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IMPACT OF AI SYSTEMS ON MANAGERIAL DECISION-MAKING PROCESS[1]

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SUMMARY

This paper is about a research study on the impact of AI systems on management and the decision-making process. The study aims to investigate the level of AI systems involved in the decision-making process and the level of those systems efficiency. Also, the research is looking forward to finding out whether these systems are going to be able to replace human managers entirely in the future, or this is something impossible?

The research starts with an introduction to this topic and representing the research question that will build the whole research on, followed by a theory and developed hypotheses that test throughout the investigation. The second part will be introducing the literature review for this topic and the previous findings and reports that can help strengthen the idea of the research.

After making a solid introduction and stating the hypotheses, the methods and operations that will be used will explain carefully along with the chosen methods, the pros and cons of these methods, defining variables, testing validity and reliability, measurement and the whole operationalization method of the research variables.

The last part will be explaining the sources of data and conclusions or future predictions of the research, clearing out the implications, outcomes, and the potential future topics that need to be studied late.

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ABSTRACT

"The development of full artificial intelligence could spell the end of the human race" **Stephen HAWKING**

Almost every aspect of modern human life is influenced by science and technology. In other words; it can be said that technology is invading people's lives in every single use starting from smart phones up to smart homes and medical surgery.

The name of Artificial Intelligence refers to the work processes of machines that would need intelligence if humans applied it. As people's lives' complexity level increases, the AI or what is called (robots) become significant trying to digitalize all our work processes and move all business sectors to complete automation as much as possible. In what most scientists called the fourth industrial revolution; robots have taken an enormous step-in decision-making process and selecting employees, especially in some companies in Japan. Moreover; replacing some human resource departments in some companies with a complete AI system that can perform selection, recruiting, appraising, and training for the employees. All these reasons pushed to ask the question of what extent can robots' effect on management positions, and can they perform accurate decisions instead of humans?

In this paper; the impact of AI on the human managerial decision-making process will be investigated. Also, if AI systems will replace human managers will be investigated through the use of previous researchers and conducting other research methodology to obtain more relevant and accurate data for future studies.

Keywords: Management, AI systems, Managerial Decisions, Automation

INTRODUCTION

Technology has a significant role in modern life that it is almost used in every aspect of it, starting from smartphones and watches up to the most complicated and complex medical procedures. The name of Artificial Intelligence refers to the work processes of machines that would need intelligence if humans applied it. In simple words; it is replacing complicated works that need much thinking and complex mathematical equations with digital (robots) that can significantly do this process in better efficiency and shorter time. Moreover, this precisely what happens in almost all business sectors that are being fully automated nowadays.

In what most scientists called the fourth industrial revolution; robots have taken a considerable step-in decision-making process and selecting employees, especially in some companies in Japan. Moreover; replacing some human resource departments in some companies with a complete AI system that can perform selection, recruiting, appraising, and training for the employees. All these pushed to ask the question of what extent can robots' effect on management positions, and can they perform accurate decisions instead of humans in Gulf countries?

The impact of AI on the human managerial decision-making process in Gulf countries will be studied in this paper. Also, if AI systems will replace human managers will be investigated through the use of previous researchers and interviewing some managers working in the most automated industries along with surveying to see how this will affect managers and employers.

Movies and science fiction books have contributed a lot in developing the imagination of tech experts and pushed them to go forward with continues efforts of developing and creating AI systems that can learn and perform as humans. Movies always represented AI systems or robots as a danger and can destroy people lives and Probably this is a reflection of the humans psychological fear of these technologies, and this is might be the main factor that pushed tech experts to keep work on developing systems that can make our life easier not put us at more risk. However, the questions are: how can these changes impact life? Moreover, to what extent they can replace humans in managerial positions? Also, how managers will react to their replacement by robots or AI systems. All these questions raise to the top of heads and need to be studied, and this is the reason for conducting this research.

1. RESEARCH QUESTION

Due to the tremendous technological advancements in all business sectors and the automation of most of the processes, the research question is raising as whether AI systems will be able to make sufficient management decisions instead of human managers and whether managers in top-level will be willing to accept this change or they will resist. The main research question is "**how can robots (AI) affect the managerial decision-making process?"** which leads to secondary questions that can give us more clear findings such as asking if AI or robots will replace human managers in the future or how human managers think of AI systems taking over their jobs. Taking into consideration all the factors that affect the process of decision making such as the economic impact, organizational behavior, the quality of the decision, opportunities and threats, and the level of firmness and trustworthiness.

The process of decision making will directly affect the efficiency and productivity of the work and hence will directly affect the profit of the organization if these decisions made correctly. According to this fact; if the AI advancement can be able to analyze problems and reach the correct decision instead of humans, this will increase the profit and decrease the cost. Another factor that might be affected is the rate of turnover of employees and managers as they might be more resistant to be replaced by robots.

Also, this research can show the effect of having a robot manager on the behavior of employees in the organization and the level of obedience they will show to their manager. Moreover; how much the employees will be willing to accept having a digital superior. There will be a different code of ethics and reporting systems applied if the manager was a robot, not a human and there will be no relation between workers and their manager and this might decrease the motivation level. In other words, the resistance to change needs to be studied

carefully to determine if workers are willing to take orders from a robot superior. Moreover, the resistance of managers to AI advancement can be a significant factor in delaying this step.

There are sequential steps in making a managerial decision; especially ones that affect the business and need action. A good manager with a great experience knows when there is no time for all the analyzing steps and can jump directly to taking the action stage and give the right managerial decision. If robots were chosen to replace humans in taking those steps, there might be an effect on the quality of the decision. The research studies the quality of the decision made by both robots and humans and their influence on business. To conclude, the best solution for a complete replacement to human managers, or it would be better to have them collaborate and improve the quality of the decisions.

Studying the impact of AI on business will increase innovation and creativity. It will also open the way for more investments in AI development in order to improve the effectiveness of work and the quality of decisions made by robots in the future. As the researchers are trying to mitigate humans, maybe they can learn how to mitigate the feelings of humans to make robots more able to communicate with workers and control their stress and fear.

AI development in the decision-making process will help in overcoming the complexity level of data in large organizations. The level of trustworthiness of AI and technological systems can play a better role than humans and can collaborate with humans to obtain an efficient and precise decision. Also, these robots or AI systems can be programmed to obtain the highest security codes to protect information and privacy for the company as a high code of ethics to keep all the company data classified. These systems can be computerized to violate the privacy of the company and record what happens between employees and their superiors, and this can cause insecurity in the work environment and can harm them if these systems got hacked from competitors.

2. THEORY BEHIND THE QUESTION

Based on the introduction above and the question that is raising for this study, the theory that is built behind this question is:

Despite the tremendous technological advancement of AI; robots will not entirely replace the human race.

It is true that AI can lead to more efficiency in the economy and according to previous studies, those systems have helped humans in improving the quality of the decision-making process and save more time in analyzing the sophisticated procedures and big data analysis. It is suggested that AI advancement will lead to a significant substitution of humans as they have more ability to solve problems with enhanced prediction algorithms and the deep learning machines systems which can make more efficient decisions. If this happened; the positions of human managers will be affected, and thus, the whole structure of organizations will be different. Also, it will affect the cost of the business. There will be many implications that will result due to this replacement of human managers by robots.

