Artificial Intelligence and Big Data 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 Big Data (BD). 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) ES as one of the dimensions of AI play an important role in enhancing and improving the role of Telecommunication companies 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 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 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 play an important role in improving the performance of Telecommunication companies in Egypt by providing information, making decisions, tackling problems, and reducing costs and (6) 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.
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.
Keywords: Artificial Intelligence, Big Data, Telecommunication Sector

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 (BD), 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 (BDA) field, it is quite different since it is derived from the use of AI with BD, 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).

This study is structured as follows: Section one is introductory. Section two presents the literature review. Section three presents the research model. Research questions and hypotheses are presented in section four. Section five explains the research strategy. Hypotheses testing is provided in section six. Section seven handles the empirical results. Finally, section eight presents the main recommendations of the study.

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. Big Data

2.2.1. Big Data Concept

BD concept came out in 2001 by Laney. He described big data as data that cannot be processed with traditional data management tools. In order for this big data to exist, it must have three characteristics which are volume, velocity, and variety. Three other characteristics have been added to big data which are validity i.e. data integrity veracity, value i.e. value data. Complexity is the degree of environmental linkage between the data structure and complexity. However, the first three are still the most important characteristics of big data (Wang et al., 2016).

BD is a recent terminology that has emerged as a recent trend in describing the massive flow of data. It is noted that we all produce a very large amount of digital data daily. This data that is produced through the internet, and all the devices and tools that we deal with are recorded and stored in the various applications and programs available (Power, 2016).

BD is the collection, storage and analysis of a large amount of data in order to benefit from it in providing the organization with information resulting from it that helps in building wise decisions of real benefit. Investing in BD through proper organization and analysis contributes greatly to making appropriate decisions for the organization (Janssen et al., 2017).

BD plays an important role in the sustainable development program in order to achieve the goal of sustainable consumption and production (Dubey et al., 2018).

BD also positively affect the achievement of regulatory compatibility (Dubey et al., 2018).

BD has become an issue of concern to many researchers and decision makers in government sectors and companies. There is a very large acceleration in the growth of information (Chen & Zhang, 2014).

BD has caused great troubles for humans, and it includes many untapped treasures. In addition to that big data stores many potential, useful and valuable benefits (Chen & Zhang, 2014).

BD is a problem for many organizations in many fields and disciplines, and given that processing current data does not help in making use of big data. The main reason for organizations to process and analyze BD is to reduce organizational and technological risks and generate profits, in the light of the fact that organizing and analyzing data will help in reaching useful parameters that help in making the right decisions and ensuring a strong future for the organization (Bohdan, 2015).

2.2.2. Big Data Analytics

BD is the process necessary to understand a set of data in order to extract and generate useful information and knowledge (Chen et al., 2012).

The primary goal of the BD collection and analysis process is to develop an actionable vision and new knowledge to achieve competitive advantage (Liu, 2014).

Managers can use BD to learn more about their business and turn knowledge into effective decisions. This will lead to improving organizational performance on the one hand, and the quality of decision-making on the other (Gupta & George, 2016).

2.2.3. Big Data Dimensions

The dimensions of Big Data analysis are (1) big data analytics management capabilities, (2) big data analytics technology capabilities, (3) big data analytics talent capabilities (Aker et al., 2016).

2.2.3.1. Big Data Analytics Management Capabilities

Big Data Analytics Management Capabilities (BDAMC) includes (1) Big Data planning, (2) Big Data investment decision making, (3) Big Data analytics Coordination, and (4) Big Data control.

