T.C.
BAHCESEHIR UNIVERSITY

TRANSFER OF BANKING OPERATIONS TO ARTIFICIAL INTELLIGENCE APPLICATIONS

Master Thesis

SEÇİLEN ÖZTÜRK

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ABSTRACT

TRANSFER OF BANKING OPERATIONS TO
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Seçilen Öztürk

Master of Business Administration

Thesis Advisor: Assoc. Prof. Dr. Adnan Veysel Ertemel

May 2019, 58 pages

This thesis deals with to examine which banking operations can be transferred to artificial intelligence applications. For this purpose, keywords, such as artificial intelligence, banking operations, banking and technology relationship, are defined. Banking transactions that can be conducted by artificial intelligence platforms are classified according to their priorities in this research.

The theoretical part deals with the artificial intelligence systems, its applied areas and it's how used in banking. Qualitative research was conducted in order to make an outline of operations prioritization. Semi-structured interview was used as data collection method. In order to provide a solid insight, relevant managers and artificial intelligence experts were selected to participate in to the study.

This study aims to provide managers in banking system with a basic guideline on how or in which order operational tasks to be transferred to artificial intelligence applications.

Keywords: Artificial Intelligence Banking, Operations, Prioritization

ÖZET

BANKACILIK OPERASYONLARININ
YAPAY ZEKA UYGULAMALARINA DEVRİ

Seçilen Öztürk

İşletme Yüksek Lisans

Tez Danışmanı: Dr. Öğr. Üyesi Adnan Veysel Ertemel

Mayıs 2019, 58 sayfa

Bu tez, hangi bankacılık işlemlerinin yapay zeka uygulamalarına aktarılabileceğini incelemeyi amaçlamaktadır. Bu amaçla yapay zeka, bankacılık işlemleri, bankacılık ve teknoloji gibi anahtar kelimeler tanımlanmıştır. Yapay zeka platformları ile yapılabilecek bankacılık işlemleri, bu araştırmada önceliklerine göre sınıflandırılmıştır.

Teorik kısım, yapay zeka sistemleri, uygulamalı alanları ve bankacılıkta nasıl kullanıldığı ile ilgilidir. Operasyonların önceliklendirilmesi ana hatlarını belirlemek için nitel araştırma yapılmıştır. Veri toplama yöntemi olarak yarı yapılandırılmış görüşme kullanılmıştır. Sağlam bir kavrayış sağlamak için, araştırmaya katılmak üzere ilgili yöneticiler ve yapay zeka uzmanları seçildi.

Bu çalışma, bankacılık sistemindeki yöneticilere, operasyonel görevlerin yapay zeka uygulamalarına nasıl ve hangi sırayla aktarılacağına dair temel bir kılavuz sunmayı amaçlamaktadır.

Anahtar Kelimeler: Yapay Zeka Bankacılığı, İşlemler, Operasyon, Önceliklendirme

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LIST OF ABBREVIATIONS

ADC	:	Alternative Distribution Channels
AI	:	Artificial Intelligence
ANN	:	Artificial Neural Network
ATM	:	Automated Teller Machine
AUM	:	Assets under Management
CC	:	Call Center
DNN	:	Dotnetnuke Systems
EFT	:	Electronic Funds Transfer System
HR	:	Human Resources
IT	:	Information Technology
R&D	:	Research & Development
RPA	:	Robotic Process Automation
SME	:	Small Medium Size Enterprise
SWIFT	:	Society for Worldwide Interbank Financial Telecommunications
VOIP	:	Voice over Internet Protocol

1. INTRODUCTION

Technology has been developing at an unprecedented pace. Tremendous increase in data has provided different innovative business models to basically every system. Customers' behaviors, perceptions, expectations and attitudes have been reshaped according to technological change. The use of social media and the spread of digital tools enabled customers to need more qualified services in almost every fields. Since artificial intelligence and machine learning tools are promising systems to meet this need, it would not be wrong to say that interest in these systems has increased significantly.

Martin Ford's NY Best Seller Book "Rise of Robots" has explained Moore's law. It tells us that processor power doubles every 18 to 24 months. Ford gives an example to tell the exact size of this situation as we start driving at 5 km/h. In a minute we speed up our speed to 10 km. In a minute, our speed reaches 20 km and we continue to accelerate to such a folding fold. In this way, we do not only increase our speed but also the distance we have taken is also doubled. In the first minute we go only 83 meters, in the second minute we get 330 meters, in the fifth minute we reach 80 km, so we are over a kilometer in a minute. After six minutes, our speed is now too fast for normal roads. The integrated circuits were invented in 1958. Since then, the speed of computers has increased about 27 times. What would happen if we were to increase the speed of the car by 27 times in our example? The speed of our car was 671 million kilometers per hour at 27th minutes. At the 28th minute of our journey, we traveled 11 million kilometers in a single minute. We would be at Mars that fast in 5 minutes. (Ford, 2015)

This extraordinary advance of information technology has severely reduced the number of people engaged in routine work. Certainly, the banking sector has taken it from it. These applications are formed on products such as credit cards, ATM, telephone banking, home and office banking, internet and mobile banking assessable. In addition, the majority of banking practices EFT, SWIFT, VOIP technologies radically changed banking applications. (Işın, 2006) These services have brought fewer number of employees than before, however operational processes of them are still many and the existence of operational processes of these transactions is still a significant cost in banking sector. Therefore, the cost of operations should be reduced in order to increase profitability in banking. Operational tasks in the banking sector are repetitive, time-consuming and also involve complex decision-making mechanisms. Artificial intelligence applications are complex structures that can process more data faster than human beings and can achieve optimum results much faster than human intelligence. In this context, artificial intelligence solutions are preferred in banking systems to provide higher efficiency, lower costs and higher profitability. However, when we look at the sector, there is not objective guidance, we only see that commercial software companies provide information in this regard. It is important to examine the demand for transferring operational jobs to artificial intelligence technology and to reveal the need.

Moreover, technology companies have entered in finance world as rival of banks. Therefore financial institutions have started to focus exploring innovative business ideas and establishing digital business models executed by new technologies such as AI, machine learning, deep learning and blockchain. In that sense, it is not wrong to say that somehow a need has arisen for banks to transform into technology firms.

This research focuses on analyzing whether operational processes of banking could be transferred to artificial intelligence applications or not in terms of operational efficiency. At the same time, with this study, we focused on providing a prioritization proposal in which sequence of operational processes can be transmitted to artificial intelligence technology.

The literature review showed that this development in technology in the field of banking could directly affect competition, bank-customer relationship and alternative distribution channels such as internet, mobile branches and call centers. Besides, artificial intelligence technology in banking could fit the need of big data management and the importance of right decision-making mechanisms.

After the literature review, a research has been conducted to suggest the usage order of AI solutions in banking operations. Semi-standardized interviews have been conducted with the experts in AI and/or banking operations. The interviews have been summarized as well as text processing was also applied to each questions asked in the study.

2. LITERATURE REVIEW

2.1 WHAT IS INTELLIGENCE?

Howard Gardner stated: “I define intelligence as a bio psychological potential to process specific forms of information in certain kinds of ways. Human beings have evolved diverse information-processing capacities — I term these ‘intelligences’ — that allow them to solve problems or to fashion products. To be considered ‘intelligent,’ these products and solutions must be valued in at least on culture or community.” (Gardner, 2006, p. 27)

2.2 WHAT IS ARTIFICIAL INTELLIGENCE?

2.2.1 Definition

A set of many analytic tools that conjointly try to imitate life may be defined as Artificial Intelligence. Computing has matured in to analytic tools that facilitate resolution issues that were antecedently troublesome or not possible to unravel within the last twenty years. The combination of these tools is getting common now, additionally like standard technologies such as statistical analysis, to create subtle systems capable of resolution difficult issues. (Brent, 2011)

Another definition is done by Whitson (2013) as a structure that performs execution, and use of programs, machines as human intelligence with its most significant functions being understanding, judging, and learning is called artificial intelligence. Neural networks, machine learning, deep learning, voice recognition, image identification and processing, natural language processing, expert and planning systems, robotics, and intelligent assistants are covered by artificial intelligence. Artificial intelligence provides the investigators to more sophisticated programming techniques, including logic programming and search functions as classical, probabilistic ways. (Whitson, 2013)

Besides, evolutionary programming and fuzzy logic are the paradigms that are classified as Artificial Intelligence. An ability to learn and accommodate new things by possessing one or more attributes of "reason", like generalization, discovery, association and abstraction, are exhibited by these technologies. (Brent, 2011)

2.2.2 How Artificial Intelligence Basically Works

1. First task of AI mechanism is to grasp interconnection of multiple facts in the formation of information and to convert into a machine-understandable structure.

2. Second task is to reach a reliable result by a reasoning process.

3. Final task is to combine its process with a learning process so that it enhances system itself. (Whitson, 2013)

2.2.3 Applied Areas of Artificial Intelligence

Artificial intelligence applications vary from computer games to academic tools (theorem provers in mathematics) from medical digital assistants to chatbots. It will be explained as follows in terms of both theoretical and practical ones.

a) Expert Systems,

b) Theorem Provers, (Especially in Mathematics)

c) Intelligent Tutor Systems,

d) Electronic Games,

e) Careers and Course Work, (Whitson, 2013)

Medical diagnosis, credit card fraud detection, bank loan approval, smart household appliances, subway systems, automatic transmissions, financial portfolio management, robot navigation systems, and many more are employed by Artificial Intelligence practices. At the same time, oil and gas sector, AI tools are used to solve issues associated with pressure transient analysis, well log interpretation, reservoir characterization, and candidate well choice for stimulation, among others. (Brent, 2011)

The study of computational agents that act intelligently is AI according to Poole (2010). An agent acts by its previous information, its history of observations, and its goals and preferences. A physical image system that manipulates symbols to see what to try to do is intelligent agent. A designer of an agent should focus on modularity in order to describe the environment, however so much ahead to set up, uncertainty in each perception and therefore the effects of actions, the structure of goals or preferences, alternative agents, the way to learn from expertise, and therefore the incontrovertible fact that all real agents have restricted process resources. (Poole & Mackworth, 2010)

2.2.4 Short Chronological History of Artificial Intelligence:

1943- McCulloch & Pitts: They did the Boolean circuit model of the brain.

1950- Turing's Discovery as “information processing machines and intelligence”.

1956- Dartmaouth Meeting: Artificial intelligence expression was found.

