümüş et al. (2020) surveyed a sample of 500 people and found out that as the age, income and education level of the people participating in the survey increase, the confidence in artificial intelligence increases, too. It has also been concluded that the effective use of Artificial Intelligence in the financial sector provides excellent convenience for users.

A survey of 215 people by Medetoğlu and Saldanli (2018) investigated the use of Artificial Intelligence in the finance and banking sector and found that AI applications considerably reduce costs. In addition, another finding of the study is that the concept of financial technology is not very common yet, but Artificial Intelligence automation is thought to change the way of doing business in future.

Given the limited number of studies on the use of AI by banks in Turkey, the present study appears to fill a gap in the literature by investigating the AI adoption pattern of the banks operating in Afyonkarahisar province of Turkey.

3. METHODOLOGY

This research attempts to reveal the general profile of AI adoption in banking services and expected effects perceived by bank managers of AI on banking services in the future. In order to obtain data on these expected effects, a questionnaire was drawn based on the prior literature.

The questionnaire consisted of two parts, of which the first one was about unveiling significant attributes of the current use of AI by the banks. This first part of the questionnaire was made up of multiple-choice questions, allowing the respondents to tick more than one option where possible. The first question of that part, for example, probed whether the banks use AI in areas such as business advice, personal finance management solutions, and automatic data management. The following two questions looked at the generational range and customer portfolio targeted by the banks' artificial intelligence-supported financial services applications.

The second part of the questionnaire housed a set of questions configured to measure respondents' evaluations of the AI usage by banks using Likert scale questions. For example, respondents were asked to evaluate the statement "with the increase in the application of artificial intelligence, job losses are experienced in the banking sector" on a five-point scale ranging from "1=strongly disagree" to "5=strongly agree".

Of the 34 commercial and six participating banks operating in Turkey as of 31st March 2021 (Banks Association of Turkey, 2021), 12 and 5 have branches in Afyonkarahisar province, respectively. Information was drawn from all those 17 banks operating in Afyonkarahisar via a questionnaire. Twelve deposit banks surveyed constitute the largest banks in terms of the number of branches operating in Turkey. Furthermore, they are among the largest 14 deposit banks by asset size. Excluding a new entrant, five participation banks surveyed in the study represent all incumbent ones. So then, it appears that the sample has the attribute of representing the deposit and participating banks in Turkey.

This study collected the data set by conducting surveys in April 2021 with the senior officials of those 17 banks in Afyonkarahisar. The branch manager, or in her/his absence, the vice manager of each bank was requested to answer the self-administrated questionnaire. This research thus utilizes the data obtained from all 17 bank branches operating in the Afyonkarahisar province of Turkey.

4. ANALYSIS RESULTS

From Table 1 below, of the 17 banks surveyed, only one bank currently does not use artificial intelligence technologies. Except for one, all banks surveyed (16 banks, 91,4 per cent) have strategies to make their stakeholders adopt AI. More than half of the banks (11 banks, 64,7 per cent) collaborate with a fintech company to develop its Artificial Intelligence infrastructure. Moreover, all banks employ a cyber security measure for their digital operations. No bank considers Artificial Intelligence in banking services as a risk.

Table 1: Major Features of AI Adoption by Banks

	No	%
Using AI in operations		
Yes	16	94,1
No	1	5,9
Having a strategy to make stakeholders adopt AI		
Yes	16	94,1
No	1	5,9
Considering the use of AI in banking services is a risk		
Yes	0	0
No	17	100,0
Cooperating with a fintech company for AI infrastructure development		
Yes	11	64,8
No	3	17,6
Missing	3	17,6
Having cyber security measure		
Yes	17	100,0
No	0	0
Percentage of the transactions bank's customers can perform without visiting branches		
%10-%20	2	11,8
%30-%40	4	23,5
%50-%60	3	11,8
%70-%80	8	47,1
%90-%100	1	5,9
TOTAL	17	100,00

Source: Authors' Compilation

The respondents were asked to indicate what percentage of the transactions they think their banks' customers can perform, via mobile channels and chatbots, without personally visiting the branches. Almost half of the respondents (8 banks, 47,1 per cent) think that 70% to 80% of the operations could be carried out via digital means.

