A Study on Artificial Intelligence And Risk Management

دراسة حول الذكاء الإصطناعي وإدارة المخاطر

by

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ABSTRACT

This paper has focused on the topic "**ARTIFICIAL INTELLIGENCE AND RISK MANAGEMENT"**. The aim of this paper was to develop an understanding of artificial intelligence along with exploring the relation between AI and risk management. In this paper, the researcher has focused on analyzing the effects and challenges of artificial intelligence as experienced by companies and government. In order to conduct this study, the researcher has followed primary qualitative data analysis and secondary thematic analysis method. In the primary data collection method, the researcher has interviewed senior level employees of leading organization including the members of research department of DEWA and risk analytics department of IBM. It has been observed that most of participants have positive attitude towards artificial intelligence. Majority of respondents believed that artificial intelligence can enhance the capabilities of risk management framework in an organization.

In the secondary thematic analysis, the researcher has analyzed the findings of scholars and journals. Majority of researchers in this domain believe that artificial intelligence can help in minimizing risk of the business organization and government organization. However, several researchers have argued that current artificial intelligence system is not enough matured, it requires target research and development for improving their efficiency. It has been observed that rate of error produced by artificial intelligence system has reduced steadily during the last ten years. However, it is efficiency that remains is questionable. It has been found that the average productivity of the developed nation has not increased with respect to increase in the efficiency of artificial intelligence. In this paper the researcher has made recommendation regarding the use of open-source software, Cognitive Analytics and the Implementation of cognitive computing for data modeling. The open sources model can help in dealing with operational risk at the workplace. In addition to this, application of cognitive analytics could also help in dealing with financial risk in the business.

ملخص

تركز هذه الورقة على موضوع "الذكاء الاصطناعي وإدارة المخاطر". تهدف هذه الورقة إلى تطوير فهم الذكاء الاصطناعي من جانب، ومن الجانب الثاني استكشاف العلاقة بين الذكاء الاصطناعي وإدارة المخاطر. في هذه الورقة ، ركز الباحث على تحليل تأثيرات وتحديات الذكاء الاصطناعي في الشركات والجهات الحكومية. اتبع الباحث، عند إجراءه هذه الدراسة، طريقة التحليل النوعي للبيانات الأولية، ثم طريقة التحليل الموضوعي الثانوي. إعتمد الباحث في طريقة جمع البيانات الأولية أجراء مقابلات مع موظفين رفيعي المستوى في هيئة رائدة بما فيهم أعضاء قسم الأبحاث في هيئة كهرباء ومياه دبي، وإدارة تحليلات المخاطر في شركة آي بي إم. وقد لوحظ أن معظم المشاركين في المقابلات لديهم موقف إيجابي تجاه الذكاء الاصطناعي. يعتقد معظم الاشخاص الذين أجريت معهم المقابلة، أنه بإمكان الذكاء الاصطناعي تعزز الإماكانات الخاصة بإطار عمل إدارة المخاطر في الهيئة. أما في التحليل الموضوعي الثانوي، أجرى الباحث تحليل للنتائج التي توصل لها العلماء والمجلات. حيث يعتقد أغلب الباحثون في هذا المجال أن الذكاء الاصطناعي يمكن أن يساعد في التقليل من مخاطر تنظيم الأعمال التجارية والتنظيم الحكومي. ومع ذلك، فقد جادل العديد من الباحثين بأن نظام الذكاء الاصطناعي الحالي غير كافٍ تماماً، ويتطلب البحث والتطوير المستهدف من أجل تحسين كفاءة هذه الأنظمة. من الملاحظ أن معدل الخطأ الناتج عن نظام الذكاء الاصطناعي حقق انخفض بوتيرة ثابتة خلال العشر سنوات الماضي، إلا أن كفاءة نظام الذكاء الاصطناعي تظل هي موضع الشك. وجد أن هناك عدم إرتفاع في متوسط إنتاجية الدولة المتقدمة فيما يخص زيادة كفاءة الذكاء الاصطناعي. قدم الباحث في هذه الورقة توصية بشأن استخدام البرامج مفتوحة المصدر والتحليلات المعرفية وتنفيذ الحوسبة الإدراكية الخاصة بقولبة البيانات. يمكن أن يساعد نموذج المصادر المفتوحة في التعامل مع المخاطر التشغيلية في مكان العمل. بالإضافة إلى ذلك ، يمكن أن يساعد تطبيق التحليلات المعرفية أيضًا في التعامل مع المخاطر المالية في مجال الأعمال.

ACKNOWLEDGEMENT

It provides me immense pleasure to present my dissertation entitled as "**ARTIFICIAL INTELLIGENCE AND RISK MANAGEMENT**". This topic of research has helped me to gather immense knowledge about artificial intelligence as well as risk management within the organizations.

I wish to extend most sincere gratitude for those who have helped me to lead this research work towards a reality. Firstly, I thank those who have helped me to gather data throughout the research. I would like to like to present heartiest thanks towards my professors who have helped me to understand this topic and have also helped me to land into a conclusion in this study. I would also like to thank my fellow mates as well as friends who provided me with enough assistance to reach a definite goal. I acknowledge support of batch mates, supervisors as well as professors for this study and I declare to be solely responsible for shortcomings of this research.

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CHAPTER 1 INTRODUCTION

1.0 Introduction

Artificial intelligence, also known as machine intelligence, is a human technological creation that has not only changed the life of human but also improved technological era in modern context. Artificial intelligence basically, is a technology of science that works like humans. Businesses in modern era have developed dramatically with the advancement of technologies. Although, artificial intelligence has developed ways for doing business along with improving organizational practices, it has lead to become a matter of concern for companies to maintain risk related to it. With the advancement of technology, risk management has become an important aspect for business to maintain their organizational procedures and privacy. Growing technological advancements has lead to increase in cyber crimes as well.

In order to understand the importance of artificial intelligence and management of risk, this dissertation has focused on relationship between artificial intelligence and risk management. The study provides an analysis of challenges faced by government and organization in implementing artificial intelligence. In addition, ways, AI has effectively fulfilled the needs of organizational process is discussed in this paper. Moreover, this paper has carried out an investigation on analyzing the opportunities of AI in developing organizational performance.

1.1 Background of the study

AI has considered to an effective tool for decades in context to search algorithms, integrating statistical analysis, machine learning algorithm and others. Introduction of artificial intelligence has lead to maximize the chances of success and goal fulfillment by organizations. In addition, it has proven to be an effective function that works like human mind. As mentioned by Chen *et al.* (2015), with the implementation of AI in every field, problem solving has become easier and faster. Nowadays, AI has taken over the role of human in each field to great extent. Moreover, tremendous use of AI has also lead to

develop security factor for businesses. From small to multinational business, utilization of computers has become a common place for businesses.

In context to the opinion of Papadaki *et al.* (2014), implementation of machine intelligence has expanded the growth of maintenance of information security as well. Previous research studies proves that maintaining security in communication process, business networking have become a target of susceptible attack. This has lead to develop various business threats based on security maintenance. As mentioned by Shoham (2014), management of security process in modern context is the most important factor in maintaining business safety. In addition, a country's management process, government data, business process all are dependent on machine intelligence.

In order to maintain the entire network and system, effective security and risk management tools is been utilized. This developed an interest in the field of management of the risk related to AI by companies and government. From previous studies, it can be identified that implementation of technologies has lead to develop various others factors of risk management, privacy policy in order to maintain data security. In this context, present study focuses on determining the risk management processes implemented by companies and government in order to maintain privacy and data security. In addition, this study shed lights on the challenges faced by companies while implementing AI in business process.

1.2 Rationale of the Research

Management of risk is an essential part of business process in order to maintain business efficacy. In this context, various security and risk management tools and technologies are implemented by business to retain data security and privacy. As asserted by Wu *et al.* (2014), advancement in the technologies has lead to influence business performance. This has lead to increase in business efficacy as well. As mentioned by Ziuziański *et al.* (2014), businesses adopt various techniques and strategies for maximizing their profitability and reducing risk related to business loss. Among these, implementation of technological advancement is one of the tools adopted by business in developing business process and performance. According to Zang *et al.* (2015), implementation of machine intelligence in

business process has lead to improve organisational performance. However, with the implementation of technological advances, the issue lies in management of risk for business process. Negligence of risk management associated with implementation of the artificial intelligence might affect the performance in negative way.

Companies failing to manage risk face problems based on data security and privacy. As opined by Raza & Khosravi (2015), adaptation to advancement also requires analysis of the risk factors associated with it. Analysis of the risk associated with the implementation enables to reduce the risk of business loss. In context to modern technologies and business process, risk related to IT security, data security and privacy has become a matter of concern for business. In order to avoid risk related to this, business need to adopt effective risk management strategies that can help in enhancing business process along with avoiding business loss. As mentioned by Maleki & Askarzadeh (2014), most of the companies lack effective decision-making process, which leads to lack of risk accountability. However, of risk assessment requires effective management strategies by business in order to reduce business loss.

From previous research studies and arguments, it is evident that effective risk management strategies need to be incorporated by business process in order to avoid susceptible attacks (Quarchome.org, 2017). In context to this, this paper sheds light on various aspects of using artificial intelligence and risk management. This paper focuses on the challenges faced by companies and government while incorporating artificial intelligence in process.

1.3 Research Aim

This paper is aimed to develop an understanding of artificial intelligence along with exploring the relation between AI and risk management. This paper focuses on analyzing the effects and challenges of artificial intelligence as experienced by companies and government.

1.4 Objective of the Research

Based on the aim of the research study, following are the research objective of the study

1.   To identify the risks and opportunities based on artificial intelligence
2.   To critically analyze the effectiveness and challenges of artificial intelligence
3.   To examine the effects of artificial intelligence on company or government process
4.   To recommend strategies based on improving artificial intelligence for companies and government in increasing performance and avoiding risks related to it.

1.5 Research   Questions

1.   What is the relation between artificial intelligence and management of risk associated with it?
2.   What are the benefits of implementing artificial intelligence?
3.   What is the necessity of artificial intelligence in companies and government?
4.   What are the challenges faced by companies and government while implementing artificial intelligence?
5.   What is the impact of artificial intelligence on performance and productivity of company and government?

1.6 Motivation and feasibility of the dissertation

Use of AI has lead to develop modern lifestyle, leading to make life easier. Whether it is business, related process, of daily household activities, use of AI has changed the lifestyle of an individual. Moreover, it has proven to be an effective technological advancement. However, development in the technologies and enables to manage risk associated with it (Quarchome.org, 2017). In this context, risk management seems to be an important aspect for business in order to maintain privacy and data security in business process. In fact, every business process, companies are following effective risk management strategies for reducing technological and other risk related to business process. As mentioned by Papadaki *et al.* (2014), effective risk management strategies lead to enhance business efficacy. In this context, every business in modern context successfully implements technological aspects for improving their business process. Hence, it can be identified that implementation of AI and risk management has become a concerning topic for the research work. In addition, relation between AI and risk management in business process has become a striking point for the study.

Relation between AI and risk management along with challenges faced by government in implementing AI motivates to explore more regarding various strategies used by companies and government in risk management. As mentioned by Pedrycz & Chen (2015), implementing effective strategies based on risk management in an organization leads to identification of the susceptible attacks. However, identification of the threats prior to the attack enables to develop strategies for further improvement. As asserted by Dunis *et al.* (2016), effective network design development by business helps in maintaining secure network for business process. This prohibits data loss along with maintaining privacy of data. In addition, it avoids data to get into wrong hands. However, advancement of technology in business has led to implement technologies that enhance business process. In context to the opinion of Lin (2017), increase in AI for every modern process has led to develop the lifestyle of an individual to great extent. This motivated the researcher to explore more regarding the benefits of artificial intelligence. In addition, ways government, companies can improve their performance with successful implementation of AI and avoid

risk related to it. Moreover, use of AI is a boon or a curse for the modern era has developed a curiosity within the research to explore more regarding this topic. In addition, ways companies manage to retain an effective secure network in business process has motivated researcher to work on this topic.

1.7 Problem statement

This research is aimed to shed light on the challenges faced by organizations, government in implementation of artificial intelligence. In addition, ways risk management processes can be effectively implemented in organization while using artificial intelligence for business process. In precise, artificial intelligence has covered a vast area of organizational processes. It has removed the needs for business management for smooth functioning of organizational processes and made the process more structured and organized. Moreover, implementation of artificial intelligence for business management and working process in less time has increased the risk factors somehow.

It has become an important aspect of business to manage risk related to organizational process. However, risk management based on artificial intelligence is an important factor that modern business process is more concerned. In addition, increasing use of machine intelligence in every field has increased the risk related to data management and privacy as well. However, it is necessary for business to identify the risk related to the use of technology and challenges faced in handling or accessing the technology in business. Moreover, determination of the strategies in risk management and minimization of the problems is also a matter of concern.

1.8 Significance of the research

Based on the increasing use and technological development of artificial intelligence, this research has focused on providing concept of artificial intelligence and risk management. The current focus of the research is to analyze the impact of artificial intelligence on companies and government. In addition, ways it companies use strategies for management of the risk is the focus of the research paper. Moreover, this research study has focused on providing a critical assessment of relation between artificial intelligence and risk management in companies and by government for maintaining security of confidential of a nation.

Ways business adopts strategies for successful assessment of the risk along with its management is being focused in this research paper. This research has provided information on impact of artificial intelligence in modern context of business. In this context, this paper aims at recommending strategies for business for improving management of risk factors that can help in enhancing business efficacy. This information of the research paper can be further utilized for businesses in developing strategies for risk management and implementation of artificial intelligence accordingly.

1.9 Structure of dissertation

Chapter 1: The first chapter of the dissertation focuses on providing an overview of the research paper along with analysis of purpose of the study.

Chapter 2: Second chapter focuses on the literature review of artificial intelligence and ways companies manage risk factors in business process.

Chapter 3: Third chapter is based on methodology that researcher has applied for approaching the right process in order to conduct the research work in an effective manner.

Chapter 4: Fourth chapter of the dissertation provides analysis of the data collected and findings from research study.

Chapter 5: Last chapter comprises of dissertation conclusion. In addition, recommendations based on findings from the study are discussed in this chapter.

Chapter 1: Introduction
Chapter 2: Literature Review
Chapter 3: Research Methodology
Chapter 4: Data Analysis and Findings
Chapter 5: Conclusion and Recommendation

Figure 1.1: Structure of the dissertation

(Source: Created by Author)

1.10 Summary

As an introductory chapter, this chapter deals with providing an overview of the necessity and purpose of the study. Based on the analysis of the purpose of the study, researcher has focused on analyzing the problem statement in implementing artificial intelligence. In addition, this chapter provides a rationale for the study for justifying the research study purpose. Based on this, this chapter represents the research aim, questions, and objective for setting direction for conducting the research study.