1952-1969: IBM wrote the first program that can play chess. The first international conference on AI was held.

The 1950s: First AI programs, Samuel's control program, Newell and Simon's logic theory, Gelernter's geometry engine were produced.

1965-Robinson has developed a complete algorithm for logical thinking.

The 1966-73: AI countered account complexity and therefore neural networks research have almost disappeared.

1969-79: The first development steps of information-based systems were taken.

1980- AI became industrial.

1986- Artificial neural networks became popular again.

1987- AI became science.

1995- Intelligent agents (term use) emerged.

1997- Deep Blue defeated Kasparov.

1998- AI based programs have reached to a wide audience with the spread of the Internet.

2000-05: Robot toys have been launched and AI applications are still used on many electronic devices. (Pirim, 2006)

2.3 BANKING & TECHNOLOGY

It is not the time that the banks are in complacency. In view of profound changes driven by advances in information technology and competitive pressure from FinTech companies, they need to re-evaluate their competitive advantages. Because of IT developments in social networks, communications, artificial intelligence, and big data analytics, societies are on the verge of profound transformation. Now, a challenge is understanding banking in these fluctuating times. (Jakšič & Marinč , 2019)

2.3.1 Today's banking

The reason for the existence of banks is trust. Banks are trusted to hold our money and allow it back to us when it is necessary; and we trust business firms to buy the securities we need at feature costs and to charge and credit our records in like way. Since trust is so basic and important, we have commonly held banks and budgetary foundations too much higher benchmarks of consistence and control than different organizations.

Financial organizations are required to take on well-characterized frameworks with oversight and additional plans aimed at reducing risk and enhancing open trust. These procedures generally included individuals as they were logically extended with progress after some time. In any case, the last 20 years have seen the rise of a new and distinctive aspect generally empowered by internet access: the business of the "platform." Many mind-boggling forms, including consistency and checks-and parity techniques, are performed safely by machines in these platform organizations.

In addition to this stage marvel, more up-to-date people's ages have co-advanced to be gradually happy with confiding in machines to settle on or reinforce choices. It would have seemed incredible 10 years before imagining relying on self-ruling driving vehicles to take control of the wheel, or trusting robots to do medical procedures on us.

However we are only gradually doing that in a number of certifiable territories that are developing. We seem to be overwhelmingly happy with trusting in machine-settled choices in spaces where the risks are recognized. (Dhar & Stein, 2017)

2.3.2 Banking Operations and New Approach of Fulfillment:

According to the paper written by Milić et al. 2017 it is defined that the banking industry takes a crucial place in the safe-keeping and delivery of various financial transactions required by the customers. Servicing problems such as queues, delays and too much paper work are the elements which force to the efficiency of service operations in the banking industry. It is also determined the importance of synergy between information technologies and the banking system, besides, using information technologies in the daily routine of banks are analyzed in the regarding study. Platform banking, internet or mobile branches ensure better customer experience by eliminating long queues in bank branches and supplying access to any information of customers via internet. Besides, they provide efficiency by reducing the number of employees in banks themselves. All physical devices such as ATMs, card readers, and application apps, including mobile apps and web pages supply customers with quick and easy access to customers' private information at the front.

Modernization can be expected in the mode and technology in which banking services, payments and interaction between the client and the bank will be performed, as well as in guaranteeing greater security of new distribution channel services. Together with the execution of the administrations, it must be focused to the technology of tools (back office and customer interfaces) that will actualize information security and preserve trust between banks and clients. (Milić, et al., 2017)

For conventional banking structure, lower edges and expanding regularity requests makes an operational optimization criticalness. From 2010 to 2015, the cost-income proportion calculated for 150 European banks expanded from 59% to 65% percent, whereas the income-asset ratio remained at the same level. (Mills & McCarthy, 2016)

Nowadays FinTech gives the opportunity of operational efficiency to banking sector and to target strategic dimensions value chain: originations and sales- activities accounting for 60% of banks profit, with a ROE of 22%, much higher than 6% from the provision of balance sheet. FinTech attracts traditional bank customer by designing online applications & services (Nisar et al, 2014). PayPal, Amazon and eBay that are the important examples of online business platforms US located manage credit approval process based on risk assessment using customer operations by accessing databases real time. This new business model forces banks to transform all customer interactions and operations to online platforms.

The review of the major academic research journals revealed that automation and social media connectivity had generated a disruptive innovation phase in financial services industry. Research journals, are at an incipient phase to identify the major strategic implications for traditional banking system in the context of the new financial technology. (Brătăşanu, 2017)

According to the same article of Brătăşanu, it is proved that innovative advancement is revising the business model of finance. It is stated that clients and traditional banking structure benefit from the automation and social media connectivity technologies in recent times. The patterns recommend that automation of client relationship, progressed predictive analytics and with AI software, will make improved client experience and increasing productivity of risk management process.

In view of strategic dynamic alternatives conventional banks may contend or work together with digital platforms, or they may implement both strategies at the same time. There's a big potential in the acceleration of the cooperation between conventional banking system and FinTech start-ups in near future. The key competitive advantage of Fintech collaboration raised on operational excellence and big data optimization analytics, however that will challenge strategic decisions of financial corporations in managing market dynamics. Modern innovation approach will provide key opportunities to traditional financial corporations:

a. quicker potential of worldwide deployment for digital business models;
b. re-design customer experience comforming to the demands of new generations and education level, under the pressure of demographic changes in the next 20 years

c. strategic integration with completing industries (e.g. telecom, retail chains, medical services), determined by increasing smartphones users based on integration.
d. Integration banking and telecom services have the potential to accelerate, considering complementary know-how, client relationship models (globally are more than 5 billion active mobile phone accounts and 1.3 billion active credit and debit accounts).

When we look from a financial inclusion perspective FinTech start-ups may play an important role in the coverage of small business clients and digital platforms. Financial technology based startups may have the capability to target more customer than traditional banking system, so they can much more easily influence regulators to revise policy structure in digitalized sense. (Brătăşanu, 2017)

2.3.3 Relationship Banking

Nowadays banks search to develop new business opportunities and build relationships with corporate clients, while answering the industry mandate of moving toward real-time payments, technology has become the driving strategy. The tactics are to develop customer interfaces while adding new capabilities and improving them that utilize artificial intelligence, the blockchain, and application programming interfaces (APIs). According to the results of the 2016 Transaction Banking Survey published by GTNews in connection with CGI, only 38 percent of corporate customers planned to remain with their primary bank. This rate is lower than the rate of previous year, 52 percent of results of told they would stay with their primary bank.

In response to this new competitive approach, banks are making an effort to think two or three steps beyond the offerings they currently provide to all customers. Since customers expect to have strategic alliances when they run their business or for their personal financial needs. Many new ways in which technology can support them advance their business model as well as individual requirements, so that they shift from credit provider and deposit holder to the role of a knowledgeable consultancy that can make strategic and useful recommendations to corporate treasury departments or private budgets. (Johnson, 2017)

As Linda Coven suggests in the report of Johnson “The more value banks can provide, the stickier the relationship. The more value-added banking services become, the more afraid [treasurers] will be to pull the plug on that relationship.” (Johnson, 2017)

As Thomas Leith says in the report of Johnson “Having these types of technologies allows customers to be much more nimble with payments and to know what to do to optimize the cash they have.” (Johnson, 2017)

As we know that the banking economy hasn't changed. The raison d'être of banks is and will continue to be mitigating the asymmetry of information between investors and borrowers. (Greenbaum, et al., 2016) Evaluating limited information is the need of banking system, it sometimes can be difficult to quantify this information in order to estimate bank clients' creditworthiness, whose incentives may be completely misaligned with banks. A relationship bank retains considerable flexibility and discretion to act on soft information and relies on confidentiality and confidence. (Jakšič & Marinč , 2019)

Relationship banking, however, needs to respond to significant challenges due to IT-driven innovations as (Currie & Lagoarde-Segot, 2017) highlighted. The potential disadvantage of relationship banking refers to its efficiency as compared to technologies driven by transactions. IT developments have increased efficiency in transaction banking (e.g., payments, clearing and settlement, internet banking, and transaction loans), changing the role of distances in banking. Artificially intelligent computers have begun performing transaction banking tasks that are central to the banking relationship. Human beings are still needed in banking, but they need to reconsider their role as bankers.

It becomes increasingly important to understand how people think and act. Banks need to understand biased behavior, herding behavior, bounded rationality, and emotions of people. Information is rapidly spreading across social networks, making society prone to herding, manipulation of information, and unfounded panic. Perfect rationality could be an overly simplistic concept in this light.

IT developments have stimulated competition in banking, further affecting banks' strategic choice between the banking relationship and the banking orientation of transactions. If scaling up is easy in transaction banking, how to leverage relationships is a challenge. We suggest that IT technology for relationships is becoming mature. A number of FinTech companies, for example, successfully scale up a banking relationship technology. Competition then works to lessen the disadvantage of "hold-up" stage of relationship, described by Sharpe (1990) and Rajan (1992), in which relationship banks use proprietary information to their advantage and make borrowers overly dependent on it. (Sharpe, 1990), (Rajan, 1992)

In the banking sector, IT developments have had a transformative effect. IT developments have enhanced banks' cost-effectiveness. In payment processing and clearing and settlement systems, Beijnen and Bolt (2009), Schmiedel et al. (2006), and Li and Marinč (2018) point to economies of scale. (Beijnen & Bolt, 2009), (Schmiedel, et al., 2006) (Li & Marinč, 2018)

Additional cost savings are provided by online and mobile access channels combined with electronic and mobile payment systems and enhanced transaction lending techniques. The article of Jakšič and Marinč (2015) identifies improved communication, decision-making, automation and empowerment of bank customers as core dimensions in which banks are reconfigured by IT developments. (Jakšič & Marinč, 2015)

Societies face significant economic challenges. IT developments—such as full-time connectivity, social networks, and the internet of artificial intelligence — transform society. (Aral, et al., 2013)

Customers are changing as well. They want a cheap service that can be accessed anywhere and at any time and that is tailored to their needs. They demand experience and gaming on multiple channels. They want empowerment and decision-making. All these changes have resulted in higher short-termism. Information is transmitted instantly, and through new media vehicles, customers align their thoughts and actions. The pressure on the customers is peer pressure (Baqna & Umyarov, 2015).