The banks' prevalent patterns in AI adoption are reported in Table 2. This Table intends to shop the services where banks make use of AI. Therefore, the respondents were asked to specify whether their banks use chatbots and apply AI in QR code transactions, fraud detection, business advice, personal finance management solutions, automatic data management and authentication.

The two most frequently used AI applications are QR code transactions and fraud detection (13 banks, 76,5 per cent), followed by authentication and automated data management (12 banks, 70,6 per cent), chatbots and business advice (10 banks, 58,8 per cent).

The next question asked which generations were targeted by the AI-powered financial services applications. As shown in Table 2, the banks mainly target Y and Z generations (11 banks each, 64,7 per cent). However, baby boomers appear to be a somewhat neglected generation, falling within the target range of only two banks (11,7 per cent).

The respondents were asked to indicate the customer portfolios targeted by the banks' AI-based Bot services. As Table 2 clearly shows, all banks but one target individual customers (16 banks, 94,1 per

cent). Following individual customers, banks address SMEs with their services (13 banks, 76,5 per cent). Finally, large companies and non-profit organizations are also among the customer portfolios (11 banks each, 64,7 per cent) that the banks offer AI-based Bot services to.

Table 2: Prevalent Patterns in AI Use by Banks

	Rank	No	%
Fields AI used			
QR Code Transactions	1	13	76,5
Fraud Detection	1	13	76,5
Automatic Data Management	2	12	70,6
Authentication	2	12	70,6
Chatbots	3	10	58,8
Commercial Advice	3	10	58,8
Personal Finance Management Solutions	4	9	52,9
Targeted generation			
Y	1	11	64,7
Z	1	11	64,7
X	2	5	29,4
Baby Boomer	3	2	11,7
Customers Targeted by Artificial Intelligence-Based Bot Services			
Individuals	1	16	94,1
SMEs	2	13	76,5
Non-profit organizations	3	11	64,7
Large companies	3	11	64,7
Note: n=17			

Source: Authors' Compilation

Adoption of AI is a rather strategic decision. Therefore, personal evaluations of bank managers could reflect the nature of strategic decision making about AI adoption. In order to explore the managerial evaluations towards AI, the respondents were asked to assess a set of statements in the form of a five-point Likert scale ranging from 1=strongly disagree to 5=strongly agree.

Table 3 shows that the banks have a positive attitude towards AI and expect it to have a more prominent role in banking operations in the future. The bank managers conceive of using financial technology as a convenience for customers (4,824 mean). Consequently, they perceive the use of Artificial Intelligence in their financial services as providing a cost-reduction advantage for their banks (4,7059 mean) and think their banks would experience a high level of benefit from Artificial Intelligence in the next decade (4,5295 mean). Furthermore, managers highly agree with the statement that the transition from traditional banking to modern banking is a reason for customers to choose their banks (4,4706 mean). The respondents believe that their banks have increased efficiency after introducing artificial intelligence applications (4,2941 mean).

As shown in Table 3, the increase in the use of Artificial Intelligence applications in the banking sector is expected to cause both a decrease in the number of branches (4.000 mean) and job losses (3.8824

mean). Overall, managers do not think the banking sector is late in using Artificial Intelligence compared to other sectors (2.4706).

Table 3: AI Usage Evaluations by Banks

	Mean	SD
The use of financial technology services is a convenience for customers.	4,8824	,33211
Using Artificial Intelligence in our financial services provides cost reduction for our bank.	4,7059	,46967
The use of artificial Intelligence in our bank's financial services will provide a high level of benefit to your bank in the next 10 years.	4,5294	,62426
The transition from traditional banking to modern banking is a reason for customers to choose our bank.	4,4706	,79982
Our bank has increased efficiency compared to the situation before using artificial intelligence applications.	4,2941	,77174
The increase in the use of Artificial Intelligence applications in the banking sector in financial services is expected to cause a decrease in the number of branches.	4,0000	1,06066
The banking sector is late in using Artificial Intelligence compared to other sectors.	2,4706	1,17886
With the increase in the percentage / area of application of Artificial Intelligence, job losses will be inescapable in the banking sector.	3,8824	1,21873
Notes: n=17, The mean is an average on a scale ranging from 1=strongly disagree to 5=strongly agree; SD=standard deviation		