CHAPTER 2- LITERATURE REVIEW

2.1 Introduction

Artificial intelligence has covered a vast area of human life as well as organizational process. The process has become popular in less time due to its extreme efficiency and accuracy. As discussed earlier, technology is growing rapidly and with the introduction of Internet, the combination has covered a large sector of business. Even national government is relied on artificial intelligence for maintaining nation's confidential information and working process. The use of artificial intelligence has increased with the popularity of internet since 2000s. In context to modern world, capability of performing various tasks has exponentially increased.

In this context, this chapter deals with understanding of the concept of artificial intelligence. With the analysis of this, this chapter provides an assessment over relationship between artificial intelligence and risk management. In addition, need of artificial intelligence by government and in companies is focus in this chapter. Moreover, this chapter provides an overview of the theories and models related to risk management in an organization that can help business to enhance business process and functions. However, this chapter of the dissertation has focused on providing an analysis of artificial intelligence from both positive and negative side.

2.2 Conceptual Framework
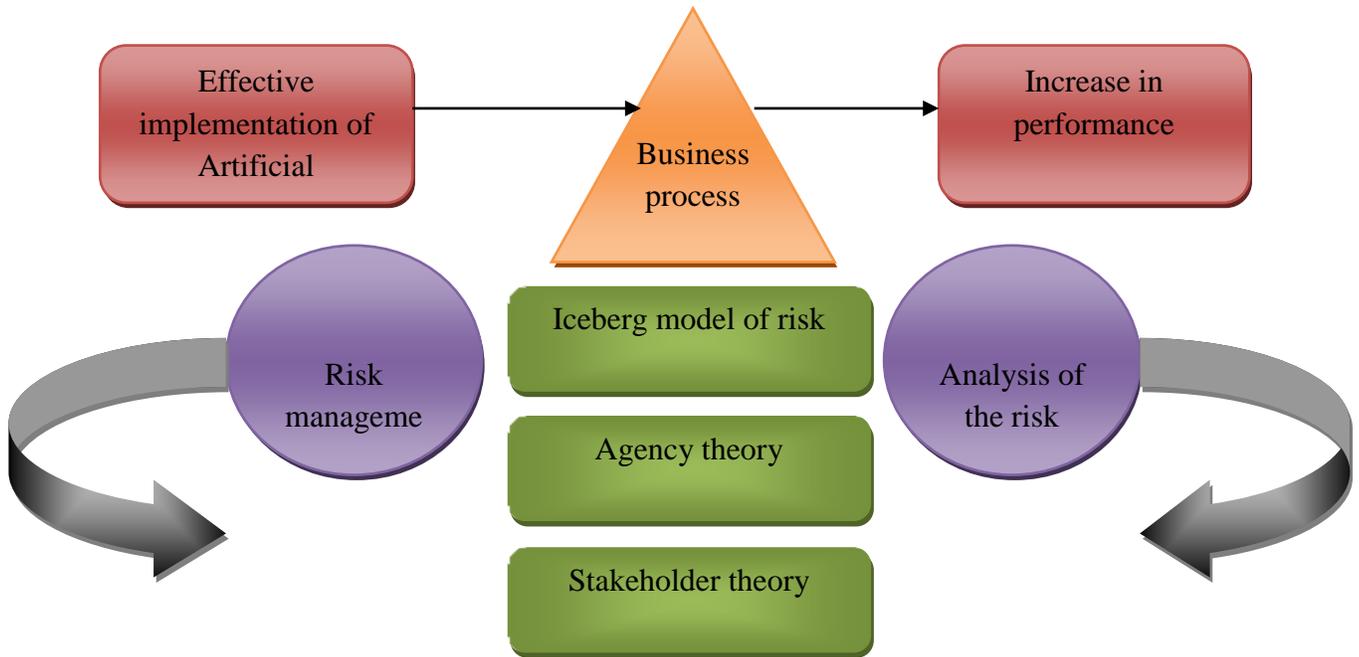
Figure 2.1: Conceptual framework

(Source: Created by Author)

2.3 Gap in the literature

Researcher has successfully assessed research work and studies done by previous researchers for developing a strong understanding of the fact in relation to the topic chosen. After identifying of previous studies, it was observed that most of the studies focused on providing an understanding of importance of artificial intelligence in business process. From previous studies, it was analyzed that artificial intelligence is considered boon for businesses in performing various task. Since invention of machines and computers, the process of maintaining business and structured process has grown exponentially. This provided an analysis of extreme utilization of artificial intelligence by

companies but somehow restricted analysis of the risk based on management process in reference with artificial intelligence.

Further, it was analyzed that previous studies focused on analyzing the effectiveness of computer systems in terms of their increasing speed, working domain and other such facilities. Effectiveness of artificial intelligence in context to modern world somehow restricted to explain risk management factors that business uses for assuring data security and other business processes. However, only the analysis of factors of artificial intelligence and its effectiveness in business process is not sufficient. Development of artificial intelligence was introduced with an intention of reducing working pressure of humans along with increasing working efficiency. However, increasing development in technologies and business processes has to lead to increasing the problems of cyber risk and other risks. In this context, previous research studies have focused on analysis of the use of computer systems or machines and risk related to it. Based on the analysis of the risk related to artificial intelligence in business process, previous research works provided analysis of the risk factors associated with machines.

In addition, it was identified that previous studies focused on providing an analysis of advantages and disadvantages of using artificial intelligence. This somehow restricted the research studies to focus on the relation between artificial intelligence and risk management. Considerations regarding growing use of computer technology by business, increasing working efficiency, ability to perform multiple tasks at same time, and other such factors were raised as a boon for companies for increasing business efficacy in less time. However, risk management techniques and challenges faced by companies and government for improving business process were somehow unrevealed. Because of gap of previous studies, this research shed lights on relationship between artificial intelligence and risk management and ways it can be improved in order to manage risk issues by companies which previous studies failed to explain.

2.4 Concept of artificial intelligence

Artificial intelligence is nothing but intelligence that is displayed by machines, in contrast to natural intelligence that is displayed by humans. As asserted by Hu *et al.* (2013), machines can often act as humans if they possess abundant knowledge or information related to world. Artificial intelligence has contributed to various fields of science in terms of its diverse working domain. In context of the opinion of Caron *et al.* (2013), branch of computer science is termed as artificial intelligence, which pursues creation of computers, machines such as robots as intelligent as humans do. Artificial intelligence development has to lead to influence business processes in much simpler ways, leading to developing business and other areas.

Artificial intelligence contributions
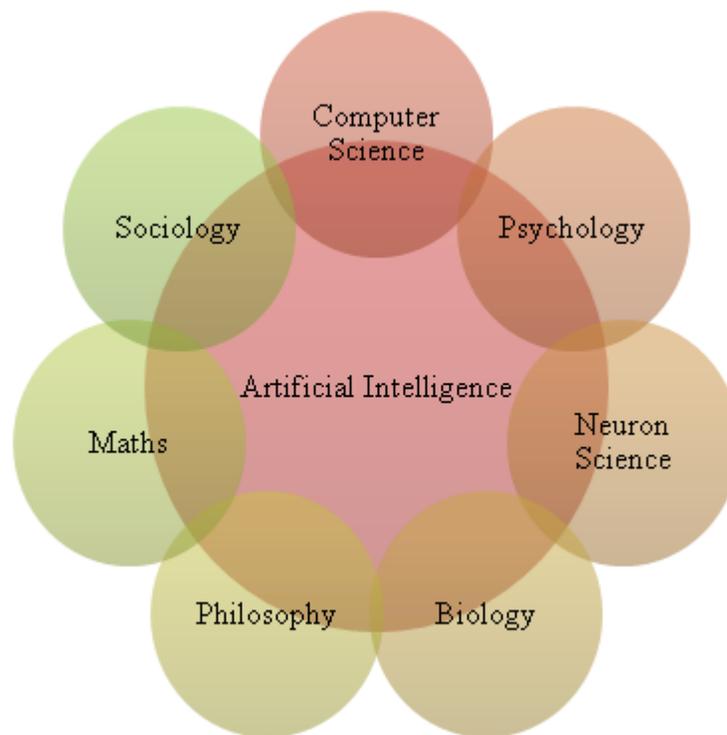
Figure 2.2: Artificial intelligence contributions

(Source: Choi *et al.* 2017, p.51)

The implementation of technology has contributed to every sector of wellbeing, leading to developing human lifestyle along with improving lifestyle. In context of the opinion of Zhao *et al.* (2013), main thrust of artificial intelligence lies in developing computer functions, which are linked with human intelligence such as problem-solving, planning, reasoning, and learning. The technology is designed to perform human activities. However, AI has become an important part of industry and associated with various technological advancements. Businesses, government uses AI for various purposes such as data storing, maintaining data security, developing business faster, for performing multitasking activities at same time and others. As mentioned by Keramitsoglou *et al.* (2013), AI has a great contribution in the field of medical science as well. Advancement of technologies and machines has lead to improving medical science along with introducing management and curing of various diseases that were earlier not possible or very much difficult to cure or maintain. Apart from this, AI has a great contribution to companies. As asserted by Işık *et al*. (2013), business advancement and management have become much easier for handling.

In context to the opinion of Vukšić *et al*. (2014), with the introduction of AI, advances in the field of data mining, multi-agent planning, demonstration through machine learning's, scheduling, translation and other has become easier. Moreover, development of digital computer since 1940s has enabled business to perform tasks such as project management, mathematical theorems, reasoning ability. This is evident that AI has to lead to creating advancement in the field of business, medical, technological and others. However, with the advancement of technology, management of risk has also become an important aspect to maintain. Most interestingly, risk management based on AI is somehow managed but AI itself (Theirm.org, 2017). Hence, this is evident that the intelligence has covered every aspect and requirement of human being.

2.5 Relationship between artificial intelligence and risk management

Innovation poses an increase in risk factors to its users if one does not have knowledge of the innovation implemented. As mentioned by Mohamed *et al*. (2013), there exists various risk related to a particular implementation. One needs to know the implementation of the technology in order to assess the risk factors associated with it. In context to business process, risk of losing market position is the major risk that exists in today's world. In context to the opinion of Wu *et al.* (2013), rapid technological changes and their adoption by business without proper knowledge of the technological advancement creates a major risk for organizational process. The issue lies with the adaptation to the technological growth. Although it is true that idea of computers with replacement of humans, fortunately, has not happened yet on wide scale. However, this has created an importance of understanding the AI technologies by humans in order to retain business efficacy.

In this context, an advanced technological platform has developed a risk factor for companies to great extent. Here lies a major relation between artificial intelligence and risk management by companies. According to Kerzner (2013), companies face a major risk of market failure due to various factors. These include improper knowledge of technology by employees, increasing market competition, rapid shift in technology, maintenance of organizational data privacy, risk of data security and other. In order to manage the risk based on organizational process, it is necessary for companies to implement effective strategies that can help in management of the risk. In context to AI, risk based on data loss, data encryption, and risk in maintaining structured organizational process exists in business process (Debortoli *et al.* 2014). However, in order to manage risk related to business process, analysis of the implementation of effective AI and its handling is required. Failing to manage risk based on business process leads to improper organizational process.

For managing risk, analysis of the risk factors and knowledge of technological advancement is required. Hence, it can be concluded that major relationship between AI and risk management lies in context to modern business process and market failure.

Components of risk management

For management of the risk identified in context to artificial intelligence, it is necessary to identify components of risk management by business. This enables business to develop strategies based on risk management and better organizational performance. These are as follows.

Strategy

In order to manage risk and develop business process, the first and main component for risk management is development of strategy based on the analysis of the risk. As mentioned by Citron & Pasquale (2014), development of strategies is only possible with analysis of the risk.

Objectives

As strategies are developed, it is necessary to develop business objectives in order to bring strategies into function. Development of objective helps business by providing guideline for effective implementation of the strategies.

Process, people, product

As mentioned by Sadgrove (2016), it is necessary to identify the process, people and product or services involved in management of risk. This enables to business to identify management process for effective implementation.

Information

Information is one of the important components in risk management. As observed, knowledge of AI as per the requirement of business develops success factors for AI implementation and management. However, failure of proper information regarding technology leads to develop risk factors for business.

Evaluation, monitoring and investigation

As asserted by Lam (2014), evaluation, monitoring and investigating on the implemented strategy is an important component of risk management. Effective evaluation of the strategies enables identification of further improvements by business. In addition, it helps in assessing the effectiveness of proposed strategy in order to avoid risk.

Action management

Based on the evaluation of the strategy and by proper monitoring of the process, action management helps in managing the required actions for enhancing business activities and smooth functioning of the business process.

Figure 2.3: Components of risk management

(Source: Sadgrove, 2016, p.16)

Based on the analysis of knowledge of implemented technology in organizational process and strategies for handling of the technology, it can be emphasized that risk management lies with proper knowledge of the implemented innovation. As mentioned by Chang (2014), AI is considered as a foundational change for business process. In order to retain business efficacy and reduce the risk of market failure, companies need to implement various risk management strategies in order to reduce AI handling risk. For broader business community, execution of the AI and assessing the major risk related to its implications provides identification of risk factors and their remedies for business. Moreover, analysis of the risk management techniques accelerates the business process with proper risk management processes to a point.

2.6 Requirement of artificial intelligence in companies and government

Increase in innovations and technological development has lead to increase the need for AI in companies. Every company or government activities are based on artificial intelligence nowadays. Not only companies but also government activities based on data security and privacy rely on use of artificial intelligence. As mentioned by Choi *et al.* (2017), government nowadays uses AI for important fields that can help in maintaining data privacy as well security. This includes:

1.   Postal services using AI
2.   Precision medicine
3.   For development of smarter and safer cities
4.   Recognize threats and prevent hacking
5.   Keeping record of nation's finance

Postal service of every nation uses AI in order to improve efficiency and saving 7 million gallons of fuel. In addition, other government interest in the field of cyber security, improving healthcare, defense and various other fraud-reducing activities are handled by government with effective implementation of AI. As mentioned by Foshay & Kuziemsky (2014), government has able to introduce faster diagnosis of diseases, better care of patients in government hospitals with effective use of AI. Moreover, doctors, researchers,

scientists are using AI for guiding and diagnosing of patients. As asserted by Keramitsoglou *et al.* (2013), various steps towards smarter and safer cities have been introduced by government. This is done by effective implementation of technologies such as security cameras, sensors in order to track and synchronize information. Such processes are also used for finding missing people as well. This has enabled government to change city operations along with assisting law enforcement.