Based on the status of technological advancements, there is still more time needed for AI systems to able to replace humans in decisions making process although, at the time being, they can work together to obtain better solutions. As designing a robot that can mitigate all the features of a human manager will increase efficiency, decrease cost, and increase profits for the company, which will cause to replace all human managers by robots. If this happens; the natural outcome will be a higher unemployment rate for the management level. However, this will create a need for new positions and roles to be filled by humans as the economy will be enhanced, and there will be more opportunities to obtain.

To some extent, it is scary for some humans to live in a whole digital world surrounded by robots and automated systems that can do all their works instead of them, but also human nature loves the luxury of having systems that can make life easy to them and help them do their jobs better. So, depending on the recent studies and before conducting the research, humans can work in a hybrid environment where they can get help from automation systems and AI systems in making better and faster management decisions, but this is just a theory that needs to be tested.

There is an excellent discussion on whether AI systems advancement will be good for humans, or it will destroy their lives. However, some of the psychological experts believe that these advancements will have a considerable impact on human's behavior and can transform the whole society. As an opinion; no matter how technological advancement has become, humans will always be needed and can never be replaced, but without conducting real research those opinions can be invalid or just a theory that has not been studied or stated to be correct.

There are more optimistic predictions about AI systems that predict that AI systems will succeed human's intelligence, but they do not believe that they will harm humans or enslave them, but they can find a balance between humans and those AI systems. By the year 2020, the world will be affected by the fourth industrial revolution. According to (Gray,2016) Gray believes that robots will implement %35 of jobs and that some jobs will disappear, and other jobs will grow or improve and although robots can help us work better Gary believes that they cannot be created enough so robots will not replace those jobs that need creativity. This article pretty much agrees with this research's theory because the decision-making process needs much creativity in finding other suitable solutions and overcome some obstacles in the work field.

3. LITERATURE REVIEW

"*Artificial Intelligence (AI) is a branch of computer science with the equipping machines with reasoning and perceptual abilities. This overall objective is pursued through two routes, which one might crudely divide into applied and theoretical*" (Clocksin, 2003).

The term artificial intelligence is used a lot lately according to the vast advancement of technology and the fast and enormous adaptation of generations to these technologies. However, the term artificial intelligence is not new as all think, in fact; according to history, some says it goes back to the 19th century, but papers and studies were started actually to raise in 1950 (Anyoha,2017) about the history of artificial intelligence and the origins of this term. Anyoha claimed that the origins were back to 1950 where a poly mathematical person known as Alan Turing raised the question "Can machine think?" in his paper computing machinery and intelligence,1950. Turing claimed that humans use information and logic to solve problems and make sufficient decisions, and that made him question the possibility of imitating this to machines. The limitation of his research was due to the high cost of machines at that time, the lack of these computers to keep track of information and procedures at that time. However, he raised the fundamental question that led to the first artificial intelligence program known as the logic theorist found in 1955 and presented in 1956 by Simon and Newell in the summer research project of artificial intelligence. The program is the first artificial intelligence program that mimics the human in solving problems. Twenty years later in 1957; computers were more advanced, cheaper and faster but it could not keep track of large amounts of data, so advancements were still going on till the 1980s where expert systems were presented by Feigenbaum to replicate problem-solving techniques of humans. These systems or machines are working by learning machines technique; they have a knowledge database stored in its memory, and by repeating some processes and facing daily errors and risks those machines can be updated to replicate humans in its best way. Humans were giving situations to deal with, and their answers are saved in the system for the future. Advancement is going on to increase the memory of computers to enhance their capability, efficiency, and ability to support human work.

According to (Kowalski,2011); there are tools and techniques such as logic, procedures, production and daily correlations that can reconcile together and make humans learn and being able to update their skills and behavior to make better decisions and enhance communication. Moreover, the same logic can be enhanced to AI systems to enhance these systems abilities to attain better performance in decisions making the process. Now that people are living in the big data age, the era of the fourth industrial revolution led by technology like AI and robots became the language and tool that can compute, analyze, learn, and solve complex problems in the daily life. AI systems feed on data, and the more companies have historical data and history of procedures and algorithms, the more they can build a better AI model avoiding mistakes in business and probably able to make decisions. Artificial Intelligence has many definitions but generally is a computer or electronic components that can replicate or mimic the intelligence of humans and able to perform complex algorithms to solve sophisticated problems that can be solved by intelligent humans only. AI can be known as machine learning systems, expert systems or knowledge-based systems, and there are natural language processing systems and robotics. (Lawrence, 1991) (Hardt & Rapaport, 1986).

AI contributed a lot to medicine, technology, banking, and business. Also, now that humankind is entering the stage where AI systems go beyond expecting the ability of AI systems to replace managers in different domains starting with HR management.
As its already happening now based on the paper presented by (PwC, 2017) which announced that emerging technologies in AI will allow human resources department in all business to catch up with technology and have a fully automated system that can save time in completing repetitive tasks, selecting candidates, and continuously learning and improve work engagement. Moreover, probably in the future, robots can be seen able to make entirely managerial decisions if the advancements were able to mimic humans' feelings and being able to make these systems feel and communicate or maybe build decisions based on historical data and expertise of human managers. (Evans, 2001) (Thagarad, 2017).

The artificial intelligence and decision analysis (Dewhurst & Gwinnett, 1990) is a case study that explained the importance of using artificial intelligence support systems that mimic the human analytical and statistical tools to solve complex business situations reaching to forming a decision in some business domains. Their study started with stating that there are decision-makers and decision analysts who differ in their jobs and thus later ones can add extra employment expenses on any corporate; also there might be a difficulty in communication between decision-makers and analysts due to experience level difference. Their theory was that the decision-making process by humans depends on three principal axes which are; experience, logical deduction, and intuition. The conceptual definition of the study was that human intelligence is very complex and cannot be fully replicated by AI systems, but those axes can mimic in AI systems to replicate some business decision situations. Dewhurst and Gwinnett believed that operational definition would be by modeling specific problem situations and record the human intelligence process in solving it then replicate those traditional approaches into an AI system using simulation language.

The replication of the three human intelligence axes will be a storage area where all the knowledge will be stored, analyzed and processed, a typical interchange which means translating the data into a format that can be understandable by humans and the main user interface that will be used by decision-makers to enter data. This system will have two levels of users as experts and naïve depending on the expertise of the user. The case study shows the great imagination and intelligence of humans in the 1990s. Moreover, how they were looking for ways to make life easy if they could have implemented this study in that time they believed that it would have several advantages such removing bias of individuals in making decisions, the ability to use more than one technique in solving a problem and help decision-makers in having more control. The limitations they had was the vast space of memory in computers back then and difficulties in data collection due to cost and acceptance. The article, as an opinion; was the start for IT programmers to develop such a program and start the continuous development that is still going nowadays.

