Artificial Intelligence and Business Intelligence a Study on Telecommunication Sector in Egypt

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Abstract

The objective of the research is to examine the impact of Artificial Intelligence (AI) on Business Intelligence (BI). The research population consists of all employees at Telecommunication sector in Egypt. The researcher adopted a sampling method to collect data for the study. The appropriate statistical methods such as Alpha Correlation Coefficient (ACC), Confirmatory Factor Analysis (CFA), Multiple Regression Analysis (MRA), were used to analyze the data and test the hypotheses.

The research has reached a number of results, the most important of which are (1) the dimensions of AI play an important role in improving the performance of Telecommunication companies in Egypt by providing information, making decisions, tackling problems, and reducing costs and (2) Telecommunication companies in Egypt still do not use advanced AI technologies to the degree that they are used in international Telecommunication companies such as the AI system and techniques in the areas of the use of NN and GA to support financial decisions related to asset and liability management, (3) expert system as one of the dimensions of AI play an important role in enhancing and improving the role of Telecommunication companies in Egypt, (4) neural networks as one of the dimensions of AI are concerned with downloading large amounts of information that are used to provide Telecommunication companies in Egypt with multiple options due to their high capabilities in analyzing and processing information, (5) genetic algorithms as one of the dimensions of AI help Telecommunication companies to find quick solutions to the problems they face in light of the changing environment conditions, with the aim of helping the management to reach quick results, (6) intelligence agents as one of the dimensions of AI help Telecommunication companies in making decisions in light of the knowledge base that is stored, which leads to reduced time on the one hand, and cost on the other hand, (7) organizations do not rely on BI applications and technologies as a repository of data and immediate analytical processing, (8) the organizations operate in a competitive framework, represented by other organizations operating in the Egyptian environment, which makes the organization's environment suitable for using BI and competitive intelligence applications, (9) the low level of the organizations 'infrastructure to deal with the field of software that supports BI. Perhaps this is due to the organizations' tendency to deal with technologies that work to accomplish the traditional activities of the organization, (10) the interest in BI was limited to certain aspects, the most important of which is the use of BI in reviewing and completing operations within the organization, while the lesser concerns were related to various aspects, the most important of which is cooperation with individuals inside and outside the organization, and the search for new knowledge, and allowing individuals to learn in multiple locations, (11) attention has been focused on the practice of BI in specific aspects, the most important of which is the focus on ensuring that workers in the organization understand the importance of BI for the success of the organization and considering this concept as part of the organization's culture.

The study referred to a number of recommendations, the most important of which are (1) the necessity of expanding the applications of AI according to the Telecommunication companies' need for each type of AI, (2) the necessity of introducing leaders in the Telecommunication sector in Egypt in intensive courses in the field of AI to keep pace with global developments and raise the efficiency of employees in this sector, (3) promoting the role of GA in applications of AI to promote Telecommunication companies within the Telecommunication sector in Egypt, (4) paying attention to the role of ES and IA in the departments of Telecommunication companies due to their great and vital impact in enhancing the applications of AI, (5) focusing attention on NN within the different departments of Telecommunication companies. NN plays a great role in improving and enhancing performance and applications of AI, (6) Telecommunication companies should rely on AI technologies. It plays a significant role in achieving an appropriate level of service provision and achieving customer satisfaction, (7) Telecommunication companies must rely on modern concepts of AI and are appropriate to achieve customer satisfaction, and (8) the necessity of

keeping abreast of new and continuous developments in the field of AI and utilizing them in developing and improving the performance and satisfying the desires and needs of customers, (8) the necessity of attracting workers with experience and skill in dealing with BI techniques, as well as the possibility of developing workers in the technical field by directing them to participate in training courses in this field, (9) the use of the data warehouse as the most prominent techniques that provide analytical information through which administrative decisions are made, in addition to the analytical and immediate processing of the data and presenting it in an appropriate manner, (10) the necessity of integrating BI techniques in a manner that achieves the highest level of efficiency in exploiting and analyzing data, in order to achieve the highest level of decisions in light of the use of cost-benefit analysis, (11) identify the applications of BI in organizations operating in the same field in order to benefit from them and achieve the highest levels of benefit in this field, (12) the need to pay attention to amending the services provided by banks to their customers, with the aim of making use of BI systems in developing the performance of employees, which leads to the survival, growth, and distinction of the banking sector while it is in the process of providing services to its customers, (13) the necessity to invest in all available resources in a manner that meets the needs and desires of customers on a daily basis, and to work on increasing and diversifying the services provided.

Keywords: *Artificial Intelligence, Business Intelligence*

1. Introduction

Artificial Intelligence (AI) risks take two forms (1) threatening human functions in smart programs that are designed and doing the human job to the fullest. This is in addition to the low degree of risk and low cost (Wisskirchen et al., 2017), (2) the transmission of control to the machine loses human control (Helbing et al., 2019).

The terrifying problem lies in the destiny of man in the world in which most of the work is done by machine, in addition to the technological development that requires interaction with the machine. This makes the future of the human element mysterious and difficult to predict (Lu et al., 2018).

The basic principle underlying AI is not to solve problems more quickly, or to process more data, or to preserve the largest number of information. The principle is to process information, whatever its nature or size, in an automated or semi-automatic manner, appropriately and proportionately with a specific goal (Panesar, 2018).

Automated intelligence or AI is a synonym for each other, but AI is the most used in all academic fields. There are rapid technological changes on the one hand, and economic reasons on the other hand, in addition to the emergence of big data in recent years (Carlos et al., 2018).

The future of AI and its applications has taken on great importance after a conference at the White House in the United States at the end of 2016. It addressed an important issue concerning the future of applications and ethics of AI (The Executive Office of the President of the USA, 2016).

AI has brought about a scientific breakthrough for humankind during the past two decades in terms of the high skills and achievements that have resulted in it in various fields of medicine (Li et al., 2017), logistics (Thomassey & Zeng, 2018) and economic facilitation (Aghion et al., 2017), natural language processing (Panesar, 2018), stock trading in financial markets (Milgrom & Tadelis, 2018), and security systems in image analysis and voice recognition (Allen & Chan, 2017).

Intelligence is the ability of a person to understand and learn things. Also, it indicates a different approach in dealing with matters facing the individual (Negnevitsky, 2005).

The term AI was first coined by John McCarthy's science of 1956, but the journey to understanding the idea that machines could really think in 1945 started when Bush indicated that a machine could work as we thought. Five years later, Alan Turing stated that machines have the ability to simulate humans and the ability to do many intelligent things (Smith et al., 2016).

AI is science, since it developed smart computer systems by employing mathematical principles. It also has the ability to solve some difficult problems in chemistry, geology, and medicine. AI is an art that works on the basis that the idea of designing intelligence systems is done by employing technological methods of programming (Nath, 2009).

AI is the intelligence displayed by a machine. It is the science that makes machines perform the tasks that require intelligence if humans do them (Dalbelo & Snajder, 2014).

The technology of AI includes the computer system (computer and its software) that attempts to imitate human behavior. It is the most intelligent software in the computer that includes two directions, the first is to increase information processing, and the second is to increase the degree of information understanding (Alter, 1999).

AI technology is designed to increase the susceptibility of workers, not to replace them. It makes connections between complex applications and employees (Winston, 1997).

AI systems rely on human experiences and knowledge. The current systems are an extension of human expertise but do not replace it due to the lack of human feeling (Laudon & Laudon, 2010).

AI can simulate human intelligence such as the ability to learn through experiments, use a logical solution to solve problems, make effective decisions, and control product lines (Baltzan & Phillips, 2008).

Imitating human behavior through computer programs is not an easy thing. Because computer programs must be able to do various and varied things so we can say it is intelligent (Joost et al., 2012).

The field of information is currently experiencing confusion between the concept of AI and Big Data (BI), especially in field of applied sciences that links intelligence to the concept of big data despite the complete separation of each field separately (Veronica et al., 2017).