Various cyber security steps have become easier with effective implementation of AI technology by government. In context to the opinion of Caron *et al.* (2013), with the severity of breaches, private and government, sectors are challenged for prevention of hacking and recognition of the threats. In this context, effective implementation of AI for detecting and responding to the threats has become easier by private and government sectors. In addition, policy makers and business decision makers are working in collaboration for determining the regulation for combat of cyber crimes. Maintaining a record of the entire financial data by government and companies can be easily handled by implementing artificial intelligence. As asserted by Zhao *et al.* (2013), financial service industry and predictive analytics of the market has a great influence in implementation of AI. Moreover, this enables companies to get higher accurate results along with identification of the challenges based on fraud detection, regular compliances, credit risk, and customer analytics.

Utilization of artificial intelligence in companies and by government

Needs	Justifications
Postal services using AI	1. Uses AI in order to improve efficiency and fuels
Precision medicine	1. Faster diagnosis

	2. Better care of patients
	3. For guiding targeted treatments and to speed up diagnosis
For development of smarter and safer cities	1. Implementation of security cameras, sensors in order to track and to synchronise information
	2. Used for finding missing people
	3. Helpful in maintaining security of the nation especially females with street cameras
	4. Enables analysis of any theft or fraud in company with the help of security cameras
Recognize threats and prevent hacking	1. Prevention of hacking with effective AI implementation
	2. Recognition of the threats
	3. Increasing cyber security
	4. Assessment of the risk
Keeping record of financial details of government and companies	1. Maintaining record of entire financial data
	2. Predictive analytics of the market

	3. Analysis of regular compliances, fraud detection in finance

Table 2.1: Utilization of artificial intelligence in companies and by government

(Source: Created by Author)

2.7 Theories and models relating to effective risk management

For developing an understanding of the strategies for risk management, companies, government need to identify various models and theories. Successful implementation of theories and models in risk management process helps in managing risk factors due to use of artificial intelligence. In this context, this paper provides assessment of certain theories and models that business can incorporate while developing risk management strategies. This includes analysis of iceberg model of risk, stakeholder theory and agency theory.

Theories and models relating to effective risk management
1.   Iceberg Model of risk
2.   Agency theory
3.   Stakeholder theory

Table 2.2: Theories and models relating to effective risk management

(Source: Created by Author)

2.7.1 Iceberg Model of risk

This model of risk assessment deals with analysis of business risk factors in order to develop business value. As mentioned by Kleiman *et al.* (2013), this model provides analysis of the risk in context to visibility and ability. As per the model, the ice part that is visible above the waterline is the company risks that are visible to the company. However, such risk is easy to identify and suspected in comparison to risk that are underwater level. Risk based on technologies, processes, tools, techniques are visible to a company, and strategies based on this can be developed effectively. As asserted by Mok *et al*. (2014), risk based on leadership, engagement with employees, behaviors, alignment of the strategies with work process are some of the major risk that companies fails to assess in most of the cases. In context to Bharathy & McShane (2015), assessment of both type of risk is important for business in order to develop brand recognition along with avoiding market failure and risk based on company security and privacy.

Since, risk based on technologies, processes, techniques and tools are visible to company. Hence, it is important for company to implement effective tools and techniques for organizational development. As mentioned by Fillat & Garetto (2015), risks, which are underwater, are linked with risk above waterline. Effective management of the risk based on techniques, tools, processes and technologies enables company to reduce the risk related to underwater. Nowadays, every company rely on technology for business process. From this, it can be emphasized that effective technological management is an important aspect for business that required attention. In this context, business needs to develop strategies of risk management based on technological failure, security and privacy. Effective analysis of the risk based on organizational process and technological techniques helps in evaluation of processes for effective management.

In context to iceberg model of risk, business development focuses on effective assessment and management of the risk factors. As mentioned by Omolo (2014), incorporation of cognitive technologies and evaluation of structure data process are few strategies that a company adopts in order to work in an organized way along with maintaining business

confidentiality. In context to modern business process, maintaining data confidentiality and security of business details is a crucial point in order to retain market value. In addition, analysis of the AI risk enables to detect fraud processes in an organization.

Figure 2.4: Iceberg model of risk

(Source: McNeil *et al.* 2015, p.63)

2.7.2 Agency theory

This theory deals with assessment of the problems or issues related to agency. As suggested by Leslie *et al.* (2015), an issue of agency problems arises when there are conflicts based on interest among principles and agents. In this context, it becomes important for business to incorporate agency theory in process in order to reduce the risk related to agency problems and assessment of the management strategies for minimizing the conflicts. As we know company do not exist without any relationship between principle and agent. Hence, it is necessary for company to perform task based on organizational principles. Analysis of the theory in this context enables company to identify principles and necessities that business can adopt for developing business efficacy. As mentioned by Wu & Birge (2016), effective implementation of the theory in business process helps in reducing and eliminating agency problems. In addition, it develops fundamentals for business for improving principal-agent relationship.

Effective implementation of the theory by companies enables them to develop and manage their business relationship along with resolving various priority issues. As mentioned by Ziuziański *et al.* (2014), effective principal-agent relationship by business helps in assessment of task complexity, measuring outcome and uncertainty of the outcomes. In addition, analysis of the theory provides information based on proper management of risk along with analysis of different risk attitudes. This, in turn, leads to successful completion of organizational goals (Ncbi.nlm.nih.gov, 2017).

Figure 2.5: Agency theory

(Source: Omolo, 2014, p.47)

2.7.3 Stakeholder theory

As per the theory, analysis of the stakeholders plays a crucial role in management of risk by organization. In context to the opinion of Caron *et al.* (2013), for assessment of the risk factors, analysis of technological, stakeholders, organizational tools and techniques are important. In this context, analysis of stakeholders is also important for business in order to manage risk. As mentioned by Debortoli *et al.* (2014), stakeholders are categorized into two, namely, internal stakeholders and external stakeholders. However, internal stakeholder comprises of employees, managers and owners of an organization or company. On the other hand, external stakeholders comprises of suppliers, creditors, customers,

government, society and competitors. As per the theory, it is important for business to manage and assess stakeholder's value for management of risk related to it. However, it is important for companies to develop strategies based on internal stakeholders, as they are the main component for reducing organizational risk (Ncbi.nlm.nih.gov, 2017). This comprises of management of company employees, management and owners.

As asserted by Işık *et al.* (2013), it is necessary for business to identify internal risk in order to manage external risk. For effective risk management, apart from management of technological development and improvement, management of company employees, owners and management is also necessary. In context to the opinion of Shoham (2014), effective management of company employees enables to develop business performance along with management of organizational processes. In addition, it leads to work in collaboration by employees of an organization, leading to develop effective relationship among company members. This enhances the ability of individuals working in an organization along with developing company reputation. According to Pedrycz & Chen (2015), stakeholder management is the core section of company management. Effective management of stakeholders enables business to develop business strategies along with incorporation of necessities that can help in enhancing business performance.

In context to the theory of stakeholder for risk management, analysis of the stakeholders provides business to develop relative power, interest and importance of the business process. In addition, effective implementation of theory by business helps in development of better relationships along with proper business management. According to , effective implementation of the theory leads to identification of the company risk in a better and easier way by business. This enables business to develop better and organized decisions and strategies of risk handling. Great acceptance of company actions is easier with effective assessment of stakeholders by business process.
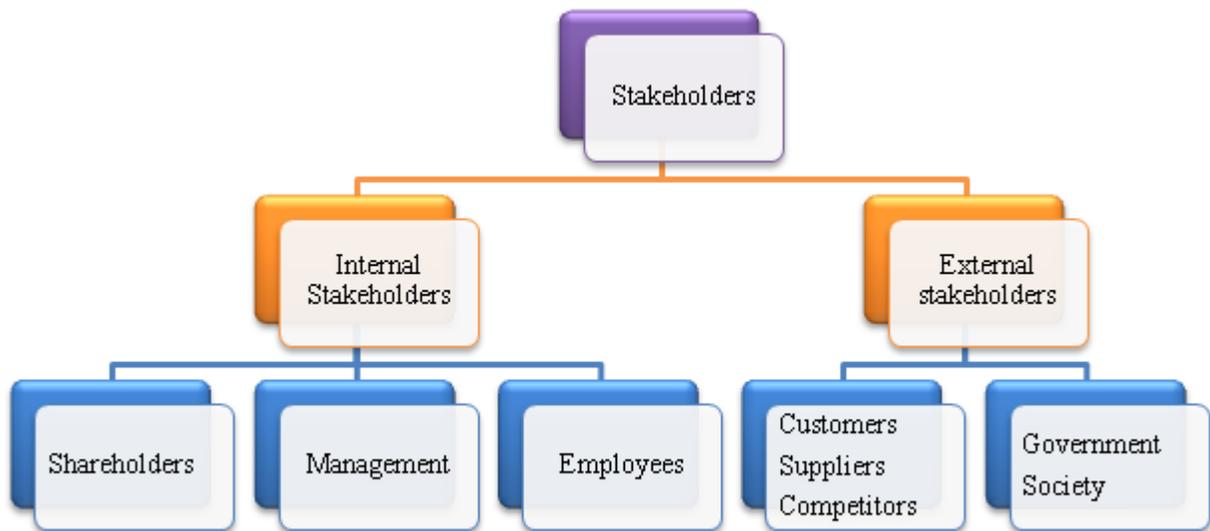
Figure 2.6 Classifications of Stakeholder

2.8 Challenges faced by government and companies while implementing artificial intelligence

Implementation of artificial intelligence by companies and government has led to incorporate everything small thing from image recognition to robotics. Businesses and government processes totally rely on artificial intelligence with technological development and innovation. It has made process and style of working very easier, faster and compatible. As mentioned by Keramitsoglou *et al*. (2013), increases in number of innovations have brought the power along with efficiency of AI into various fields. This includes finance, medicine, marketing, advertising, news and various other fields. In this context, companies are undertaking initiatives to undergo various changes in business process. Moreover, introduction of technology and its rapid advancement has changed the set of challenges faced by companies in present context. Increasing demand of technology and computer system has lead to companies and government to adopt the innovation for betterment and increasing efficiency of the process. In this context, business and

government faces certain challenges while its implementation. Some of the common challenges that companies or government faces while implementing artificial intelligence are as follows.

Different developmental approaches

Companies face difficulties in various developmental approaches by AI. As mentioned by Zhao *et al.* (2013), tradition development in systems required effective analysis of planning, designing, testing, and developing accordingly. In this context, it becomes difficult for government or companies to implement effective AI system into work due to lack of effective assessment or planning of the phases for AI incorporation. In addition, development in data sources and content gathering becomes an important aspect for business for implementing AI technology Dunis *et al.* (2016). Such type of approaches requires different types of methodologies by companies or government. This required proper training of the AI intellectual systems that most of the time companies lack behind while implementing AI system.

Comparison between conventional programming and AI programming

Attributes	Conventional programming	AI programming
Knowledge	Precise	Imprecise
Control/data	Mixed	Separated
Solutions Sought	Optimal	Satisfactory
Processing	Numeric	Conceptual based and symbolic

Defining solutions steps/techniques	Exact, algorithmic	Inexact, Heuristic search
Changes	Rare	Frequent
Viewpoint	Quantitative	Logical reasoning and plausible

Table 2.3: Comparison between conventional programming and AI programming

(Source: Created by Author)

No clear view of the insights

One of the common issues found while implementing AI system into business is lack of clear view of the insights. As suggested by Leslie *et al.* (2015), for implementing any change into process, it is necessary to have a clear view of the implemented process in order to assess the risk and advantages related to its implementation. However, companies while implementing AI in business faces challenges due to lack of clear vision and insight knowledge of the innovation. In addition, employees, staffs are found with issue of system handling and familiarity with the system processes. As mentioned by Glendon *et al.* (2016), it is difficult to identify how much a system can bring to a project. In addition, prediction of ROI is nearly impossible for business. This becomes hard for business to understand the entire concept. Hence, analysis of the insights before implementing any technology in project is necessary for business.

Knowledge of high quality data for AI to learn

This is known that artificial intelligence requires data for learning things. As mentioned by Fillat & Garetto (2015), AI and machine learning rely on high quality data for observing the behavior pattern and trends. In addition, this enables to quickly adapt and improve the accuracy of the data analysis. However, businesses get the data first and the required AI.

System requires more data and information in comparison to human (Ncbi.nlm.nih.gov (2017). In addition, quality of data also matters for interpretation of results by system. In this context, it is important for companies to provide extreme balanced and representative data else, system adopts bias data sets. This, in turn, leads to increase the chances of data disparity and providing wrong information by system.

2.9 Effectiveness of artificial intelligence on productivity and performance of the companies and government

Implementation of AI into business process has lead to development of business to great extent. It has not only changed the process of business process for companies but also increased the level of working. As mentioned by Bharathy & McShane (2014), businesses got a new approach to gain success with the implementation of AI. The process helps in bringing higher level of work process by the companies. With the effective implementation of AI in business has lead to develop business to great extent. In context to the opinion of Mok *et al.* (2014), machine learning and its implementation has enabled the task and business process easier. In addition, communication and networking process by companies has become more effective and faster with the advancement of AI. This, in turn, leads to develop efficacy of business as well.

Effective implementation of AI with combination to human intelligence has a great effect of productivity of a business process. As mentioned by Kleiman *et al*. (2013), performance of the companies along with assessment of the strategies with effective implementation of AI systems has led to develop business process in easier way. As mentioned by Glendon *et al.* (2016), businesses have developed in certain fields with increasing productivity along with better company performance. This includes:

1.   Custom research and planning supports

Implementation of AI in companies and by government has led to customize research work and planning. This, in turn, leads to make the process faster and more effective for companies, leading to increasing business productivity. As mentioned by, customizing government processes and development of planning's leads to effective management of business process.

2.   Project management and development

Advancement of AI technologies and their effective implementation on business process has enabled business to develop and manage project. As mentioned by Mok *et al.* (2014), assessment of the accuracy systems and technological tools as per the requirement of the project develops effective management and successful completion of the project work, leading to develop business process.

3.   Effective strategic alternative simulation

Assessment of the alternative that business need to adopt for enhancing their performance has become very easier with effective implementation of technological tools. In addition, this has also benefited companies in increasing business productivity. Assessment of the right strategic alternative for business helps in developing strategies based on the requirement of the business.

