Impact of Artificial Intelligence on Performance of Banking Industry in Middle East

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Abstract
Artificial intelligence is a cutting-edge technology that have been forefront in technological revolution worldwide. Owing to greater acceptance of new technological innovations, artificial intelligence sector had been developing at an unprecedented pace and is being applied in many walks of life. Artificial intelligence systems have potential in transforming all operations of banking industry is seen as (AI) and is received with enthusiasm due to its capability of taking human-like decisions and avoiding human-like errors. Artificial intelligence has been adopted in some sectors more widely than others, banking sector is amongst the few sectors that had shown moderate level of acceptance and adoption of this technology. This study explores the adaption of artificial intelligence in banking sector of Middle East. This region is known for its mixed pace acceptance of various technological tools in the local banking industry. The primary data required to analyse issue at hand was collected using survey as a research strategy, the data was collected from 200 bank employees across a few selected banks in the region. The main behind this survey is to gather information related to understanding implementation of Artificial intelligence in banking sector and understand its impact. The data collected was also quantitatively analysed using SPSS21.0 software.

Key Words:
Artificial intelligence, Banking Industry, Impact, Performance, Middle East, Employee perception

1. Introduction

This section of the report presents a brief overview of the concept of artificial intelligence and its application in banking sector.

1.1 Concept of Artificial Intelligence (AI)

Artificial intelligence (AI) is the field of science that deals with rivalling the capabilities of modern computer systems to resolve isues using human-like complex capabilities of reasoning, learning and self-correction. Possibility of applying artificial intelligence in diverse fields are far-reaching, and with recent development in both hardware and software technologies had increased the capabilities of artificial intelligence systems. Application of artificial intelligence is wide-ranging, it is applied in the field of optical communication, network planning, programming, transportation networks, medical science to name a few. Artificial intelligence systems use various complex algorithms that communicate at high speed and designed with superior decision-making capabilities (Mata et al., 2018). In the opinion of Mannino et al., (2015) artificial intelligence in computer system is more efficient and superior than human experts. Presently, artificial intelligence had been applied in narrow but well-tested application areas such as certain medical diagnostics, driverless cars are a few amongst them. In these areas of applications, it was noted that number of road accidents decreased as well as medical diagnostics became more accurate with the use of artificial intelligence system. As artificial intelligence had opened up several global opportunities, optimisation of relevant algorithms will further aid in developing superhuman intelligence of various automatic process in near future.

1.2 Artificial Intelligence in banking industry

Technological adaptation in the banking sector have been gradual as compared to technological adoption in other sectors. One of the crucial region behind it is the high dependence of banking industry on human involvement, most of the operations were dependent on employed manpower. With time technological inventions were adopted in day-to-day working of banks and it efficiently improved their performance. Application of artificial intelligence in banking sector can make the operations more impactful and hassle free (Manning, 2018). Some of the areas in banking industry, where artificial intelligence can be successfully applied are enlisted below (Noonan, 2018; Punamaraju, 2018)–

Tailored Financial Services: Artificial intelligence can aid in analysing stock markets and provide recommendations as per financial goals of individual customers.

Underwriting: Automation of this process is possible with the use of artificial intelligence services that can use unstructured information in the decision-making process.

Voice Aided Banking: Language processing using artificial intelligence can reduce human error and improve efficiency of the process.

Data-Driven Loaning Decisions: Artificial intelligence systems' assistance in analysing huge chunks of data, performing calculation and prediction capabilities can aid

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in developing strategies in financial loaning department for better returns.

Digitalisation of Branches: The lengthy process of banking can be replaced complete digitisation of documents by developing a comprehensive platform using artificial intelligence.

2. Aim of the study

The main aim of this study to analyse application of Artificial Intelligence in banking industry in Middle East. This study presents a comprehensive review of the application of AI techniques in banking sector improving overall performance of the systems and banking network.

3. Central research question

The central research question based on the aim of this study is as follows:

What are the opportunities associated with application of artificial intelligence in banking sector of Middle Eastern region?