If the data contributes to feeding the Genetic Algorithms (one dimension of AI), it does not mean that smart algorithms are directly related to the field of condensed parameters. As for the Big Data Analytics (BIA) field, it is quite different since it is derived from the use of AI with BI, and with the passage of time it began to take a new branch in the field of technological sciences (Hordri et al., 2017).

According to the generalization of the use of algorithms, all employees in this field agree that their primary role is based on research by solving problems of logical, computational or highly complex algorithm (Matzel & Sauce, 2017).

The ambition of AI technologies has been to imitate man in certain applications of his cognitive functions. The growing growth in big data has become beyond these aspirations in the hope of reaching more strength extracted for different uses (Jha & Eric, 2018).

There is no doubt that the biggest impediments to AI is the missing data, which is the main problem in the feature of learning and self-prediction. It is one of the problems that attracted the attention of a large number of researchers in recent years (Gartner Data & Analytics Summit, 2017).

An educated algorithm requires the largest number of data in order to adjust its behavior to be more accurate in the prediction process, as the more data is provided the more accurate the prediction (Berk, 2016).

When the nutrient data is missing, the algorithm becomes a cut-out image, but with the increase in data and the entering of the era of big data, these algorithms become more saturated with data. This led to the emergence of a new stream under the shadow of AI called BDA. It expresses a harmony between smart algorithms and BD (Jha & Eric, 2018).

In light of the above, it can be said that there is a confusion between BD and BDA. BD is concerned with storing, collecting and organizing data. As for the BDA, it is branched out on the AI, which is concerned with analyzing huge amounts of data and helping users in deriving the results to reach more strength extracted for different uses and its cognitive functions, but with the increasing growth in problem ornaments (Jha & Eric, 2018).

The term BI appeared in 1958 when Hans Peter adopted the idea of building an automated system for disseminating information at the level of the organization (Luhn, 1958). However, the real interest in BI began in the late 1980s, as it was the beginning of the shift from focusing on reporting and information to managers to focusing more on situational analysis about how the organization has performed in the past, current performance, and future performance (Ionescu & Podaru, 2014).

Howard Dresner, Chief Executive Officer at Hyperion, is consider the father of the term BI in 1989, which he described as the concepts and methods that are used in the process of improving decision-making at work through the use of supportive systems based on facts (Evans, 2010).

The term BI has been used instead of decision support systems, executive information systems, and management information systems, and in some literature the term BI and analytics (Abai et al., 2016).

Reports indicate that investments in BI tools are expected to double at the service level (Tabbitt, 2013).

In the context of the decision support environment, BI systems have improved the effectiveness of decision-making at different levels in various areas, including the industrial sector in airlines, banking,

insurance, finance, securities, manufacturing, and communications (Propovic et al., 2012, Ramakrishnan et al., 2012).

Although many organizations have successfully implemented BI systems in organizational decision-making, decision-making and performance, some organizations have not achieved this (Henshen, 2008).

Researchers have viewed BI from different perspectives, with some researchers studying BI as a tool from a technical perspective (Elbashir, et al., 2008), while others have viewed BI as an approach or a means to support decision-making (Moss & Atre, 2007).

The effectiveness of BI lies in its ability to support the decision-making process within the organization and to provide decision-makers with appropriate and timely information (Massa & Testa, 2005).

Most organizations are striving to understand the increasing diversity, speed, and volume of data that is being produced from internal and external sources. The importance and role of BI in understanding the huge volume of data and helping organizations improve their performance appears (Isik et al., 2013).

A critical component of an organization's success is its ability to make use of all available information (Cody et al., 2002). The ability to collect and analyze data and turn it into information that can be used in a timely manner is not only a necessity for success, but also a necessity for survival (Pirttimaki et al., 2006).

Investing in BI has a high priority in all organizations worldwide (Gartner, 2016), and its global market is expected to reach 22.8 billion dollars in 2020 (Ghosh, 2018).

2. Literature Review

2.1. Artificial Intelligence

2.1.1. Artificial Intelligence Concept

AI is a field of computing science, but its start was by specialists in the field of neuroscience and psychology (Gunning, 2017).

AI is a system associated with computing systems and algorithms that combines all methods aimed at simulating capabilities in the United States at the end of 2016. An important issue addressed the emergence of mental data for humans and animals and their working patterns without pre-programming of behavior. The most important of these characteristics are inference (Born, 2018) and self-machine education (Mullainathan & Spiess, 2017).

AI is the scientific and technical current that includes methods, theories, and techniques aimed at creating machines capable of simulating intelligence (Li et al., 2017).

AI is a cognitive science and not a technical science. This is due to the fact that it started with the work of a group of researchers in computational neuroscience and mathematical logic, while it is now considered a computing science (George, 2018).

AI is a science based on fields such as computer science, mathematics, biology, psychology, and engineering with the aim of developing computer systems that can think, see, speak and thus act intelligently (O'Brien, 2000).

2.1.2. Artificial Intelligence Dimensions

The dimensions of AI are expert systems, neural networks, genetic algorithms, and intelligence agents (Baltzan & Phillips, 2008; Kenji, 2013).

2.1.2.1. Expert Systems

The primary purpose of Expert System (ES) is to help a person in thinking processes, not to provide him with information, and thus to make a person more judgmental (Kenji, 2013).

ES use their knowledge base to make decisions and accomplish tasks in a manner that achieves the user's goal (Baltzan & Phillips, 2008).

ES is computer programs that imitate the procedures of experts in solving difficult problems, and expert experiences are transferred to systems of expertise for the benefit of those employees in problem solving (Baltzan & Phillips, 2008).

ES is knowledge engineering, by putting in place expert knowledge in computer programs by imposing some different tasks in the organization (John, 2007).

ES is a knowledge-based information system, which uses its knowledge about special and complex applications and works as a staff consultant (O'Brien, 2000).

ES emerged in the 1970s, precisely when Stanford University designed the first ES named Dendral (Kosko, 1997).

ES consists of knowledge base, working memory, interface engine, explanation facility and interface (Durkin, 1994).

2.1.2.2. Neural Networks

Artificial Neural Networks (NN) are a process for processing information in a manner similar to the human nervous system. The main thing is the different structure of the information processing system (Yaris & Ahmad, 2014).

NN rely on a simple look at the nerves, as they are arranged in levels forming a large network, and the network function defines both learning and communication (Kenji, 2013).

NN attempt to simulate the way the human mind works. The way it works is that the cell evaluates the inputs, estimates their weight, calculates the sum of the input weights, and then compares the sum with the beginning of the inputs (Awad & Ghaziri, 2004).

Neurons will change the strength of bonding between process elements in response to changing patterns in the data received and results achieved (O'Brien, 2000).

NN are related to industrial logic. The data is formed throughout development time in contrast to statistical guesses based on a mathematical model that illustrates how outputs depend on inputs (Kosko, 1997).

NN are free-model estimates. They learn from experience, and non linear, massively parallel feedback dynamical systems (Kosko, 1997).

NN are distinguished from other techniques by their ability to self-learn through their own rules according to a specific methodology. This approach is strengthened through training in a way that simulates the work of brain neurons in terms of their structure and treatment (Laudon & Laudon, 1996).

2.1.2.3. Genetic Algorithms

Genetic Algorithms (GA) are a set of instructions that are repeated to solve a problem. The word Genetic refers to the behavior of algorithms that can resemble biological processes (Kenji, 2013).

GA are a system that attempts to find the mix of inputs that give the best results. It is appropriate for making decisions in different environments (Baltzan & Phillips, 2008).

GA are methods of solution that help create solutions to specific problems using environmentally friendly methods. GA are programmed to work the way a person solves issues by changing and reorganizing component parts using methods such as reproduction, transformation and natural selection (O'Brien, 2000).