4.   Development of IP strategies, business development plans and valuation

Development in business plans, development in IP strategies is possible due to integrate technological research work by business, effective assessment of the AI system as per the project requirement by companies helps in developing business plan accordingly. This, in turn, leads to progress business performance. As mentioned by Kleiman *et al*. (2013), proper development of business plan and IP strategies helps in increasing business productivity along with reducing the risk of market failure.

5.   Advisory and consulting services

Consulting and advisory services has become faster and easier by business with effective implementation of AI technology. Individual in an organization now can easily communicate with other along with maintaining an effective networking with business process with the help of AI. As mentioned by Glendon *et al.* (2016), effective incorporation of AI in company leads to develop business ability along with business flexibility.
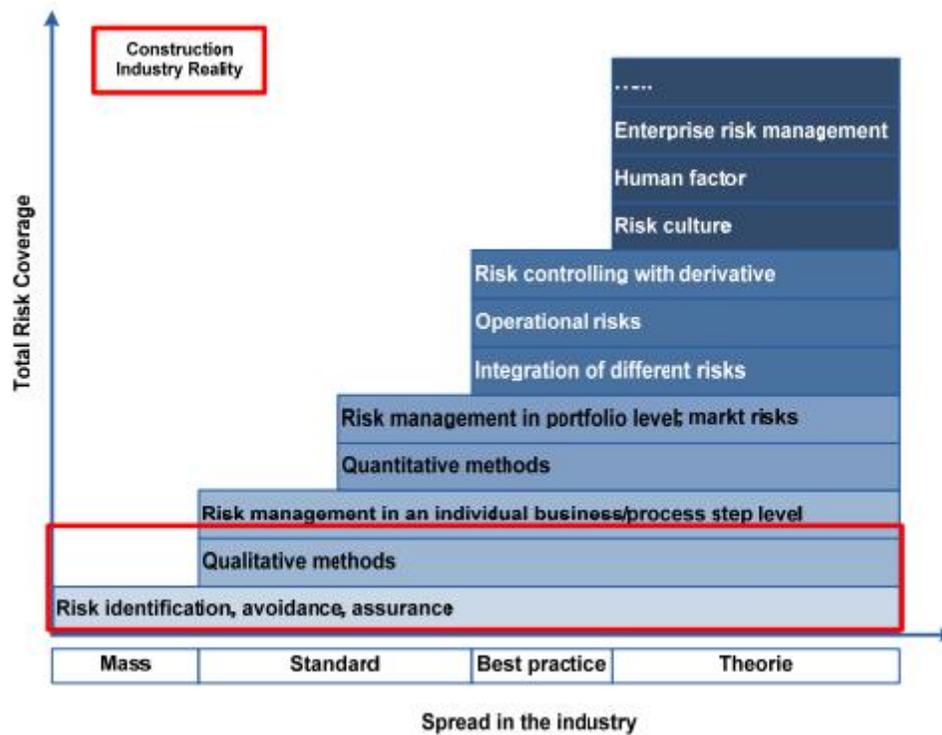
Figure 2.7: Risk management speed in industries by using AI

(Source: Glendon *et al.* 2016)

Effectiveness of artificial intelligence on productivity and performance

Effectiveness	Justification
Custom research and planning support	1. Customize research work by companies 2. Customizing government processes 3. Makes process faster and effective
Project management and development	1. Enabled business to develop and manage project 2. Assessment of the accuracy systems and technological tools
Effective strategic alternative simulation	1. Helps in Assessment of right strategic alternative for business 2. Analysis of proper business requirement
Development of IP strategies, business development plans and valuation	1. Integrate technological research work 2. Effective assessment of the AI system as per the project requirement 3. Helps in reducing risk of market failure
Advisory and consulting services	1. Developing effective communication

	networking
	2. Increasing business flexibility

Table 2.4: Effectiveness of artificial intelligence on productivity and performance

(Source: Created by Author)

2.10 Opportunities of artificial intelligence in companies and government

Development of AI and its use in various fields by government and companies has enabled government to build a global leadership in the area of legal, ethical and social implications. As know, artificial intelligence is a technology developed wholly for the sole purpose of making individual life easier. In addition, it provides various opportunities to the companies and government. As mentioned by Boswell *et al*. (2017), from various reviews and analysis, it is identified that AI has developed a great opportunity for companies and government in the area of commercialization, legal, social and ethical implications by government. In context to the opinion of Panasyuk *et al.* (2013), effective use of AI has to lead to created revolutionary strength to the government and companies. However, implementation of AI by government has benefited in various sectors. This includes maintaining data, security of the data, and improvement in strategic performance, social media, tracking, object identification and others. However, the technology has a great opportunity in IT sector by companies. In addition, robotics and its continuous development have provided a great revolutionary change to the practices of government and companies.

Use of artificial intelligence by government and companies

Government is already found using data science techniques or machine learning for data program purpose (Gov.uk, 2017). As mentioned by Husnin *et al.* (2013), implementation of this technique provides insight to a range of digital service delivery by government in

the field of agriculture, land, analysis of satellite images and others. Implementation of AI in these areas improves the process along with benefiting government to critically assess the following areas effectively. UK, European government and U.S include emergency services, tailoring services, services based on health care by effective use of AI. In addition, implementation of AI by companies has made decision-making process more transparent along with informed decision process. This, in turn, leads to reduction of errors and fraud issues.

Companies are found to use AI to deliver exceptional customer services to their users. For example, IBM uses Watson AI platform for business. The AI platform termed "Watson" is a question answering computing system that combines analytical software and AI for the answering process in natural language to business, leading to making effective decision-making process and improving customer services. Not only IBM Watson but other AI technologies such as Prism which is a unique combination of AI and neural network helps in transforming photos, videos into art work by using famous artistic style (Top500.org, 2016). The technology has enabled the process of Photoshop and digital editing of the photos and videos in artistic style that is appreciated by most of the users. Advancement of these technologies has enabled the business process easier along with providing an edge to business by incorporation of various technologies. From review, it has been identified that US is profoundly reshaped with the software technology, especially by AI algorithms. The AI algorithms have able to increase the volume of data and control of better process management decisions. Increasing demand for AI in various fields has lead to provide opportunity to the technology along with increasing its revenue rates. The forecast report for artificial intelligence revenue by 2025 is provided below.
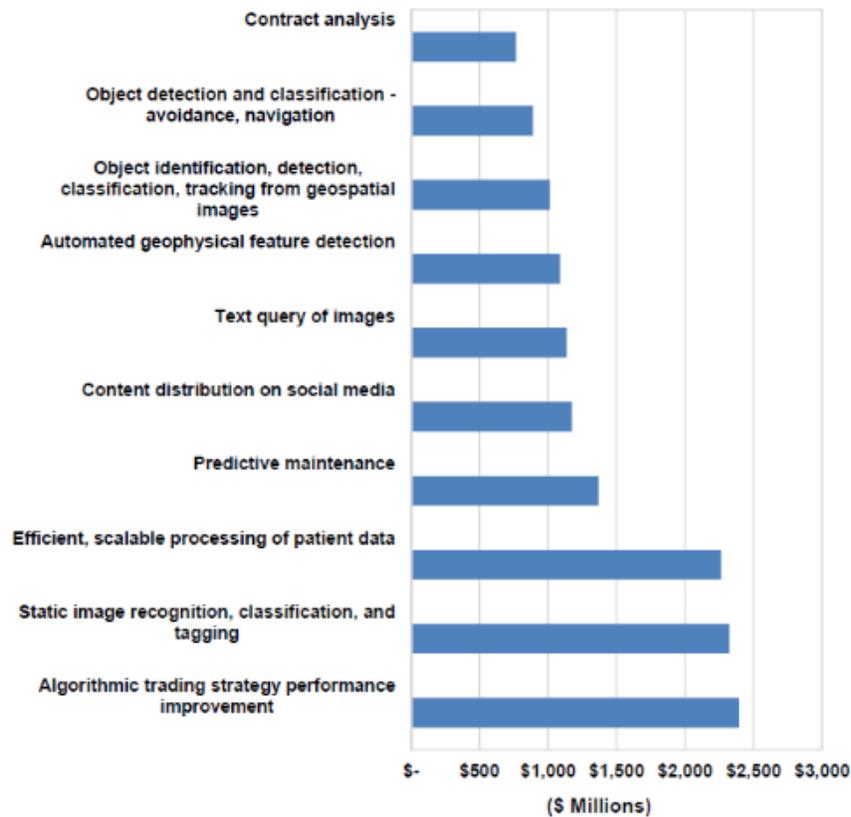
Figure 2.8: Artificial intelligence revenue forecast by 2025

(Source: Top500.org, 2016)

2.11 Linking with literature

From previous studies and researches over years, it has been observed that artificial intelligence is considered a strong weapon of technological advancement. Various researches identified the importance of artificial intelligence in developing government and companies' processes and performance. As opined by Husnin *et al.* (2013), artificial intelligence is developed and is being developed for the sole purpose of developing human life. The advanced technology has developed human lifestyle to great extent. In this context, Panasyuk *et al.* (2013) opined various ways and processes that use artificial intelligence for improving business. In addition, the effectiveness of implementing

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artificial intelligence in business in order to enhance business process was provided. Further, Bharathy & McShane (2014) opined contradicting the fact, that artificial intelligence is developed to replace humans. Moreover, use of artificial intelligence has partially gained its goals as well. Further, Fillat & Garetto (2015) opined contradicting the viewpoints of author, stating, artificial intelligence has made the process of doing business more efficient along with maintaining the process more compress and effective.

As evident from previous studies and research work, most of the researcher focused on studying the effectiveness of artificial intelligence in business process. As a result, interest in the field of risk management related to use of artificial intelligence was partially ignored. Moreover, the study focused on developing understanding of relationship between artificial intelligence and risk management. This somehow reflected the gap in existing literature that focused on artificial intelligence and risk management.

2.12 Summary

This chapter of the research paper focused on understanding the concept of artificial intelligence and the relation between AI and risk management. In this context, need of artificial intelligence government and companies in improving their working process is discussed in this chapter. Moreover, this chapter provides an understanding of theories and models that can be implemented by companies in order to manage risk in organizational process along with identifying the risk related to data security and privacy. In order to maintain risk and implement artificial intelligence in companies and by government challenges faced while its implementation is provided in this chapter. In addition, effectiveness of artificial intelligence in company's productivity and performance is focus in this study. Moreover, the study provided an analysis of the gap of literature that previous research studies failed to provide.

CHAPTER 3: METHODOLOGY

3.1 Introduction

Research methodology provides analysis of the research methods and processes used by researcher in order to conduct the research work in a successful manner. It develops an understanding of the approaches, tools, and techniques that can help researcher to select the exact process for successful completion of the research work. Moreover, analysis of the research methodology helps in achieving effective solutions to the issues. Research methodology process involves quantitative and qualitative data collection method. Quantitative research methodology deals with statistical, analytical or calculation based data. On the other hand, qualitative data collection process or methodology focuses on quality of the data used for data collection process. However, methodology for research work is applied for helping researcher in constructing an authentic research work. In this context, this chapter deals with analysis of the research philosophy, design, and approaches used for data collection method.

3.2 Research Onion

The purpose of research onion is to provide a framework to help researchers to develop strategies for conducting the research work at different stages of the onion. As asserted by Saunders *et al.* (2017), research onion has six-layers for data collection and analysis process. This includes strategies, time-horizon, choices, philosophies, techniques and approaches. However, the onion deals with three stages known as Axiology, Ontology and Epistemology. Epistemology deals with facts, ontology with reality and axiology with values and roles.
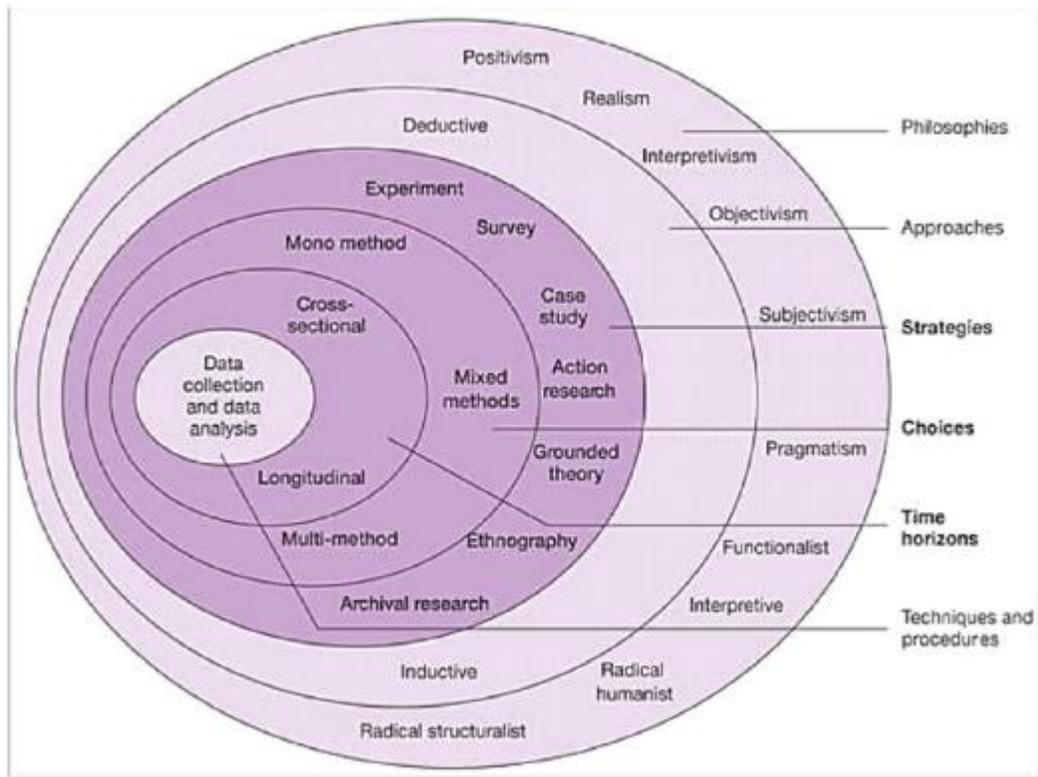
Figure 3.1: Research Onion

(Source: Saunders *et al.* 2017)

3.3 Research Philosophy

Research philosophy deals with the study of processes used for the study of the research work. It provides an explanation of the processes used by the researcher for conducting the research study. As mentioned by Kumar (2014), research philosophy is of four types. These are realism, positivism, Interpretivism and pragmatism. These are the most popular research philosophy processes used for data collection process by researchers in order to complete the research work. In context to the opinion of Mackey & Gass (2015), research philosophy is based on assumptions that are the source for data collection process and helps in guiding researcher for further approaches and methods for data collection.