The outcome of these arguments is that the world has become a different place. While banks' fundamental competitive advantage in mitigating information issues has remained, the economic environment has changed. Financial crises, social changes and developments in IT are straining economies (Jakšič & Marinč , 2019; Currie & Lagoarde-Segot, 2017).

In banking matters being close to customers. Loan officers who are closer to their borrowers geographically and culturally make better lending decisions that help both their bank and their borrowers. The banker must have sufficient flexibility and discretion to incorporate cultural knowledge into decision-making in order to do this. A combination of banking relationship and cultural proximity then works to improve decisions on bank lending (Jakšič & Marinč , 2019).

2.3.4 Artificial Intelligence in Banking:

The role of humans in banking needs to be re-evaluated with the rise of artificial intelligence. (Jakšič & Marinč , 2019)

Is there still a need for a human banker, a loan officer who collects soft information through personal interaction with a borrower (Uchida, et al., 2012) or will computers take over from the multitude of bank borrowers ' data through automatic transaction loans? In other words, in mitigating information asymmetry issues (e.g., adverse selection and moral hazard issues) in banking, can computers outperform humans?

Relationship banking still bears advantages despite advances in IT (Marinč, 2013) For some firms matching transaction-oriented banks, credit rationing increases compared to those matching relationship-oriented banks (Ferri & Murro, 2015). Soft information loans provide more bargaining power than hard information loans to borrowers with high managerial skills and character (Grunert & Norden, 2012). It is known that humans can be easily replaced by computers in modifiable, routine tasks that follow well-defined procedures. (Autor & Dorn, 2013), then the question is how much discretion loan officers need in lending as opposed to rules. Cerqueiro et al. (2011) show that discretion is particularly applied to opaque and small businesses, to small and unsecured loans, and when a company is far from a lender. Loan officers ' discretion is predominantly used in loan pricing rather than in the credit origination process. (Cerqueiro, et al., 2011)

Artificial intelligence model has mainly shaped as the following domains in Banking Sector:

a. Business Functions – E.g., Accounts
b. Analytical Business Focus – E.g., GRCS- Governance, Risk and Compliance Service
c. Strategic Goal – E.g., Transformation of The Bank
d. Intelligent Automation – E.g., Robotic Process Automation
e. AI Algorithm – E.g., DNN
f. Smart Channels – E.g., Mobile
g. AI Types – E.g., Smart Vision Systems

This model was presented by Vittorio D'Orazio in the Gartner Symposiom in 3-4 November, 2017. (D'Orazio, 2017)

2.3.5 Mostly Used AI Technology Categories in Banking:

2.3.5.1 Smart Vision Systems- focused on "See" function of the brain

1. Authentication (e.g., HSBC and Citi), web access (e.g., Lloyds),

2. ATM security (e.g., China Union Pay in Macau), advisory for tellers/agents, interpersonal recognition

3. Social Analysis in meetings (e.g., JP Morgan Chase, NAB, Citi).

2.3.5.2 Virtual Customer Assistants (VCA) - focused on "Speak or Write" function of the brain

1. Physical robots (e.g., Nao at Bank of Tokyo-Mitsubishi, Pepper at Mizuho and Emirates-NBD),

2. Portal virtual assistant (e.g., "Ask Sara" at Commercial Bank of Dubai),

3. Intelligent virtual assistant (e.g.,"Widdy" at Widiba),

4. Robo advisors for investments (e.g., Charles Schwab).

2.3.5.3 Virtual Personal Assistant (VPA)

a. A virtual personal assistant that can reach you on any channel (e.g., "Ally Assist" at Ally Bank, IP Soft Amelia at SEB, "Erica" at Bank of America).
b. Bank of America and Erica: You ask Alexa a question, it gives you an answer. When you think of artificial intelligence, Erica goes farther to say, 'Yes, your balance is $521, but if you keep going, you are going to overdraw your account." (Moore, 2016)
c. Smart Advisors Online/Mobile customer Q&A (e.g., IBM Watson at DBS, Swedbank), conversation commerce (e.g., Granify), corporate client onboarding.

2.3.5.4 Other NLP Applications

a. Translation of structured voice logs to support customer information collection (e.g., Credit Suisse Group, Quill at USAA, Mastercard and Century Investments), speech analytics (e.g., Bank of Montreal, ICICI).
b. Touch Smart Campus Infrastructure Many examples but not necessarily related to banking (i.e., horizontal technology) and definitely. (Gartner, 2017)

2.3.6 Some Specific Examples in Banking AI Applications:

2.3.6.1 ANZ Banking Group -"It's not boring, I am a bot"

a. Opportunity: Better the quality levels of internal helpdesks and lower costs by bots-learning software that can reply questions that won't have any problem or difficulty in doing a boring job every day at a fraction of cost.
b. Data and analytics: ANZ Banking Group has launched a robot software system, which can do the work of employees for internal help desk ranging from payroll administration to support and customer service in a fraction of the time and at a greater quality. ANZ's project for Robotic Process Automation (RPA) has started in its captives worldwide (India, Philippines and China) and integrated with existing help desk to verify its goodness and gradually extended.
c. Results: According to plans, ANZ expects to see cost savings more than 30% across key areas such as F&A, HR and the supply chain by 2018. RPA project is not aiming for staff-reduction but rather to improve quality and process efficiency while moving staff to more qualified roles. Expected huge implications in future hiring and sourcing (e.g., PO).

2.3.6.2 “Say Hello to the DBS digibank App”

a. Opportunity: In 2014 at DBS, mobile banking users surpassed traditional web banking users and the 2016 launch of the "DBS digibank" app posed the question on how to automate support for this new customer segment by integrating the set of digital functionalities.

b. Data and analytics: The answer has been KAI (the AI platform by Kasisto) that operates as a native chatbot. DBS customers will be able to use natural language to converse with the bank, and perform tasks like checking on the balance of their accounts, paying bills, tracking expenses and making payments. DBS plans to roll out this service on Facebook Messenger and then to expand it to other popular messaging apps like WhatsApp and WeChat.

c. Results: The goal is to improve the customer experience by enabling customer services running on the clients' favorite chat apps and reducing the traditional call center workload.

2.3.6.3 Evolution of a Robo advisor Strategy

a. Opportunity: In 2010-2014 Betterment and Wealthfront were able to collect in 5 years about $2 Billion in Assets under Management. In 2015 Charles Schwab launched robo advisors to contrast FinTechs such as Betterment and Wealthfront, particularly aggressive in the use of this technology. Charles Schwab could offer EFT to customers at very low fees and by targeting low segment customers with a minimum balance as low as $5,000 as an eligibility criteria for this algorithm-based service.

b. Data and analytics: Robo advisors limit the service to portfolio management, which includes allocating stocks and investments to various asset classes based on a questionnaire/survey filled by the customer. Based on the answers to the questionnaire, the algorithm invests in a diversified portfolio of exchange traded funds taking into account the risk appetite of the customer. There is minimal human intervention, practically no time constraints and low minimums of investable assets for eligibility to advisory services.

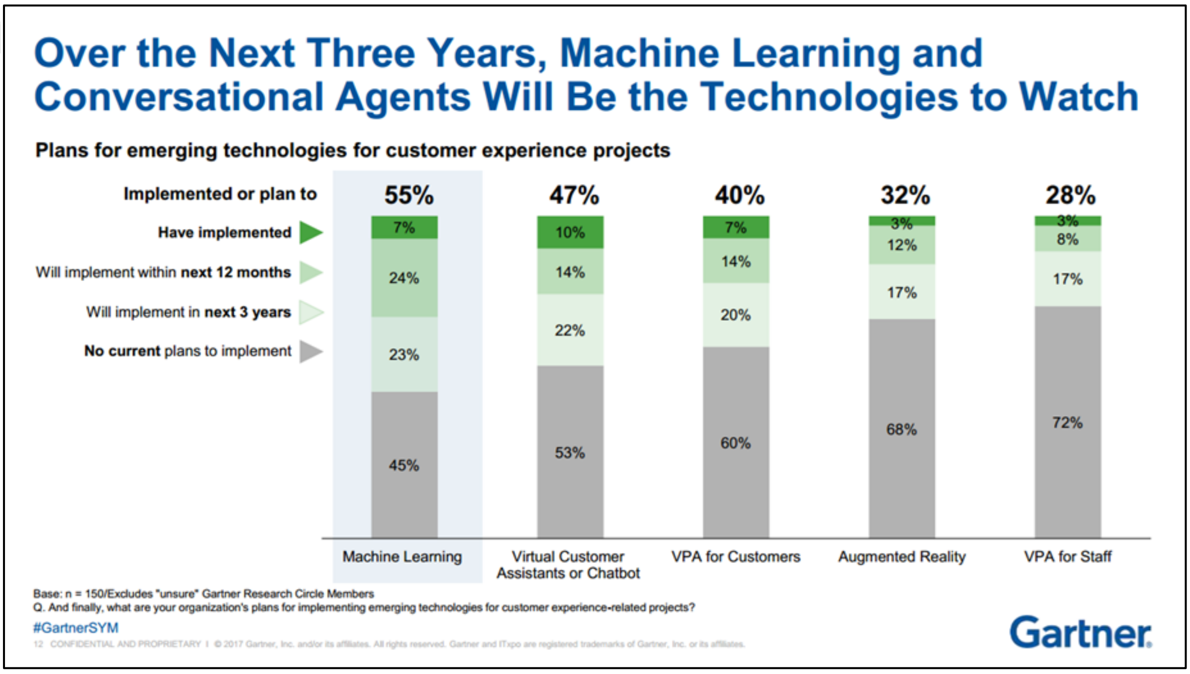
c. Results: In 2015, after the introduction of the robo advisors, Charles Schwab was able to increase the accumulation of AUM by $20 Billion. Today, Charles Schwab extended the use of robo advisors beyond the initial low customer segment and roughly 20% of the robo advisors' clients have more than $1 Million AUM.

2.3.6.4 Over the Next Three Years, Machine Learning and Conversational Agents

Machine Learning and conversational agents that will have important role over the next three years were discovered according to Gartner Study. (Gartner, 2017)

Gartner Study is shown as below figure.