4. Literature Review

This section of report presents a comprehensive analysis of the existing literature on banking performance of Middle Eastern countries, application of technology in banking sector of Middle East as well as advantages and disadvantages associated with the use of artificial intelligence in banking sector.

4.1 Performance of Banks in Middle East in past decade

Financial and banking services sector of the Middle Eastern region is amongst the fastest growing banking markets in the world. Amidst the colossal overhauling, banking industry in many of the Gulf Cooperation Council (GCC) countries is profitable, efficient and well-developed (rncos, 2012). As per Eisazadeh, Shaeri and Ali, (2012) in most of the middle eastern countries, the public-sector banks dominate baking industry, due to intervention of local governments in losses and liquidity challenges as well as credit allocation. As per the analysis conducted by the author Middle Eastern banking industry was expected to grow over 16% during the year 2011-2014. In the past ten years, Islamic banking in the middle east also have carved its niche in the region and have shown more growth as compared to conventional banking sector of the region. In the opinion of Jamall, (2017), banking sector in middle east have expanded over the years, which had led to increase in competitiveness within the sector.

In recent years, many of the Arab investors had initiated investing a part of their money in the local market instead of solely investing in American or European markets, which had aided the banking and financial sectors recent growth. The growth trend in the banking sector was also supported by policy changes made by most of the Middle East governments, that allowed more foreign investment which were more regulated and independent. Another boost came in the form of investment banking, that led to middle eastern countries accept instruments of modern banking system (Farazi et al., 2011). The developing banking sector of middle east still faces lags behind in certain fields such as risk management, better corporate governance, mitigating the negative impact of economic shocks and slowdowns and such more. In addition to this, banking sectors also faces significant challenges in determining productive projects, managing savings, investing in sustainable businesses to name a few (Jamall, 2017).

4.2 Use of technology in banking sector in Middle East with special reference to AI

Use of technological innovation in the banking and financial sector has been a global trend for quite some time, been adopted in both developed and developing economies. Adaptation of technological innovation in the Middle eastern banking and financial sector had been rapid in recent years, which had benefited bank's customers as well as the finance remitters by reducing the cost of the services. Moreover, technological adaptation in banking sector had also increased profitability of the regional banks by reducing fees of money transfer fees and such (Sophia, 2018). Technological inventions working complimentarily with banking sector can provide more harmonised and modernised services to the customers. Banks in middle east are in transformation phase having been adopted new technologies on various levels, still being gradual on others. It is an ongoing process that brings to table challenging opportunities in the industry (John, 2017).

In the opinion of Shirish, Jayantilal and Haimari, (2016), strong consumer adaptation is the primary reason behind greater acceptance of technological advances in banking sector of Middle eastern countries. Considering significant penetration of e-commerce, digital banking is adopted by 20% to 25% of the consumers, which is a large number owing to lack of essential digital resources and security protocols. As per (Dash, 2017) UAE's banking sector is the trendsetter in embracing new technological innovations, banks such Emirates NBD, First Gulf Bank and Emirates Islamic Bank and such have been leader in providing digital banking services. The entire banking industry is now being disrupted by new technologies, and Artificial intelligence disruptive move by many, as this technology have potential to transform all banking operations (Ghurair, 2018).

According to Verma, (2017), artificial intelligence can be pivotal in changing in customer engagement within the banking sector in Middle east. A few of the banks in Middle East have used chat boxes for providing their customers a more personalised experience.

4.3 Pros and cons of Artificial Intelligence in banking sector

Adaptation of Artificial Intelligence in banking sector have certain pros and cons associated with it, some of them are enlisted below (Mannino et al., 2015; Verma, 2017; Ghurair, 2018; Manning, 2018; Noonan, 2018; Punamaraju, 2018):

Pros:

It can enable and accelerate automation of all the processes in banking.

Less room for human errors.

It can significantly reduce the cost of banking services.

It can aid in systematically analysing behaviour pattern of customers and offer them more personalised services to cater their needs.