Based on the study of the impact of artificial intelligence on organizational decision making (Lawrence,1991), Lawrence conducted a research based on previous studies conducted by (Hickson et al., 1986) at the University of Bradford and Lawrence did his

research based on 11 hypotheses to examine the relationship between AI technologies and organizational decision-making dimensions. According to Hickson and his collogues, there are two organizational technologies which are expert systems and natural language systems.

Lawrence developed a comprehensive conceptual model by integrating the two elements of complexity and political concepts. The paper demonstrated the complicated relationship between AI and organizational decision making and the effect on the two different systems of AI. The findings of the study claimed that the expert systems would reduce the complexity of the decisions and keep the balance between organizational parties and thus reduces politically and this reduction will change the dynamic of the decision-making process in organizations between AI and humans.

Following this study came the invention of the first automated decision-making system that was published as a US patent in 1998 by Denture and Suever (Wayne, 1998). The inventors discussed in the patent the rational decision-making process, including problem definition, developing alternatives, and choose between these alternatives reaching the decision. They stated that the accuracy and quality of decisions made by humans could be biased, and the quality cannot be measured accurately. So, they came up with an automated system that follows the same procedures of the rational decision-making process, but for a more accurate way and through a program they believed it would improve the quality of the decisions and enable human managers to evaluate their decisions. The patent is quite precise, and the inventors explained the way their automated system will work through block diagrams. It shows a great invention to the management sector, although the patent did not show a real implementation for this invention and whether it was a success, or it had some drawbacks.

Simulating the human decisions strategies of data collection, analysis and developing alternative decisions can play a significant role in reducing the time needed in applying all these processes by humans and can improve the efficiency and effectiveness of the operations systems especially in-service sector. A great test of interactive visual stimulation through the methodology of a knowledge-based improvement system was applied on ford plant to simulate humans in tackling the flow of operations in one section of production lines to decide between maintaining faulty machines automatically. (Robinson-Waller et al., 2005). The methodology of KBIS was implemented to improve the decision-making process in operations systems by developing a model before the test that can simulate the human process of tracking operations and making systematic decisions based on specific inputs and although this methodology can show a success, but those simulation methods lack the logic of humans in making decisions. This methodology was the first real implementations of simulations systems and expert systems, and even though it has some lacks in objectives, it certainly added more to future studies.

"*After decades of anticipation, the promise of automated decision-making systems is finally becoming a reality in a variety of industries*" Davenport and Harris, 2005.

Right up to 2005, AI role in the business was always as a decision support system due to lack of technologies, the resistance of managers to accept fully automated decisions replacing them and also the fact that these systems need highly skilled people to deal with them. All these reasons together contributed to delaying the advancement of AI in business.

However, according to (Davenport & Harris,2005) the new era of AI systems has begun, and the new applications are easier to deal with, more independent on humans and can make logic decisions without any human initiation or intervention. Based on the research; many corporates in many business sectors are now adopting the AI systems in making decisions such as banking, transportations, fraud detections because they see the opportunity in using these systems and how it affects their business in a matter of time, efficiency, quality, and accuracy.

Moreover, it can reduce the labor force needed by corporates. The authors stated that even though AI systems can implement complex and accurate routine decisions, the need for human expertise is still in need of monitoring those contexts of data to ensure accuracy and minimize error risk. One other challenge the study raised is that laying off some low skill labors in fully automated systems companies will not reduce expenses of labors as they will have to employ a highly skilled people to monitor, maintain and update those systems and machines with will increase the level of labors needed and thus extra cost.

Science fiction contributed a lot in motivating the scientists and technical experts to build machines that can be close enough to the imaginary systems and robots they presented for years in books and films. If they reflect something; then it would reflect the great imagination of humans in predicting for future, and also is reflected the danger that those systems might cause if they got very advanced and go beyond humans. There were lots of thoughts about the danger of these systems that were explained to be myths (Atkinson, 2016). In his paper; Atkinson explained that AI advancement would not take over humans' jobs because the advancements are a bit slow raced, all AI systems invented till now are Narrow systems which means they can be significant in one job only not everything as humans and this guarantee that humans will always have jobs. Also, since all data and information of corporates are bound to government laws, and there are codes to protect them; AI cannot destroy privacy.

Moreover, those systems have no feelings or emotions so that they will have decisions or answers based on the knowledge data stored in the memory; thus, AI systems will have no bias. Another myth was explained as those systems are opening great opportunities for economic growth and those opportunities should be studied carefully to optimize the benefits for such technological advancements without neglecting the major faults that can cause drawbacks or damage the business. Studying the pros and cons of this advancement and evaluating the opportunities will keep the balance between humans and AI systems in business.

Based on the article published in HBR on leadership development (Kolbjørnsrud, Amico & Thomas, 2016) the role of AI systems will add more collaboration and more time to managers to focus on more strategic jobs that can only be performed by humans. The author conducted a survey in 14 countries and conducted interviews with executives also, and they explained the major daily jobs that managers spend more time on and what jobs can be replicated by AI systems. The study showed the willingness of managers to collaborate with AI systems in finishing administrative, controlling and monitoring jobs to the level that needs routine decisions based on data knowledge and expertise of managers saved in the system.
Moreover, strategic, planning, coaching, and mentoring jobs will be executed by human managers. If this implemented correctly, managers would save more time, and business efficiency will increase.

Artificial Intelligence systems are improving fast day by day, and recently they can efficiently perform automation procedures and simple tasks without errors, but the main goal of AI systems is to outrace human intelligence and perfect human activities as it will be considered the greatest invention of humanity throughout history. Based on research conducted to study the impact of AI systems on different daily life aspects and jobs (Poola, 2017) robots had saved a lot of human lives when they were hired to defuse bombs instead of humans as they were able to perform this dangerous job with zero percent error. According to the article, a lot of industries today are using AI systems in procedures that do not require human interventions (Frey & Osborne,2017). Since these systems do not feel tired, and the error percentage is way less than the error percentage by humans; the industrial sector can take advantage in increasing productivity and efficiency of the products using these systems. With time those systems can make an accurate management decision in the same sector. Moreover; time will be significantly saved using these machines in analyzing data and applying sophisticated algorithms and make decisions in a short time.

One of the most critical challenges to AI systems is the interaction between humans and robots (Lemaignan-Alami et al.,2017). According to the article; there is two recent development that has improved robots' ability to interact with humans on action and planning levels. By estimating the human intentions during collaborative tasks and sets; some approximate actions that allow the robot to estimate the mental state of the human and be able to interact with his human partner not only considering the environment but the goals, plans, and actions. Those intelligent systems are called social robots as they can interact with humans and make decisions based on the experiments made in the study to observe the process and stages of execution controller and decide the level of interaction between robots and their human partners at work and how can they collaborate with humans to obtain the best decision. The ability of these new systems to read the mental state of the human partner along with the algorithms and equations, the robots will be able to reflect on the screens list of actions to be taken using the shared plans of human-robots interaction.