Figure 2.3: Emerging Technologies For Customer Experience Projects



2.3.7 Some Examples from Turkey

2.3.7.1 Artificial Intelligence Application: Etiya

After R&D studies of artificial intelligence field, Etiya has realized first product into market in 2015. Etiya's artificial intelligence was developed for customer services and call centers where written communication is heavily used. Etiya can analyze customers' expressions via all channels like email, message or social media and answer them automatically by its natural language processor. Only when it is necessary, it can connect customers to customer representatives. In the pilot studies, it was observed that the regarding solution reduced the return time to the customer by 50 percent in written channels, and the ability to understand fast content provided 40 percent cost savings of call centers. This information is taken from the article of NTV named Turkey's first artificial intelligence application from Etiya. (Anon., 2018)

2.3.7.2 Dahi.ai / Yapaytech:

Yapaytech was established basically as a technology company and targeted to produce the applications that are based on natural language processing and machine learning algorithms in 2013. Yapaytech is the most well-known product that is the chatbot platform “Dahi.ai”. Dahi.ai gives an infrastructure that provides users to develop their own chatbot platforms without having any technical expertise in AI technologies. Yapaytech uses machine learning algorithms, in order to allow chat-human interactions as natural as possible.

Yapaytech’s product is mainly based on rules and if conditions. This tool is not an artificial intelligence technology in its naked form, but it uses an artificial intelligence-based model, such as predict this than that. (Anon., 2017)

2.3.7.3 Veslabs / Jetlink:

Jetlink is one of the attempts to develop a chatbot using the native language processing library. With the Jetlink Chatbot Framework, it grows rapidly and responds to both flow-based chatbot setups and customer needs at natural language understanding. On the other hand, with its live support panel, it provides many suggestion mechanisms based on machine learning to facilitate the daily life of customer representatives. (Anon., 2017)

2.3.7.4 Paym.es:

Webrazzi website (In the internet space, and Turkey is a media company that analyzes examining developments in the world) the Paym.es is an initiative that enables secure shopping and sales with chatbots developed for messaging applications. Paym.es, who wants to offer a complex e-commerce experience without complex forms, long approval times to the users doing social commerce, is also intended to make people feel that they have a human mind. For this purpose, it aims to give you a special experience according to your social media movements, products and conversations. Paym.es platform, which takes various decisions such as publishing the product, filtering, creating popular product list and solving the problems in purchasing, aims to develop a system that gives many answers by analyzing the dialogues of the sellers with the buyers. (Anon., 2017)

2.3.8 AI Perspective of Turkish Banking Sector

As explained in Türkiye AI Platform, financial institutions have begun to understand the advantages of artificial intelligence in increasing revenues and decreasing costs, identifying cases of fraud and enhancing customer experience. Banks and credit institutions are focusing on the potential of this technology and how artificial intelligence can make its operations more efficient and how to better anticipate products to be offered to customers in Turkey.

Financial institutions have had a significant advantage in this area from the first day by using large data pools and analytical tools. Data from payment systems to daily banking services has made it easier to implement artificial intelligence applications.

Financial organizations have had a noteworthy favorable position here from the principal day by utilizing expansive information pools and analytical instruments. Information from payment systems to day by day banking administrations has made it simpler to execute AI applications. According to Accenture's Research of Turkish Banking Sector, 67% of customers have allowed their personal data to be trusted by relying on their banks, and 63% are more personally advised to them by private banks (such as predetermined loan allocations, market-specific interest rates, etc.). Today, Turkish banks have already started to fulfill this desire of customers. (Anon., 2019)

There are seen especially chatbots and RPA applications in Turkish banks. For example: ING Group hired a Turkish manager, Mr. Koseoglu as Artificial Intelligence and Robotics Global Head. He stated that competition via banks will be based on artificial intelligence applications in near future. Koseoglu also suggested that Turkish banks are very good at artificial intelligence and robotics, and that they will make a contribution of 100 million Euros to their profits after the use of these technologies.

Koseoglu emphasized that more than 1000 robots are already in use at ING Bank on the robot process automation side. Besides, he exampled that they have implemented a fraud detection model and KGF robot applications in Turkey. Koseoglu also stated that a robot can perform a KGF application in about 40 minutes in less than 5 minutes with zero error. Robots have provided ING Bank with 20 thousand hours saving in operations. Koseoglu emphasized that with the use of technology, the operational burden of many employees in the branch has been reduced and the employees are more concentrated as well. ING Group 150 people in a robot that has been shifted to the work, he added. (Yüksel, 2018)

There are some chatbot applications of big rivals in Turkish banking sector such as Garanti's UGI, Is Bank's Maxi and so on. They have already provided efficiency and reduce costs in call centers by transferring call center transactions to chatbots.

3. RESEARCH METHODOLOGY

3.1 THE METHODOLOGY OF THE RESEARCH

This section presents the research objective together with the research methodology adopted, sampling method and results.

3.2 RESEARCH OBJECTIVE

This study specifically investigates efficiency of artificial intelligence applications in banking operations. This research aims at depicting a prioritization list in terms of artificial intelligence applications in banking operations A qualitative research was conducted using expert opinions in this subject.

3.3 RESEARCH QUESTIONS

Today, technological developments take place in the middle of banking trends. With the flow of these developments, we evaluate different technological applications and try to observe their effects on profitability. The increase in operational workloads from banking operations to head office, marketing to human resources and even to information technologies has led to the search for technology in this area. In the first place, we are focusing on the more sophisticated systems that we are trying to overcome with software automation. With the RPA tools, we can say in the first stage the most basic artificial intelligence applications, we are trying to make operations more efficient. However, the introduction of more advanced algorithms, machine learning, deep learning and big data issues in the industry, brings to mind two specific questions:

1) In fact, artificial intelligence applications, which lies in the basis of operations, frequencies, large amounts of data, image processing, customer to provide the desired channel services, internal and external processes can simplify the process for us?

Thus, it is hypothesized that;

H1: Transferring operational tasks in banking to Artificial Intelligence applications will increase efficiency.

2) If it can solve, where should the work start and how to proceed? Looking at the point of artificial intelligence at present and in the near future, is there any process that cannot be transferred to artificial intelligence?

Hence, this question is hypothesized that;

H2: Ordering operational tasks according to their priority while transferring them into AI applications will provide convenience to Banking Managers.

This study was carried out to understand if these hypothesis are meaningful.

3.4 THE LIMITATIONS OF THE STUDY

The fact that the fifty percent of experts participating in the study were selected from the participation bank, the subject was relatively new and the areas of application were transferred to new artificial intelligence technologies very recently in the location are the main constraints of the study. This situation may raise suspicion in the validity of the results.

Since the know-how of artificial intelligence technologies has not yet been spread equally in the business world, different opinions were encountered in terms of the functions of AI applications. However, the transfer of banking operations to artificial intelligence is found highly efficient by participants. Besides, a high degree of consensus in the prioritization of the processes to be transferred was observed.

This study was made with the qualified and competent individuals in Turkey, the experience in the related domain could be relatively more limited than the know-how of experts in western countries, Japan, Chine, etc. Since these applications have been comparably recently implemented by Turkey.

3.5 THE RATIONALE OF THE STUDY

Operational costs directly affect profitability in banks. The profitability of banks can be maintained precisely by keeping their current customers and gaining new profitable customers. The quality of service, speed of service and the diversity of the channels strengthen the relationship between bank and customer. That ensures customers continue to be the customers of that bank by increasing their satisfaction and banks know their customers more and manage their risk better. It has been experienced by banks that the operations of the customer contact points are brought to the desired point by making the operations in the background efficient. Therefore, for banks, making numerous transactions such as fraud detection, loan allocation, instructions, saving transactions, branch operations, providing information, foreign trade services to provide better and efficient service level, brings two main questions into agenda. First, which technologies are useful and then, in what order these transactions can be transformed to the regarding technologies should be answered. From this point of view, with the increased importance of artificial intelligence, this study stems whether artificial intelligence applications are on the agenda in banking operations.

3.6 SAMPLING PROCESS AND DATA COLLECTION METHOD

3.6.1 SAMPLING PROCESS

There is generally no standard sample size recommended for research into mixed methods. (Genç, 2017) Most researchers claim that until data saturation occurs, interviews should be continued. Johnson and Christensen (2004) suggested that 6-12 participants should be sufficient. (Johnson & Christensen, 2004). Also 6-10 participants according to Morgan, (1997) ; Langford et al., (2002) or 6-9 participants Krueger, (2000) are proposed by other researchers as an optimal sample.

The 10 interviewees who are at top management in banking operations or specialist in artificial intelligence applications and mostly have expertise in banking sector’s AI applications were selected for the study. Special attention was given to the expertise of the participants and their interest of the research subject.

Most of the interviews were conducted face to face in this study. The other few interviews were carried out by telephone and other means. 80% of the interviewees agreed to register one-to-one interviews, 20% allowed to take notes only in the interviews.

3.6.2 DATA COLLECTION METHOD: SEMI STRUCTURED INTERVIEW

In Alvesson and Deetz Study, it is found out that the most often used qualitative research method is semi-structured (or semi-standardized) interview. Qualitative research focuses on the essence of the meaning and clarifying wonder. It tries to understand in-depth definitions and work flows of the related issue. However quantitative data are mainly concerned with the numbers such as frequency or quantity. Hence interview is a data collection tool which provides gathering information of participants' opinions, judgments and knowledge on related domain is often used in Qualitative Researches. (Qu & Dumay, 2011)

Semi structured interviews provides the resilience that and it gives opportunity for unexpected answers and phenomena to occur in conversations according to Tod (2006). Semi-standardized interviews grant the interviewer to maintain the flexibility in questioning in terms of wording, different language usage. Besides it enables interviewer to analyze and manage various topics mentioned by the experts. (Qu & Dumay, 2011)

Semi-standardized questionnaire brings the researcher to discover probes and manage interview as whole.

The face to face conversation method gives an opportunity to the researcher to share his/her own experience and thoughts so that in order to gather data in an individualistic manner. This situation provides richer data gathering than that gained by standard questionnaire. (Qu & Dumay, 2011)

The semi-structure interview data collection method has been selected in this study by the light of aforementioned information. All participants were interviewed and the knowledge and approaches of them about the subject have been obtained. The results of the interviews were analyzed and summarized for this study.

Besides, this method facilitated the speakers to utter their own transfer priority of operational tasks. The participants experience and perspectives in the prioritization was clearly revealed through these interviews.