2.2.3.2. Big Data Analytics Technology Capabilities

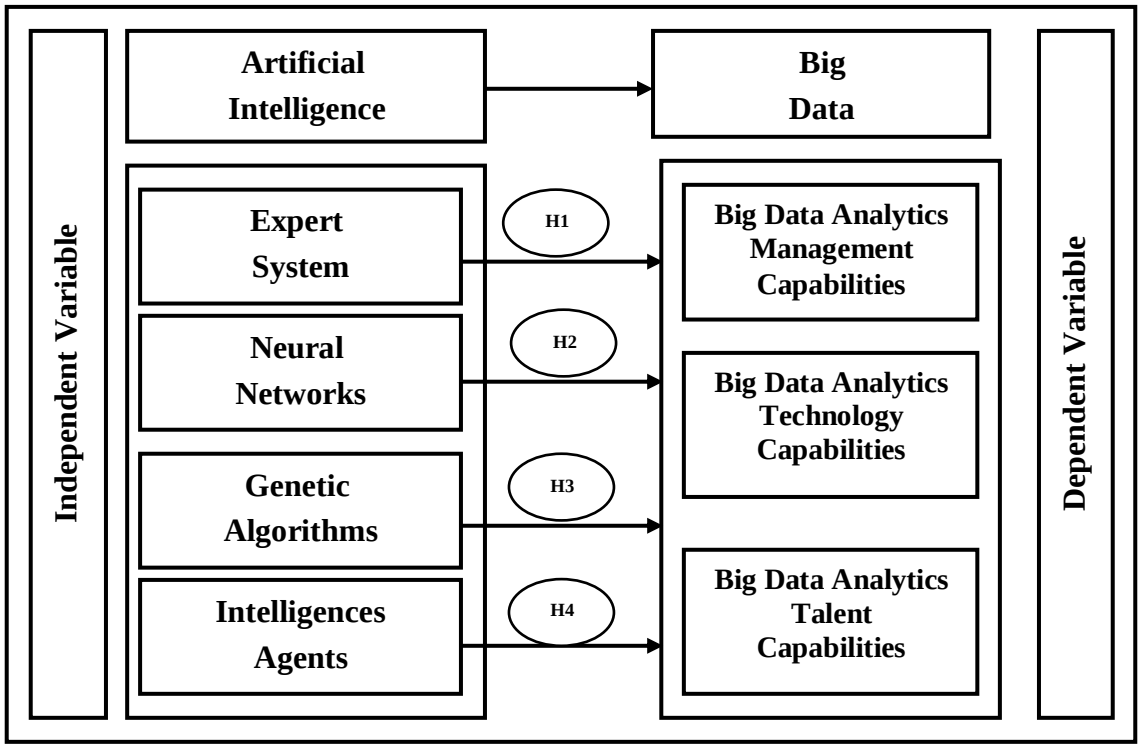
Big Data Analytics Technology Capabilities (BDATEC) includes (1) Connectivity, (2) Compatibility, and (3) Modularity.

2.2.3.3. Big Data Analytics Talent Capabilities

Big Data Analytics Talent Capabilities (BDATC) includes (1) Technical Knowledge, (2) Technology Management Knowledge, (3) Business Knowledge, and (4) Relational Knowledge.

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 BD. It shows the rational link among the two types of observed variables. The research framework suggests that AI have an impact on BD.

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

BD is measured in terms of big data analytics management capabilities, big data analytics technology capabilities, and big data analytics talent capabilities (Aker et al., 2016).

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 AI and BD. This called for the researcher to test this relationship in the Egyptian environment.

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

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

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

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

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

5. Research Hypotheses

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

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

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

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

H4: AI (Intelligence Agents) has no significant impact on BD 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:

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

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. Telecommunications	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	200	67%
	Female	100	33%
	Total	**300**	**100%**
2. Marital Status	Single	70	23%
	Married	230	77%
	Total	**300**	**100%**
3. Age	From 30 to 45	190	63%
	Above 45	110	37%
	Total	**300**	**100%**
4. Educational Level	University	170	57%
	Post Graduate	130	43%
	Total	**300**	**100%**
4. Period of Experience	From 5 to 10	220	73%
	More than 10	80	27%
	Total	**300**	**100%**

7. Procedure

The goal of this study was to identify the significant role of AI in affecting BD. A survey research method was used to collect data. The questionnaire included three questions, relating to AI, BD, and biographical information of employees at Telecommunication 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 11-item scale BD section is based on Aker et al., 2016. There were four items measuring big data analytics management capabilities, three items measuring big data analytics technology capabilities, and four items measuring big data analytics talent capabilities

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 main variables. The first is AI (independent variable). The second is BD (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