Positivism

Positivism research philosophy is the type of research philosophy that focuses on quantitative data collection process. As mentioned by Taylor *et al.* (2015), positivism research philosophy is highly structured. In addition, it uses large samples for data collection process. However, positivism can use qualitative data as well for conducting the research work. In context to the opinion of Silverman (2016), positivism philosophy adheres to factual knowledge based on the observations. This type of philosophy includes measurement of the observations and is trustworthy for collecting data. However, in this type of process, researcher's role is limited to interpretation and data collection only. Moreover, such type of process is based on observations and quantifiable.

Realism

Realism philosophy focuses on the ideas of independence of reality. As asserted by Smith (2015), realism philosophy focuses on the independent reality of a person. In other words, this process is based on both qualities as well as quantity of data collected. As mentioned by Husnin *et al*. (2013), this type of research philosophy is based on the assumptions related to scientific approach. However, realism philosophy is further divided into two, namely, direct realism and critical realism. Direct realism portrays the data through personal sense. On the other hand, critical realism argues the experience and images of real world.

Interpretivism

Interpretivism research philosophy focuses on qualitative method for data collection process. As mentioned by Boswell *et al*. (2017), this philosophy involves researcher to interpret the elements related to the study. Hence, this type of research philosophy integrates interest of an individual in the study. In context to the opinion of Smith (2015), development of Interpretivism philosophy is based on the critiques of positivist philosophy. As per this research philosophy, its emphasis on qualitative analysis over the other one that is quantitative analysis.

Pragmatism

Pragmatism research philosophy is the type of research process that deals with both research methods, namely qualitative and quantitative. As asserted by Mackey & Gass (2015), this research philosophy accepts concepts that are relevant only if it support action. Moreover, as per this philosophy, interpreting world for undertaking the research work can be done in various ways. However, one cannot interpret through only one single point as per the philosophy.

Figure 3.2: Research Philosophies

(Source: Taylor *et al*, 2015, p.46)

3.3.1 Justification for selection

In order to conduct the research work, researcher has selected positivism research philosophy for data collection. This research study focuses on artificial intelligence and risk management for companies and government along with challenges faced by companies while implementing artificial intelligence. In addition, this paper focused on

providing an understanding of the effectiveness of AI in company performance and productivity. For this purpose, positivism philosophy process is selected as this process follows scientific method for gaining knowledge of the insights of the topic selected or conducting the research work. In addition, this research approach provides a generalized view and concept of the research study. Nevertheless, this philosophy is based on the concepts and ideas of the scientific study along with learning regarding the truth behind the science.

In context to the opinion of Mackey & Gass (2015), positivism philosophy has five main principles for collecting data. This can be summarized as; there is no difference in the logic of the inquiry, entire research aim is based on explanation and prediction. In addition, positivism philosophy avoids biasing of the research findings. Lastly, the science is judged only on logics in this research philosophy process. Thus, research has chosen positivism philosophy for data collection process. Hence, positivism philosophy is considered accurate for conducting the research work and data collection process.

3.4 Research Design

Research design deals with process or methods used for designing of the research work. This helps in developing a structure for the research in order to meet the research objectives. As mentioned by Vukšić *et al.* (2013), research design are categorized into three sub parts. These are descriptive research design, exploratory design and explanatory design. In the opinion of Panasyuk *et al.* (2013), descriptive design of research work focuses on providing systematic information on the topic whereas exploratory design deals with the background information of the topic. On the other hand, explanatory design deals with connecting effect and causes of questions for the research study.
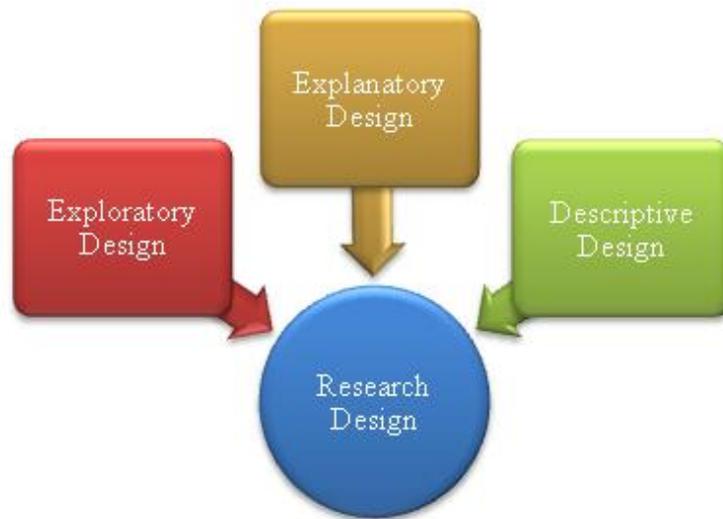
Figure 3.3: Research design

(Source: Silverman, 2016, p.34)

3.4.1 Justification for selection

For this research study, descriptive research design has been selected by the researcher as this research design provides an in-depth details and description of the topic along with exploring the research questions and objectives. Since, the study is based on scientific approach; it requires more detailed information regarding the use of artificial intelligence and the risk faced by the companies while implementing it. In addition, ways companies effective manage the risk based on its implications is focused in this paper. For assessing the entire process, observing and describing the behavior of the subject is required. In this context, research found descriptive research design over explanatory and exploratory to be more suitable for conducting the research work.

3.5 Research approach

The approach used by researchers in order to achieve the answers to the research question is termed as research approach. In addition, analysis of the effective research approach for conducting a research study provides in-depth analysis of the research. This helps

researcher to get an effective outcome of the study. As asserted by Zhao *et al.* (2013), research approaches are of two types for scientific study, namely, inductive and deductive.
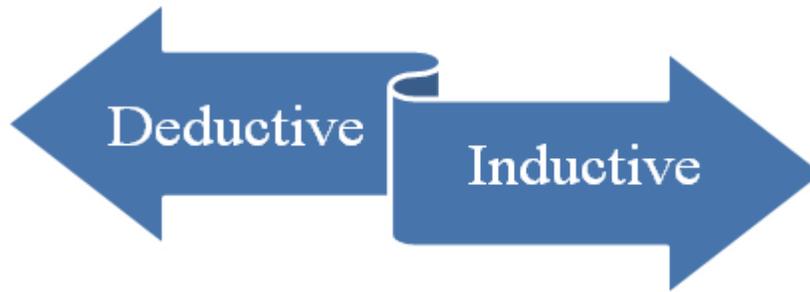
Figure 3.4: Research Approach

(Source: Smith, 2015, p.32)

Inductive research approach

Inductive research approach contributes to the emergence of new theories and generalizations. As stated by Ziuziański et al. (2014), this research approach is not based on formulating the hypothesis. In addition, by implementing inductive research approach, one can gather and analyze research data. Based on the analysis of the data collected, theory is constructed for explaining the findings of the study. The steps of inductive research approach are provided below.
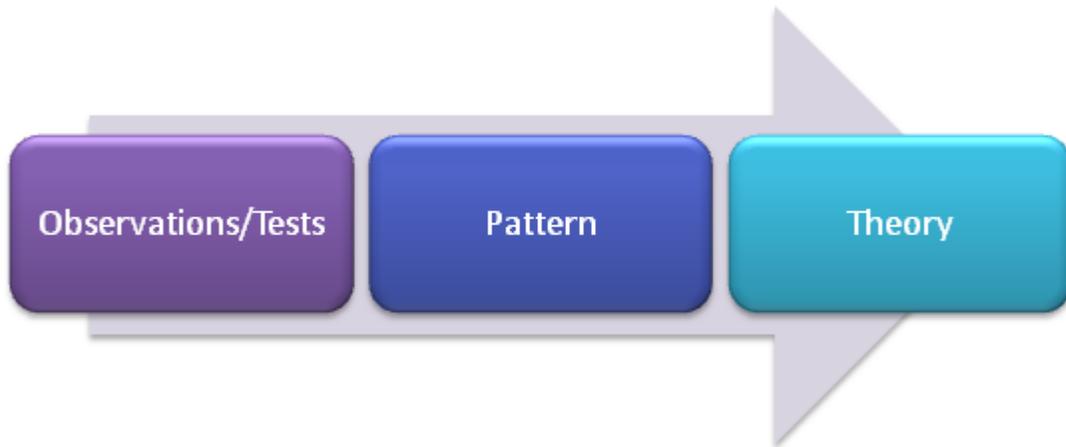
Figure 3.4.1: Inductive Research approach steps

(Source: Smith, 2015, p.33)

Deductive research approach

Deductive research approach focuses on testing of the theories by collecting evidences and examining them. As asserted by Bodie *et al.* (2014), this research approach focuses on formulating the hypothesis for confirming or rejecting the approach process. This approach helps in developing an understanding of existing theories for conducting the research study. Steps used for deductive research approach is provided below.
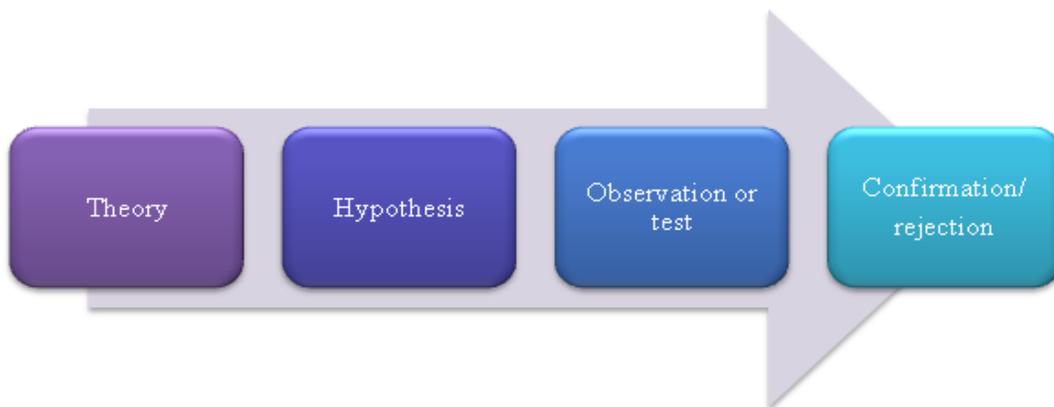
Figure: 3.4.2: Deductive research approach

(Source: Smith, 2015, p.34)

3.5.1 Justification for selection of the approach

For the current research study, research has selected deductive research approach. The reason behind selecting deductive approach is to answer the question by analyzing existing theories and literature. This research approach examines the evidence in order to confirm or reject the research questions based on data acquired. However, this is not possible in case of inductive research approach, since, inductive approach focuses on developing hypothesis and theories instead of formulating the hypothesis. Moreover, deductive research approach begins with general and abstract level for conducting the scientific research and then works on specific and concrete levels (Millington & Funge, 2016). This helps in analyzing and examining the data gathered in more specialized way. Thus, researcher found deductive approach to be suitable for conducting the current research study. In this context, the researcher selects deductive approach.

3.6 Data Collection Methods

The method or technique used for collecting data in order to conduct the research work is known as data collection method. Analysis of the proper data collection technique enables researcher to find the answers of the questions based on the relevance to the research subject. As asserted by Kerzner (2014), data collections are of two types for scientific research study; these are primary and secondary data collection process. Primary process of data collection focuses on gathering data by maintaining the quality of the data. This helps in maintaining authenticity of the data gathered for the study. This process of data collection focuses on collecting data through quantitative as well as qualitative data collection process. Data collected from interview, surveys are categorized into primary data collection process.

On the other hand, secondary data collection process focuses on collecting data from books, journals, websites and others. In other words, secondary data focuses on collecting data that already exists in some of the other way. As mentioned by Glendon *et al.* (2016),

data collected from secondary data process can be altered or violated. However, this hinders the authenticity of the data collected for the study process. Although, the process of secondary data has some advantages due to less time consumption for data collection as it accesses the existing data or information.
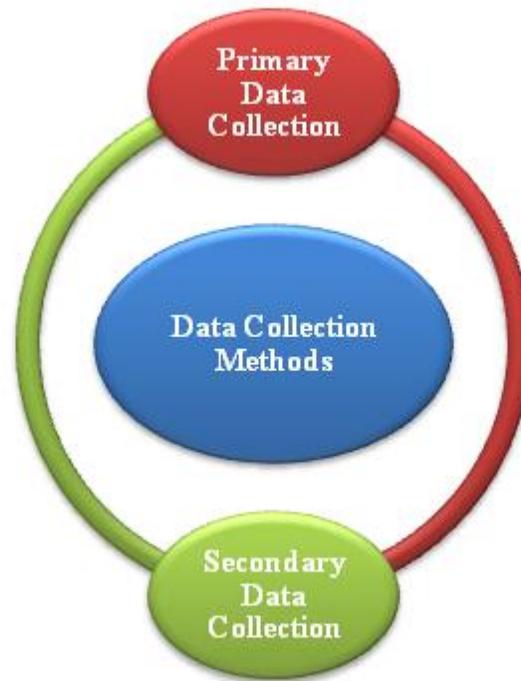
Figure 3.5: Data collection methods

(Source: Smith, 2015, p.23)

3.6.1 Justification for the selection

For this study, research has selected both primary and secondary data collection method for collection of data. Since, the research work focuses on maintaining the authenticity of the data along with data validity, hence, interview with research and development team of DEWA and IBM has been conducted. This is done for identifying the perspective of managers and R&D department of these companies in managing risk and processes with implementation of artificial intelligence. In addition, secondary data collection method is conducted by thematic analysis from journals for data collection process. Collecting data

from both the process provides maintaining reliability and validity of data. Moreover, by using secondary process, researcher is able to gather more data in less time, leading to assess the topic from different perspectives and analysis. Therefore, both primary and secondary data collection methods are selected for conducting the process of data collection.

3.7 Sampling Techniques

It is quite difficult or impossible task to gather data regarding a topic from a wide population range. Therefore, analysis of the sampling technique helps in recognizing the target parameters for data collection process (Papadaki *et al*. 2014). Gathering samples for research process is a technique that enables researcher to identify the target auditions, population for data collection process. As mentioned by (Papadaki *et al*. 2014), sampling techniques are of two types for scientific research study. These are probability sampling technique and non-probability sampling technique. In opinion of Leech (2013), probability sampling technique deals with samples that have the probability of being selected whereas non-probability sampling technique is the techniques of selecting random samples. In other words, non-probability technique does have the chance of being selected as a sample.