Based on a report that has been published by Infosys to follow delves into the impact AI is having on enterprises, and how business leaders and the workforce are evolving (Jha,2018).

The report has been made through years to study the effect of AI systems on return on investment, people and skills and leadership as they believed that the advancement of AI systems will develop human skill and efficiency and will also cause lower costs and a higher return on investments and create real value. This report was made based on a survey conducted on IT decision-makers and senior executives in 7 countries (figure 3 in Appendix A).

The primary critical findings of this report were Seventy-three percent of all respondents agreed or strongly agreed that AI has already transformed the way they do business and forty-five percent of respondents said the AI deployments in their organization are significantly outpacing the accuracy and productivity of comparable human activity (figure 2 in Appendix A). Based on Infosys report, the industries that use AI systems the most nowadays are retail and consumer product goods followed by telecommunication service providers, banking, oil and gas companies, manufacturing, media, healthcare and the least in the public sector (figure 1 in Appendix A). Moreover, based on these results, sample design, along with the right people who can give right and accurate answers related to the research question, will be chosen.

Up to this moment, all studies have indicated the role of AI systems as support systems. Based on surveys and interviews with companies that are using those systems (Claude & Combe, 2018) or corporates that are willing to adopt such systems (Kolbjørnsrud, Amico & Thomas, 2016) results were clearly stating that those systems can only be supporting human managers in decision-making process. As this process needs much cognitive thinking, source of gut feeling and emotional factor which lacks in those systems but according to the new advancements there are registered robots who claim to have some level of intelligence equal to humans and can also express some feel like the robot just like the first humanoid robot known as Sophia (Retto & Jessus, 2017). Which was declared as the first citizen robot in the world by Saudi Arabia due to her ability to talk, communicate, and express facial gestures and even make jokes. Sophia has put the first brick in the new era of AI systems, and now studies should go into the direction of whether these systems can fully replace human managers in the future.

Most of the previous studies are based on theoretical background and historical theories, and surveys were conducted to measure the human feelings, opinions, and thoughts of managers and predictions of future business environments. That is why the research question that is raised earlier in the study will hopefully be able to test the future water of this ability and it can close some gaps in literature clarifying some obstacles that can make this advancement get delayed and how can it be achieved. Also, the study will show the impact of this technology on the economy, employment, efficiency, and society. The study will be conducted as a survey and interview to managers and executives in top management positions, operation employees, and question their willingness to trust decisions made by robots and also implement them in reality.

4. RESEARCH HYPOTHESIS

There are two hypotheses for the research that will be tested to prove the theory or reject it.

Hypothesis 1: "The ability of AI systems to make efficient management decisions might lead to fewer management positions for humans."

Hypothesis 2: "The continuous advancement of AI systems increases the resistance of managers to change."

The first hypothesis is representing the effect of AI systems on Managerial positions. Based on all the literature and previous studies, if AI systems were able to mitigate the human mind in making effective zero-errors decisions with less time, this will affect the positions of human managers. If business owners were able to avoid the cost of manager's salary by having an AI system that can perform human manager duties, then there will be no need for full-time managers in future and this will change the environment of any business and will lead to a higher unemployment rate of human managers.

Probably the cost of hiring human managers is not the only factor that will make business owners consider AI systems. However, also, the amount of change resistance by employees and how much they are willing to accept decisions made by robots or machine learning systems. The code of ethics and organizational behavior will also play a significant role in deciding which manager will be the best fit, whether it is a human manager or robot manager Moreover, if the business owners change the business environment to a whole automated one replacing the working staff with complete AI systems leading to the second hypothesis. This states that the advancement of AI systems will increase the resistance of human managers because they might be the first people who will get affected and lose their jobs, so it is a significant threat to their position. Human Managers who are facing the threat of losing their jobs might be the first cause in delaying the technological advancement in this sector as they do not want to be entirely replaced by robots although they enjoy the help of these systems in making the decision process faster and more efficient.

The research will study these two hypotheses and see whether they are correct or not and to what extent those hypotheses can affect business and managerial positions. Moreover, how this technological change will create opportunities for business and might declare a new management era that is ruled by robots. Also, the study will discuss threats of these hypotheses and the outcomes that will be built on the replacement of human managers in industrial and management sectors.

Further, the research study can give an insight into future investment thoughts and can discuss weaknesses in the development of AI systems. Moreover; it can open eyes for new research questions to be asked

5. RESEARCH DESIGN AND METHODS

Decision making is the process of gathering information, identifying and developing alternative solutions, then assessing them to choose the best solution. In business; the process of decision making is critical and sometimes making a wrong decision can cause a massive loss to the company, or it can have significant effects on the business.

In the recent years, technological advancements have played a significant role in developing an artificial intelligence system that can help human managers in saving time and effort needed in analyzing and gathering big data and increasing the quality of the decision made by humans.

However, with the continuous and non-stopping developments of AI systems, the questions that cross minds, what if people woke up one day and found robots managing people and responsible for making decisions in business. Thus; the research is designed to answer this question and find out whether this can happen, or human managers will always be in need.

For answering the research question; a mixed-method between quantitative and qualitative structured and direct methods will be applied. By conducting an online cross-sectional survey on a random stratified sample of major decision-makers working in companies using AI systems in Gulf countries along with conducting structured interviews with senior executives in different sectors and analyze their responses on the impact of AI systems on their business and how much they are willing to collaborate with tech experts to develop the best AI systems in the future. Also surveying working staff in the same industries and see their resistance to change and willingness to trust decisions made by robots and apply them.

The time frame of the research is supposed to be within one year as technology changes and updates fast year by year and so making the time frame large will possibly make data irrelevant or no accurate. Moreover, the unit of analysis will be organizations and companies as the survey and interview results will be aggregated later. The study will measure the association of variables and causality through asking short closed-ended questions in survey, and that can give the ability to prove or falsify the research hypotheses. Based on the Infosys report of 2018, the primary sectors that will be included in the survey and interviews are the sectors using AI systems more which are retail, consumer production, telecommunications, and IT companies, banking, manufacturing, healthcare, and media (figure 1 in Appendix A).

5.1. Operationalization

Linking the conceptual definition of the problem with procedures and techniques of measuring variables. It is the relation between theory, concepts, assumptions, and the operations that need to be done to indicate findings in the real-world and putting the whole measurement and definitions in a conceptual framework. Concepts are the images that represent mental images and can be drawn using languages and words, but they are scientifically insufficient unless people use the aid of indicators or variables to make these images meaningful and scientifically accepted.

The research has two main hypotheses than can be operationalized as follows:

Hypothesis one: "*The ability of AI systems to make efficient management decisions might lead to fewer management positions for humans."*

Concept one: Successful management decisions by AI systems. The first concept in this hypothesis is presenting the picture of successful management decisions taken by AI systems. The concept is giving people the ability to build conceptual and operational definitions as follows:

Conceptual Definition: Measuring the ability of AI systems to make management decisions. The conceptual definition sets the framework to measure the ability of an AI system in making sufficient and accurate managerial decisions. Moreover, it gives a glance of the indicators that must be measured to indicate the extent of these systems' ability to up human head managers in the decision-making process that will be **operationalized** through gathering information about the ability of AI in decision-making and indicators of the conceptual definitions.