3.6.3 TYPOLOGY OF INQUIRIES UTILIZED IN RESEARCH INTERVIEWS

Alvesson and Deetz (2000) defined that semi standardized interview is an empirical phenomenon and situational according to environment. There is no structured transcripts in interviews. Therefore, there is no one correct way of questioning, no structure is suitable for all attendees of research, and no unique way of expressions will be used in any cases. (Qu & Dumay, 2011)

Semi structured interview has some difficulties for researchers in order to demand responsiveness and awareness for the most relevant answers according to same study of Alvesson and Deetz (2000). (Qu & Dumay, 2011)

Shensul et al.'s study states that efficient interview can be conducted by fulfilling three important points:

(1) Providing the attendee to share his/her own story;

(2) Establishing a positive relationship with the attendee and

(3) Refraining researcher bias. (Qu & Dumay, 2011)

3.6.4 QUESTION TYPES OF SEMI STANDARIZED INTERVIEWS

The following interview topology was adapted by Kavale (1996).

a) Presenting Questions

To begin the discussion and move to the participant to the principle subject

"Can you explain your opinions about …….?

"Do you recall last event when [...]?"

"What is mentioned at the last chapter [...]??"

b) Yes/No Questions

Getting answers yes or no

Emphasizing some important vocabulary related to the subject

c) Examining questions

To extract increasingly total stories "Would you be able to say something all the more regarding that?"

"Would you be able to give an increasingly nitty gritty depiction of what occurred?"

"Do you have further instances of this?"

d) Indicating inquiries

To grow progressively exact portrayals from general explanations

"What did you think at that point?"

"What did you really do when you felt a mounting tension?"

"How did your body respond?"

e) Direct inquiries

To inspire direct reactions

"Have you at any point gotten cash for decent evaluations?"

"When you notice rivalry, do you at that point think about a sportsman like or a dangerous challenge?"

f) Roundabout inquiries

To offer projective conversation starters

"How would you accept different understudies respect the challenge of evaluations?"

g) Organizing questions

To allude to the utilization of key inquiries to complete off one piece of the meeting and open up another, or to show when a topic is depleted by severing long insignificant answers "I might now want to present another theme [...]"

h) Quietness

To permit stops, so the interviewees have plentiful time to relate and reflect, and end the quietness themselves with critical data

i) Translating questions

Like a few types of examining questions, to reword an interviewee's response to elucidate and decipher instead of to investigate new data

"You at that point imply that [....]?"

"Is it right that you feel that [...]?"

"Does the articulation [...] spread what you have quite recently communicated?"

j) Discard questions

To fill an assortment of needs, for example to loosen up the subject when touchy territories have been broken

"Graci ous, I neglected to ask you [...]" (Qu & Dumay, 2011)

In the first plan, although all of the aforementioned question types were not included in the pre-prepared questionnaire, more detailed information was obtained from the participants with these questions according to the course of the interviews. The structure of survey could been found at Appendix 1.

3.7 TEXT PROCESSING

Text processing work is, in the simplest sense, a data mining study that accepts the text as a source of data and seeks to obtain structured data from a different definition. For example, text classification, clustering, concept / entity extraction, granular taxonomy production, sentimental analysis, text summary, entity relationship modeling) are aimed at working. (Şeker, 2014)

It uses methods such as data mining and even visualization to achieve the above goals, and information retrieval in the context of text mining studies, lexical analysis, word frequency distribution, pattern recognition, tagging, information extraction are the other structures used in data mining. (Şeker, 2014)

Text processing studies are often associated with the processing of natural language (NLP), another area of study in literature related to text. Studies of natural language processing mainly involve studies under artificial intelligence based on linguistic knowledge. Studies of text mining are aimed at achieving more statistical results. Extraction of features is often done through the use of natural language processing during text mining studies. (Şeker, 2014)

Text processing algorithm is used to find out which processes and concepts have been mainly focused and which processes were prioritized by the interviewees in this study. Since text processing may be subject to certain specific information from within the text. When receiving specific information is required, for example, such as email addresses, phone numbers, addresses, dates. In these cases, regular expressions or context-free grammars are defined and run on the text. (Şeker, 2014).

Each question was combined to each participants' answers, and applied text processing by Python language programming tool. The most frequent used keywords were extracted for each question. In this way, the main points of interviewees' answers that were attached at the following sections were revealed.

For instance, for the question number 2, the keywords which the most of the artificial intelligence experts mentioned same expressions such as fraud, chatbot, speech processing demonstrated consistency. A similar stability was observed in all other questions according to the results of text processing.

4. THE FINDINGS OF THE RESEARCH

4.1 THE SUMMARIES OF THE INTERVIEWS

4.1.1 Emre Yazıcı: Chief Data Scientist in Zack-Ai

He has been working with artificial intelligence models for about 14 years, he studied AI in England and works as the specialist of AI. Image processing, text processing, audio processing, big data, data analytics are his main area of studies. According to Mr. Yazıcı, AI can be used in three main areas. First is operation analytics: Appropriate number of resources to the convenient branch, assigning the relevant task to the fitting person. The second is risk analytics: fraud determinations. The third is CRM analytics: churn, segmentation and valuation analytics.

He thinks he would definitely think to use AI in banking operations. Chatbots, speech enabled IVR systems will optimize operational processes and decrease the number of employees in large staffed departments such as call centers. There will be time saving for manual tasks or even automated tasks. Most of the call center services are in-house solved by banks for legal grounds. In-house call centers services can be difficult to manage by maintaining its banking focus, call centers for banks are the domains that generate high costs.

The prioritization is made by Mr. Yazıcı as follow:

a. High usage areas: Call center chatbot, branch workload forecasting, branch optimum task deployment,
b. Medium usage areas: Human resources - chatbot, call center load forecasting, Call center optimum job deployment,
c. Low usage areas: Auto-completion and progression of details by learning the display operations

He declares that critical and rare transactions should not be realized by AI systems.

4.1.2 Rafet Maltas: Advanced Analytics Leader and Vice President of Analytical Banking Systems in Kuveyt Turk Participation Bank

He states that when we talk about artificial intelligence, we have analytical models and decision support systems. Machine learning is the tool of these systems. Decision support systems are divided into five types, reporting, business analytics, and descriptive, predictive and prescriptive models. Descriptive model is used in data mining. Predictive models provide predictions for the future. Prescriptive model reveals structures in which the action is taken. Cognitive models are behavioral models, structures that model human consciousness. These structures are called artificial intelligence, although ruled based structures are not accepted as fully artificial intelligence. It is not very efficient in the use of e-commerce examples in Turkey. However, they see some examples in USA. Amazon uses artificial intelligence. Besides, even if the presence of data in data analytics systems is very important, the real applications of artificial intelligence do not require data. Just like human intelligence, it can progress without knowledge.

Decision support systems are basically used everywhere. However, due to their costs, artificial intelligence decision support systems are used in the areas of which results, impact and risks are high. Self-deciding structures should be preferred especially if they are to be used in places with high importance and impact. Frequency, Serious Decisions, Cost of the items of cost items of the system are the right choice in the need of modeling and the rise of opportunity cost.

There are two places in operations usage, he mentioned. These are improving processes and achieving higher quality results with fewer elements. Artificial intelligence is used to ensure efficiency in operation. In Total Quality Management (TQM), for example, many elements need to be balanced at the same time, old cases must be remembered and analyzed. The human brain may not provide this focus. In addition, AI can be used for fraud detection.

Currently, hybrid systems are in use in order to help in the decision-making process of staff. For example, the British online branchless bank makes credit decisions based on artificial intelligence system. However, such examples are very few. Mostly, final decisions are still made by human beings. Artificial Intelligence is now in the stage of infant, self-learning structures over time will be revealed.

Right now, nothing can fully be done by artificial intelligence systems. Everything has hybrid structures. But in the future everything will be done by artificial intelligence. Not much can be done with artificial intelligence. HR fields cannot be managed by artificial intelligence, such as recruitment, dismissal.

4.1.3 Cengiz Arslan: Chief of Information Technologies Officer in YKB

He tells that the first industrial revolution has robotized human muscle power and artificial intelligence automatize human's cognitive power. For example, they are able to code a robot, to identify the emails according to the subjects, to enter this data into a specified Excel file, then to extract some of data and to enter them into the relevant fields of their core banking software, and finally to email results to certain people by Robotic Process Automation (RPA) systems. These types of systems here will be transformed into self-learning structures in near future. Instead of classical models such as RPA, instead of linear models, models with machine learning will allow more complex problems to be solved. These models will be the structures that understand the intention of customers with strong guessing structures and they will execute transactions for customers. He states that it is seen these models in some as chatbots right now. There are a few applications in this way in different domains. Besides, customers' next actions are predicted by AI systems.

He states that "they have developed their own libraries with a team specialized in natural language processing. Examples of this is for English, especially in the world, but there are not many experts working for Turkish. Therefore, they have formed their own team. In addition, they receive scientific support from universities. For example, with ITU, they set up Yapı Kredi Technology in ITU Arı."

He says that "Yes, sure. They actually develop their own applications. They mostly use Natural Language Processing methodologies for the developments. For example, Their IT team developed a tool for managing transactions that come by fax or email. These steps are to decide on the transaction types of customer instructions at the beginning, to interpret them by OCR, and to understand main purpose, then to extract the necessary information according to the type of transaction in order. If you want to transfer money, the relevant information of instruction needs to be understood such as receiver, sender account, and amount data. They have been using this system in their bank for quite a long time. They started with high volume transactions at the first stage, then they spread out it to other tasks, so they have been trying to automate all of operations in their bank. In order to make the resource management of the central operations wisely, they made a tool to predict the future workload, looked at the resource at hand, and cleverly distributed the resource of the pools. In addition they have made a chatbot running on WhatsApp. He declares that we can find the information we want about YKB with this chatbot. Making a library in NLP is a dimension of work, but connecting AI to a chatbot is a real challenge, he claims.

Success in marketing and risk departments were increased by 30% by using machine learning Technologies according to their banks’ figures. The use of RPA is available in banking system. In their bank, more than 10 processes in credit card operations and chargeback operations are done by RPA. They aim to solve fraud and security cases by using machine learning tools. ML algorithms detect abnormalities without creating more fraud and offer next best action in customer relations. At any time the customer interacts any channel, which product should be sold, which approach is suitable for that customer must be determined. If the customer is a risky customer, actions with a focus on risk reduction should be proposed by the system; on the other hand, if the customer who is prepared to churn out, the customer needs not to try to sell new products. According to the customer segment and profile, advertisements must be shown on digital channels. For example, more personalized services must be provided by Chatbots. Nowadays, questions such as my credit card debt and payment history is answered. However, in the later stages, "Can I buy a new house? Can I go to the theater this evening?" They are planning to be able to offer suggestions to their customer via chatbot in near future.