GA are optimization techniques that use processes such as Genetic Combination or the so-called Mutation and Natural Selection based on the concepts of evolution (Watson, 1999).

GA function as programs or software packages in a manner that allows possible solutions to the financial or banking problem. This technique is used in general in the financial banking activity and in particular in providing solutions and supporting investment decisions (Watson, 1999).

GA are a growing application of AI to use mathematical applications to simulate advanced procedures that produce better solutions to a problem (Goldberg, 1994).

2.1.2.4. Intelligences Agents

Intelligence Agents (IA) is a knowledge-based experience system implanted within computer-based information systems or its components to make it smarter (Kenji, 2013).

IA is software applications that help in keeping the internet tasks in the company for the sales and purchases. It also warns users when something important happens (Baltzan & Phillips, 2008).

IA is applied in the email systems and cell phone software (Baltzan & Phillips, 2008).

IA is the one who uses his or her knowledge base about a specific person or process to make decisions and accomplish tasks in a way that achieves user goals (O'Brien, 2000).

IA is anything that observes its environment through sensors and action by responding to the environment (Russell & Norvig, 1995).

2.2. Business Intelligence

2.2.1. Business Intelligence Concept

The concepts presented by researchers regarding the term BI have varied and varied, depending on the scientific background or the viewpoint through which this concept is viewed.

Intelligence is the mental energy that we apply to our prior knowledge in order to generate ideas, discover relationships between things, draw conclusions, and solve problems. Intelligence has transferred to organizations and their actions, and organizations have turned to BI or the use of information systems to collect and analyze information from internal and external sources in order to make efficient and effective decisions (Chen, 2016).

BI is the leveraging of software and services to transform data into actionable vision and support strategic and tactical business decisions of the organization (Pratt & Fruhlinger, 2019).

BI is a term that encompasses analytical applications and infrastructure, as well as best practices in creating benefit (Gartner, 2019).

BI is the technologies, applications, and practices for collecting, integrating, analyzing and presenting business information to support better and faster decision-making (Balachandran & Prasad, 2017)

BI is an umbrella term that includes a variety of information technology applications that are used in analyzing the organization's data and communicating it to users (Maheshwari, 2015).

BI is the use of analytical methods with the purpose of using them both now and in the past to predict the future (Alawin & Mayteh, 2014).

BI is a set of technological tools and processes that help convert data into information, information into knowledge, and knowledge transfer to help the organization's strategy for planning and facing competitors (Loshin, 2013).

BI is a set of technologies that help to discover the best data from the huge amount of data to improve the production process (Naraina, 2013).

BI is the process of transforming raw data into useful information in order to create strategic and operational vision on the one hand, and decision-making on the other hand, with the aim of achieving real business benefits (Duan & Xu, 2012).

BI is a set of tools and techniques that help convert a large amount of data from different sources into meaningful information to support decision-making and improve organizational performance (Ramakrishnan et al., 2012).

BI is the computer-based technologies used in identifying, extracting and analyzing business data and using it in making various decisions in an organization with the aim of improving its performance (Kumar, 2012).

BI is the use of technology in the process of retrieving, extracting and analyzing the organization's data in order to produce concise and meaningful information to support decision-making, and this type of intelligence is usually presented in the form of a written report, summary or presentation with diagrams (Barbieri, 2012).

BI is the core of the organization's system, which is based on a series of strategic and tactical steps implemented by technology in terms of providing data and producing analytical results to generate an efficient and effective decision-making process in the business sector, at a time when many organizations seek to explore the vast amount of data. (Karim, 2011).

BI is a term that includes tools, databases, data warehouses, and performance management, all of which are combined into a unified software package (Turban & Volonino, 2011).

BI is a set of processes, tools, and technologies that deal with data and turn it into information, and information into knowledge, and this accumulated experience, as well as the accumulated knowledge, are transformed into sections that are managed intelligently and used in decision-making, building appropriate strategies and tactics (Turban et al., 2011).

BI is a process that focuses on supporting a variety of business functions, and using advanced analytics to create real benefit (Glancy & Yadav, 2011).

BI is a group of programs that collect and analyze data in order to assist workers in the field of making decisions efficiently and effectively (Chaudhuri et al., 2011).

BI is the approach followed by the management of an organization that allows identifying useful information relevant to its decisions (Lioyd, 2011).

BI is a set of tools and practices that help managers and users control business activities, improve organization performance and maintain competitiveness (Matei, 2010).

BI is the use of technologies, applications, and processes to collect, store and analyze data with the purpose of helping its users reach appropriate decisions (Wixom & Watson, 2010)

The steps in analyzing BI systems are to process data with the aim of producing the necessary information for its users. These steps are data collection, data storage, information dissemination and use of information (Kaplan & Norton, 2010).

BI is a set of perceptions, methods, and processes to improve managerial decisions, use information from multiple sources, and apply experiences to develop a correct understanding of business dynamics (Tabatabaei, 2010).

BI is an integrated set of tools, technologies and software used to discover, simplify and analyze information from various sources (Yeoh & Koronios, 2009).

BI is a large group of application programs that are used in data collection, analysis, and storage with the purpose of assisting business practitioners in making better decisions (Watson, 2009).

BI is a set of data repositories related to customers, competitors, the competitive environment and internal processes of the organization, which gives the organization the ability to make decisions efficiently and effectively (Dayal et al., 2009).

BI is a technological method that is used in business management to manage data in order to make better decisions (Rubio et al., 2008).

BI is a description of the applications that are used to collect, analyze and provide data and information in the organization for the purpose of making business decisions in the best possible way (Wu et al., 2007).

BI is the process of properly collecting the right information in the right way and at the right time and delivering the right results to the right people for the purpose of making appropriate decisions (Xu & Kaycl, 2007).

BI is a package of new technologies such as data warehouse, real-time analytical processor, and data search that are used in structured data processing and analysis (Haag et al., 2007).

BI is the umbrella that brings together the architecture, tools, database, analytical tools, applications, and methodologies (Turban et al., 2007).

BI is a set of tools and methods that improve executive decision-making, business activities, and increase value in an organization (Zeng et al., 2006).

BI is all that is related to obtaining, accessing, understanding, analyzing and converting one of the basic and valuable assets of the organization, which is raw data into effective information for the improvement of business and decision-making process in the organization (Azvine et al., 2006).

BI is a management philosophy and an essential tool that helps organizations manage and improve information in order to make more effective decisions (Lonnqvist & Pirttimaki, 2006).

BI is a set of approaches and processes by which raw information is converted into final information that is used in support of strategic, tactical and operational plans in a manner that leads to improved decision-making (Kimball et al., 2005).

BI is a set of software used to rationalize decisions within an organization and increase its effectiveness. This is in addition to providing the latest information on the various commercial actors (Pirttimaki, 2004).

BI is a set of analytical tools used to understand the capabilities available to the organization, trends in the market, technology used in the environment and the work of competitors, with the aim of providing the necessary information to planners and decision-makers within the organization, with the aim of converting information into a competitive advantage for the organization (Negash, 2004).

BI is a group of processes that convert data into information, as well as convert information into knowledge (Golfarelli et al., 2004).

BI is an information system that allows users to look at data in databases easily and quickly (Turban, 2002).

BI is a purposeful analytical process to collect and accurately analyze information about competitors, markets, and customers to support business decisions or convert data, information and knowledge into actionable value in the organization (Kalakota & Robinson, 2000).

2.2.2. Business Intelligence Importance

BI analyzes help to discover important trends, identify the opportunities that can be exploited, as well as the threats that must be faced, and BI helps shape strategic intelligence analyzes (Fleisher & Bensoussan, 2007).

The benefits of BI are tangible and intangible, and that is why companies invest in it in the hope of a quantum leap in the future (Negash, 2004).

The tangible benefits of BI are to reduce the overall infrastructure costs in the organization by eliminating the data extraction processes that are widespread in the organization that may contain duplicate data. Accessing data from multiple sources in a centralized, single format (Watson & Wixom, 2007).