With the use of machine learning, artificial intelligence systems can identify abnormalities in patterns to recognise security threats and responds to them in time.

Cons:

It is disruptive for all the bank processes to adopt artificial intelligence in their day-to-day operations.

Complete automation of process will lead to no supervision.

It lacks the ability to take decisions under special circumstances.

It requires more security protocols for developing a safe automated environment.

5. Methodology

Research methodology is defined as a well-planned and methodical academically procedure that is used for gathering the required data for related to a research study for accomplishing all of its aims and objectives effectively (Kothari, 2004). A suitable research method selected for the study facilitates in resolving research issue at hand (Newman and Benz, 1998). This study had employed descriptive and explanatory research methods as it is primarily a quantitative study and these methods aid in collection of quantitative data for getting a better insight on the relationship between various research variables. Explanatory research method is selected here as it is a flexible and casual method for understanding background of the study. Moreover, descriptive research method was selected for analysing demographic distribution and general perception of the respondents on the issue at hand. Research approach selected for this study is a mixed in nature using both inductive and deductive approaches. Research approach acts as a guide for conducting the study and improves credibility of the study (Blessing, Chakrabarti and Blessing, 2009). The mixed approach is selected here for enhancing accuracy of the research findings. The research strategy for this study was based on survey that had been used to collect primary quantitative data from the respondents. Survey method was selected here to gather data from a wide-geographical area and a large sample population– 200 bank employees from selected banks of Middle Eastern region. The research instrument used here for collecting quantitative data was structured and close-ended questionnaire. They were approached and surveyed to understand the areas of implementation of AI and its impact on the performance of banking sector in Middle East. The quantitative data analysis was conducted using SPSS21.0 software.

6. Data Analysis

6.1 Quantitative analysis

The quantitative analysis is performed here for the primary data collected from surveying 200 bank employees of some selected banks across Middle Eastern region. For this analysis, only respondents who have submitted complete responses were included and partial or incomplete responses were excluded. For conducting this survey all the participants were pre-informed about the aim of study and the survey was conducted via e-mail after obtaining required permission and information from respective banks.

6.1.1 Descriptive Analysis

Firstly, **descriptive analysis** here is used to present the demographic profiling of the respondents that were involved in the survey and the general background for the current research study being conducted.