Source: Authors' Compilation

5. CONCLUSION

This study has investigated the underlying nature of AI adoption by Turkish deposit and participation banks. Though the banking sector in Turkey has increased the use of AI in its operations, there are only a limited number of studies on the subject. Hence, this study attempts to contribute to the literature by delineating the prominent patterns, as perceived by the bank managers, of AI usage in the financial services banks render.

Drawn on the evidence from all 12 deposit and five participating banks operating in Afyonkarahisar province of Turkey, the banks, in general, are found to display a positive attitude towards AI use. All banks in the sample except one are already using AI to cover QR code transactions, fraud detection, automatic data management, authentication, chatbots, commercial advice, and personal finance management solutions. This shows that Turkish banks are not being outdone by their foreign counterparts who apply AI in various areas, as Wamba-Taguimdje et al. (2020) report.

The technology and innovation aiming to compete with traditional financial methods in delivering financial services are regarded by the banks surveyed as a convenience for customers. This result conforms with the finding by Noonpakde (2020). Additionally, similar to the results of the studies by Wheeler (2020) and Medetoğlu and Saldanli (2018), the bank managers in the current research consider using Artificial Intelligence in their financial services as a cost-reducing exercise. Therefore, the increase in the use of artificial intelligence applications in the banking sector is expected to decrease the number of branches and cause job losses in the future.

In their AI-based services, the banks mainly target individual customers and SMEs, focusing less on non-profit institutions and large companies. However, the perceived prevalence of human existence in the relations with non-profit institutions and large companies might be the consequence of the large magnitude of deposit and credit relations with those entities.

The banks primarily focus on Y and Z generations whilst neglecting baby boomers. This result conforms with Wheeler (2020). Though AI applications might not involve a steep learning curve, it appears older generations are not as adept as younger ones at mastering AI-backed applications.

Saraswat (2017) cited that AI applications are laden with potential risk factors such as prejudice, privacy violation and transparency issues. However, an interesting and important finding of the current study is that the bank managers do not consider the use of AI in banking services as a risky venture. This optimistic approach sounds plausible given the already proven success of digital technologies and AI applications as perceived by the bank managers. The bank managers regard the transition from traditional to modern banking as a factor for customers choosing their banks. Almost half of the bank managers think that around 70 to 80 per cent of operations can nowadays be handled via digital platforms without visiting branches in person. The bank managers also declare that the banks have already experienced increased efficiency with the Artificial Intelligence applications. Therefore, Artificial Intelligence in financial services is thought to provide a high level of benefit to the banks in the following decades. The assessments by the bank managers imply the irreversible role that AI applications would play in the services the banks will provide in future.

The study has attempted to provide the general profile of AI adoption by banks based on the data gathered from the banks operating in the Afyonkarahisar province of Turkey. Future studies could explore the differences in AI usage among public deposit, private deposit, and participation banks by enlarging the sample size. In addition, the link between AI adoption and its possible environmental determinants could be a venue for future researches.

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REFERENCES

Ahmad, T., Zhang, D., Huang, C., Zhang, H., Dai, N., Song, Y. and Chen, H. (2021). "Artificial intelligence in sustainable energy industry: Status Quo, challenges and opportunities", Journal of Cleaner Production, Volume 289, 125834. https://doi.org/10.1016/j.jclepro.2021.125834

Akıllı, A. and Atıl, H. (2014). "Süt Sığırcılığında Yapay Zeka Teknolojisi", Journal of Animal Production, 55(1), 39-45.