BI plays an important role in improving organizational performance (Trieu, 2018). It also contributes to improving the operational efficiency of operations, raising the dynamic capabilities necessary to innovate new products or services, enhancing organizational intelligence, and the dynamic organizational structure (Moreno et al., 2018).

BI also helps in making appropriate strategic and operational decisions since it eliminates the method of guessing, in addition to that BI provides more accurate data on various business aspects such as financial data, production, and customers, which helps management in making decisions that are based on reality. It is not just a guess (Moreno et al., 2018).

2.2.3. Business Intelligence Dimensions

The BI dimensions are technology, people, and strategic alignment (Torres et al., 2018; Knabke & Olbrich, 2017; Yeoh & Popovič, 2015; Sangari & Razmi 2015; Cosic et al., 2012).

2.2.3.1. Technology

Technology refers to the technological components of a BI system, and includes extracting accurate data from various process systems to be integrated into the data ware house, and using interactive reporting technology to address structural problems.

In addition to that, the use of data mining technology to deal with non-structural problems, and display information according to the user's request for the system, in addition to the necessity of integrating the BI system with other information systems.

BI technology includes data quality from its sources, information query, report generation, data visualization functions, and knowledge discovery by extracting variable information from data in databases (Yeoh & Koronios, 2010).

A set of basic elements of technology must be taken into account in the sense that it is one of the basic dimensions of BI and these elements are data quality, reporting and visualization technology, discovery baseness analytic technology, user access, integration with other systems, Systems Integration (Torres et al., 2018).

2.2.3.2. People

The management role is concerned with the necessary support, the skills of the BI team, and the skills of the system user. Individuals include everything related to those related to BI systems, such as senior management, its team, and its users in terms of their predominant technical, managerial and cultural capacity that governs their actions and decisions (Mungree et el., 2013).

There is a set of basic elements for individuals in the sense that it is one of the basic dimensions of BI. These elements are to support the upper management, the team and its skills, the system user and the skills of (Yeoh, & Koronios, 2010).

2.2.3.3. Strategic Alignment

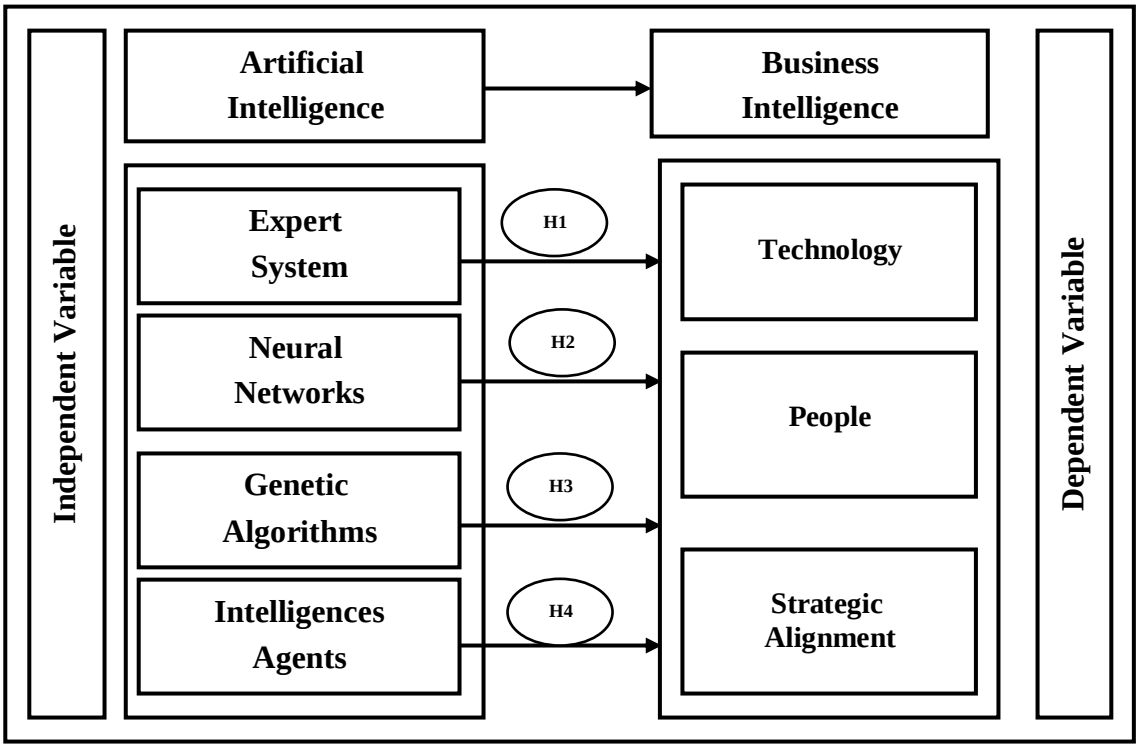
Strategic alignment means undertaking the necessary restructuring to align applications and uses of BI with the objectives of strategic operations in order to support and enhance the operational processes (Watson & Wixom, 2007).

Strategic alignment is the foundation in the governance of information systems, which requires alignment of BI, and business strategy must be aligned with strategies and plans of information technology with strategic business objectives so that information technology provides the ability to provide business value and create a clear vision of BI (Wilkin & Chenhall, 2010).

Strategic alignment means that BI strategies and plans are aligned with the objectives of operations management (Luftman, 2000).

3. Research Model

Figure (1) Proposed Comprehensive Conceptual Model



The diagram shows that there is one independent variable of AI. There is one dependent variable of BI. It shows the rational link among the two types of observed variables. The research framework suggests that AI have an impact on BI.

AI is measured in terms of expert systems, neural networks, genetic algorithms, and intelligence agents (Baltzan & Phillips, 2008; Kenji, 2013).

BI is measured in terms of technology, people, and strategic alignment (Torres et al., 2018; Knabke & Olbrich, 2017; Yeoh & Popovič, 2015; Sangari & Razmi 2015; Cosic et al., 2012).

4. Research Questions

The research problem has two sources. The first source is to be found in previous studies. There is a lack in the number of literature review that dealt with the analysis of the relationship between BD and BI. This called for the researcher to test this relationship in the Egyptian environment.

In light of the review of previous studies, there is a study aimed at identifying the effect of BI on BI capabilities. The study found that there is a significant relationship between the experience of BI employees and the capabilities of BI. The study also indicated that BI can be considered a strategic investment in improving the performance of the organization (Torres et al, 2018).

There is a study that aimed to implement the service oriented BI (SOBI) to integrate academic and financial data in the data warehouse. The study found that when implementing SOBI, therefore, Dashboard applications that work to manage the data integration process must be performed, and data integration is usually done on the BI. The service provider can be called by the dashboard application to perform the data retrieval process and transfer it to the data warehouse (Somya, 2018).

There is also another study aimed at identifying the effect of BI on artistic creativity. The study found a relationship between the BI dimensions represented in data storage, data mining, and immediate analytical processing on technical creativity in the organization (Irtaimeh et al, 2016).

There is a study aimed at identifying the impact of BI on managing organizational performance. The study concluded that BI is considered a basic necessity to assist decision makers in a way that leads to improving organizational performance. The study also indicated that designing a good BI system is useful to ensure that the organization's performance management is done effectively and more dynamically (Yahaya et al, 2016).

There is a study aimed at identifying the way in which BI can help in knowledge management for employees in the financial sector. The study indicated that BI systems play an important role in achieving a competitive advantage for employees if they are able to employ and exploit BI tools such as data warehouse, data search, data analytical processing, converting and writing data (Muhamnad et al., 2014).

There is another study aimed at developing a framework of critical success factors in BI. The study found all the factors that are strongly and successfully linked to the application of BI, with the exception of the technological framework, and they classified these factors from most to least important which are senior management support, the executive sponsor, the clear vision, Managing change, user engagement, aligning BI strategy with business goals, team skills, adequate resources, all of these factors lead to BI success (Mungree et al., 2013).