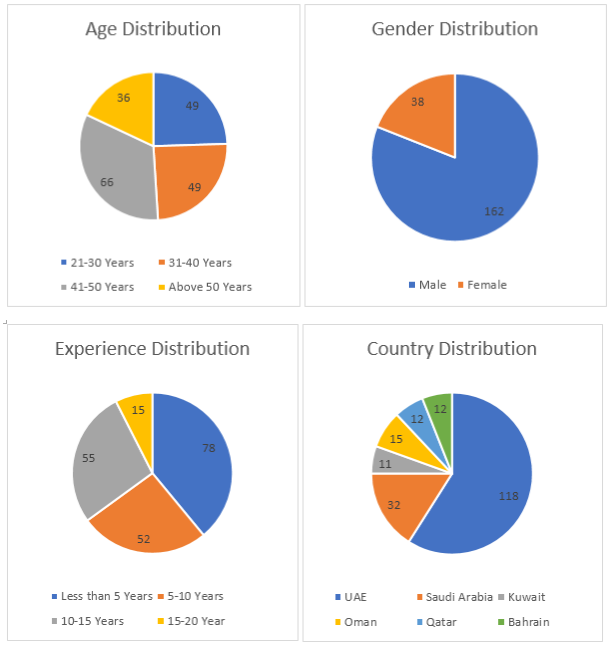

Fig. 1 Demographic Distribution

The demographic description of the participants is depicted in figure 1. The first parameter of the demographic profiling of all the participant in the survey is age-wise distribution. It was found that majority number of the participants belonged to 41-50 years age group i.e., 33%. Age group of 21-30 and 31-40 both had 24.5% of the participants each and remaining 18% were above 50 years in age. Next parameter is gender distribution, as per demographic data collected, 81% of the respondents were male employees of various banks and rest 18% were female employees. Therefore, it can be concluded that male employees were more participative in the survey and it also is in sync with social situation in middle eastern countries, where female employment is quite low as compared to other parts of world. Another demographic profiling parameter was experience in the banking industry, it was found that maximum percentage of participants i.e., 39% had been working in the industry for a period of less than 5 years, 26% had experience of 5-10 years, 27.5% had experience of 10-15 years and remaining 7.5% had experience of more than 15 years. Another parameter was country of residence and the majority of 59% belonged to UAE, 32% to Saudi Arabia, 15% to Oman ,12% to Qatar and Bahrain each and 11% to Kuwait.

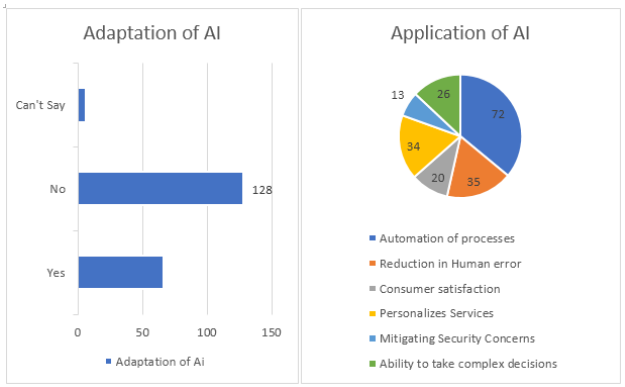

Fig. 2 Distribution charts for adaptation of AI in banking sector and application of AI in specific area of banking sector.

Figure 2 presents frequency distribution for adaptation of AI in banking sector and application of AI in specific area of banking sector. All the participant in this survey were aware about the application of AI in banking and finance sector. However, 64% of all the 200 participants admitted that artificial intelligence systems were not adopted in their banks, 33% of the participants admitted to application of AI systems in their respective banks and remaining 3% were undecisive. In the opinion of majority of the participants i.e., 72%, artificial intelligence is mainly applied for automation of the processes and around 17.5% and 17% were of the opinion that AI is applied for reduction in human error and personalisation of services respectively. These findings were similar to findings of the secondary research conducted, majority of existing studies also suggests that artificial intelligence application in banking sector is for automating process to reduce manual labor as well as reduce human error and provide personalized services to customers.

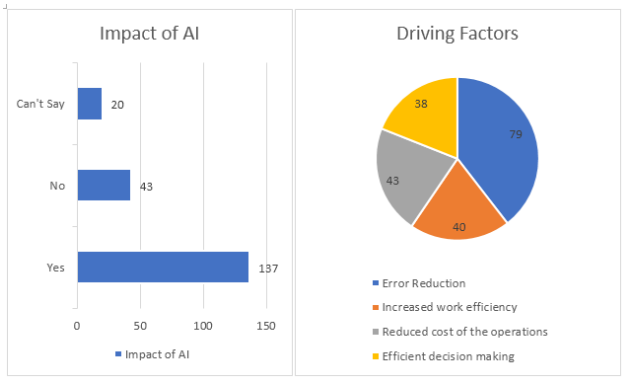

Fig. 3 Distribution charts for impact of AI in banking sector and driving factor behind implementing AI in banking sector.

Figure 3 presents, frequency distribution charts for impact of AI in banking sector and driving factor behind implementing AI in banking sector. The statistics shows

that 68.5% out of all the 200 participants admitted that artificial intelligence systems would significantly (positive) impact on performance of bank, 21.5% of the participants were of the opinion that AI systems will not significantly impact the banks and remaining 10% were undecisive. When asked about the driving factor behind adaptation of AI in banks, 79% of the participants were of the opinion that reduction in human error is the primary factor, 21.5% considered reduction in service cost to be the primary factor, 20% considered efficient working of AI systems as a major driver and 19% opined that efficient decision-making capability of AI system was the major driving factor behind the success of adaptation of AI in banking sector. This finding was also noted to be in sync with the finding of secondary research, which also reveals that reduction in manual error is major driving force behind adaptation of AI in banking and finance sector.