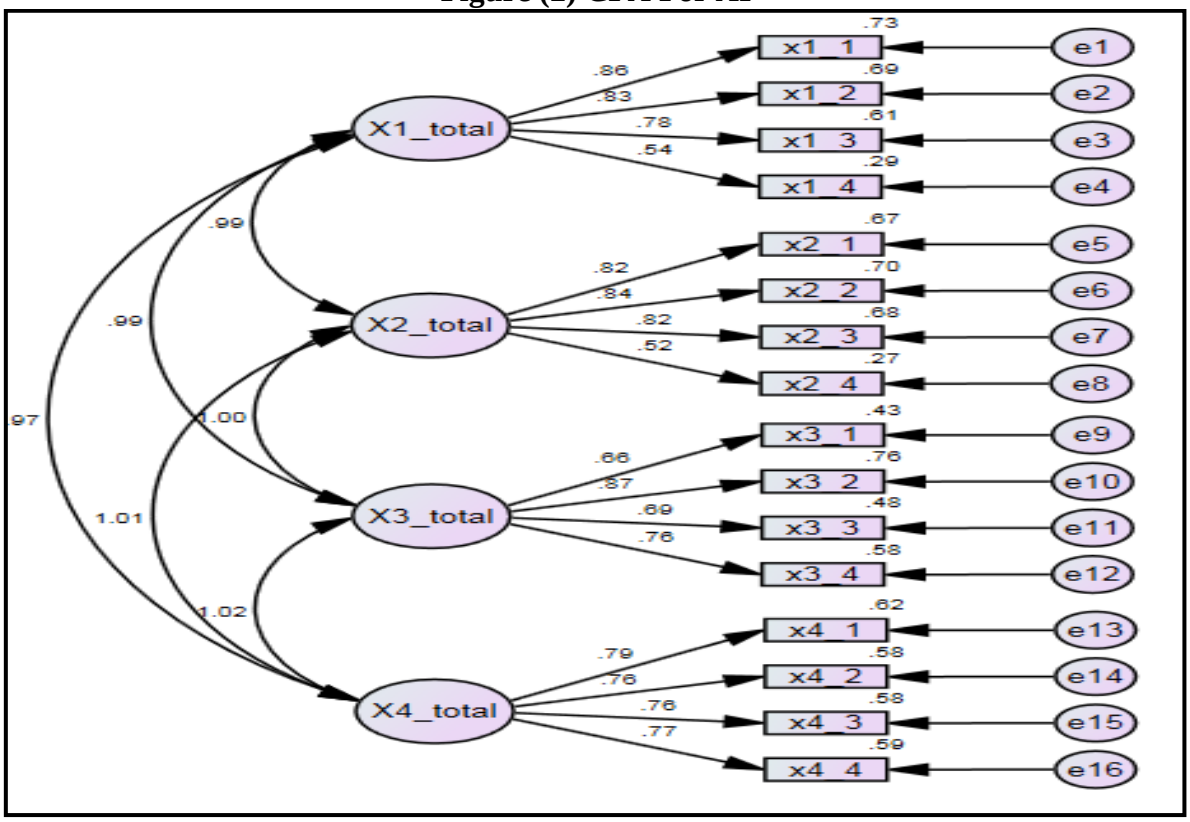
Main Variables		Sub-Variables	Number of Statement	Methods of Measuring Variables
Independent Variable	Artificial Intelligence	Expert Systems	4	Baltzan & Phillips, 2008; Kenji, 2013
		Neural Networks	4	
		Genetic Algorithms	4	
		Intelligence Agents	4	
Total AI			**16**	
Independent Variable	Big Data	Big Data Analytics Management Capabilities	4	Aker et al., 2016
		Big Data Analytics Technology Capabilities	3	
		Big Data Analytics Talent Capabilities	4	
Total BD			**11**	

9.2. Construct Validity

9.2.1. Artificial Intelligence

The researcher used Confirmatory Factor Analysis (CFA) for AI. This variable consists of four dimensions. They are expert systems, neural networks, genetic algorithms, and intelligence agents. The total number of AI is 16 statement. This can be illustrated by the following figure:

Figure (2) CFA For AI



Source: AMOS, V.23

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

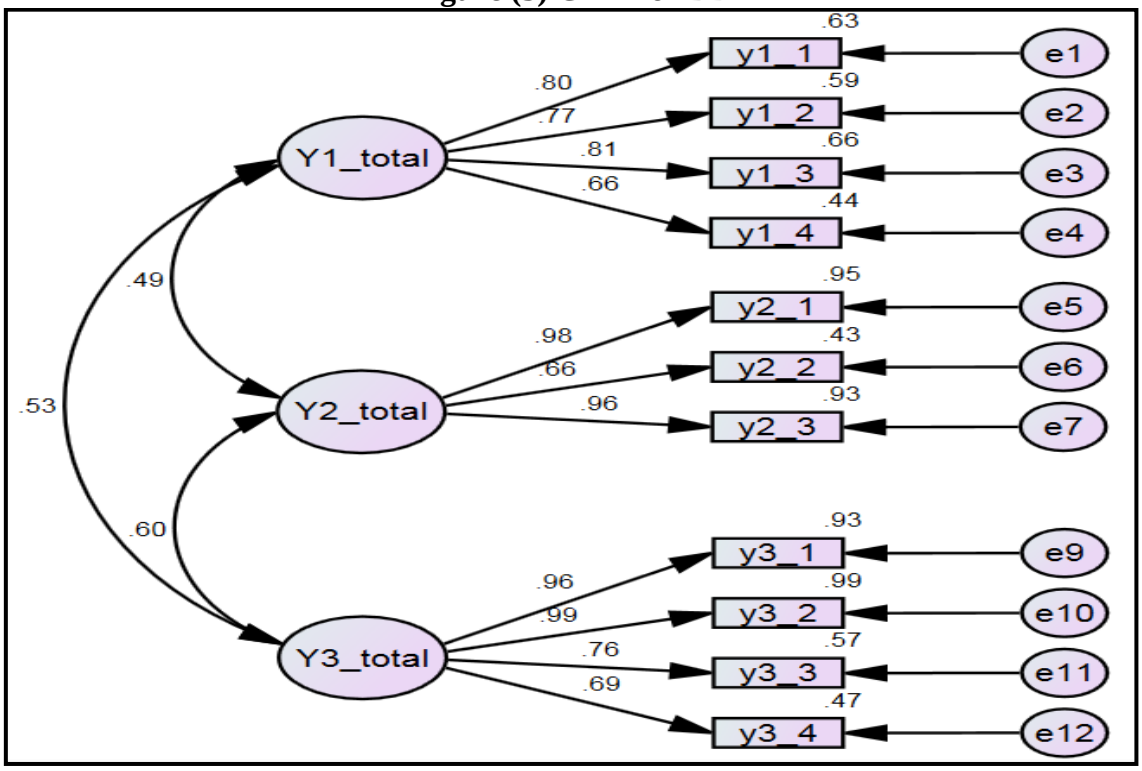
Source: AMOS, V.23, 2015

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. Big Data

The researcher used CFA for BD which consists of three dimensions. They are big data analytics management capabilities, big data analytics technology capabilities, and big data analytics talent capabilities. The total number of BD is 11 statement. This can be illustrated by the following figure:

Figure (3) CFA For BD



Source: AMOS, V.23, 2015

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

Table (5) Quality Indicators for BD Using AMOS Analysis

Test the Quality of the Model Acceptance Condition (Daire et al., 2008)	Test Value
X^2 / Degree of freedom < 5	244.020
P. value > 0.5	0.000
Goodness of fit Index (GFI) > 0.90	0.872
Tuker-Lewis Index (TLI) > 0.95	0.905
Comparative Fit Index (CFI) > 0.95	0.929
Normed Fit Index (NFI) > 0.90	0.917
Incremental Fit Index (IFI) > 0.95	0.930
Relative Fit Index (RFI) > 0.90	0.888
Root Mean Square Residual (RMR) < 0.5	0.107
Root Mean Square Error of Approximation (RMSEA) < 0.5	0.129

Source: AMOS, V.23, 2015

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 BD

Variables	The Dimension	Mean	Standard Deviation
Artificial Intelligence	Expert Systems	2.66	0.927
	Neural Networks	2.71	0.931
	Genetic Algorithms	2.68	0.920
	Intelligence Agents	2.84	0.940
	Total Measurement	**2.72**	**0.877**
Big Data	Big Data Analytics Management Capabilities	2.80	0.894
	Big Data Analytics Technology Capabilities	2.65	0.887
	Big Data Analytics Talent Capabilities	2.36	1.035
	Total Measurement	**2.62**	**0.781**

Source: The researcher based on the outputs of SPSS, V.23, 2015

According to Table (6), most of the respondents identified the presence of expert systems (M=2.66, SD=0.927), neural networks (M=2.71, SD=0.931), genetic algorithms (M=2.68, SD=0.920), intelligence agents (M=2.84, SD=0.940), and total AI (M=2.72, SD=0.877).