3.7.1 Justification for selecting sampling technique

Researcher has focused on collecting data by conducting an in-depth interview with the R&D department of DEWA and IBM Company. In addition, 2 employees from IBM Risk Analytics, 2 employees from research department of DEWA and 2 employees from Enterprise Risk management are selected as samples. Hence, samples were purposively selected in order to get authentic data along with maintaining the validity of the data. Moreover, analysis of the samples provided understanding of the target audience that can help in getting proper and accurate data for the study. Since, authentic and valid data can be collected by interviewing IT company's members; hence, purposive sampling has been done for this process. Therefore, purposive probability sampling technique is been selected by the researcher for gathering of data.

3.8 Data Analysis Techniques

Data analysis technique is the analysis of the techniques used for data interpretation. As opined by Mohamed *et al*. (2013), analysis of the data enables individual to examine the issues based on the study. Analysis of the data techniques help researcher to identify the problems while assessing the data before going into a conclusion. In addition, it enables researcher to identify the exact process for data collection such as interview, survey and others. As mentioned by Leslie *et al*. (2015), data analysis techniques comprises of qualitative data analysis and quantitative data analysis. Qualitative technique for data analysis provides collection of data from authentic source such as managers of an institution, company and others in the form of interview. However, quantitative data analysis technique focuses on surveys for data collection from employees of a company, books, journals, websites and others.

In order to conduct the research study, this paper has focused on primary qualitative data analysis technique. For gathering research data, researcher has selected IT companies for assessing their process in AI implementation in business along with challenges faced while its implications. In addition, ways risk management related to implementation of artificial intelligence is managed and processed is focused in this research study. Hence, for this process, researcher has focused on conducting an in-depth interview with the R&D department of the IT companies. This helps in maintaining the quality and authenticity of the data along with analysis of company's management process in avoiding risk.

3.9 Ethical Considerations

For conducting the research study, researcher is bound to follow the necessary ethical principles and values. As opined by Chen *et al.* (2015), maintaining proper rules and regulations while conducting the research work helps researcher to conduct the research work in an effective manner along with developing research process efficacy. In this context, researcher has followed the regulations and principles for data collection process. As asserted by Taylor *et al*. (2015), analysis of the ethical considerations helps in maintaining ethics while collecting data for research purpose.

In addition, it was ensured that privacy of the participants is leaked while the process. Moreover, participants had the choice to quit the interview process anytime on their own will. No personal information of the participants was asked during data collection process. Moreover, data collected was solely used for academic purpose only and bound the researcher to abide Data Protect Act of 1998. Recognition of the ethical considerations helped researcher to distinguish between wrong decisions and right decisions.

3.10 Research Limitations

No research work is successfully completed without facing certain limitations (Sadgrove, 2016). In this context, the current research also faced certain limitations while carrying out the research study. At the time of conducting the research study, researcher faced various difficulties while collecting authentic data. Lack of sufficient time hindered the process of data collection to some extent. In addition, it became quite difficult for the researcher to go into validity of information or data gathered. However, finance was another limitation that affected the process of data collection for the required research topic. Language was another factor that restricted researcher to stick only to one language for data collection process. Only English language was given priority for collecting data over other languages.

3.11 Time Plan

This entire research has taken 24 weeks of time for its completion. First week of the research work was contributed for topic selection and analysis of the wider literature. Middle weeks were contributed for further analysis of the literature review and data collection process whereas in the last week of the research study, conclusion was drawn from the findings. In addition, recommendations were made based on the findings of the study. Final submission of the research work was done on the 24th week of the research study.

[Refer to Appendix 5]

3.12 Summary

This chapter provided analysis of different research approaches, methodological tools used for conducting research study. Understanding of the methodologies and data collection techniques helps in identification of the issues related to research study. In addition, it provides researchers to distinguish between right and wrong decisions. This chapter dealt with understanding of sampling techniques and processes that helps researcher to identify target audience for data collection process. Moreover, this chapter provided analysis of ethical considerations that helped researcher to maintain the rules and regulations along with ethical principles while conducting the research work.

CHAPTER 4- DATA ANALYSIS AND FINDINGS

4.1 Introduction

This chapter of the dissertation deals with analysis of the data and focuses on discussing from the research findings. For this particular research work, researcher has focused on interviewing 2 employees from IBM Risk Analytics, 2 employees from machine intelligence and research department from D and 2 employees from Enterprise Risk management. In addition, thematic analysis has been done by taking 4 journals by secondary data analysis process. Themes based on artificial intelligence, relation between artificial intelligence and risk management along with concept of artificial intelligence and others has been selected for the data analysis.

4.2 Primary Qualitative Data Analysis

Q1. According to you, how has AI contributed in risk management in organizations?

Discussion

As per the gathered information from interview process, it can be analyzed that different employees have different point of view regarding risk management by implementing AI. In the opinion of first employee from IBM risk analytics department, assessment of the risk is the initial stage before developing strategies. As stated by first employee, AI plays an effective role in monitoring organizational process. Moreover, implementation of AI has lead to develop effective monitoring of organizational process as per the opinion of employee one from IBM risk analytics department. Second employee from IBM risk analytics agreeing with the reply of first employee stated, assessing risk is the first task before managing it and one need to analyze the risk factors before implementation of management process. From this it can be emphasized that risk assessment is considered to be an important task before developing strategies for its management by companies.

On the other hand, employee one from Enterprise Risk Management stated AI plays a great role in risk management. In addition, the employee mentioned that security and privacy

system of the company has become stronger due to effective intelligence of machine technology.   In this context, second employee from Enterprise Risk Management enlightened by saying technological development has made organizational process much easier and faster. In the field of risk management as well, analysis of the risk has become easier with effective implementation of AI.

Upon asking the same question to employees of DEWA, employee one from research department stated, evaluation of the risk factors have become comparatively higher with the advancement of AI. Effective evaluation and controlling of the risk related to company security and data privacy has become stronger with AI. Second employee from same department stated, checklist, brainstorming and other such factors due to implementation of AI has made process of risk identification easier by companies. Implementation of checklist methods, pondering or brainstorming provides an important aid for risk identification. In addition, successful implementation of these methods has become possible due to advancement of technologies.

From analysis, this is evident that a difference in the perception of employees from various department of the company exists. However, the motive and purpose is found to be same. Employees interviewed for the data collection considered assessment and evaluation of risk factors and important aspect for managing risk. In this context, AI plays a crucial role in managing risk along with its assessment. According to the employees of both companies, AI has led to develop a strong privacy and security services to the companies. The artificial intelligence has developed an effective risk assessment and data encryption process, leading to develop strong security process for company. This proves that companies are greatly influenced with advanced technological process in business along with risk assessment.

[Refer to Appendix 6 for transcript]

Q2. What is your assessment regarding relationship between artificial intelligence and risk management?

Discussion

From analysis of the study, it was identified that employee one from IBM risk analytics considered a strong relationship between AI and risk management. As per the perception of the first employee of IBM risk analytics department, AI has a strong relation in context to risk management. It provides analysis of the risk factors for companies along with development of strategies for its effective control over organizational process. As stated by second employee from risk analytics department of IBM, the company uses Artificial Neuronal Networks (ANNs) for risk management. Second employee mentioned Artificial Neuronal Networks (ANNs) is an AI technology that helps in risk management decision-making process in many project start-ups. From this it can be emphasized that risk related to start-up projects and its implementation can be managed with effective implementation of this AI technology. The employee of IBM did not go into depth regarding the technique but it is evident that AI has a great relationship with risk management. First employee from enterprise risk management department of the company when asked the same question, he stated, AI has developed a high potential in risk analysis. Further, the employee stated that effective implementation of AI and technological advancement has increased the risk factors associated with it, but somehow developed strong security process as well. When the same question asked to the second employee of enterprise risk management, the employee agreed with the statement of first employee.

In contrast to the reply of first employee from enterprise risk management, second employee stated the most important relation that exists between AI and risk management is, with the advancement of AI, risk factors and cybercrimes has also increased. From this, it can be emphasized that AI has a strong relationship in managing risk factors in an organization. In context of government process as well, AI has developed a strong bonding in managing confidential and important dockets of the country. The employee further

considered the cybercrime and security management has developed a strong link in managing risk factors for an organization.

On the other hand, first employee research department of DWEA considered assessment of risk management process has become easier for risk planning with effective AI implementation. The employee stated AI has made assessment process high in every field of business, leading to risk management planning and other planning's by business. In addition, the process of question answering technology and clearing customer queries has become a revolutionary and easy process with AI. However, second employee stated risk metrics have become essay to tackle. This develops a strong relationship between risk management and AI.

From findings from the interview process, this is evident that employees of both the company considered a strong relationship between AI and risk management. The technology has led to developing risk management processes more advanced by the companies. In addition, it has led to develop technological advancement to benefit companies and government worldwide for maintaining a safe and secure business networking and privacy.

[Refer to Appendix 6 for transcript]

Q3. In your opinion, what are the key benefits of artificial intelligence in organizational risk management process?

Discussion

According to the data collected from the process, first employees from IBM risk analytics stated artificial intelligence has a great role in risk controlling, planning and management. The employee considered artificial intelligence as a revolutionary change in IT industry and has helped in developing various organizational and government process. In addition, it has developed as a helping hand for humans that actually have the ability to work and think like humans. In this context, second employee from the same department of the company said, AI has to lead to make the analysis process of risk along with organizational

barriers an effective place. The employee stated analysis of the risk and barriers to effective AI analysis process has lead to benefit organizational process hugely.

On asking the benefits of AI to the Enterprise risk management department, first employee stated assessment of the actions required for risk management and controlling system has greatly benefited organizational process through effective AI implementation. As per the perception of the first employee, organization can take effective actions that are required for risk management, leading to benefit organization. The second employee from the same department considered monitoring of the risk and organizational barriers along with providing necessary strategies for its handling is the key benefit of AI in an organization. Further, the second employee stated, AI has to lead to provide risk handling strategies to companies and government as well. Moreover, the technology is being developed for further advantages to the government.

On asking the same question to the employees of DEWA from research department, both employees considered implementation of high AI field methods in risk analysis has provided a great benefit to the companies and business processes worldwide. However, second employee from the research department revealed that company uses

Analysis of the reply provided interlink in the perception of the employees. This provided a lucid analysis of AI benefits in organizational process. Moreover, this is very clear from the interview process that risks management and organizational hindrances are easily solved with effective AI implementation. However, companies are developing AI in order to extend their hands in various field of advancement for making life simpler and easier.

[Refer to Appendix 6 for transcript]

Q4. Do you think inclusion of Artificial intelligence in almost every field is a risk to?

Discussion

On asking whether AI has replaced humans in every field or not, and its impact on humanity, it was quite interesting to note that different employees have different viewpoints but ultimate conclusion draw was same. In the opinion of first employee from IBM Risk Analytics, it is many people's perception that AI is developed for replacing humans, although, it is developed and is being developed for the sole purpose of benefiting humans, not replacing them. Agreeing to the point of first employee, second employee stated, AI is meant to help humans not to replace them. In this context, it can be observed that risk analytics department of IBM considered AI an effective tool for making human life easier.

In context of the perception of first employee from enterprise risk management department, the employee stated that, although it has replaced humans in certain areas but not totally replaced. Further, the employee stated, AI is being developed for developing various fields. This is done for development of business process and making organizational processes easier. First employee from risk management considered AI to replace humans to some extent. He further stated that, if advancement of AI continues to grow, there are chances that it might replace human totally, leading to create an imbalance in nature.

From the perception of second employee from enterprise risk management, AI is being developed for the betterment of humanity. However, it's extending demand and growth of AI is a matter of concern for humanity, if went to wrong hands. In this context, AI is a risk to humanity if it totally replaces humans in every field. Moreover, it is necessary to maintain a balance in nature and technology. Keeping this in mind, IT teams are developing strategies that can help humans to inculcate AI in working process and not by replacing them.

Contrary to the perception of IBM employees, first employee from research department, their team is focusing on working in this section, so that AI is developed for betterment of

humanity and not a risk to it. Agreeing to this, second employee forms the same department of stated, this is correct that machines have taken over human in some field but not to replace them, rather they have been developed to make their work simpler. From this, it can be emphasized that AI is developed solely for betterment of humanity. However, risk exists with its extraordinary intelligence and growth over humanity. In this context, IT departments are working in developing AI such that it creates no risk to humanity.

[Refer to Appendix 6 for transcript]

Q5. What affect artificial intelligence has created on your organizational performance and productivity?

Discussion

From data gathered from the interview process, it can be observed that Organizations have greatly benefited with AI inclusion. From the perception of first employee from risk analytics department of IBM, AI has increased the overall performance of the company. Concisely, second employee considered growth in productivity and popularity rates of the company over years. Further, they stated, inclusion of AI in organizational process has made the working process faster and simpler, leading to increasing annual productivity of the company. As per the reply of first employee from enterprise risk management department of IBM, the company has a huge growth in IT industry with inclusion of IBM Watson. This AI platform has enabled them to answer the questions posed in natural language.

On the other hand, second employee from the same department stated that organizational performance of their company could be assessed by their company name only. This is evident that AI has improved the performance of organizations largely. Interviewing with the employees of IBM, it is clear that their company is focusing on developing further such AI platforms like Watson for increasing business process.

On asking the same question to the employee of DEWA from research department, one employee stated, DEWA has developed a renowned position in UAE along with increasing productivity in the recent years keeping in mind heavy increase in electricity and water needs in ever growing UAE economy. Second employee from the same department stated, implementation of AI in work process has reduced manpower. In addition to this, it has increased machine process in business activity, leading to one-time investment over machine intelligence and increasing productivity. From this, it is evident that the company has benefited to great extent with the implementation of AI technology in business process. From analysis of the reply of every employee from various departments of the organizations, organizational performance and productivity rate has a great impact on the inclusion of AI in organizational process. In addition, AI has to lead to develop their work process faster and effective.

[Refer to Appendix 6 for transcript]

Q6. What strategies would you recommend to improve the application of artificial intelligence for increasing organizational performance and mitigate risks?

Discussion

It has been observed that majority of the research participants emphasize on managing the risk for improving the organization performance. The employees of the IBM have supported open sources software for enhancing the performance of artificial intelligence. According to the respondents this software provides a source code, which is easily accessible, and it can be changed as per the need of the organization. It can helps organization in maintaining the privacy and it can enhance security standard of the organization. At the same time, other employees of the IBM have recommended to focus on the market data.