6.1.2 Inferential Analysis

Inferential statistical results for the data collected from survey for this research study is presented in this section.

Table 1: Correlation Table

Impact of AI on bank performance	Pearson Correlation	1
	N	200
R1	Pearson Correlation	.193**
	Sig. (2-tailed)	.006
	N	200
R2	Pearson Correlation	.672**
	Sig. (2-tailed)	.000
	N	200
R3	Pearson Correlation	.954**
	Sig. (2-tailed)	.000
	N	200
R4	Pearson Correlation	.917**
	Sig. (2-tailed)	.000
	N	200
R5	Pearson Correlation	.944**
	Sig. (2-tailed)	.000
	N	200
R6	Pearson Correlation	.737**
	Sig. (2-tailed)	.000
	N	200
R7	Pearson Correlation	.893**
	Sig. (2-tailed)	.000
	N	200
R8	Pearson Correlation	.949**
	Sig. (2-tailed)	.000
	N	200
R9	Pearson Correlation	.972**
	Sig. (2-tailed)	.000
	N	200
R10	Pearson Correlation	.464**
	Sig. (2-tailed)	.000
	N	200

**. Correlation is significant at the 0.01 level (2-tailed)
R1- Customer Satisfaction, R2- Risk Management, R3- Asset Management, R4- Reduction in cost of services, R5- Ease of services, R6- Fraud Detection, R7- Security, R8- Digitisation and automation in back-office processing, R9- Wealth management for masses, R10- Enhanced performance of the ATMs

As per the statistics presented in table 1, correlation table it can be inferred that all the variables are significant at 0.01 level of significance. It was noted that R3 i.e. "Wealth management for masses" has highest correlation with dependent variable with Pearson correlation= 0.972, closely followed by R3 (Asset Management), R8 (Digitisation and automation in back-office processing), R5 (Ease of services) and R4 (Reduction in cost of services) having Pearson correlation value of 0.954, 0.949, 0.944 and 0.917 respectively, whereas R1 i.e. "Customer Satisfaction" is least correlated with the dependent variable among all with Pearson correlation= 0.193. This means that the relationship application of AI's application in banking sector and wealth management for the customer is strongest as with the use advanced data analytics techniques and complex predictive algorithms can provide more probable predictions for investments made. Also, least correlation with customer satisfaction indicates towards hesitation on customers' part to depend entirely on artificial intelligence. Later, regression analysis was conducted for primary data collected for this research study, in order to scrutinise the impact of application of AI on the overall banking performance. Table 2 and table 3 presents model summary and ANOVA respectively.

Table 2: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.980a	.961	.958	.294

a. Predictors: (Constant), R10, R1, R2, R6, R8, R7, R4, R3, R5, R9

Table 3: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	398.504	10	39.850	460.058	.000 b
	Residual	16.371	189	.087		
	Total	414.875	199			

a. Dependent Variable: Impact of AI on bank performance
b. Predictors: (Constant), R10, R1, R2, R6, R8, R7, R4, R3, R5, R9

As per the above tables 2 and 3, it can be seen that value of R square value has been calculated to be 0.961, which indicates that 96.1% of variation in the dependent variable can be explained on the basis of the independent variables together. This means that Artificial Intelligence system's application in banking industry can be reason behind 96.1% of improved performance factors of the banking industry. As per a article published by Nuseibeh (2017)on application AI in banking, it was found that the with the application of AI in banking sector can provide more efficient and fast services as compared to any financial advisor. It also supports more efficient and smart portfolio management along with cost and service time reduction. The ANOVA analysis presented above facilitates in inferring that the null hypothesis can be rejected in the regression analysis, as the value of F is equal to 460.058, mean square value is 39.850 and high significance level

value is 0.000. This indicates that model presented by the research is fit.