He thinks that as of today, the actions touching emotion cannot be done with artificial intelligence systems. He suggests that these type of problems can be solved by AI in the future.

4.1.4 Selman Ortakoy PhD: Head of Operations in Kuveyt Turk Participation Bank

He states that in fact, artificial intelligence is not a new technology, the development continues since the 1950s. He tells about that AI will progress in three stages. Artificial narrow intelligence, they are in this very narrow sense in the world. Sound, image recognition are the main sources of big data today. But AI systems can only find solutions to specific areas by this data. Historical data is needed to feed these specific areas directly. Best offers, face, signature, voice recognition systems, lending processes, individual sales are domains that AI can be used. Artificial NI is an immature artificial intelligence application. Next phase is artificial general intelligence which closes to human intelligence. Human mind's the mechanism in decision making is copied by these systems. AI learns by trying. There is no the product yet, it is kind of science fiction. At the last stage, there is a super artificial intelligence is much cleverer than human brain. Artificial intelligence is making better decisions by optimizing its own decisions. Artificial narrow intelligence systems used in maturation and they began to see products. Organizations now use image recognition structures and achieve much more successful results than human eyes because these structures are more successful in simple and specific tasks.

It can be used in many places, for example in the marketing. AI system determines the right product, the right customer, the right channel that all the retail companies need. AI can be used in all decision processes such mainly as fraud, cash operations, and cyber security domains. It enables to recognize the customers when they visit to the branch by face recognition, they can be authorized by biometric elements for banking transactions. AI can be used in all operational tasks at all levels of credit risk models. They start and do some other projects like chatbot, paperless banking transactions, risk tracking collection modeling, limit allocation modeling. Personal assistants, structures that advise people could be also used.

AI is very useful in central operations such as cash optimization. Besides, image recognition can be used in reading phase of all documents in operational processes throughout the organization. It can be used for accuracy needs such as insurance damage assessments, invoice accuracy. In addition, Chatbot and robo advisory provide customers doing all the banking transactions conveniently.

Classification could be done as follows:

a. High priority tasks: Security-fraud; All jobs related to image processing, Audio - Chatbot;
b. Medium-priority tasks: Cash Optimization, Decision Matters, Insurance Transactions- damage assessment;
c. Low-priority tasks: Resource Management - OLA approach, intensive day management.

Emotional intelligence cannot be done with artificial intelligence. Emotion analysis of the customers, the human resources for the relationship between the bank and the employee is still very important. Persuasion and communication capabilities, such as who will throw the goal in the game of sales will not be realized by the artificial intelligence applications. Finally, Algorithm driven tasks can be executed by AI systems. However, experts driven works cannot be realized by AI systems.

4.1.5 Levent Arslan Professor: Founder & CEO at SESTEK, Instructor of Bosphorus University

He states there are seen some artificial intelligence applications such as image recognition brings pictures of the criteria one wants, this technology is available even on our mobile phones. AI is used in important domains such as medicine and law. For instance, in the detection of cancer cells in health; finding similar articles in the field of advocacy are in use and very efficient. Besides, artificial intelligence is used to define fingerprints, or deep character methods are used extensively in optical character recognition. There is also the use of artificial intelligence in the sense of natural dialog. However, they do have a natural dialogue applications as Chatbot, speech enabled IVR projects in Turkey.

Artificial intelligence applications can be used in customer self-service financial transactions or can be used as Chatbot in any domain. There is also speech enabled services, such as speech enabled IVR and vocal passwords systems with. A virtual assistant that serves the customers of their needs can be developed for mobiles. Another domain of AI may be the subject of complaint handling. A lot of complaints come to the bank from different channels. There are a number of prediction-oriented algorithms that detect the fraud probability of credit card spending in daily life. Call center fraud detections can be used in areas of non-genuine insurance damage detection.

Yes, AI systems provides efficiency.

It is possible to automate the instructions in banking operations by AI systems and image processing. Unilever uses an AI system on the HR side to give specific answers to their job applications. The robots are already coming in physical world as they are as RPA systems. Chatbots can be used both internal & external customers in the organizations. Even in branches, robots will greet customers and perform banking transactions soon. Artificial intelligence applications also will be used more often in IT support. Applications that automatically open tickets for people provide significant productivity.

Artificial intelligence is actually more useful for mental tasks. Emotional intelligence is not suitable for artificial intelligence. In fact, artificial intelligence and people can work together. If 98% of the tasks can be solved by artificial intelligence applications, 2% of tasks should be held in human hands. Besides, they don't want to use artificial intelligence to communicate with customers, especially those that are valuable. Because those customers will probably not want to communicate with a robot.

4.1.6 Okan Acar PhD: Head of Digital Transformation in Kuveyt Turk Participation Bank

They need to define what really artificial intelligence is. Artificial intelligence models are called systems that can decide by themselves with the help of predictions.

In these times, systems called as artificial intelligence in the market are not exactly artificial intelligence driven systems. Most of them are rule based systems that aren't self-driven systems. Artificial intelligence is able to learn the system itself. Yandex can be an AI system. In order to give you the most appropriate and efficient directions for your destination. In areas such as weather forecasting, agriculture, a structure that fully decides itself is artificial intelligence. They haven't seen more sophisticated yet.

Artificial intelligence can be used in many domains of banking. In all decision-making mechanisms, artificial intelligence can be used in structures that act like a customer himself /herself. Besides, they can design their own services by machine learning tools. Banks even can use artificial intelligence models in their own investment decisions. AI can identify the errors in the systems and inform both the bank employees and customers.

Rule based systems can be used everywhere in banking systems. It can be used to execute official processes and generate reports for legal authorities. Artificial intelligence can be used in operational tasks such as checking whether the invoices are real or not real.

Artificial intelligence does not make a complete decision on behalf of banking employees. For example, AI system recalls that 98.2% of an invoice is real but it is likely that 1.8% is not real. With a decision it did before, it accepted an invoice of 95% reliability as accurate it is accepted by banking system. One day, artificial intelligence can tell me, these bills no longer come in at 95% of accuracy their accuracy rate is between in 98.9% 98.8%. Now you can pull the confidence interval up. Artificial Intelligence has now moved a step forward. It is said that AI has been made as augmented intelligence.

He states that artificial intelligence is important to provide a data to make business decisions. But he thinks that the decision should be made by human.

4.1.7 Selim Tastan PhD: Vice President of Digital Transformation and Innovation at Kuveyt Turk Participation Bank

When you look at the global examples such as Netflix, it is customized according to your personal tastes. Amazon is one of the best examples. Besides, Amazon Go can manage the preferences of customers, card-free payments are done in them. It uses IoT technology as well as AI. But still, there are not many applications nowadays.

The applications of artificial intelligence in banking, in particular which it is used in decision support mechanisms such as automatic lending. It can be used in credit decisions in banking by machine learning tools. Artificial intelligence could have an important role of fraud detection. Besides, it can be used in face & speech recognition, internet & mobile branches. Biometric Authentication Controls are very popular domain of AI.

Yes. Now, in operation processes, machine learning is important. It provides significant operational efficiency, especially in document recognition, data input and retrieval. For example, there are lots of documents in the Official Correspondence department and document recognition function enable operational excellence.

There many processes are preferential for use of AI systems such as IT operations, decision support systems, credit decisions and AI can basically perform all operational tasks.

Artificial intelligence acts like a human being. A software that can act or think like a human is AI. But artificial intelligence can only be rationally thought and action. Also, consciousness, intuition, values in man cannot exist in artificial intelligence.

4.1.8 Ilhami Dogan: Head of Strategic Program Office of Kuveyt Turk Participation Bank

According to Gartner, IBM Watson, high-tech, AI-powered robotic technologies will play a high role in our lives soon. AI can be used in any production line.

In ATM systems, card payment systems, mobile technologies, limit allocation, smart buildings, meeting rooms' management, and administrative services. It can be used in standard operational tasks in central operations department.

Yes, they can be used in existing systems.

Rating tasks all through the banking system can be done by AI. Financial analysis allocation tasks can be realized. Besides, monitoring of the money volume of ATMs and ATM management can be executed by AI systems. Cash optimization of branches can be made to artificial intelligence. At the same time, the buildings of the banks can be managed entirely by AI-guided smart systems. It is used in defense industry and progressing day by day. Automation Systems is not currently based on artificial intelligence. There's many things to do on that side. Only simple routine works are managed now. It will progress in near future. For example, he says "they are unable to detect anything related to channel efficiency. AI Systems to make the best estimate of our systems, recommends best practice. The fast transformation of data will be provided in the meaning of structured & unstructured data.

Human beings, emotions and communication cannot be executed by AI as much as human beings.

4.1.9 Halil Aksu: Owner and CEO of GelecekHane & Chief Thinker

He has a wide range of detailed and extensive knowledge because he has studied informatics and electronics engineering. As a management consultant for the last 20 years, he has also a very up-to-date and strategic information since he has guided the future, technology and digitalization strategies of many important institutions.

Artificial intelligence can be used in almost every field in the banking sector. If artificial intelligence is imitating the human intelligence, rational activities that people do can be done by AI. As a matter of fact, it started to spread rapidly. They can gather in three headings: Customer experience, operational excellence and product / service innovation. The most popular applications in the field of customer experience are chatbot and voice assistants. Thanks to chatbot, a new channel will be offered to the customer. With virtual assistants, they will step into a whole new era. They will communicate with our home, our car, the elevator, the meeting room and indeed our bank account. In the background of customer experience, customer analytics, providing the right products, pricing and limit determination, risk prediction and similar basic banking processes have started to produce value-added artificial intelligence algorithms. Artificial intelligence software has been launched on the market, based on your risk appetite and saving preferences. They're going to see more variants. With such approaches as real-time personalized precision marketing & value proposition, it requires a huge data center, a large amount of data and algorithms that will work very fast in order to offer huge amount of customers simultaneously. The internet giants like Facebook, Amazon, and YouTube are making this for millions of customers constantly.

For sure. In fact, they should leave all the works that are routine, routine or even chore, to automation, robots, integrated and autonomous systems.

The three top priorities are Process automation with robots (RPA), Intelligent Assistants (with Chatbot and voice, and even to Robo advisor), Biometrics and Security (Voice Recognition, Face Recognition, etc.)

The three medium priorities are Customer Recognition by Image Processing at Branch (Showcase, queue, Box Office, Kiosk, etc.), Natural Text Processing and Intelligent Text Reading and Processing, Advanced Analytical Applications in Customer Analytics and Marketing.