According to the participants, utilizing most authentic data can help in better estimation of the market situation. It reduces the risk related to market operation. However, the employees of Enterprise Risk Management believe that principles of financial legislation

will provide guidance for enabling artificial intelligence. According to the employees of this organization, following the principles of the final legislation will minimize the probability of the market risk. It can helps in minimizing the risk of the market loss. Moreover, other employees of the organization has consulted that, following the principles of financial legislation reduces the risk related to civil prosecution and other risk related to legal system. Employees of machine intelligence and research department of DEWA has concluded that, in order to develop an effective artificial intelligence system, it is required to follow the principles of Governance, Risk and Compliance. According to the employees, it can help in analyzing the risk in systematic manner, which reduces time and cost of the risk management.

[Refer to Appendix 6 for transcript]

4.3 Secondary Thematic analysis

Theme 1: Accessing the risk artificial intelligence systems

Artificial intelligence systems have been implemented in most of the business organization and government organization such as DEWA. The artificial intelligence systems are used in various domains such as through computers and software. It as well has been used in modes of transportation such cars and buses. The artificial intelligence systems have been very helpful the humans, because it reduces the time required to process a task. In addition to that, this method is quite cheap, because it reduces the need of human intervention and hence revenue average cost of operation.

However, Scherer (2015), has mentioned in his paper "Regulating artificial intelligence systems: Risks, challenges, competencies, and strategies", that risk of accidents and financial risk has increased with the implantation of the artificial intelligence systems. According to the author, artificial intelligence systems implemented in the cases can results in the accident. Forever, excessive use of the artificial intelligence systems in the organizational function can result in data loss and financial loss for the organization. According to the author, the artificial intelligence systems can face difficulties in

conducting heavy financial transaction; it can become challenges for the organization to maintain their average cost of operation.

The author has supported this argument based on the opinion of leading businessman such as Bill Gates and Elon Musk. The author has explained that level of technology is not as advanced to implement in it for daily usage. The author has claimed that most of the organization are utilizing the technique for modify using their gadget for increasing their sale. It has been claimed that, most of this organization are not devoting required amount of resources on the researcher and development of this technique m which can results in the poor development of artificial intelligence systems. The author has recommended that implementation of the legislation on international basis for reducing the negative impact of the artificial intelligence systems. In the words of the author, it is required to develop tort liability for minimizing the misuse of freedom provided to the organization. According to the author, development of such legislation can force business organization to devote extra resources in the development of artificial intelligence systems.

Theme 2: Economic impact of Artificial Intelligence system

The Artificial Intelligence system has helped business organization is successfully conducting their business. This system allows the organization to shift from the labor-intensive technique to capital-intensive technique in the business. The Artificial Intelligence system has been utilized in various ways; it can be used as software for monitoring organizational performance. In addition to this, it can be sued for the high scale analysis and interpretation. According to Chen *et al.* (2016), this method can help in reducing the average cost of operation for the organization. The implementation of this technique reduces the requirement of the addition unit of labor, which reduce cost of wage rate and additional cost of incentives. Moreover, this system require comparatively less time than humans, hence, it most sustainable for the organization. It has been mentioned by the author, that implementation of this technique can improve global economic performance.

According to the author, Global GDP will increase from $1.49 trillion to $2.95 trillion dollars in the next ten years. Moreover, the author has claimed that the GDP of the high-income countries will increase $63.1 billion to $115.5 billion in next ten years. The author has claimed that eight major organizations are making the contribution in the global GDP through artificial integrated system. It has been mentioned that between 2014 and 2016, 26 acquisitions had been made by the leading organization which amount to $5 billion. The major organization contributing in this technique was Facebook and Microsoft. According to the author, the major contribution of the artificial intelligence system can be observed in venture capital sector. The venture capital firm has made significant amount of investment in the development and implementation of artificial intelligence system. It has been observed that total; investment in the venture capital industry has increased from $31.2 million in 2010 to $211 million in 2015. Moreover, it has been observed that rate of investment has steadily increases during this period of time; according to the author total investment made by the venture capitalist in the artificial intelligence is higher than $850 million up to 2015. Moreover, it is estimated that economic effect of artificial intelligence system will be higher in IT investment followed by broadband investment.

Theme 3: Impact of Artificial intelligence on workforce

Artificial intelligence has enhanced the productivity compare by saving time. The artificial intelligence system has proved to be most beneficial in reducing the time taken in the production process. In addition to this, it has been very helpful in reducing the average cost if the production for the organization. However, it has been argued by some of the scholars, that increased use of artificial intelligence system has reduced the demand for the labor in the international market. According to Wisskirchen *et al.* (2017), the average cost of utilizing robotics is 15% lower compares to the labor worldwide. In such situation, the demand for the labor is expected to reduce by significant amount worldwide. The author has claimed that average out of the labor in Germany is 40 Euro; on the other hand, average cost of the robots varies from 5 to 8 Euros. Moreover, the robots has high capacity to work compared to human, a robot can work 24/7 without rest and it does not require to pay additional wage for over time. On the other, human workers requires extra wage rate

for working extra hours. This facts has results in the reduce demand for the labor in the international market. According to the author, the labor market of China, India and Bangladesh is at greater risk compared to other countries. It has been explained by the author, that 47% of the US labor force is at risk. Similarly, 70% of the labor of India and Thailand is at risk because of artificial intelligence system. In addition to this, it has been claimed by the author that, more than 90% of the labor are suffering because of risk of job loss. According to the author, artificial intelligence system is likely to have greater risk non-low and middle-income countries compared to high income countries.

Theme 4: Artificial intelligence and national security

Artificial intelligence has been very effective in reducing risk related to the business. In addition to this, artificial intelligence has contributed by significant amount in the military action. Government agency and armed forces utilize artificial intelligence for monitoring and managing their employees. It helps organization to evaluate risk of the foreign threats. According to Allen & Chan (2017), leading countries of the world are devoting significant amount of the financial resources in the development of artificial intelligences system. The artificial intelligence system enhances security system of the armed forces. It helps armed forces to analyses and evaluates risk related to cybercrime and other related risk. According to the author, the average expenditure on the robotics by the armed forces has increased from $2.4 billion to $7.5 billion from 2000 to 2015. It is expected that average spending will increase by more than double amount in next ten years. The author has claimed that rising risk of war and terrorist attack has forced the organization to invest in the implementation of artificial intelligence system. The artificial intelligence system helps armed forces to locate the position of the enemy's position through GPS system. Moreover, this artificial intelligence system, can work in poor network zone as well without any issue. It helps armed forces to monitor the location of missiles and other weapons used in the war. The Biggest use of the artificial intelligence system was observed in development of Drone fighter plane used by US army. The artificial intelligence system used by the US helped in hiding exact position of the army vase, it helps in hiding the position of the plane and it doesn't any noise during the process of takeoff and landing,

which helps armed forces to conduct their operation successfully. It has been observed that US government has made significant amount of expenditure in their defense sector. The total investment made by the US government in defense sector was $19,034 billion as per the data of 1996.

Theme 5: Artificial intelligence and collusion

Artificial intelligence system has been utilized by the organization to compete in the market at national and international level. Business organizations are utilizing this system for developing most effective strategies. The artificial intelligence system helps organization to main the privacy in the business. It helps in conducting the business intervention of third parties. Most of the artificial system helps in storing and transporting the information. However, this system can be sued for false representation as well. Business organization is using this system for creating false values and image of their financial performance. It has been observed that action undertaken by an organization affect the international market. In such situation, misuse of artificial intelligence system for financial; purpose can results in the false estimation of the market performance. It can become difficult to evaluate accuracy results of the market performance, which can become a challenge for the investors.

In such situation investing in the market can results in the huge financial loss. The artificial intelligence system can utilize for the purpose of hacking and cyber bullying. It can store data from other system and might represent false data. In such cases, it can become difficult to understand market threat. In the words of Ezrachi & Stucke (2017), artificial intelligence has been an instrument of the stock market fraud for a long period of time. The author has claimed that leading organization has adopted this strategy for creating a false impression of their market performance. Higher representation of market performance of the organization than actual rate will help in attracting the investors. The author has supported this argument based on 2000 market crash in US. In this case it was found that leading organization has generated huge sum of money from the market by creating a false

image of their financial position. However, investment in those companies has resulted in huge market loss.

Theme 6: Artificial intelligence and productivity

Artificial intelligence system and national productivity has direct correlation. Artificial intelligence such as smart computers system has been utilized to increase the average productivity of an organization. The artificial intelligence system helps in conducting the business operation more smoothly and at a fast rate. Initially it was difficult to use artificial intelligence system in the production process because of the high defaults in the system. Brynjolfsson, Rock & Syverson has claimed that rate of defaults of artificial intelligence system has decreased by significant amount in past five years. According to the authors, error in the image recognition has steadily decreases in the past five years. It has been observed that the percentage of image recognition error has from 30% in 2010 to 5% in 2016. The improved standard of image recognition has been helpful for the business organization. It help organization in conducting the business operation without any risk and more smoothly. Organization such as Facebook has experience greater improvement in their operation, through the importing the image recognition of artificial intelligence system. The Facebook utilized neural network for the purpose of translation. It has been observed that improved face recognition system, has helps the organization in conducting 4.5 billion translations every day.

It was expected that improved efficiency of artificial intelligence system, can helps in increasing the productivity of the labors and of the entire nation. However, the author has argued that average productivity of the employees has reduced with respect to the time. According to the author average productu8bvey of the US was 2.8% between 1995 and 2005. However, it has reduced to 1.3% during 2005 and 2016. Moreover, the author has claimed a tights average annual productivity of the labor has reduces from 2.3% to 1.1% globally from 2004 to 2016 level. It has been observed that the improvement in the artificial intelligence system has not made any significant change in the productivity of the developed nation. According to the author, developed nation, already have high level of

technologies at the time of the introduction of artificial intelligence system. Hence, their average productivity increases by slightly small rate. However, the average annual productivity of the labors in developing countries has increased at an increasing rate from 1990's to 2010 but it reduces after 2010. It is important to note that average productive of the labor in the developing countries is still high compared to developed nation.

4.4 Summary

In this chapter, the researcher has conducted primarily qualitative data analysis and secondary thematic analysis. In the primary data analysis the researcher has interviewed the employees of the leading organization such as IBM and DEWA. It has been observed that most of participants believe that artificial intelligence system has improved the risk management system of the business organization. On the other hand, in secondary data analysis the author has reviewed scholarly articles and journals. It has been observed that different authors have different opinion regarding artificial intelligence system. Most of the author believes that artificial intelligence system has improved the risk management system because it helps in conducting the business more securely. However, other authors have argued that artificial intelligence system is not enough matured. It has been observed that most of the author has recommended strategic changes in the implementation of artificial intelligence system. Nonetheless, artificial intelligence system has help the business organization to achieve the desired outcomes it has been observed that improved standard of artificial intelligences system has increased the average productivity of the developing nations.

CHAPTER 5-CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

Artificial intelligence is responsible to cover a large area of the organizational process and human life. This paper has aimed to develop a brief understanding regarding the artificial intelligence by expanding a relation in between the risk management and artificial intelligence. Therefore, it is required to discuss about its different consequences to that of risk management and regulation system. In the risk management system, AI is responsible to merge business policies as well as its various procedures. Moreover, it helped to control several regulatory changes by the regulator for developing the organizational compliance.

The introductory chapter has dealt with purpose and the necessity of overall study by analyzing its problem statement to implement artificial intelligence. This paper was also aimed to highlight the significance of the research paper where there is gradually increasing a technological development as well as its various application of artificial intelligence.

Accordingly second chapter of this research paper has focused on the literature review to that of artificial intelligence and also described how a company could manage its different risk factors to develop business practice in existing business process. The process of an artificial intelligence is become very popular in the recent world because of its accuracy as well as its extreme efficiency in an organizational process and also in human life. In addition, national government is responsible to improve artificial intelligence to maintain the nation's working system and its confidential information. Moreover, this chapter can be able to provide a brief understanding of artificial intelligence and risk management by analyzing different theories and model, which was helped to enhance business practice and its function in an organization.

The third chapter of this research paper has developed an overall understanding of research methodology, research approaches, and its technique as well as research tools to determine the impact of artificial intelligence on risk management of an organization. In addition,

different analytical tools of this research paper could be help to achieve an efficient and effective solution of existing issue. Moreover, this methodological analysis included several data collection method such as qualitative data collection method and quantitative data collection method. On the other hand, fourth chapter of this research paper has focused on discussing the data analysis along with research findings. In order to identify an appropriate research finding, researcher has focused on interviewing six employees of different sector for collecting the raw data set, which was helped to improve the business practice of an organization.

Therefore, an effectiveness of the artificial intelligence in company's performance and productivity has focused in entire research paper. In this way, the paper has presented a brief and holistic analysis regarding the relationship in between the risk management and artificial intelligence of a business practice.

5.2 Linking with the objectives

1.   In linking with first objective

Artificial intelligence could helped to determine a large number of the molecular information which was directly associated with organizational practice and human life. For that it was required to find out the risks and opportunities based on the artificial intelligence of government and companies. From the fourth chapter of this research paper, it could be find various risk and opportunity of artificial intelligence. As per the opinion of IBM risk analytics, artificial intelligence could be able to play an important role to risk planning, risk controlling and risk management system of an organization. AI was responsible to bring revolutionary changes in several industries, which could be help to flourish the governmental process and organizational system. Moreover, the overall process was responsible to enhance human ability and capability to work in a organic manner. Therefore, from the entire discussion, it had found that artificial intelligence would be very efficient and effective analytical tool that helped to make the human life easier. In this context, it can be said that first objective of this research paper has been

achieved in terms of avoiding different risk as well as opportunities associated with artificial intelligence.

2.   In linking with second objective

In the context of this artificial intelligence and risk management system, there has been a various type of challenges and effectiveness of the artificial intelligence. From the perception of an employee of research and intelligence department, this artificial intelligence could be able to improve the humanity, but not the risk which is associated with it. It could be concluded that artificial intelligence was responsible to develop the working ability of its employee in an organization. For improving the working practice in government organizations and companies, it is required to analysis overall challenges and effectiveness of artificial intelligence. According to the opinion of other employee of different industry, the advance technology of this artificial industry could help to increase market position, but as the same time, it reduced the overall manpower in a particular work process. On the other hand, this advance technology has expanded the machine process by increasing the business productivity. Therefore, it could be said that there has a several number of challenges with its effectiveness in an organization. In this context, the second objective of this research paper has been achieved in terms of maintaining a balance in between artificial intelligence and risk management of an organization.