Table 4: Coefficients for Regression Analysis

Model			Unstandardized Coefficients		Standardized Coefficients	t	Sig.
			B	Std. Error	Beta		
1	(Constant)		-.294	.120		-2.442	.016
	R1	-.006	.015	-.006	-.387		.699
	R2	.003	.033	.002	.088		.930
	R3	.277	.062	.226	4.471		.000
	R4	.112	.040	.111	2.781		.006
	R5	.036	.056	.035	.638		.524
	R6	-.031	.034	-.021	-.936		.351
	R7	.047	.063	.027	.752		.453
	R8	.179	.051	.178	3.521		.001
	R9	.445	.066	.445	6.793		.000
	R10	.000	.009	.001	.035		.972

a. Dependent Variable: Impact of AI on bank performance

Table 4 presents the coefficients for regression analysis; this table was found to be significant statistically as it aids in stating the existing dependency of the dependent variable on the independent variables and establish relationship between them. As per statistics presented in the above table, it can be inferred that out of 10 variables only 6 variables are coming out to be significantly having "Sig.>=0.05", that indicates, R1- Customer Satisfaction, R2- Risk Management, R5- Ease of services, R6- Fraud Detection, R7- Security, and R10- Enhanced performance of the ATMs. This indicates that performance of the banks is related to application of AI system in banking industry, application of such systems boosts efficiency of overall system by increasing ease of service, increasing predictability capabilities of system and reducing manual errors and discrepancies. An article published by Ghurair, (2018), noted that application of AI will be transformative for the banks of the region and implementing it broadly will be both an opportunity and challenge of the local banking sector. The author emphasised that use of AI-powered tools would systematically improve performance of the banks by tracking customer behavior patterns, offering personalised services, decrease errors, reduce banking cost as well as time to closely match the needs of its customers. Thus, it can be concluded that use of Artificial intelligence in banking sector can significantly impact upon the performance of bank and have positive impact on overall productivity of the system.

7. Conclusion

7.1 Answering Central Question

The answer to the central research question is as follows:

7.1.1 What are the opportunities associated with application of Artificial intelligence in banking sector of Middle Eastern region?

Artificial intelligence expected adoption in banking sector of Middle East region had opened up many opportunities. Currently artificial intelligence is used in detecting mismatching in transactions, providing personalised recommendations for the customers and developing solution for eliminating human errors (Pwc, 2018). Further, reduction of manual task and reduced need for back office operation can also be achieved by using artificial intelligence in banking sector. Although implementation of artificial intelligence in banking sector is in quite early phase, but with the use of sophisticated algorithms of artificial intelligence can enable efficient risk and asset management in the banking sector that can further optimise financial policies at the Middle Eastern banks. Banks in the region can use quick and efficient artificial intelligence systems can enable banking organisations to develop revenue generation models and start using smart financial management tools. However, currently available artificial intelligence tools used by the banks are mostly static that provides mostly requirement and risk profiling. For providing more pragmatic and faster services, dynamic systems are required to sense change patterns of markets adjust financial strategies accordingly (Nuseibeh, 2017).

7.2 Implications

It can be noted form this study that technological adaptation in banking sector of Middle-eat have moved at a much slower pace as compared to other global markets. With time there had been shift in attitude towards technological tools and now banking professionals aim to work hand in hand with the technological developments. Artificial intelligence adaptation in banking sector is far from reaching to complete maturity level within the industry but use of artificial intelligence in banking industry had become trendsetter. The findings of the quantitative analysis conducted for this study was comparable to the findings of the secondary literature analysed. Thus, it can be inferred that with application of Artificial Intelligence in banking sector of middle east, performance of local banks can be significantly boosted.

7.3 Future Scope

This study had focused on analysing the impact of artificial intelligence in the banking sector of middle-east region, further it can be analysed, whether or not it had similar impact on banking sector of different regions across the globe and global market. This study had only focused on advantages, disadvantages and opportunities associated with use of artificial intelligence in banking sector, but it

does not include risks associated with it and challenges faced during its implementation as well operations. Machine learning, blockchain, data analytics and such more are some of the technological tools that have ability to transform the manner in which the banking industry works. Further studies can be conducted on analysing the impact of such new technologies adaptation in the banking sector.