The three low priorities are advanced analytical applications in the field of Fraud, Advanced analytical applications in the field of risk, Optimization of all processes.

With artificial intelligence, there is hardly anything to be done in the near future. Artificial intelligence has started to make works that require creativity such as painting, designing, writing poetry. Who knows what AI will be able to do in the coming years? For now, situations such as critical thinking, the art of asking questions, empathy cannot be done AI systems. Besides, compassion is very special to us, human being. He thinks we also will witness that mimics will be recognized by artificial intelligence systems, may be feelings could be copied by them like science fiction movies.

4.1.10 Ergi Sener PhD: Managing Partner at IdeaField BV * Instructor at Sabancı & Bahcesehir University * Technology Editor at Mynet

He has in-depth knowledge of the history, and development of Artificial Intelligence applications.

Digital virtual assistants can be used in different areas such as chatbots, fraud systems, segmentation, campaign management, detection of the customer's channel preference and personal communication, churn estimation, cross-selling suggestions, pricing.

Artificial intelligence can be used to make operational efficiency, speed and decision processes more effective.

The classification as follow:

1. Top priority: digitalization of data inputs, process automation, chatbots.
2. Medium-priority three tasks intelligent digital virtual assistants, campaign fictions, churn forecasting.
3. Minimum priority tasks/ processes: physical robot assistants.

In problematic customer communication and strategic decisions, it is useful to put human control into practice by not relying on artificial intelligence alone.

4.2 INTERVIEW PARTICIPANTS

The participants were selected according to their experience, position and education. The following table indicates the details of the participants.

4.2.1 Participants' Background Information Details

4.2. Table: Research Participants

Title	Name & Surname	Current Position	Background	Experience
	Emre Yazıcı	Chief Data Scientist in Zack-Ai	University of Essex, Bachelor of Computer Engineering, Artificial Intelligence; Sabanci University Master Degree, Data Scientist	Software Development, Consultant, Machine Learning Architect, Data Scientist: https://www.linkedin.com/in/data-scientist-emre-yazici/
	Rafet Maltaş	Advanced Analytics Leader and Vice President of Analytical Banking Systems in Kuveyt Turk Participation Bank	Dowling College, Bachelor of Science, Computer Science; Stony Brook University Master of Science, Computational and Applied Mathematics	Market Intelligenct Analyst, High Tech Entrepreur, Senior Advisor: https://www.linkedin.com/in/rafet-maltas/
	Cengiz Arslan	Chief of Information Technologies Officer in YKB	ITU Computer Engineering	Garanti and YKB Head of Software Development: https://www.linkedin.com/in/cengiz-arslan-80426820/
PhD	Selman Ortaköy	Head of Operations in Kuveyt Turk Participation Bank	Boshorus University, Economics; Bahcesehir University, Economics & Finance; Istanbul University, Doctor of Philosophy Economics	Inspection, Strategical Performance Measurement, https://www.linkedin.com/in/selman-ortak%C3%B6y-phd-39942132/
Prof.	Levent Arslan	Founder & CEO at SESTEK, Instructor of Bosphorus University	Boshorus University, Electric Engineering; Duke University, PhD Electrical Engineering	Research Engineer, Profesor of Signal Processing: https://www.linkedin.com/in/levent-arslan-2aa90b11/
PhD	Okan Acar	Head of Digital Transformation in Kuveyt Turk Participation Bank	Marmara University, Industrial Engineer, Istanbul University Management & Organization, MBA and Istanbul University, PhD Finance	Marketing and Product Development: https://www.linkedin.com/in/drokanacar/
PhD	Selim Taştan	Vice President of Digital Transformation and Innovation at Kuveyt Turk Participation Bank	Istanbul University, Electrical Engineering, Arkansas University MBA, Texas University Business, Halic University Doctor of Business Administration	IT, Project Management, Dijital Innovation: https://www.linkedin.com/in/selimtastan/
	İlhami Doğan	Head of Strategic Program Office of Kuveyt Turk Participation Bank	Fırat University, Mathematics; Sebahattin Zaim University, Master of Islam Economics	Developer, IT Service Manager, Project Manager, https://www.linkedin.com/in/ilhami-do%C4%9Fan-21817a35/
	Halil Aksu	Owner and CEO of GelecekHane & Chief Thinker	Technical University of Munich, Bachelor of Science, Informatic	Advisor, Futurist and Founder: https://www.linkedin.com/in/halilaksu/
PhD	Ergi Şener	Managing Partner at IdeaField BV * Instructor at Sabancı & Bahcesehir University * Technology Editor at Mynet	Sabancı University, Microelectronics Engineering, Sabancı Management, Marketing, Yeditepe University, PhD	Lecturer, Founder: https://www.linkedin.com/in/ergi-sener-phdc-0bb09211/

4.3 THE RESULTS OF INTERVIEWS

The questions were asked from the most general ones to the most specific ones. Some of the speakers gave short answers to some of the questions. This was usually the case with the participants have relatively less close communication with the researcher, and the number of such interviews is very low, and sufficient data has been obtained for the research. As far as possible, the participants were chosen from the different perspectives of the subject. Additionally, it has been observed that the information differs from one participant to another and the level of knowledge is still not standard. Therefore, during the interviews, some questions had to be further elaborated.

In the initial question, the experts were asked about their general knowledge about artificial intelligence applications and how much of these systems they were dealing with. All of the interviewers had the opportunity to try and experiment with these applications either in Turkey or abroad, and in a way they participated in meetings, seminars and events where these products were explained in the banking field. According to experience of the participants, artificial intelligence systems are not exactly at a mature level. However, some of the experts declared that the majority of AI applications is available in the United States. Most of them emphasized that artificial intelligence technologies are on the agenda mostly in e-commerce and finance world. Many of the participants have associated artificial intelligence with deep learning, machine learning and human knowledge. Likewise, many of the experts stated that most of the firms' applications are developed on ruled-based architecture instead of artificial intelligence technology. Nonetheless, those firms claim that AI architecture is used in their products. The participants describe rule-based systems as the initial phase of AI technologies. However, there are a few firms use real AI algorithms. Amazon has come to the fore as an organization capable of using artificial intelligence in e-commerce by many interviewers.

In the second question, when it is asked to associate AI technology with banking, experts talked more about decision-making mechanisms. Especially, the decisions taken with too much data will be a difficult problem for human intelligence, however these problems can be solved by artificial intelligence much more easily, fast and correct. Almost all experts had the common point in the direction that artificial intelligence would be an effective technology, especially in difficult fraud detections. In addition, the effect of artificial intelligence applications was mentioned in the operational works in banking, considering the excess of volumes.

The third question is replied by almost all respondents as “absolutely yes”. Even the participants who did not answer yes in the first place think that artificial intelligence applications are useful in the operational processes of banking. These participants exampled some central operational tasks that could be solved by AI such as credit and control processes. Chatbots are also mentioned for Call Center transactions in order to provide efficiency. They all stated that operational jobs of banking system could be very boring for human beings, especially for young generations, since they are the tasks done in the same way repeatedly and error-prone. Thus, it is thought that these tasks can significantly reduce human productivity and create unnecessary cost burden.

Most of the respondents made a clear classification for the use of artificial intelligence in operational tasks in the fourth question. While all participants made their own prioritization lists, they considered the level of technological maturity and evaluated whether there is any practice in the relevant field.

1. They mostly put fraud detection systems, security & authorization tools with comparably simple biometric elements such as voice, also some basic decision making mechanisms and basic process automations tools like RPA systems at **the top priority**. They also mainly emphasize that chatbots could solve the needs in the points of contacts with the customers and increase productivity in operations such as obtaining customers' individual information needs, credit processes and saving needs. Branch operations and workload distribution tools are also placed at the top of the list according to the most of participants.
2. Churn predictions, virtual assistants, campaign management tools, cash optimization of branches and more sophisticated biometric login methods such as voice and facial recognition **are put at the second line**. According to speakers, the solution of the areas with operational load and risk has gained importance in the first place of prioritization, while operations aimed at providing more specialized services to customers have gained priority in the second place.
3. Physical robot assistants and high level analytical systems for risk, credit transactions and self-learning & self- developing mechanisms are **the last of the list in**

terms of prioritization. Since these forms of artificial intelligence applications are perceived at the very developing stage yet.

In the last question, when the participants were asked if the tasks could not be solved by artificial intelligence applications, the answer was that there would be almost “no job” for the future. Even now, it is emphasized that human and artificial intelligence interactions are working together. There is a general consensus that the vast majority of today's hybrid structures will become artificial intelligence systems in the near future. However, in some tasks where emotional items are needed human touch will not be able to be fully realized by AI systems. The speakers express that the emotional links with internal and external customers are too human to be transferred to artificial intelligence.

4.4 KEY WORDS GAINED FROM TEXT PROCESSING

Question Number 1: In general, what information do you have about Artificial Intelligence applications all around the world?

Keywords: intelligence, system, rule, criterion, learning, Amazon, human, knowledge, Chatbot, model, chess, deep

Question Number 2: Where do you think Artificial Intelligence can be used in banking?

Keywords: fraud, customer, decision, mobile, branch, chatbot, risk, operation, speech

Question Number 3: Would you consider using it in operational operations? Why?

Keywords: decision, control, automatic, credit, center, customer, intelligent, invoice, robot, operation, chatbot, cost

Question Number 4: In what tasks / work areas will your priority be AI applications? Why?

Keywords: auto, credit, customer, chatbot, institution, fraud, robot, digital, branch, support, operational, HR, invoice, call center, image processing, analytics

Question Number 5: Which tasks, do you think, cannot be done with artificial intelligence?

Keywords: customer, firm, emotional, empathy, allocation, hybrid

5. DISCUSSION

Today, we see that the most of banks have started to implement digital transformation programs. Automating banking operations plays a critical role in terms of both providing efficiency and sustainably maintaining better and faster services to customers. The development of artificial intelligence applications is gradually coming to maturity that can meet the need at this point. My research concludes that there is no study directly focusing on transferring the banking operations to artificial intelligence applications in terms of tasks' priority. However, there have been several researches on artificial intelligence techniques used in finance and banking from 1990's until recent years that are very much valuable to discuss.