Armağan, Y. (2019)."Artificial Intelligence in Furniture Design: an Assessment on Design and r&d Centers", Yüksek Lisans Tezi, Hacettepe Üniversitesi,

Banks Association of Turkey. (2021). Available at https://www.tbb.org.tr/tr/bankacilik/banka-ve-sektor-bilgileri/istatistiki-raporlar/59)

Buchanan, B. (2019). "Artificial Intelligence in Finance", Seattle University. https://doi.org/10.5281/zenodo.2612537

Daks, M. (2018). Banking on Technology: Artificial Intelligence helping banks get smarter. Njbiz, 31(7), 10. https://njbiz.com/banking-on-technology/

Erol, K. and Erol, A. (2019). "Psikiyatride Yeni Bir Dönem; Tenoloji ve Yapay Zekanın Esinledikleri", Nöropsikiyatri Arşivi, 56(2), 84-85.

Fernandez, A. (2019). "Artificial Intelligence in Financial Services", Economic Bulletin, 1-7. http://dx.doi.org/10.2139/ssrn.3366846

Gacar, A. (2019). "Yapay Zekâ ve Yapay Zekânın Muhasebe Mesleğine Olan Etkileri: Türkiye'ye Yönelik Fırsat ve Tehditler ", Balkan Sosyal Bilimler Dergisi , 8 (19) , 389-394 . Retrieved from https://dergipark.org.tr/en/pub/bsbd/issue/51031/650750

Gottfredson, L. (1997). "Why g matters: The complexity of everyday life", Intelligence, 24 (1), 79-132. https://doi.org/10.1016/S0160-2896(97)90014-3

Gülşen, İ. (2019). "İşletmelerde Yapay Zeka Uygulamaları ve Faydaları:Perakende Sektöründe Bir Derleme", Tüketici ve Tüketim Araştırmaları Dergisi, 11(2), 407-436.

Gümüş, E., Medetoğlu, B. and Tutar, S. (2020). "Finans ve Bankacılık Sisteminde Yapay Zekâ Kullanımı: Kullanıcılar Üzerine Bir Uygulama", Journal of Bucak Faculty of Business, 3(1), 28-53.

Hancı, G. and Özkoç, E. (2019). "Chatbot Uygulamalarının Bankacılık Sektöründe Kullanımı ve Güvenliği", 2.Uluslararası Bankacılık Kongresi Hitit üniversitesi, 2019, Çorum, Türkiye, 216-220.

Harari, Y. (2019). "Hayvanlardan Tanrılara Sapiens'in yazarı Harari: Yapay zeka ve biyoteknoloji, insanlığı yok edebilir", available at: https://www.youtube.com/watch?v=O5bJznVDgGw / (accessed 14 May 2019)

Hawking, S. (2017). " Stephen Hawking Warns About AI Development | CNBC", available at: https://www.youtube.com/watch?v=760yQw_clpQ / (accessed 7th November 2017)

Kaplan, A. and Haenlein, M. (2020). "Rulers of the world, unite! The Challenges and Opportunities of Artificial Intelligence", Business Horizons , 63 (1), 37-50.

Kayaönü, E. (2000). "Theoretical Fundemantals of Artificial Intelligence", Yüksek Lisans Tezi, İstanbul Teknik Üniversitesi.

Keskinbora, K. and Güven, F. (2020). "Yapay Zeka ve Oftalmoloji", Türk Oftalmoloji Dergisi, 50(1), 37-43.

Kömürcüoğlu, Ö. and Akyazı, H. (2020). "Finansal Teknolojilerdeki Gelişmeler: Fırsatlar ve Riskler", Karadeniz Journal of Economic Research, 1(1), 35-48.

Lauterbach, A. (2019). " Artificial intelligence and policy : QuoVadis?", Digital Policy, Regulation and Governance, 21(3),238-263. Doi:10.1108/DPRG-09-2018-0054

Lewis, T. (2014). "A Brief History of Artificial Intelligence", available at: https://www.livescience.com/49007-history-of-artificial-intelligence.html / (accessed 4th December 2014)

McKinsey Global Institute. (2017). "Artificial Intelligence : The Next Digital Frontier". McKinsey & Company.