References

[1] Blessing, L. T. M., Chakrabarti, A. and Blessing, L. T. M. (2009) DRM, a design research methodology. Springer.

[2] Dash, S. (2017) 'Significant banking changes due to tech innovation | GulfNews.com', Gulf News. Available at: https://gulfnews.com/business/sectors/banking/significant-banking-changes-due-to-tech-innovation-1.2138124 (Accessed: 31 July 2018).

[3] Eisazadeh, S., Shaeri, Z. and Ali, B. (2012) 'An analysis of bank efficiency in the middle east and north africa', The International Journal of Banking and Finance, 9(4), pp. 28–47. Available at: http://www.ijbf.uum.edu.my/images/ijbfvol9no4dec2012/2-An-analysis-of-bank-efficiency-in-the-Middle-East.pdf (Accessed: 30 July 2018).

[4] Farazi, S. et al. (2011) Financial Flagship Bank Ownership And Performance In The Middle East And North Africa Region. Available at: http://siteresources.worldbank.org/INTMNAREGTOPPOVRED/Resources/MENAFlagshipBankPerformance4_5_11.pdf (Accessed: 30 July 2018).

[5] Ghurair, A. A. (2018) 'Embracing artificial intelligence: Do UAE banks have a choice? - Khaleej Times', Khaleej Times. Available at: https://www.khaleejtimes.com/business/banking-finance/embracing-artificial-intelligence-do-uae-banks-have-a-choice (Accessed: 31 July 2018).

[6] Jamall, A. (2017) Middle East Region: Industries - Banking & Capital Markets - PwC Middle East. Available at: https://www.pwc.com/m1/en/industries/banking-capital-markets.html (Accessed: 30 July 2018).

[7] John, I. (2017) 'How technology will change the banking industry - Khaleej Times', Khaleej Times. Available at: https://www.khaleejtimes.com/business/banking-finance/how-technology-will-change-the-banking-industry (Accessed: 31 July 2018).

[8] Kothari, C. R. (2004) Research methodology : methods & techniques. New Age International (P) Ltd.

[9] Manning, J. (2018) How AI Is Disrupting the Banking Industry, International Banker. Available at: https://internationalbanker.com/banking/how-ai-is-disrupting-the-banking-industry/ (Accessed: 30 July 2018).

[10] Mannino, A. et al. (2015) 'Artificial Intelligence: Opportunities and Risks Policy paper', Effective Altruism Foundation . Available at: www.foundational-research.org (Accessed: 29 July 2018).

[11] Mata, J. et al. (2018) 'Artificial intelligence (AI) methods in optical networks: A comprehensive survey', Optical Switching and Networking, 28, pp. 43–57. doi: 10.1016/j.osn.2017.12.006.

[12] Newman, I. and Benz, C. R. (1998) Qualitative-quantitative research methodology : exploring the interactive continuum. Southern Illinois University Press.

[13] Noonan, L. (2018) AI in banking: the reality behind the hype | Financial Times. Available at: https://www.ft.com/content/b497a134-2d21-11e8-a34a-7e7563b0b0f4 (Accessed: 30 July 2018).

[14] Nuseibeh, Y. H. (2017) 'Artificial Intelligence: Opportunities and challenges in finance industry | GulfNews.com', Gulf News. Available at: https://gulfnews.com/business/sectors/banking/artificial-intelligence-opportunities-and-challenges-in-finance-industry-1.1976801 (Accessed: 31 July 2018).

[15] Punamaraju, R. (2018) How Artificial Intelligence Is Changing The Banking Sector - CXOtoday.com, CXOtoday. Available at: http://www.cxotoday.com/story/impact-of-artificial-intelligence-on-the-banking-sector/ (Accessed: 30 July 2018).

[16] pwc (2018) The potential impact of Artificial Intelligence in the Middle East - PwC Middle East. Available at: https://www.pwc.com/m1/en/publications/potential-impact-artificial-intelligence-middle-east.html (Accessed: 31 July 2018).