In spite of the lack of existing technological infrastructure today and the constraints of the conditions of that day, Tam and Kiang (1992) showed that neural networks in terms of predictive accuracy, adaptability, and robustness are a promising method of evaluating bank conditions. (Tam & Kiang, 1992)

In the study of Trippi and Turban (1992), they stated that nearly every aspect of financial and investment decision-making has been revolutionized by neural networks. Globally, financial firms have used neural networks to address challenging tasks that involve intuitive judgment or the need to detect patterns of data that elude conventional analytical techniques. Many observers believed that even the best traders and investors will ultimately outperform neural networks. Neural networks had already been used for securities markets trading, economic forecasting and credit risk analysis. Indeed, besides the U.S. The Defense Department invested more money in neural network research than any other industry or government body. Unlike other types of artificial intelligence, neural networks mimic to some extent the processing characteristics of the human brain. Neural networks can therefore draw conclusions from incomplete data, recognize patterns as they unfold in real time and predict the future. Even from past mistakes they can learn! Robert Trippi and Efraim Turban had assembled a stellar collection of articles on the applications of neural networks in this important arena by industry and academia experts in Neural Networks in Finance and Investing. They discussed the successes and failures of neural networks as well as identify the vast unrealized potential of neural networks in numerous specialized financial decision-making areas in this study. Topics included basics and overview of neural networks, financial condition analysis and prediction of business failure, debt risk assessment, security market applications and financial forecasting approaches to neural networks. An exciting and relevant in-depth study of neural networks nowhere else could be found by financial managers for that time. Individual chapters discussed how to use neural networks for stock market forecasting, trade in commodities, bond and mortgage risk assessment, bankruptcy prediction and investment strategies. (Trippi & Turban, 1992)

In the study of Wonga and Selvi (1998) mentioned that the field of neural network technology has been studied extensively in the last decade of 1900. They pointed that considerable research on its use in various scientific applications and a variety of business applications were being developed by the light of this progress. As a result, a growing amount of application efforts were focused on their financial sector development. They investigated the trend of published applications for the 1990–1996 period in their paper. Implications to developers' researchers of neural networks were discussed in their study and they suggested for future research in the related subject. (Wonga & Selvi, 1998)

Artificial intelligence was defined as a consortium of data-driven methodologies that includes as its components artificial neural networks, genetic algorithms, fuzzy logic, probabilistic networks of belief, and machine learning in the study of Fadlalla and Lin (2003). They stated that they had witnessed a phenomenal impact in many areas of studies from this data-driven consortium of methodologies, with no exception being the economic and financial fields. (Fadlalla & Lin, 2001) The special session in International Conference on Artificial Intelligence organized by Jane Binner, Graham Kendall and Shu-Heng Chen was presented to highlight the tremendous diversity and wealth of artificial intelligence applications to economic and financial problems. According to their volume of collected works, in particular, provided examples of its impact on the economics and finance field. That volume also appealed to economists interested in taking an interdisciplinary approach to studying economic issues, computer scientists looking for potential artificial intelligence applications, and practitioners looking for new perspectives on how to build models for daily operations. (Binner, et al., 2003)

A comprehensive review of 196 studies in the evaluation of bank performance using operational research (O.R.) and artificial intelligence (A.I.) techniques was realized in Fethi’s (2010) study. Several key issues highlighted in the literature in the paper. Besides, a number of future research directions were pointed out. The applications of AI techniques such as neural networks, support vector machines, and multi-criteria decision aid, which were declared as used in recent years, in prediction studies of bank failure and evaluation of bank credit worthiness and underperformance were discussed in the study as well as numerous data envelopment analysis applications were argued (Fethi, 2010).

Bahrammirzaee (2010) pointed out that many current real financial applications nowadays have nonlinear and uncertain behaviors that change over time. Therefore, there has been a rapid increase in the need to solve highly nonlinear problems with time variants. Together with other traditional model problems, these issues caused growing interest in artificial intelligent techniques. Comparative research on three well-known artificial intelligence techniques, i.e. artificial neural networks, expert systems and hybrid intelligence systems, has been conducted in his paper on the financial market. Most famous and particularly recent research was discussed in comparative aspects for each technique. Results show that the accuracy of these artificial intelligent methods in dealing with financial problems is higher than that of traditional statistical methods, particularly with regard to nonlinear patterns. This outperformance is not absolute, though. (Bahrammirzaee, 2010)

Limsombunchai, et al.’s (2010) study have identified that credit loans are a cornerstone of the banking sector. A bank's profitability and stability is ensured by the performance of good standing loan contracts. Before any credit decision is made and is a key process to reduce credit risk, analyzing the financial history and financial background of the customer is a very critical factor. Good low-credit applicants will be granted loan approval while high-risk applications will be rejected. (Limsombunchai, et al., 2005). Banks should therefore be thoroughly controlling the management of credit. In addition, ongoing changes in the business environment, banking and credit regulations, marketing strategies of banks, competition in banks' lending strategies, and patterns of customer borrowing require frequent review and smart responses. Therewithal, in order to serve a large number of variables and a variety of customer related cases, bank loan decisions require the use of vast and varied data and substantial processing time. Thus, it will be very difficult to design or even use a banking loan model that can track all possible and real responses and interactions. Traditional models cannot display uncertainty in the banking loan environment (Shachmurove, 2002). Decision making mechanism and improving it are the main challenges for today's commercial banks by understanding large amounts of information and revealing useful knowledge. Modern bank managers are inundated with data. The sustainability of their banks depends on their ability to search, extract useful knowledge and enforce this knowledge through large amounts of data in their decisions (Mitchell & R. Pavur, 2002). An intelligent, artificial intelligence-based information system will provide managers with value-added information, reduce decision outcome uncertainty, and improve the quality of banking services. Using new technologies can therefore give a bank a competitive advantage and lead to higher performance. Artificial neural networks have been used successfully in a variety of business areas including marketing, accounting, managing information systems and managing production (Cao & M. Parry, 2009). Most studies used neural networks to predict future stock behavior, financial crises, bankruptcy, currency exchange rate, and detect credit card fraud. Researchers have also used neural networks to model collective behavior, telecommunications, and immovable property evaluations of market responses. ANNs are also used for analysis, forecasting, time series generation, optimization and decision-making (Shachmurove, 2002).

Neuro-based artificial intelligence model for loan decisions was developed in the research of Eletter, et al. (2010) with the light of information of credit processes. According to their study, different representative loan applications cases were considered to validate the neural network model based on the guidelines of various banks in Jordan. "Artificial neural networks are a successful technology that can be used in Jordanian commercial banks to evaluate loan applications" were showed by this research. (Eletter, et al., 2010)

The studies revealed the success of AI applications in domains such as decision-making mechanisms, predictive analysis, big data and nonlinear complex problems. Considering the fact that almost all of the banking functions have operational load, this research points out this load would better to be transferred to AI applications. In parallel with the studies examined, this study also emphasized that similar problems in banking can be solved successfully by artificial intelligence solutions. However, chatbot, robo advisors, biometric authorizing tools were emphasized in this study, it was observed that there was no particular research on similar tools in the literature. Both of these tools are increasing and are expected to provide significant efficiency, especially at points of contact with the customer.

According to the results of this study, today in Turkey, these applications, even for their developers, are stated as still in trial and error phase. However, AI is a very promising technology for banking sector, most of the operational tasks can be transferred to AI's applications at the first plan. Therefore, it will be favorable taking into account the performance of certain existing artificial intelligence tools and examining them, especially in the areas that are stood out in this study, while conducting a new research on the matter.

As shown by this study, there is no basic study in which banks can take guidance as they begin. The classification of this study may be useful in managing the time and focus of bank managers.

In particular, the cooperation with FinTech startups in banking accelerated the implementation of applications related to artificial intelligence. It has been monitored that the academic studies supporting this process lag behind the implementation of the practices, however the introduction of FinTechs into this area can provide a very supportive role to banks to develop and to implement AI applications.

6. CONCLUSION

Nowadays, it is very difficult for banking sector to provide a competitive advantage both in their rivalry with banks and the technology companies at the same time. In this context, it is crucial to reduce operational costs, diversify services and/or products and manage relations with customers effectively. Keeping existing customers in the portfolio and acquiring new customers are two critical points to sustain banks' profitability. Since artificial intelligence solutions have impact on making cost savings and sustaining profitability, these applications are valuable to taken into account in terms of operational tasks in banks.

In this study, it is concluded that banking operations are suitable for transferring to artificial intelligence applications due to factors such as increasing efficiency and reducing the error coefficient.

Operations that require a high amount of data, repetitive and need high level of accuracy were observed to be at the top priority, while at the same time, a general consensus was reached that artificial intelligence applications could carry out operations in order to provide faster and easier service to external and internal customers.

Some AI systems can ensure competitive advantage by churn prediction functions and develop customer experience by face & voice recognition interfaces. These systems are put at the second place according to their priority.

According to the results of my study, it has been understood that complex systems such as physical robots or self-learning robots for risk, credit or marketing will come up later than other AI technology fields. In other words, physical robots roaming in the branch and serving customers are at least priority.

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APPENDIX

Appendix 1: The Questionnaire

Interviews are realized by the guidance of the following questionnaire structure:

Dear Key Opinion Leader,
My name is Seçilen Öztürk and an MBA student at Bahçeşehir University. I am doing research on the classification of banking operational tasks to be solved by artificial intelligence applications.
All contents will be used only for the thesis in question.

1) In general, what information do you have about Artificial Intelligence Practices?
2) Where do you think Artificial Intelligence can be used in banking?
3) Would you consider using it in Banking Operational Transactions? Why is that?
4) In what tasks / business areas your priority is Artificial Intelligence? Why is that?
    a. What do you think are the top three tasks?
    b. Medium priority three tasks
    c. Minimum priority three tasks / processes
5) Which jobs do you think cannot be done with artificial intelligence?

Appendix 2: Curriculum Vitae

Name & Surname: Seçilen Öztürk

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Undergraduate: Istanbul Üniversitesi, İşletme Fakültesi, 1995

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Publications:

Working Life:

- Kuveyt Turk Participation Bank, Strategic Project Manager – 2018- Present
- Kuveyt Turk, OPM Business Development Supervisor, 2017
- Kuveyt Turk, Payment Systems Product Development Supervisor, 2017
- Kuveyt Turk, Call Center Business Development Supervisor, 2013
- Memorial Health Group, Marketing Manager
- Merck Sharp & Dohme Turkey Project Coordinator
- Merck Sharp & Dohme Turkey Turkey Sales Analyst
- Enka Export & Import Financial & Sales Analyst