3.   In linking with third objective

Similarly, chapter 4 of this research paper could be able to find the effectiveness of the artificial intelligence on government process and business practice. It has observed that governmental organization and various companies were very much benefited with that of artificial intelligence inclusion. According to the opinion of an employee of risk management of IBM, this type of artificial intelligence could be able to achieve business goals and objectives and to expand entire performance of governmental organization. As per the opinion of other employee of several industries, artificial intelligence has made overall working system very simpler, easier and faster in the organizational process. It helped to expand annual productivity and business performance of an industry. Moreover, there has been evidence that artificial intelligence could be able to develop organizational performance. Therefore, it can be concluded that third objective of this research paper has also been achieved in context of artificial intelligence and risk management system.

4.   In linking with fourth objective

As the fourth objective of this research was to recommend strategies based on improving artificial intelligence for companies and government in increasing performance and avoiding risks related to it, hence the researcher has penned down recommendations provided by research participants in the following section. In this way, current research has also achieved the fourth objective.

5.3 Recommendations

Recommendations 1: Using open-source software

The use of open-source software has a significant benefit in terms of analyzing different risks associated with artificial intelligence in an organization. In order to avoid the risk elements of business management system, they should follow a strategic method to upgrade advance technology and its software to adopt the working environment. In the recent world, the use of open-source software is very important and popular for the software activity. Most of source community can be able to use open-source software

where the tagging and retrieval are extensively applied by software organization. Therefore, to avoid the risk elements in a business practice, an organizational leader should increase ability by using this open-source software in business practice.

S- Specific	The recommendation of open-source software is specific as it exclusively focuses only on the use of open-source software
M - Measurable	The outcome of applying open-source software could be measured through risk assessment standards
A - Attainable	Implementation of these type of software's are less costly and hence can be easily applied by even small-scale organizations
R - Realistic	Using open-source software could help to manage AI risk which is essentially a realistic problem
T – Timely	It would take 3 months to implement the open-source software in any organization

Table 5.1: Breaking down recommendation 1 in SMART table

(Source: created by author)

Recommendation 2: Application of Cognitive Analytics

The application of cognitive analysis has approved the financial services to assemble public content along with the private information as well as private knowledge. It helps to determine different business strategic approach for managing business practice and avoiding the price risk in an industry. Moreover this cognitive analytics can be able to originate different analytical tools which are required to validate the relevant data set. In addition, the analytical tools are responsible to provide a brief understanding by generating source of the business value.

Cognitive analytics has been allowed to capture the personalize services as well as an unstructured information in business management system and therefore, applications of this cognitive analytics is responsible to abate a subjective prospect to that of decision making system of an industry. In addition, analytical tools of this cognitive analytics have a notable impact on the risk management system, as it can be able to detect several complexes of fraud elements of a business.

S- Specific	Cognitive Analytics could help to address one specific aspect of risk management - financial risk
M - Measurable	Outcomes of applying this analytics could be measured by data analysts and auditors
A – Attainable	Considering the revolutionary change in the field of AI, this technology is becoming more and more financially feasible for business organizations
R - Realistic	Cognitive computing could help organizations to address financial risk and thus it is a realistic proposition
T – Timely	Approximately six month time of required

Table 5.2: Breaking down recommendation 2 in SMART table

(Source: created by author)

Recommendation 3: Implementation of Cognitive Computing for data modeling

In the context of this artificial intelligence and risk management system, the implementation of cognitive computing data modeling has played a crucial role in a business management. The platform of this data modeling can be able to absorb a large amount of data set for providing a meaningful understanding as well as a proper business pattern, valuable insights and weighted recommendations of an organization. The entire process of data modeling can be able to capture an evidence based information and the financial services from a large number of documents, reports, financial histories.

S- Specific	Cognitive computing platform would allow business corporations to cross-evaluate public and private knowledge and use the combined information for specific purpose - address risks latent in AI
M - Measurable	Benefit of applying this technology could be easily measured by the gradual change of organizational productivity and risk mitigation over time
A - Attainable	Fuelled by automation and advance technology, this platform would be attainable for modern business corporations
R - Realistic	The recommendation would improve service and allow employees to perform their tasks better , thus ensuring better return in terms of real outcomes
T - Timely	Considering the complexity of this proposition, it would require six to nine months to bring entire IT infrastructure of an organization under cognitive computing platform

Table 5.3: Breaking down recommendation 3 in SMART table

(Source: created by author)

5.4 Limitations of research

This study has encountered several constraints that restricted the natural pace of this study. Firstly, lack of ample monetary funding posed the greatest barrier in terms of conducting primary data collection. In order to answer the research questions, the researcher obtained primary data through face-to-face interview method. Considering the significance and gravity of this research topic, the researcher obtained appointment from senior level employees of prestigious companies such as DEWA and IBM. Naturally, visiting the interviewees caused notable financial expense, which emerged as a problem due to limitation in monetary fund. Similarly, limited monetary grant also prevented the

researcher to obtain access to certain literary sources that were restricted only for paid access. Secondly, time limitation also acted as serious hurdle in this study as pressure of achieving deadline prevented the researcher from conducting in-depth analysis on this research topic. Had there been more time and fund granted to the researcher for this study, current paper would yield more significant outcomes and thus prove to be more useful in future.

5.5 Future Scope of the study

It is the sole purpose of every research paper to remain fruitful in future and the same is also applicable for this paper. Current study could grab strong foothold in future by assisting researchers to carry out in-depth study on assessing risks latent in artificial intelligence. Moreover, this study could also play a supporting role in academia in terms of highlighting major areas that require more empirical emphasis. However, the scope of this paper is not only limited to academia as policy makers could also be highly benefited by the outcomes of this study. The recommendations enumerated in this paper await careful thought and consideration on behalf of policy makers who prescribe effective strategies for addressing risks in organizational environment, both in private and government ones. Furthermore, the first-hand data obtained by researcher in this study would further act as bedrock for such policy makers and leaders to formulate risk assessment policies for addressing their respective domain and amplitude of risks. In this way, current paper could act a beacon of guidance for future researchers while traversing uncharted areas.

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Appendices

Appendix 1: Risk Management process

(Source: https://thoughtblotterr.wordpress.com/2016/07/24/artificial-intelligence-and-risk-management/)

Appendix 2: Risk Management strategies

(Source: http://kestrelmanagement.com/operational-risk-management/)

Appendix 3: Risk based on Artificial Intelligence

(Source: https://www.celent.com/insights/627196534)
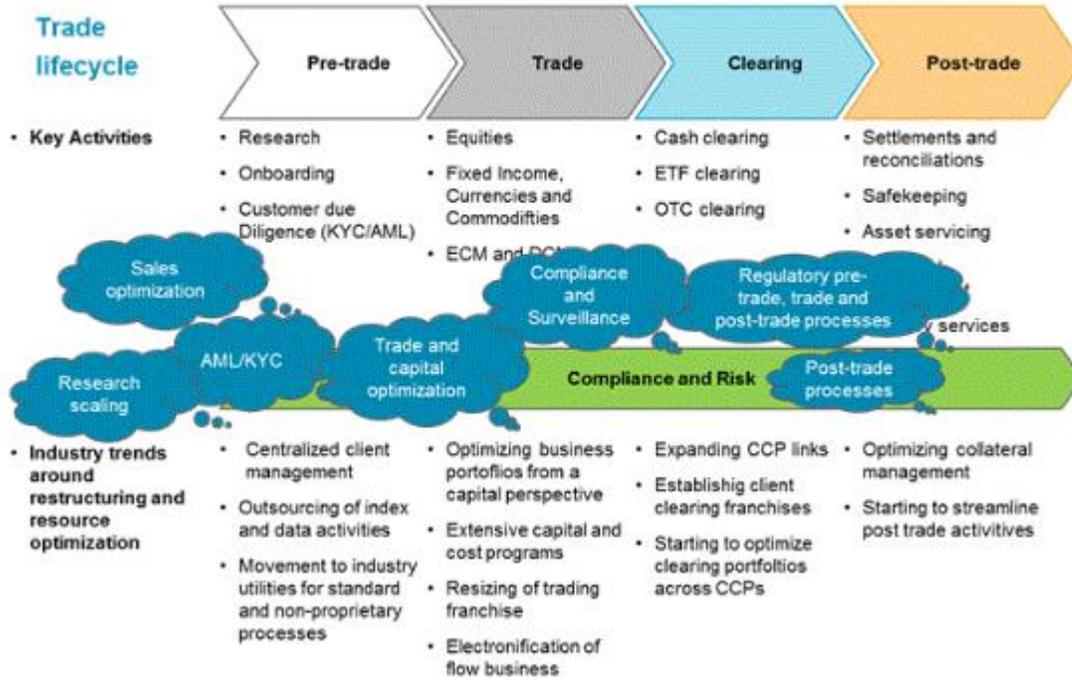
Appendix 4: Iceberg model of risk

(Source: https://www.slideshare.net/sameersanghani/risk-management-sir-a-s-chaubal)

Appendix 5: Time Plan

Main activities	1st week	2nd week	3rd week	4th+5th week	6th week	7th week
Selection of the topic	1.					
Composition of the literature review		2.				
Research methodology			3.			
Collection of and secondary primary data				4.		
Analysis and interpretation of data				5.		
Findings					6.	
Conclusion and Recommendation					7.	
Final submission						8.

Appendix 6: Transcript for interview

Q1. According to you, how has AI contributed in risk management in organizations?

Employee 1 from IBM Risk Analytics	"To me, implementation of AI has leaded to develop effective monitoring of organizational process. And I think you should know your organizational process for assessing risk"
Employee 2 from IBM Risk Analytics	"Exactly, assessing risk is the first task before managing it and one need to analyze the risk factors before implementation of management process"
Employee 1 from Enterprise Risk Management	"AI plays a great role in risk management. Moreover, our security and privacy system has become stronger due to effective intelligence of machine technology"
Employee 2 from Enterprise Risk Management	"Technology has really made organizational process much easier. In the field of risk management as well analysis of the risk has become more easier with AI"
Employee 1 from research department of DEWA	"Evaluation of the risk factors have become comparatively high with the advancement of AI"
Employee 2 from research department of	"Checklist, brainstorming and other such factors due to implementation of AI has made

DEWA	the process of risk identification more easier"

Q2. What is your assessment regarding relationship between artificial intelligence and risk management?

Employee 1 from IBM Risk Analytics	"AI has a strong relation in context to risk management. It provides analysis of the risk factors"
Employee 2 from IBM Risk Analytics	"Artificial Neuronal Networks (ANNs) is an AI technology that helps in risk management decision-making process in many project start-ups"
Employee 1 from Enterprise Risk Management	"AI has developed a high potential in risk analysis"
Employee 2 from Enterprise Risk Management	"The most important relation is, with the advancement of AI, risk factors and cybercrimes has also increased"
Employee 1 from research department of DEWA	"AI has made assessment process high, leading to risk management planning"
Employee 2 from research department of DEWA	"Risk metrics have become essay to tackle"

Q3. In your opinion, what are the key benefits of artificial intelligence in organizational risk management process?

Employee 1 from IBM Risk Analytics	"Risk controlling, planning and management"
Employee 2 from IBM Risk Analytics	"Analysis of the risk and barriers by effective AI analysis process"
Employee 1 from Enterprise Risk Management	"Assessment of the actions required for risk management and controlling system"
Employee 2 from Enterprise Risk Management	"Monitoring of the risk and organisational barriers along with providing necessary strategies for its handling"
Employee 1 from research department of DEWA	"Implementation of high AI field methods in risk analysis"
Employee 2 from research department of DEWA	"Our company uses Artificial Neuronal Networks (ANNs) techniques for project testing and development process. One practical example of AI implementation is Neuronal Risk Assessment System (NRAS)"

Q4. Do you think inclusion of AI in almost every field is a risk to humanity?

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Employee 1 from IBM Risk Analytics	"It is many people perception that AI is developed for replacing humans, although, it is developed and is being developed for the sole purpose of benefiting humans, not replacing them"
Employee 2 from IBM Risk Analytics	"I totally agree to this.AI is meant to help humans not to replace them"
Employee 1 from Enterprise Risk Management	"Although it has replaced humans in certain areas but not totally replaced"
Employee 2 from Enterprise Risk Management	"Up to some extent, yes, it has but not totally. However, its extreme advancement is concern for world in creating an imbalance in nature"
Employee 1 from research department of DEWA	"AI is developed for making human life more compatible and easier, not to replace them"
Employee 2 from research department of DEWA	"This is correct that machines has taken over human in some field but not to replace them, rather to make their work more simpler"

Q5. What affect artificial intelligence has created on your organizational performance and productivity?

Employee 1 from IBM Risk Analytics	"Definitely it has increased the overall performance of the company"
Employee 2 from IBM Risk Analytics	"The productivity and popularity rate has increased over years with its advancement"
Employee 1 from Enterprise Risk Management	"Our company has a huge growth in IT industry with inclusion of IBM Watson"
Employee 2 from Enterprise Risk Management	"It can be assessed by our company name only I guess"
Employee 1 from research department of DEWA	"DEWA has developed a renowned position in UAE along with increasing productivity in the recent years"
Employee 2 from research department of DEWA	"Implementation of AI in work process has reduced manpower along with increasing machine process, leading to one time investment and increasing productivity"

Q6. What strategies would you recommend to improve the application of artificial intelligence for increasing organizational performance and mitigate risks?

Employee 1 from IBM Risk Analytics	"Developing artificial intelligence through open source system, it can help in conducting the business more smoothly"
Employee 2 from IBM Risk Analytics	"In order to successfully implement artificial intelligence system, it is required utilize authentic data for analyzing the risk"
Employee 1 from Enterprise Risk Management	"To improve the performance of artificial intelligence system, it is important to develop the system according to the principles of financial legislation"
Employee 2 from Enterprise Risk Management	" Principles of financial legislation will provide guidance's for enabling artificial intelligence"
Employee 1 from machine intelligence and research department of DEWA	"It is required to develop artificial intelligence according to Governance, Risk and Compliance disciplines"
Employee 2 from research department of DEWA	"The principles of Governance, Risk and Compliance helps in maintaining the risk related to the business"

Appendix 7: Artificial Neuronal Networks Functionality

(Source: https://ea-foundation.org/fiales/ai-opportunities-and-risks.pdf)