Medetoğlu, B. and Saldanli, A. (2018). "Finans Sektöründe Yapay Zeka Kullanımı ve Etkileri", II. Uluslararası Ekonomi, Finans ve Ekonometri Öğrenci Sempozyumu, 2018, İstanbul, Türkiye, 28-42.

Mehrotra, A. (2019). "Artificial Intelligence in Financial Services – Need to Blend Automation with Human Touch", International Conference on Automation, Computational and Technology Management (ICACTM) Amity University, London, UK, 2019, 342-347. Doi:10.1109/ICACTM.2019.8776741

Musk, E. (2018). "Elon Musk Answers Your Questions!" available at: https://www.youtube.com/watch?v=kzlUyrccbos&t=3s / (accessed 12th March 2018)

Ng, A. (2017). "Artificial Intelligence is the New Electricity", available at: https://www.youtube.com/watch?v=21EiKfQYZXc / (accessed 3 February 2017)

Nobanee, H. and Blooshi, L. (2020). "Applications of Artificial Intelligence in Financial Management Decisions: A Mini-Review", SSRN Electronic Journal, February 2020. Doi: 10.2139/ssrn.3540140

Noonpakdee, W. (2020). "The Adoption of Artificial Intelligence for Financial Investment Service", International Conference on Advanced Communications Technology(ICACT), 2020, Phoenix Park, Korea (South), 396-400. Doi: 10.23919/ICACT48636.2020.9061412

Oxford English Dictionary. (2021) Available at https://en.oxforddictionaries.com/definition/artificial_intelligence

Ryll, L., Barton, M., Zhang, B., McWaters, R., Schizas, E., Hao, R., Bear, K., Preziuso, M., Seger, E., Wardrop, R., Rau, P., Debata, P., Rowan, P., Adams, N., Gray, M. and Yerolemou, N. (2020). "A

Global AI in Financial Services Survey", SSRN Electronic Journal, University of Cambridge, February 2020, Doi:10.2139/ssrn.3532038

Samala, N., Katkam, S., Bellamkonda, R. and Rodriguez, R. (2020). "Impact of AI and robotics in the tourism sector: a critical insight", Journal of Tourism Futures, 1-27. Doi:10.1108/JTF-07-2019-0065

Saraswat, A. (2017). "Artificial Intelligence in Financial Services: Opportunities and Challenges", June 2017, A CyberMedia Publication, 82-84.

Sengorur, B., Koklu, R. and Ateş, A. (2015). "Water Quality Assessment Using Artificial Intelligence Techniques: SOM and ANN—A Case Study of Melen River Turkey", Water Qual Expo Health 7, 2015 469–490. https://doi.org/10.1007/s12403-015-0163-9

Turing, A. M. (1950). "Computing Machinery and Intelligence", Mind, New Series, October 1950, 59 (236), 433-460.

Uslu, A. (2021). "Yapay zeka ile COVID-19 süreci öngörülebilir mi? ", Kurt Yüksel M, editör, COVID-19 Sürecinde Biyobelirteçlerin Klinik Pratikte Kullanımı,1. Baskı. Ankara: Türkiye Klinikleri; 2021,100-2.

Uslu, B. (2015). "Artificial intelligence library for HTML5 based games", Yüksek Lisans Tezi, Süleyman Demirel Üniversitesi.

Wamba-Taguimdje, S.L., Wamba, S.F., Kamdjoug, J. and Wanko, C. (2020). "Influence of artificial intelligence (AI) on firm performance: the business value of AI-based transformation project", Business Process Management Journal, 26(7), 1893-1924. Doi: 10.1108/BPMJ-10-2019-0411

Wheeler, D. (2020). "Co-opting Artificial Intelligence as an Opportunity for Financial Service Professionals", Journal of Financial Service Professionals, 74(1), 66-72.

Yuan, Q. and Jing, X. (2018). "Fintech: AI Powers Financial Services to Improve People's Lives", Communications of the ACM, 61 (11), 65-69. Doi:10.1145/3239550