Concept two: Possibility of an increase in the unemployment rate at the management level. The second concept draws the picture of a higher rate of unemployed managers and sets the framework to define conceptual and operational methods in testing the indicators and conclude the reality behind this concept.

So, the Conceptual Definition: The percentage of the unemployment rate of managers. The conceptual definition sets the framework for studying the percentage of the unemployment rate for managers due to the advancement of AI systems and what are the most important indicators of that percentage that will be operationalized through measuring the indicators and Looking for the real of effect on management positions.

Hypothesis 2: "The continuous advancement of AI systems increases the resistance of managers to change."

Concept one: The high involvement of AI systems in management. The first concept of this hypothesis presents an image of the percentage of AI systems involvement in management.

So, the Conceptual Definition: The level of AI systems advancements in management. The conceptual definitions set the framework for the level of AI systems technological advancements in the management sector, which will be operationalized through procedures to know the latest updates of AI systems.

Concept two: The likelihood of increasing change resistance by managers. The second concept presents the picture of the percentage of managers' resistance to change done by AI systems and its effect on their behavior.

Conceptual Definition: The percentage of the manager's resistance to their roles' change.

Operational Definition: Analyzing the level of resistance by managers and employees through conducting surveys with managers and analyze their tolerance to change.

5.2. Measurement of Variables

It is needed to specify factors, conditions, or traits that can help test the question. There are two types of variables in every hypothesis; one is the independent variable, which is the variable that can change and control the rest of the variables to figure out how this variable affects the result. The other type is the dependent variable, which is the variable that depends on the changes in the independent variable. These dependent variables are the one research is focusing on studying.

For this research, as the effect of AI advancement in the decision-making process needed to be studied. Then our primary independent variable will be the AI advancement and the other dependent variables will be the management positions, employment rate, resistance to change, error percentage, quality of decision and lots of other variables that can form the final answer for the research question and decide whether the theory made was correct or should be defeated.

Variables are defined as dependent and independent, which are defined by the operational definition of the problem. In order to capture the measure of these variables, there are four levels of variable measurements, which means assigning numbers that help measure efficiently, which are distinguished based on the relationship between objects. The measurement of variables will be done using three measurement types (nominal, ordinal and interval) scales to show the effect of independent variables on the management positions and the association and causality level of these variables.

5.3. Reliability and Validity of Variables

Reliability is testing the consistency of the research or its measuring variables, while validity refers to the accuracy of measurement applied to the variables.

There are different tests for reliability that determine if the research variables are reliable. According to the definition of reliability, the research is reliable depending on previous studies and also the changing attitudes of people included in the research with time. Having reliable variables indicate the validity of the variables, although few assessments test the validity and reliability of variables, the level of ability to obtain accurate results is the primary determinant of test validity. Based on the validity tests; it can prove that the research variables are valid enough. Although the content validity is not very high, the face validity and content validity are fair enough to ensure that the variables are valid and reliable. The research has criterion and high construct validity also as it can open eyes for a lot of research questions and predictions in the future regarding the managerial decision-making process and the impact of AI systems on it.

Referring to these two definitions; the variables that will be tested in this research seem to be directly correlated to the question and can genuinely help answer the research question and give an accurate explanation for all the factors that are related to the advancement of AI and its effect on the managerial decision-making process.

5.4. Data Collection Methods

For any research, without indicating a precise method for collecting data, the research will be inaccurate, and the researcher will not be able to build any findings or conclusions. Based on this fact, the research methods and techniques that will be used is the quantitative research method by building a structured survey and interviews.

The interviews were conducted in person or over the phone or using the computer as it is intended to interview executives and senior managers, and their time is limited. Questions are in the form of a focused, structured interview that can save more time and obtain better results along with a quantitative structured online survey for managers and staff working in companies applying AI systems in different countries.

The survey was a structured online-based questionnaire on a random stratified sample of executives and staff of companies applying AI systems in different countries. The questions are short, clear, structured, direct, and focused on obtaining the best quantitative data that can be compared to data collected from interviews and reach the best answer to the research solution. Moreover, it can reduce costs and improve the quality and accuracy of data collected as there will be no duplications or omission of data.

The research methods cannot be applied without choosing the right sample because it would be impossible to test the whole population or finding all executives and managers across the Gulf countries so choosing a sample that represents the whole population of managers. The sampling frame consists of senior managers and executives, or they can be grouped under the name of decision-makers and AI systems company staff. The sample will include companies that use AI systems in different countries and focusing on sectors that use AI systems the most depending on the results of Infosys report. (see figures in appendix)

The questions of the online survey are structured, direct, and focused on studying the impact of AI systems on managerial positions and the level of AI advancement in making successful managerial decisions so far. The questions start by a simple question such as the gender, position, years of experience, level of AI systems involvement, the trustworthiness of these systems, ability of the robots to replace humans in the manager’s opinion. The questions are closed-ended, short, clear, and focused on providing accuracy and easiness in the analysis.

As for interviews, around 15 senior managers were interviewed to make a clear objective understanding of the problem and give the feedback to rectify the questionnaire and compare the results that can finally answer the research question. Questions are short around ten questions, direct, focused, and clear to avoid any ambiguity or misunderstanding; open-ended questions will give them valuable qualitative feedback of the people who are involved the most of these systems.

There are two sources of data of this research; first source is the secondary sources that were collected from previous studies and reports that helped in conducting a research question and put the research on the right track. The second source is the primary sources that are collected mainly for this research, and they include the interview and survey conducted to collect specific data that answer the research question. Secondary data might not be specifically related to the research, but they might give some clarification about the right method of collecting primary data while the primary is the real observations collected by the researcher.

Interviews were conducted through email or face-to-face if applicable. Short, focused and clear open-ended questions will be asked, and data will be collected and analyzed to give an idea about quantitative findings by survey, and an online survey conducted through monkeysurvey.com will follow them, 16 short questions are designed and sent as the following link to the selected sample and data were collected and analyzed. (https://www.surveymonkey.com/r/39WVJWY). The survey sample will be shown in the appendix page.

The questions of the interview are:

1. How many years have you been working in this company?
   [Most managers explained that they are working as managers for more than 10-20 years].
2. How hard is it to make accurate management decisions? Is experience necessary or just analysis of data?
   [According to the interviews; Experience is always an extra but sometimes following to the right, and accurate details will lead to making the right decision]
3. Did AI systems help in making decisions making the process more manageable? More accurate? Alternatively, the opposite has happened?
   [All of the managers were interviewed assured the critical rule of AI systems in helping them make the decision process easier]
4. Do you believe that the next generation of management will be managed by robots or humans will always be needed?
   [some managers, especially in the information technology sector, thought that it would be possible to be happening but other sectors, managers see this step far from happening]
5. What kind of impact will this development have on employment?
   [Managers were confident that this step will increase the turnover and will increase the unemployment rate of managers, they could not imagine what roles are held for them in the future if this step happened]
6. How can AI systems involvement in management affect organizational behavior?
   [The majority thought of resistance to this change, disobeying behavior might occur, and different code of ethics and reporting criteria will be set]
7. If AI systems need advancement in the field of making decisions, are you willing to help tech experts make these advancements?
   [the majority felt happy to help]

8. Do you think employees are willing to take orders or decisions from a robot superior? [Some of them thought this would be so hard and some thought this is possible]

Answers to these questions will give a descriptive finding of the managers' perception of this problem that will be compared to the numeric findings of the survey to make the final statement.