Regarding to BD, most of the respondents identified the big data analytics management capabilities (M=2.80, SD=0.894), big data analytics technology capabilities (M=2.65, SD=0.887), big data analytics talent capabilities (M=2.36, SD=1.035), and total BD (M=2.62, SD=0.781).

9.4. Evaluating Reliability

Table (7) Reliability of AI and BD

Variables	Dimension	Number of Statement	ACC
Artificial Intelligence	Expert Systems	4	0.838
	Neural Networks	4	0.830
	Genetic Algorithms	4	0.827
	Intelligence Agents	4	0.853
	Total Measurement	**16**	**0.955**
Big Data	Big Data Analytics Management Capabilities	4	0.837
	Big Data Analytics Technology Capabilities	3	0.892
	Big Data Analytics Talent Capabilities	4	0.919
	Total Measurement	**11**	**0.917**

Table (7) presents the reliability of AI. The 16 items of AI are reliable because the ACC is 0.955. Expert systems, which consists of 4 items, is reliable because the ACC is 0.838. The 4 items related to neural networks, are reliable because the ACC is 0.830 while the 4 items of genetic algorithms are reliable because the ACC is 0.827. The 4 items related to intelligence agents, are reliable because the ACC is 0.853. Thus, the internal consistency of AI can be acceptable.

The 11 items of BD are reliable because the ACC is 0.917. The big data analytics management capabilities, which consists of 4 items, is reliable because the ACC is 0.837. The 3 items related to big data analytics technology capabilities are reliable because the ACC is 0.892. The 4 items related to big data analytics talent capabilities are reliable because the ACC is 0.919. Thus, the internal consistency of BD 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	BD
Artificial Intelligence	2.72	0.877	1	
Big Data	2.62	0.781	0.781**	1

Table (8) shows correlation coefficients between AI and BD. AI is (Mean=2.72; SD=0.877), while BD is (Mean=2.62; SD= 0.781). Also, the correlation between AI and BD is (R=0.781; P <0.01).

9.6. The Correlation between AI and BD

Table (9) Correlation Matrix between AI and BD

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	
Big Data	0.737**	0.759**	0.745**	0.706**	1

Based on Table (9), correlation between AI (expert systems) and BD is 0.737 whereas AI (neural networks) and BD shows correlation value of 0.759. Also, AI (genetic algorithms) and BD is 0.745 whereas AI (intelligence agents) and BD shows correlation value of 0.706. The overall correlation between AI and BD is 0.781.

9.6.1. Artificial Intelligence (Expert Systems) and BD

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

Artificial Intelligence (Expert Systems)	Beta	R	R^2
1. Expert systems rely on rare experiences in solving complex problems.	0.421**	0.705	0.497
2. Expert systems act as a consultant to end-users to contribute to decision-making.	0.262**	0.657	0.431
3. Expert systems contribute to acquiring knowledge in special fields to support senior management capabilities.	0.006	0.549	0.301
4. Expert systems assist senior management in thinking processes, not just providing it with information.	0.203**	0.493	0.243
▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.757 0.573 98.823 4, 295 3.31 0.000		
** P < .01			

As Table (10) proves, the MRA resulted in the R of 0.757 demonstrating that the 4 independent variables of AI (Expert Systems) construe BD significantly. Furthermore, the value of R^2, 4 independent variables of AI (Expert Systems) can explain 0.57% of the total factors in BD level. Hence, 43% 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 BD.

9.6.2. Artificial Intelligence (Neural Network) and BD

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

Artificial Intelligence (Neural Network)	Beta	R	R^2
1. Neural networks help organizations carry large amounts of information.	0.343**	0.688	0.473
2. Neural networks act as human nerves and the way information is processed.	0.222**	0.660	0.435
3. Neural networks adopt the feature of education, as in humanitarian cases.	0.196**	0.650	0.422
4. Neural networks provide organizations with multiple options to analyze information.	0.156**	0.461	0.212
▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.763 0.582 102.862 4, 295 3.31 0.000		
** P < .01			

Source: The researcher based on the outputs of SPSS, V.23, 2015

As Table (11) proves, the MRA resulted in the R of 0. 763. This means that BD 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 58% of the total factors in BD. So, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Neural Network) and BD.