There is a study aimed at identifying the processes and methodologies that underlie business administration and the relationship between it and BI. The study found that managing and improving work performance is a prerequisite not only for increasing commercial profitability but also for staying in a competitive and fast-moving business environment (Yan & Xiangjun, 2010).

The second source is the pilot study, which was conducted an interview with (30) employees at real estate tax authority in Egypt to identify the dimensions of AI and BI. The researcher found through the pilot study several indicators notably the important role that could be played by AI in affecting BI at real estate tax authority in Egypt. The research questions of this study are as follows:

Q1: What is the relationship between AI (Expert Systems) and BI at Telecommunication Sector in Egypt?

Q2: What is the nature of the relationship between AI (Neural Networks) and BI at Telecommunication Sector in Egypt?

Q3: What is the extent of the relationship between AI (Genetic Algorithms) and BI at Telecommunication Sector in Egypt?

Q4: What is the nature and extent of the relationship between AI (Intelligence Agents) and BI at Telecommunication Sector in Egypt?

5. Research Hypotheses

In the light of a review of previous studies, there is a study aimed at identifying the effect of BI on the quality of decision-making. The study found that the existence of BI management has direct and indirect positive effects on data quality and information quality, and that all these factors affect the quality of managerial decision-making (Wieder & Ossimitz, 2015).

There is also another study aimed at identifying the effect of BI on the agile performance of the supply chain. The study concluded that there is a significant relationship between the different dimensions of BI in administrative efficiency, technical competence, cultural competence and the lean performance of the supply chain which is represented in customer satisfaction, productivity, Sales, delivery, cost, quality, and product development capability (Sangari & Razmi, 2015).

There is a study aimed at identifying the nature of the relationship between BI and knowledge management. The study concluded that BI systems play an important role as a tool for knowledge management for workers in the financial sector, and this is in addition to providing benefit to this sector, which is always characterized by the speed of change, as well as the huge size of Data used (Muhammed & et al., 2014).

There is also a study concerned with identifying the potential for BI to reduce the time allocated to decision-making in the organization. The study has found that the decision-making process necessarily leads to changes in the organizational behavior of all individuals working in the organization in a manner that leads to enhancing the quality of business decisions and their approach (Bara & Knezevic, 2013).

There is a study interested in learning about the role of BI in knowledge exchange. The study found that there is a significant impact of real-time analytical processing, data mining, and data warehouse on knowledge sharing. The results also indicated that BI tools had the greatest impact on sharing knowledge, and these tools are represented in the analytical processing of data, searching for it, and extracting it from all sources available to it (Barakat et al., 2013).

There is a study concerned with choosing the relationship between BI and information quality. The study found the implementation of BI systems positively affects the quality of information. Also, The maturity of the BI system affects the information quality content and the quality of the methods used (Popovic et al., 2009).

The following hypotheses were developed to decide if there is a significant correlation between AI and BI.

H1: There is no statistically significant relationship between AI (Expert Systems) and BI at Telecommunication Sector in Egypt.

H2: AI (Neural Networks) has no significant effect on BI at Telecommunication Sector in Egypt.

H3: There is no relationship between AI (Genetic Algorithms) and BI at Telecommunication Sector in Egypt.

H4: AI (Intelligence Agents) has no significant impact on BI at Telecommunication Sector in Egypt.

6. Research Population and Sample

The population of the study included all employees at Telecommunication sector in Egypt. The total population is 56800 employees. Determination of respondent sample size was calculated using the formula (Daniel, 1999) as follows:

$$n = \frac{N \times (Z)^2 \times P\,(1\text{-}P)}{d^2\,(N\text{-}1) + (Z)^2 \times P\,(1\text{-}P)}$$

A number of samples, obtained by 381 employees at Telecommunication sector in Egypt, are shown in Table (1).

Table (1) Distribution of the Sample Size

Telecommunication Sector in Egypt	Numbers	Percentage	Sample Size
1. Telecom Egypt	33000	58%	381X 58% = 221
2. Vodafone	7800	14%	381X 14% = 54
3. Orange	8000	14%	381X 14% = 53
4. Télécommunications	8000	14%	381X 14% = 53
Total	**56800**	**100%**	**381X 100% = 381**

Source: Personnel Department at Telecommunication Sector in Egypt, 2020

Table (2) Characteristics of Items of the Sample

Demographic Variables		Frequency	Percentage
1. Gender	Male	240	80%
	Female	60	20%
	Total	**300**	**100%**
2. Marital Status	Single	105	35%
	Married	195	65%
	Total	**300**	**100%**
3. Age	From 30 to 45	180	60%
	Above 45	120	40%
	Total	**300**	**100%**
4. Educational Level	University	210	70%
	Post Graduate	90	30%
	Total	**300**	**100%**
5. Period of Experience	From 5 to 10	180	60%
	More than 10	120	40%
	Total	**300**	**100%**

7. Procedure

The goal of this study was to identify the impact of AI on BI. A survey research method was used to collect data. The questionnaire included three questions, relating to AI, BI, and biographical information of employees at telecommunications sector in Egypt. About 381 survey questionnaires were distributed. Multiple follow-ups yielded 300 statistically usable questionnaires. Survey responses were 78%.

8. Research Variables and Methods of Measuring

The 16-item scale AI section is based on Baltzan & Phillips, 2008; Kenji, 2013. There were four items measuring expert systems, four items measuring neural net, four items measuring genetic algorithms, and four items measuring intelligence agents

The 15-item scale BI section is based on Torres et al., 2018; Knabke & Olbrich, 2017; Yeoh & Popovič, 2015; Sangari & Razmi 2015; Cosic et al., 2012. There were five items measuring technology, five items measuring people, and five items measuring strategic alignment.

Responses to all items scales were anchored on a five (5) point Likert scale for each statement which ranges from (5) "full agreement," (4) for "agree," (3) for "neutral," (2) for "disagree," and (1) for "full disagreement".

9. Data Analysis and Hypotheses Testing

9.1. Coding of Variables

The research consists of two variables. The first is AI (independent variable). The second is BI (dependent variable). Each variable consists of sub-variables. Description and measuring of the research variables is presented in Table (3) as follows:

Table (3) Description and Measuring of the Research Variables

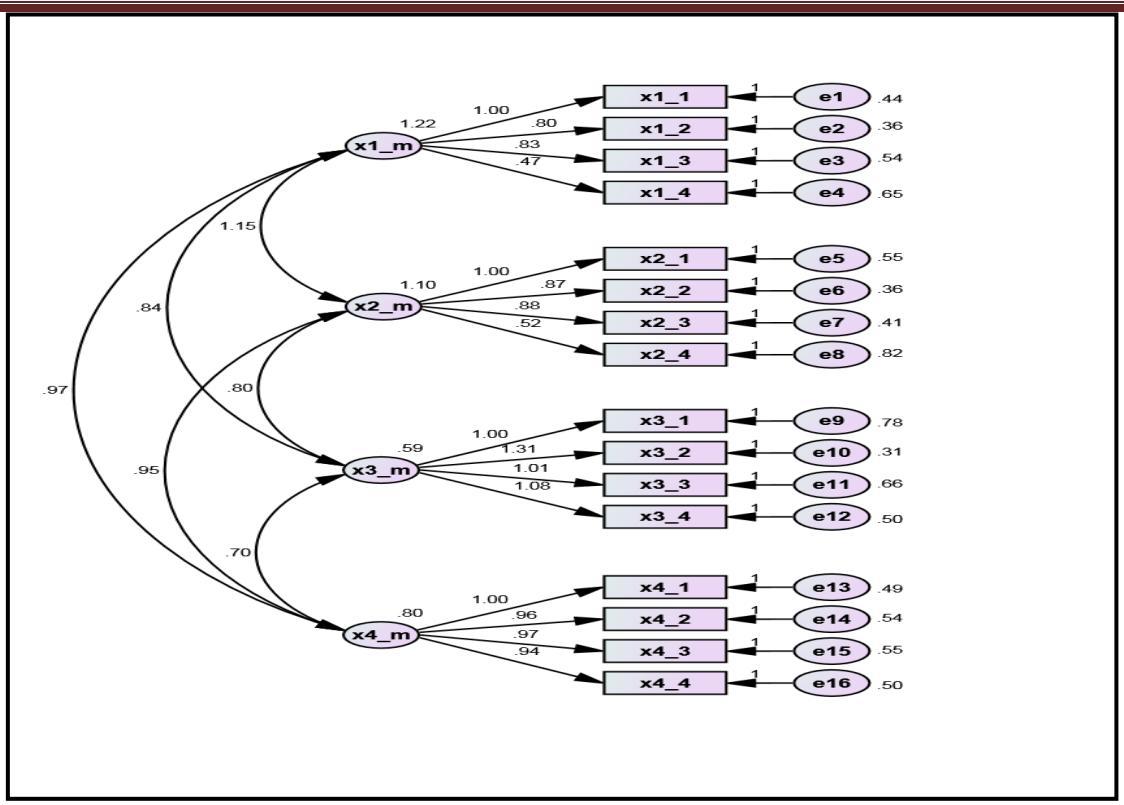
Main Variables		Sub-Variables	Number of Statement	Methods of Measuring Variables
Independent Variable	Artificial Intelligence	Expert Systems	4	Baltzan & Phillips, 2008; Kenji, 2013
		Neural Networks	4	
		Genetic Algorithms	4	
		Intelligence Agents	4	
Total AI			**16**	
Dependent Variable	Business Intelligence	Technology	5	Torres et al., 2018; Knabke & Olbrich, 2017; Yeoh & Popovič, 2015; Sangari & Razmi 2015; Cosic et al., 2012
		People	5	
		Strategic Alignment	5	
Total BI			**15**	

9.2. Construct Validity

9.2.1. Artificial Intelligence

The researcher used Confirmatory Factor Analysis (CFA) for AI. The total number of BI is 20 statement. This can be illustrated by the following figure:

Figure (2) CFA For AI



From the previous figure, it is clear that all the statement of AI are greater than 0.50, which corresponds to GFI. This is a good indicator of all other statistical analysis. The quality indicators for AI can be illustrated in the following table:

Table (4) Quality Indicators for AI Using AMOS Analysis

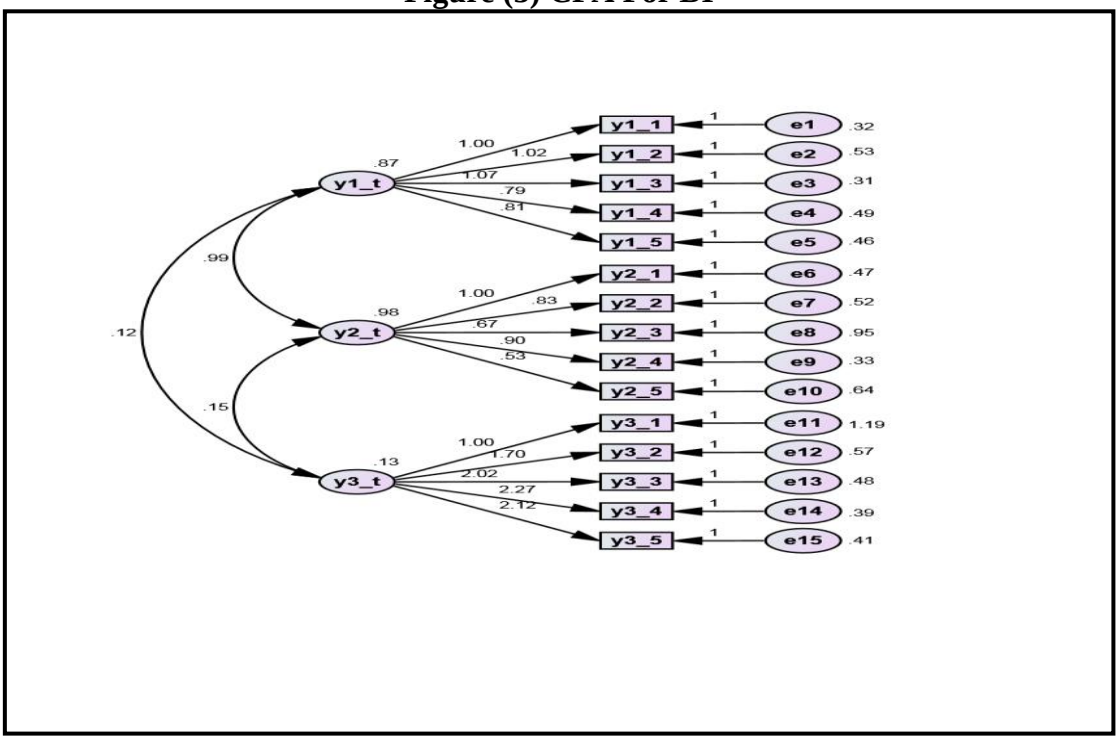
Test the Quality of the Model Acceptance Condition (Daire et al., 2008)	Test Value
X^2 / Degree of freedom >5	414.733
P. value > 0.5	0.000
Goodness of fit Index (GFI) > 0.90	0.843
Tuker-Lewis Index (TLI) > 0.95	0.895
Comparative Fit Index (CFI) > 0.90	0.914
Normed Fit Index (NFI) > 0.90	0.891
Incremental Fit Index (IFI) > 0.95	0.914
Relative Fit Index (RFI) > 0.90	0.866
Root Mean Square Residual (RMR) < 0.5	0.060
Root Mean Square Error of Approximation (RMSEA) < 0.5	0.104

In light of the above-mentioned indicators, it is clear that the previous indicators are good for making all other statistical analysis.

9.2.2. Business Intelligence

The researcher used CFA for BI which consists of three dimensions. This can be illustrated by the following figure:

Figure (3) CFA For BI



According to Figure (2), it is clear that all the statement of BI are greater than 0.50. This is a good indicator of all other statistical analysis. The quality indicators for BI can be illustrated in the following table:

Table (5) Quality Indicators for BI Using AMOS Analysis

Test the Quality of the Model Acceptance Condition (Daire et al., 2008)	Test Value
X^2 / Degree of freedom < 5	1335.6
P. value > 0.5	0.000
Goodness of fit Index (GFI) > 0.90	0.632
Tuker-Lewis Index (TLI) > 0.95	0.641
Comparative Fit Index (CFI) > 0.95	0.724
Normed Fit Index (NFI) > 0.90	0.638
Incremental Fit Index (IFI) > 0.95	0.719
Relative Fit Index (RFI) > 0.90	0.660
Root Mean Square Residual (RMR) < 0.5	0.092
Root Mean Square Error of Approximation (RMSEA) < 0.5	0.109

In light of the above-mentioned indicators, it is clear that the previous indicators are good for making all other statistical analysis.

9.3. Descriptive Analysis

Table (6) shows the mean and standard deviations of AI and BI

Variables	The Dimension	Mean	Standard Deviation
Artificial Intelligence	Expert Systems	2.68	0.928
	Neural Networks	2.73	0.932
	Genetic Algorithms	2.71	0.921
	Intelligence Agents	2.87	0.941
	Total Measurement	**2.75**	**0.877**
Business Intelligence	Technology	2.62	0.745
	People	2.68	0.810
	Strategic Alignment	2.80	0.871
	Total Measurement	**2.70**	**0.689**

According to Table (6), most of the respondents identified the presence of expert systems (M=2.68, SD=0.928), neural networks (M=2.73, SD=0.932), genetic algorithms (M=2.71, SD=0.921), intelligence agents (M=2.87, SD=0.941), and total AI (M=2.75, SD=0.877).