5.5. Findings and Results

Results show that robots can still fail in replacing humans in making decisions in management. Because up till this point the technological advancement was unable to produce an AI system that can decide on a sudden event in a business especially if these systems were not trained to solve such issues or they lack some data and this where the human manager's experience become needed. Moreover, if technology can design such a machine learning system, then the cost will be very high for some companies to adapt moreover; humans maybe still not ready to be replaced by robots. The problem is that these systems can analyze data and make decisions, but they cannot understand the real significance of these data. Moreover, it can predict their behavior sometimes or can predict the errors, or those systems may fail suddenly, and they need troubleshooting or some updates to the algorithms to upgrade its performance. Those sudden failing in these systems can delay the process of replacing humans entirely by AI systems.

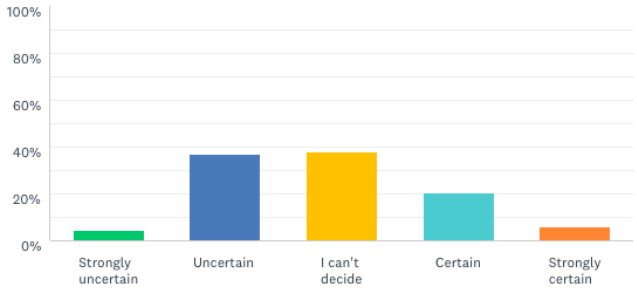
Based on the interviews that were acquired, managers clearly stated that AI systems had been a great help tool in the decision-making process, but they do not see it as a replaceable for them shortly or even beyond that. They explained this by the limited ability of these systems to handle such a decision in cases of unexpected and emergent events that need experience and gut of humans. Decision-makers were confident that their experience and human abilities still protect their places, and if they got replaced, the percentage of turnover would be higher because most probably employers will refuse the management of Robots.

To support these results with numbers, a survey distributed randomly, and 203 respondents have participated in it from two genders working in different positions. Around %45 of respondents indicated a moderate level of AI systems involved in their business. Moreover, more than 80% assured that these systems improved the quality and efficiency of the decisions made but when the questions came to see how much they are willing to be managed by robot they confirmed the managers responds in interviews and revealed their uncertainty feeling toward such situation almost 30% felt uncertain, and 43% couldn't decide. Survey results showed that up to 48% AI systems could make a sufficient decision in management but still, they are not willing to be managed by robots and they think it will affect the employment rate and increase turnover by 43% and dissatisfaction level by 32%. In questions

regarding trusting the decisions made entirely by these systems almost 39% were confident of these decisions, but 29% could not feel very particular about it which indicates a substantial percentage that still questions such decisions. Some of the results are shown in the figures below.

The survey results combined with the answers from managers in interviews can conclude that AI systems can surely help improve decisions making process but neither business industries nor employers are ready to have a robot manager and as managers declared; they cannot make decisions that need experience or intuition. So up to this point; technology might be ready to serve such a change but humans are not ready so maybe in the future if tech experts came up with an AI system that can convince people to work under robot managers and change their mind probably this study can be done again and see how the results might be.

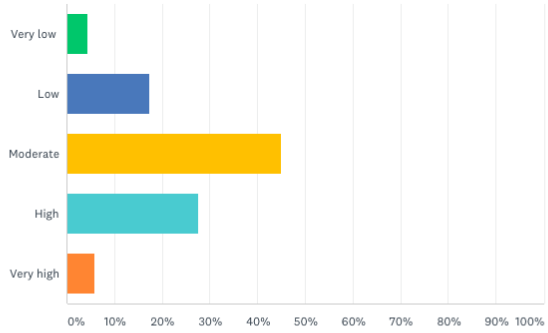
Results of Surveying Decision-Makers:



QUIZ STATISTICS			
Percent Correct 0%	Average Score 3.0/15.0 (20%)	Standard Deviation 1.24	Difficulty 1/14

ANSWER CHOICES	SCORE	RESPONSES
Strongly uncertain	1/15	4.41%
Uncertain	2/15	36.76%
I can't decide	3/15	38.24%
Certain	4/15	20.59%
Strongly certain	5/15	5.88%

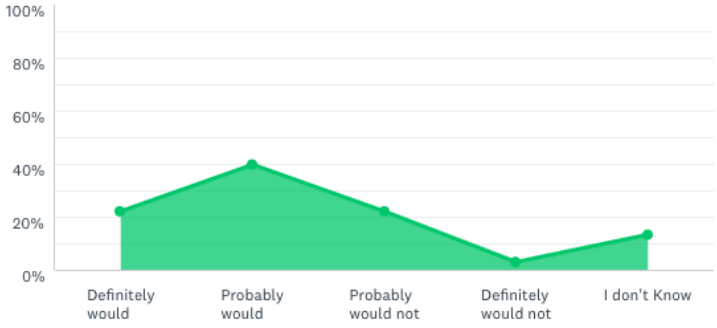
Figure 1: Certainty Level of Decisions Made By AI Systems



QUIZ STATISTICS			
Percent Correct 6%	Average Score 3.1/5.0 (63%)	Standard Deviation 0.92	Difficulty 5/14

ANSWER CHOICES	SCORE	RESPONSES
Very low	1/5	4.35%
Low	2/5	17.39%
Moderate	3/5	44.93%
High	4/5	27.54%
✓ Very high	5/5	5.80%

Figure 2: Ability of AI Systems to Make Accurate Decisions



QUIZ STATISTICS			
Percent Correct 22%	Average Score 3.5/5.0 (71%)	Standard Deviation 1.25	Difficulty 9/14

ANSWER CHOICES	SCORE	RESPONSES
✓ Definitely would	5/5	22.06%
Probably would	4/5	39.71%
Probably would not	3/5	22.06%
Definitely would not	2/5	2.94%
I don't Know	1/5	13.24%