9.6.3. Artificial Intelligence (Genetic Algorithms) and BD

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

Artificial Intelligence (Genetic Algorithms)	Beta	R	R^2
1. Genetic algorithms help organizations find quick solutions in a changing environment.	0.255**	0.590	0.348
2. Genetic algorithms can be used to access options in non-digital issues.	0.337**	0.693	0.480
3. The evolution of genetic algorithms themselves and their adaptation to the environment to keep pace with regulatory developments.	0.113**	0.533	0.284
4. Genetic algorithms are an excellent way to help management reach fast results.	0.202**	0.601	0.361
▪ MCC ▪ DC ▪ Calculated F ▪ Degree of Freedom ▪ Indexed F ▪ Level of Significance	0.752 0.566 96.224 4, 295 3.31 0.000		
** P < .01			

As Table (12) proves, the MRA resulted in the R of 0.752 demonstrating that the 4 independent variables of AI (Genetic Algorithms) construe BD significantly. Furthermore, the value of R^2, 4 independent variables of AI (Genetic Algorithms) can explain 0.56% of the total factors in BD level. Hence, 44% 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 BD.

9.6.4. Artificial Intelligence (Intelligences Agents) and BD

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

Spiritual Leadership (Intelligences Agents)	Beta	R	R^2
1. The intelligences agents helps organizations make decisions based on their knowledge base.	0.283**	0.620	0.384
2. The intelligences agents reduces the time used to reach the desired goal.	0.109*	0.552	0.272
3. The intelligences agents assists the organization in making decisions on its behalf as an agent in specific cases.	0.238**	0.580	0.336
4. The intelligences agents can be used as a substitute for human agents to reduce transaction costs.	0.219**	0.602	0.362

▪ MCC	0.711
▪ DC	0.505
▪ Calculated F	75.381
▪ Degree of Freedom	4, 295
▪ Indexed F	3.31
▪ Level of Significance	0.000
** P < .01	

Source: The researcher based on the outputs of SPSS, V.23, 2015

As Table (13) proves, the MRA resulted in the R of 0.711. This means that BD 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 50% of the total factors in BD. So, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Intelligences Agents) and BD.

10. Research Results

By reviewing the results of testing the research hypothesis, the study reached a set of results which will be reviewed and discussed as follows:

1. ES as one of the dimensions of AI play an important role in enhancing and improving the role of Telecommunication companies 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 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 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 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 artificial intelligence 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.

11. Recommendations

In the light of the previous results, the researcher concluded with a set of recommendations summarized as follows:

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.

12. Conclusion

Although AI has reached high levels of capabilities that outweigh humans, there is a great difficulty in its application. AI suffers from the difficulty of technological follow-up on the one hand, and massive financing on the other hand. In addition to fear of the future of AI. It is not clear, especially the fate of humankind in the world of the machine.

The smart technologies do pose a major threat to the human element. Humanity accepts this because the benefits exceed costs. In spite of the fears and risks of that, there is significant capital injection in the field of industrial and academic research that exceeds the qualifications of the machines themselves.

The need to focus on caution and transparency in dealing with these technologies, and for this there must be an international body to monitor and codify scientific research and innovations in this field.

In light of the influence of AI, we find that humanity is in an inevitable transformation in which the future person is part of his system and not a path to his system as is the case today.

Human societies will follow a new direction, which is coexistence and harmony with the machine, and this transformation has already started. There are examples of this, such as Smart Cities, Smart Homes and Internet of Things. Therefore, we exclude a future state of destruction of the human element in light of the use of the machine in the form terrible and terrifying.

The non-use of advanced AI techniques is primarily due to the lack of clarity of the importance of these techniques in the administration in the organization. In addition, we have the lack of necessary knowledge and expertise and the operation of the advanced artificial intelligence system efficiently and effectively.

There is an urgent need to use AI techniques to improve the quality of work in productive and service organizations in a manner that leads to achieving the competitive advantage of the organization according to the nature of its activity.

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