Regarding to BI, most of the respondents identified technology (M=2.62, SD=0.745), people (M=2.68, SD=0.810), strategic alignment (M=2.80, SD=0.871), and total BI (M=2.70, SD=0.689).

9.4. Evaluating Reliability

Table (7) presents the reliability of AI. The 16 items of AI are reliable because the ACC is 0.96. Expert systems, which consists of 4 items, is reliable because the ACC is 0.84. The 4 items related to neural networks, are reliable because the ACC is 0.83 while the 4 items of genetic algorithms are reliable because the ACC is 0.83. The 4 items related to intelligence agents, are reliable because the ACC is 0.86. Thus, the internal consistency of AI can be acceptable.

Table (7) Reliability of AI and BI

Variables	The Dimension	Number of Statement	ACC
Artificial Intelligence	Expert Systems	4	0.84
	Neural Networks	4	0.83
	Genetic Algorithms	4	0.83
	Intelligence Agents	4	0.86
	Total Measurement	**16**	**0.96**
Biasness Intelligence	Technology	5	0.86
	People	5	0.86
	Strategic Alignment	5	0.86
	Total Measurement	**15**	**0.92**

The 15 items of BI are reliable because the ACC is 0.92. Technology, which consists of 5 items, is reliable because the ACC is 0.86. The 5 items related to people are reliable because the ACC is 0.86. The 5 items related to strategic alignment are reliable because the ACC is 0.86. Thus, the internal consistency of BI can be acceptable.

9.5. The Means, St. Deviations and Correlation among Variables

Table (8) Means, Standard Deviations and Intercorrelations among Variables

Variables	Mean	Std. Deviation	AI	BI
Artificial Intelligence	2.72	0.877	1	
Business Intelligence	2.70	0.689	0.719**	1

Table (8) shows correlation coefficients between AI and BI. AI is (Mean=2.72; SD=0.877), while BI is (Mean=2.70; SD= 0.689). Also, the correlation between AI and BI is (R=0.719; P <0.01).

9.6. The Correlation between AI and BI

Table (9) Correlation Matrix between AI and BI

Research Variables	1	2	3	4	5
Expert Systems	1				
Neural Networks	0.856**	1			
Genetic Algorithms	0.845**	0.847**	1		
Intelligence Agents	0.837**	0.864**	0.871**	1	
Business Intelligence	0.688**	0.695**	0.660**	0.669**	1

Based on Table (9), correlation between AI (expert systems) and BI is 0.688 whereas AI (neural networks) and BI shows correlation value of 0.695. Also, AI (genetic algorithms) and BI is 0.660 whereas AI (intelligence agents) and BI shows correlation value of 0.669. The overall correlation between AI and BI is 0.719.

9.6.1. Artificial Intelligence (Expert Systems) and BI

Table (10) MRA Results for Artificial Intelligence (Expert Systems) and BI

Artificial Intelligence (Expert Systems)	Beta	R	R^2
1. Expert systems rely on rare experiences in solving complex problems.	0.290**	0.625	0.390
2. Expert systems act as a consultant to end-users to contribute to decision-making.	0.265**	0.613	0.375
3. Expert systems contribute to acquiring knowledge in special fields to support senior management capabilities.	0.091**	0.545	0.297
4. Expert systems assist senior management in thinking processes.	0.190**	0.467	0.218
▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.694 0.482 68.580 4,295 3.31 0.000		

As Table (10) proves, the MRA resulted in the R of 0.694 demonstrating that the 4 independent variables of AI (Expert Systems) construe BI significantly. Furthermore, the value of R^2, 4 independent variables of AI (Expert Systems) can explain 0.48% of the total factors in BI level. Hence, 52% are explained by the other factors. Therefore, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Expert Systems) and BI.

9.6.2. Artificial Intelligence (Neural Network) and BI

Table (11) MRA Results for Artificial Intelligence (Neural Network) and BI

Artificial Intelligence (Neural Network)	Beta	R	R^2
1. Neural networks help organizations carry large amounts of information.	0.257**	0.601	0.361
2. Neural networks act as human nerves and the way information is processed.	0.181**	0.588	0.345
3. Neural networks adopt the feature of education, as in humanitarian cases.	0.215**	0.605	0.366
4. Neural networks provide organizations with multiple options to analyze information.	0.199**	0.465	0.216
▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.696 0.484 69.109 4, 295 3.31 0.000		

As Table (11) proves, the MRA resulted in the R of 0.696. This means that BI has been significantly explained by the 4 independent variables of AI (Neural Network). As a result of the value of R^2, the four independent variables of AI justified 48% of the total factors in BI level. So, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Neural Network) and BI.

9.6.3. Artificial Intelligence (Genetic Algorithms) and BI

Table (12) MRA Results for Artificial Intelligence (Genetic Algorithms) and BI

Artificial Intelligence (Genetic Algorithms)	Beta	R	R^2
1. Genetic algorithms help organizations find quick solutions in a changing environment.	0.140**	0.473	0.223
2. Genetic algorithms can be used to access options in non-digital issues.	0.325**	0.620	0.384
3. The evolution of genetic algorithms themselves and their adaptation to the environment to keep pace with regulatory developments.	0.138**	0.502	0.252
4. Genetic algorithms are an excellent way to help management reach fast results.	0.192**	0.549	0.301

▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.665 0.443 58.582 4, 295 3.31 0.000

As Table (12) proves, the MRA resulted in the R of 0.665 demonstrating that the 4 independent variables of AI (Genetic Algorithms) construe BI significantly. Furthermore, the value of R^2, 4 independent variables of AI (Genetic Algorithms) can explain 0.44% of the total factors in BI level. Hence, 56% are explained by the other factors. Therefore, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Genetic Algorithms) and BI.

9.6.4. Artificial Intelligence (Intelligences Agents) and BI

Table (13) MRA Results for Artificial Intelligence (Intelligences Agents) and BI

Spiritual Leadership (Intelligences Agents)	Beta	R	R^2
1. The intelligences agents helps organizations make decisions based on their knowledge base.	0.328**	0.612	0.374
2. The intelligences agents reduces the time used to reach the desired goal.	0.129*	0.534	0.285
3. The intelligences agents assists the organization in making decisions on its behalf as an agent in specific cases.	0.177**	0.527	0.277
4. The intelligences agents can be used as a substitute for human agents to reduce transaction costs.	0.169**	0.558	0.311
▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.676 0.457 62.073 4, 295 3.31 0.000		

As Table (13) proves, the MRA resulted in the R of 0.676. This means that BI has been significantly explained by the 4 independent variables of AI (Intelligences Agents). As a result of the value of R^2, the four independent variables of AI justified 45% of the total factors in BI level. So, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Intelligences Agents) and BI.

10. Research Results

10.1. Research Results Related to AI

1. ES as one of the dimensions of AI play an important role in enhancing and improving the role of Telecommunication companies in Egypt by solving complex problems and contributing to making different decisions within the Telecommunication sector in Egypt.
2. NN as one of the dimensions of AI are concerned with downloading large amounts of information that are used to provide Telecommunication companies in Egypt with multiple options due to their high capabilities in analyzing and processing information.
3. GA as one of the dimensions of AI help Telecommunication companies in Egypt to find quick solutions to the problems they face in light of the changing environment conditions, with the aim of helping the management to reach quick results.
4. IA as one of the dimensions of AI help Telecommunication companies in Egypt in making decisions in light of the knowledge base that is stored, which leads to reduced time on the one hand, and cost on the other hand.
5. The dimensions of AI (ES, NN, GA, and IA) play an important role in improving the performance of Telecommunication companies in Egypt by providing information, making decisions, tackling problems, and reducing costs, which ultimately leads to achieving the desired goals on the one hand, and the achievement of competitive advantage on the other hand.