Figure 3: Effect of Replacing Human Managers With AI Systems On Turnover

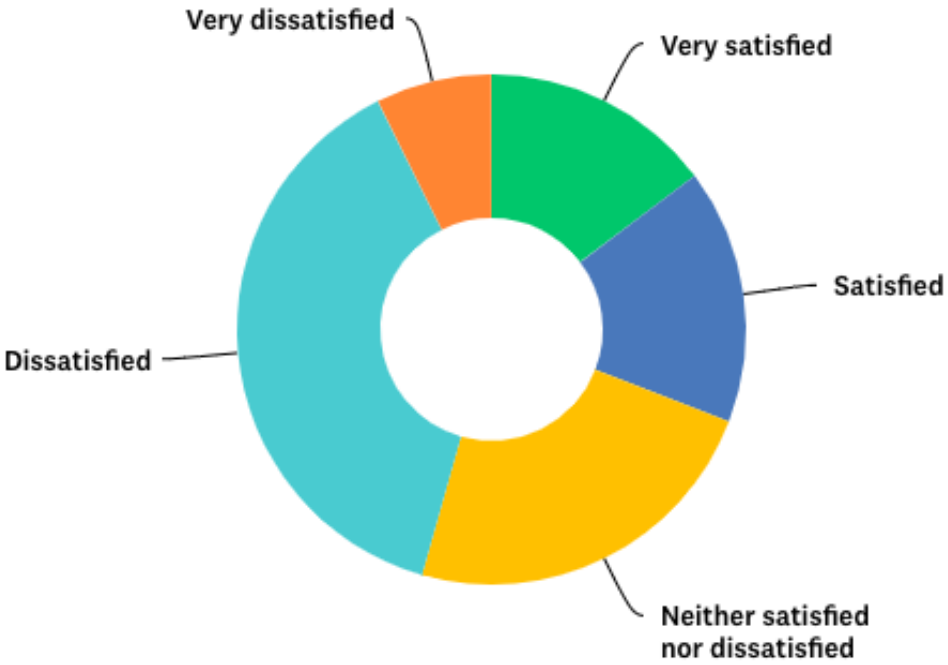
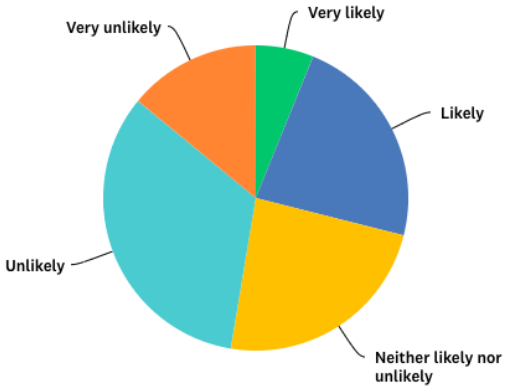


Figure 4: Satisfaction Level Under The Management of Robots

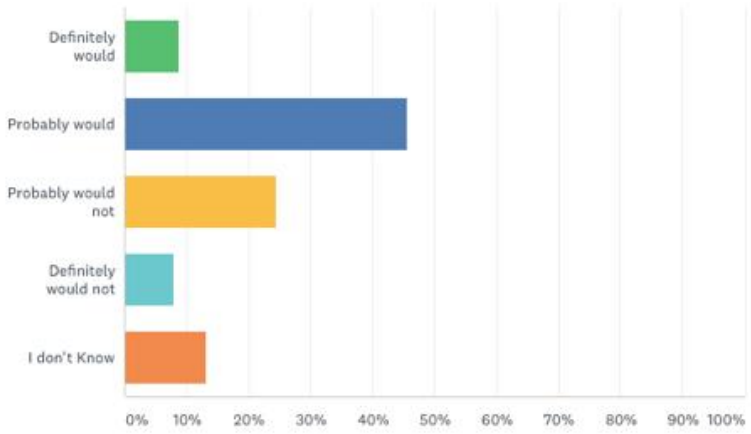
For Normal Staff or Engineers (Non-Decision Makers):



QUIZ STATISTICS			
Percent Correct 14%	Average Score 3.3/5.0 (65%)	Standard Deviation 1.14	Difficulty 6/14

ANSWER CHOICES	SCORE	RESPONSES
Very likely	1/5	6.14%
Likely	2/5	22.81%
Neither likely nor unlikely	3/5	23.68%
Unlikely	4/5	33.33%
✓ Very unlikely	5/5	14.04%

Figure 5: Probability of AI Systems Replacing Human Managers



QUIZ STATISTICS

Percent Correct	Average Score	Standard Deviation	Difficulty
9%	3.3/5.0 (66%)	1.16	9/14

ANSWER CHOICES	SCORE	RESPONSES
✓ Definitely would	5/5	8.77%
Probably would	4/5	45.61%
Probably would not	3/5	24.56%
Definitely would not	2/5	7.89%
I don't Know	1/5	13.16%

Figure 6: Effect on Turnover

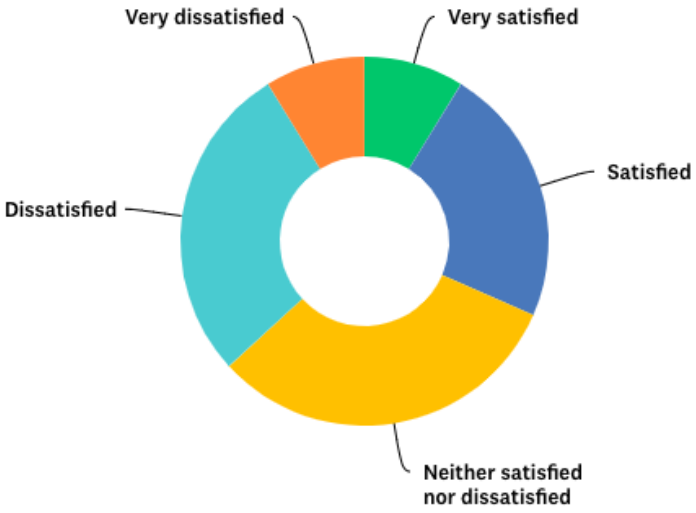
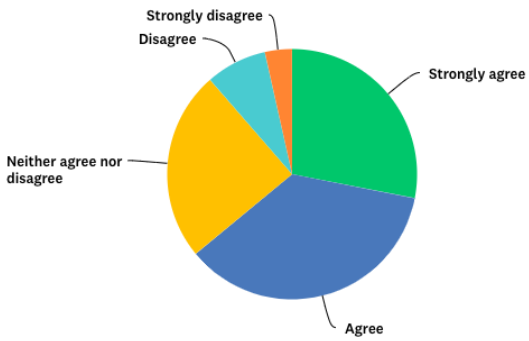


Figure 7: Satisfaction Level Under AI Systems Management



QUIZ STATISTICS			
Percent Correct 28%	Average Score 3.8/5.0 (75%)	Standard Deviation 1.06	Difficulty 10/14

ANSWER CHOICES	SCORE	RESPONSES
✓ Strongly agree	5/5	28.07%
Agree	4/5	35.96%
Neither agree nor disagree	3/5	24.56%
Disagree	2/5	7.89%
Strongly disagree	1/5	3.51%

Figure 8: Acceptance to Technology Replacing Human Managers

CONCLUSION AND FUTURE PREDICTIONS

Based on the previous studies and articles and the findings of this research, the hypotheses are approved, and the theory is set to be accepted. The answer to the research question will be that AI systems' involvement in managerial decision making process will definitely increase the quality, accuracy and efficiency of the decision made by human managers, but will not lead to full replacement of managers at least in some managerial positions that will always need human experience and hunch in making successful decisions that don't depend on data only but on conscious and emotions also.