[17] rncos (2012) Middle East Banking Sector Analysis. Available at: https://www.rncos.com/Market-Analysis-Reports/Middle-East-Banking-Sector-Analysis-IM370.htm (Accessed: 30 July 2018).

[18] Shirish, K., Jayantilal, S. and Haimari, G. (2016) Digital banking in the Gulf Keeping pace with consumers in a fast-moving marketplace. Available at: https://www.mckinsey.com/~/media/McKinsey/Locations/Europe and Middle East/Middle East/Overview/Insights/Digital banking in the Gulf/Digital Banking in the gulf 161116 DIGITAL.ashx (Accessed: 31 July 2018).

[19] Sophia, M. (2018) 'Banks Are Investing Massively Into IT Services', Forbes Middle East staff. Available at: https://www.forbesmiddleeast.com/en/banks-are-taking-note-as-fintech-spikes-customers-interest/ (Accessed: 31 July 2018).

[20] Verma, S. (2017) 'UAE banking on AI, and the results are showing - Khaleej Times', Khaleej Times. Available at: https://www.khaleejtimes.com/editorials-columns/uae-banking-on-ai-and-the-results-are-showing (Accessed: 31 July 2018).

APPENDIX I: SURVEY QUESTIONNAIRE

Section 1: Demographic Profile

Q1. What is your age?
- 21-30 years
- 31-40 years
- 41-50 years
- Above 50 years

Q2. What is your gender?
- Male
- Female

Q3. For how long have you been working in banking sector?
- Less than 5 years
- 5 – 10 years
- 10 – 15 years
- 15 – 20 years
- More than 20 years

Q4. Which country do you belong to?
- UAE
- Saudi Arab
- Kuwait
- Oman
- Qatar
- Bahrain
- Others (Please Specify)

Section B – General Background

Q4. Are you aware about the use of AI in banking sector?
- Yes
- No
- Can't Say

Q5. Does your bank uses AI in banking processes
- Yes
- No
- Can't Say

Q6. What are the areas where AI is being used in your bank?
- Automation of processes
- Reduction in Human error
- Consumer satisfaction
- Personalises Services
- Mitigating Security Concerns
- Ability to take complex decisions
- Disruption of operations

Q7. Does the AI has a significant impact on the performance of the banking sector?
- Yes
- No
- Can't Say

Q8. What is the major driving factor behind adaptation of AI at your bank?
- Error Reduction
- Increased work efficiency
- Reduced cost of the operations
- Efficient decision making
- Others (Please specify): _____

Section C: Impact of AI on the performance of the bank

Q10. Is there a significantly positive impact of AI on the performance of your bank?
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Agree

Rate the following performance aspects of banking industry as per your perception on improvement in performance of the banks after use of artificial intelligence on the scale of 1 to 5 where
- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Agree

S. No	PERFORMANCE FACTORS	1	2	3	4	5
1	Customer Satisfaction (Customer support and help desk)					
2	Risk Management					
2.1	Tailored products being offered to clients by looking at historical data					
2.2	Doing risk analysis					
2.3	Eliminating human errors from traditional models					
3	Asset Management					
3.1	Track sentiments/ Markets					
3.2	Enhance portfolio management					
3.3	Understand customer behaviour					
3.4	Automate compliance					
4	Reduction in cost of services					
5	Ease of services					
6	Fraud Detection					
6.1	Increase the accuracy of credit card fraud detection					
6.2	Increase the anti-money laundering					
7	Security					
7.1	Suspicious behaviour					
7.2	Logs analysis					
7.3	Spurious emails can be tracked down to prevent					
7.4	Predict security breaches					
8	Digitisation and automation in back-office processing					
9	Wealth management for masses (Personalised portfolios being managed for clients by taking into account lifestyle, appetite for risk, expected returns on investment, etc.)					
10	Enhanced performance of the ATMs by use of Image/face recognition using real-time camera images and advanced AI techniques such as deep learning can be used at ATMs to detect and prevent frauds/crimes.					