6. Telecommunication companies in Egypt still do not use advanced AI technologies to the degree that they are used in international Telecommunication companies in Egypt such as the AI system and techniques in the areas of the use of NN and GA to support financial decisions related to asset and liability management or commercial credit decisions.
7. There are smart administrative information systems at Telecommunication companies in Egypt that contain components and programs with good technological capabilities in the field of financial analysis, information reports and others, in light of the presence of smart protection systems with different levels of data and different files.
8. Telecommunication companies in Egypt have a technological structure that can be used to develop and modernize the information systems that are used at the present time. This structure is represented in the network style of information systems and a good level of use in management.
9. The problem of not using advanced AI techniques at Telecommunication companies in Egypt is due primarily to the lack of clarity of the importance of these technologies to management, and the lack of knowledge and technological expertise needed to operate AI systems efficiently and effectively.
10. There is an urgent need to use AI systems because of its vital importance in improving the quality of service and in achieving the competitive advantage of Telecommunication companies within the Telecommunication sector in Egypt.

10.1. Research Results Related to BI

1. Organizations do not rely on BI applications and technologies as a repository of data and immediate analytical processing. Perhaps this is due to the low knowledge of workers about these applications as one of the directions that beneficiaries must deal with.
2. The organizations operate in a competitive framework, represented by other organizations operating in the Egyptian environment, which makes the organization's environment suitable for using BI and competitive intelligence applications.
3. The low level of the organizations ’infrastructure to deal with the field of software that supports BI. Perhaps this is due to the organizations’ tendency to deal with technologies that work to accomplish the traditional activities of the organization.
4. The interest in BI was limited to certain aspects, the most important of which is the use of BI in reviewing and completing operations within the organization, while the lesser concerns were related to various aspects, the most important of which is cooperation with individuals inside and outside the organization, and the search for new knowledge, and allowing individuals to learn in multiple locations. Perhaps this is due to the leaders ’lack of interest in adopting BI in the completion of activities and processes within the organization, in addition to the lack of technical personnel necessary to manage and operate BI systems in the organization.
5. Attention has been focused on the practice of BI in specific aspects, the most important of which is the focus on ensuring that workers in the organization understand the importance of BI for the success of the organization and considering this concept as part of the organization's culture.
6. The organization focused on the need to support the top management in achieving the role of BI in the success of the organization. As for the aspects that received a lesser level of attention, they were represented in the organization's management expecting a high level of participation in the development and exchange of experiences in the field of BI.
7. The interest of organizations in the vital role played by big data technology and BI in transforming data into information, which is the first step in knowledge management, as well as the extent of organizations ’interest in all methods and procedures related to improving performance in the organization.
8. Organizations use data from a variety of sources, and that is why organizations are keen to use big data technology to link their various data sources, store them, and facilitate the speed of their analysis, with the aim of studying them and making use of them in all the different work in the organization.
9. Organizations adopt many data analyzes that help them in analyzing what happened in the past regarding customers in terms of their desires and needs, and predicting what will happen in the future.
10. The operational management in organizations seeks to improve the quality of the services they provide as a major factor in achieving customer satisfaction, as well as the desire to increase the size of their

customers, which leads to a reduction in the cost of producing their services on the one hand, and the speed in delivering the service with the required specifications on the other hand.

11. There is a conviction from the operational management that BI plays an important role in improving and developing the operational performance in the organization, in addition to the interest of the operational management in the necessity and importance of effective use of BI in order to make the appropriate decision at the appropriate time.

11. Recommendations

11. Recommendations Related to AI

1. The necessity of expanding the applications of AI according to the Telecommunication companies' need for each type of AI in order to advance the Telecommunication sector to a better level.
2. The necessity of introducing leaders in the Telecommunication sector in Egypt in intensive courses in the field of AI in order to keep pace with global developments in this field on the one hand, and raise the efficiency of workers in this sector on the other hand.
3. Promoting the role of GA in applications of AI to promote Telecommunication companies within the Telecommunication sector in Egypt.
4. Paying attention to the role of ES and IA in the departments of Telecommunication companies due to their great and vital impact in enhancing the applications of AI.
5. Focusing attention on NN within the different departments of Telecommunication companies. NN plays a great role in improving and enhancing performance in general, and applications of AI in particular.
6. Telecommunication companies should rely on AI technologies. It plays a significant role in achieving an appropriate level of service provision and achieving customer satisfaction.
7. Telecommunication companies must rely on modern concepts of AI and are appropriate to achieve customer satisfaction, which leads to an increase in market share, and thus increases profits within the Telecommunication sector in Egypt.
8. The necessity of keeping abreast of new and continuous developments in the field of AI and utilizing them in developing and improving the performance of services and satisfying the desires and needs of customers.
9. An integrated information system should be built, based on achieving customer satisfaction, keeping pace with technological developments and improving decision-making within the Telecommunication sector in Egypt.

11. Recommendations Related to BI

1. The necessity of attracting workers with experience and skill in dealing with BI techniques, as well as the possibility of developing workers in the technical field by directing them to participate in training courses in this field.
2. The use of the data warehouse as the most prominent techniques that provide analytical information through which administrative decisions are made, in addition to the analytical and immediate processing of the data and presenting it in an appropriate manner.
3. The necessity of integrating BI techniques in a manner that achieves the highest level of efficiency in exploiting and analyzing data, in order to achieve the highest level of decisions in light of the use of cost-benefit analysis.
4. Identify the applications of BI in organizations operating in the same field in order to benefit from them and achieve the highest levels of benefit in this field.
5. The need to pay attention to amending the services provided by banks to their customers, with the aim of making use of BI systems in developing the performance of employees, which leads to the survival, growth, and distinction of the banking sector while it is in the process of providing services to its customers.
6. The necessity to invest in all available resources in a manner that meets the needs and desires of customers on a daily basis, and to work on increasing and diversifying the services provided.

7. Interest in designing flexible organizational structures with which the organization's management can respond to the increasing changes in the market on the one hand, and strengthening its position in the application of BI systems on the other hand.
8. Work to form communication networks with academic institutions, whether universities, research centers or others, with the aim of getting acquainted with what is new in the field of BI systems and benefiting from them.
9. Conducting more studies and research in the field of BI and making use of it in developing, improving and diversifying the services provided by the organization.
10. The need for organizations to pay attention to employing BI tools in building strategic information systems and activating their role in all different areas in the organization.
11. Benefiting from the experiences of developed organizations and countries in building and employing BI tools and making use of available technologies, developing them and supporting them in a manner that leads to efficient and effective use of them.
12. The need for higher management in the organizations to pay attention to the mechanism of obtaining information from the various parties, so that this information is stored in the organization's storage warehouses after verification, collection and transfer so that the organization can use it well in all its decisions.
13. Increasing the interest of senior management in generating knowledge from employees and converting it into tacit knowledge, through which it is possible to achieve competitive excellence and excellence for the organization.
14. The need to pay attention to the causes of the decline in interest in the BI system by strengthening the relationships between all existing information systems in the organization, and choosing modern technology in collecting information, in addition to working to exploit the implicit knowledge possessed by workers in the organization, which leads to building learning organization.
15. The necessity of investing the progress made between the BI system in enhancing knowledge transfer processes on the basis that it is the main gateway to achieving the learning organization, by identifying the necessary resources for the development of the organization, and the optimal investment for the BI system in knowledge acquisition and sharing among users in a manner that allows the organization to diversify Its informational resources.
16. Increasing attention to the need to build the technical capabilities of individuals working in the field of information technology, through specialized training courses that increase their capabilities and skills in the field of BI technology.
17. The necessity and importance of spreading a culture of reliance on data among the organization's personnel in a manner that leads to the exploitation of the capabilities provided by both big data and BI in improving the performance of all different operations of the organization.
18. The necessity of holding training courses and workshops at the level of the operational departments in the organization in order to identify the importance of data and BI and their role in improving the operational performance of the organization.

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