There are, of course, some industries and sectors where AI systems can fully replace humans, and by this, the whole environment of the business will be changed, the economy and the quality of the business. However, this case will open an eye into a new business needs and market vacancies that were not existing before. Because tech advancement is continuous; some industries might replace the whole business environment to an automated system and thus will undoubtedly impact the business environment and will introduce new codes of ethics for business.

One of the significant factors that might delay the process of replacing human managers in the change comes off the resistance of the human to accept the fact that robots or automation systems will surpass human abilities and intelligent in making successful decisions. Human nature always refuses change and people feel intimidated by everything new and knowing that there might exist a system that can do what humans do and take away their jobs is going to make human managers feel threaten by this technological development.

The findings of the research give the tech experts, the weak points of AI systems that they can work on to develop these systems in the future. Because based on what managers and staff are working closely with these systems, it can be known precisely the difficulties they are facing, the more critical tasks they need these systems to do and how to increase the efficiency of these systems.

This research will open new eyes into more research topics and questions for investigation. The first and most important question to be asked is if those systems were able to replace humans in the future, who will be monitoring them? As we know, any system needs monitoring and ongoing maintenance to make sure that it is performing its job successfully. Tech experts or IT specialists can make sure that those systems are functioning correctly, but how do we know that these decisions are trustworthy? These questions can perform the next research topic for researchers who are interested in this topic and investigate its effect on jobs and what are the new jobs that will be created or jobs that will disappear. Moreover, the cost of replacing managers with these systems on business compared to the increased profit and work efficiency. All these factors can be investigated carefully and make a better case study on this topic.

Another fact that has to be studied is the level of income and the economy standard as a natural outcome of AI systems development and its ability to perform jobs instead of a human. This will decrease the income level of the managers and affect the economy in increasing productivity, efficiency, and profit of these companies compared to the cost needed on paying salaries for human managers. The only expense for taking care of these systems will be raised, and ongoing monitoring by tech specialists and thus will create new job opportunities in the business industry. A future study can be made to explore the job opportunities that will be created and the jobs that will be disappearing due to this technological advancement of AI systems. The most important question to be asked next is; if robots were able to achieve consciousness such as humans, what will make humans unique or special?

What makes us different from any creature is that we have consciousness and we can think and use our memories, expertise and emotional factors along with logic to make decisions in business and even those qualities cannot be found in all humans at the same level. So, if the technology was able to create a system that can mitigate all these capabilities and qualities of humans then all businesses can be run by robots and AI systems, and there will be nothing unusual in the human race, and this might be.

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Appendix A

- The following graphs have been taken from Infosys Report of 2018 and been used as secondary data in the research. They represent the industries deal will AI systems the most.

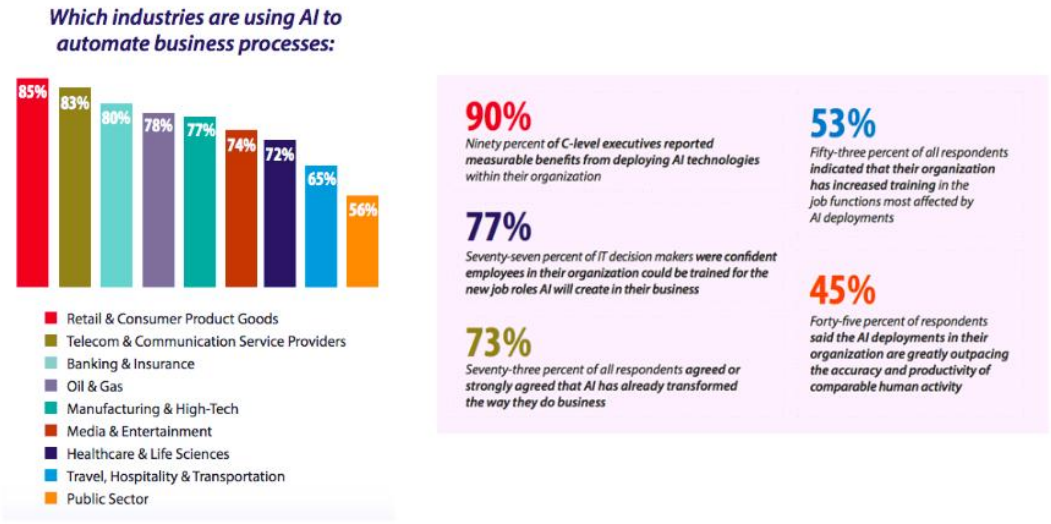

Figure 9: Graphs from Infosys Report of 2018
(https://www.infosys.com/age-of-ai/Documents/age-of-ai-infosys-research-report.pdf)

Appendix B

The following will show the survey questions

1. What is your gender?
    - Male
    - Female
    - Prefer not to declare
2. What is your position in the company?
    - Senior Executive
    - Staff member
    - Project manager
    - Chief executive
    - Engineer
    - Other, please specify.
3. How many years of experience do you have?
    - 0-4 years.
    - 5-10 years.
    - 11-15 years.
    - 16-20 years.
    - More than 20 years.
4. Kindly, indicate the level of AI systems involved in the company's managerial operations.

- Very Low
- Low
- Moderate
- High
- Very high

5. Do you think AI systems have increased the quality of the decision-making process?
   - Yes
   - No
6. Do you think AI systems have increased the efficiency of the decision-making process?
   - Yes
   - No
   -
7. How do you feel toward a managerial decision entirely taken by an AI system, not a human manager?
   - Strongly uncertain
   - Uncertain
   - Cannot decide
   - Certain
   - Strongly certain
8. In your opinion, up to what level AI systems can make decisions in management?
   - Very Low
   - Low
   - Moderate
   - High
   - Very high
9. Do you think robots will be replacing managers in the future?
   - Very likely
   - Likely
   - Neither likely nor unlikely
   - Unlikely
   - Very unlikely
10. What is the level of professional training needed to handle AI systems in the management level?
    - Extremely professional
    - Very professional
    - Somewhat professional
    - Not so professional
    - Not at all professional
11. How well do you think the environment can recover on its own from problems caused by humans if they were replaced by robots?
    - Extremely well
    - Very well
    - Somewhat well
    - Not so well
    - Not at all well
12. As a manager, how much AI systems helped you in making efficient decisions?
    - Extremely helpful
    - Very helpful
    - Somewhat helpful
    - Not very helpful
    - Not helpful at all
13. How can AI systems involvement in Management affect turn over?
    - Definitely would
    - Probably would
    - Probably wouldn't
    - Definitely wouldn't
    - I do not know

14. Decision made by AI systems is more trustworthy than those by human managers.
    - Strongly Agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
15. Technology can never replace human managers with robots because actions taken by humans are more real.
    - Strongly Agree
    - Agree
    - Neither agree nor disagree
    - Disagree
    - Strongly disagree
16. If you were working under the management of a robot; how would you rate your satisfaction level?
    - Very satisfied
    - Satisfied
    - Neither satisfied nor dissatisfied
    - Dissatisfied
    - Very dissatisfied