The Role of Artificial Intelligence in Achieving Customer Satisfaction a Study on Commercial Banks in Egypt

Author Details: Prof. Dr. Wageeh A. Nafei
University of Sadat City, Menoufia, Egypt

Abstract

The objective of the research is to examine the impact of Artificial Intelligence (AI) on Customer Satisfaction (CS). The research population consists of all employees at commercial banks in Egypt. Due to time and cost constraints, 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) there are smart administrative information systems in Egyptian commercial banks 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, (2) the Egyptian commercial banks 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 on the one hand, or the widespread use of smart machines in banking work from another side, (3) the problem of not using advanced AI techniques in Egyptian commercial banks 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, (4) there is an urgent need to use AI systems because of its vital importance in improving the quality of banking work and in achieving the competitive advantage of commercial banks within the Egyptian banking sector, (5) ES as one of the dimensions of AI play an important role in enhancing and improving the role of commercial banks by solving complex problems and contributing to making different decisions within the Egyptian banking sector.

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 commercial banks' need for each type of AI to advance the banking sector to a better level, (2) the necessity of introducing leaders in the Egyptian banking sector in intensive courses in the field of AI to keep pace with global developments and raise the efficiency of workers, (3) promoting the role of GA in applications of AI to promote commercial banks within the Egyptian banking sector, (4) paying attention to the role of ES and IA in the departments of commercial banks, (5) focusing attention on NN within the different departments of commercial banks. NN plays a great role in improving and enhancing performance in general, and applications of AI in particular, (6) commercial banks should rely on AI technologies, (7) commercial banks 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 Egyptian banking sector, 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 of banking services on the one hand, and satisfying the desires and needs of customers on the other hand.

Keywords: *Artificial Intelligence, Customer Satisfaction*

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, we have 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, to process more data, or preserve the largest number of information, but 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 and AI are synonymous. But AI is the most used in all academic fields. There are rapid technological changes, and economic reasons, 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 various fields of medicine (Li et al., 2017), logistics (Thomassey & Zeng, 2018) 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).

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

 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).

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 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 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).

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. It makes connections between complex applications and employees (Winston, 1997).

CS is a well known and established concept in several areas like marketing, consumer research, economic psychology, welfare-economics, and economics. CS has long been a topic of high interest in both academia and practice (Ganiyu et al., 2012).

CS is a collective outcome of perception, evaluation, and psychological reactions to the consumption expectation with a product or service. It is a customer's overall evaluation of the performance of an offering (Kotler & Armstrong, 2010).

CS is one of the most important issues concerning business organization of all types, which is justified by the customer oriented philosophy and the principles of continuous improvement in modern eateries. CS is a person's feelings of pleasures or disappointments resulting from comparing a product perceived performance in relation to his/her expectation (Veloutsou et al, 2005).

2. Literature Review

2.1. Artificial Intelligence

2.1.1. Artificial Intelligence Concept

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 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, and techniques aimed at creating machines capable of simulating intelligence (Li et al., 2017).

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

IA is the one who uses 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. Customer Satisfaction

2.2.1. Customer Satisfaction Concept

CS is a post choice evaluation judgment concerning a specific purchase decision (Lin & Wu, 2011).

CS is the necessary foundation for firms to retain the existing customers. The customers who are unsatisfied with the received products/services would not be expected to have long run relationships with the firm (Guo et al., 2009).

CS is regarded as the way customers can get more benefits than their cost (Liu & Yen, 2010).

CS is hard to define because normally it is extenuated by expectation. Customers will be satisfied if the product or service is above demands or expectation. On the other hand, if the product or service is below demands or expectation, customer will be dissatisfied (Schmitt 2003; Goodman, 2009).

CS has been defined in various ways, but the conceptualization, which appears to have achieved the widest acceptance, is that satisfaction is a post-choice evaluative judgment of a specific transaction (Bastos & Gallego, 2008).

CS has for many years been considered as key factor in determining why customers leave or stay with an organization. So, organizations need to know how to keep their customers, even if they appear satisfied. Every organization has come to realize that in order for it to survive, let alone grow, it has to acquire and then retain profitable customers. CS is not a guarantee of repeat patronage. Satisfied customers jump ship every day, and the reasons are not always due to customer dissatisfaction. (Michael et al., 2008).

CS plays the most important role in total quality management in the organization. CS is probably less sensitive to seasonal fluctuations, changes in costs, or changes in accounting principles and practices. CS has been a central concept in marketing literature and is an important goal of all business activities. Today, companies face their toughest competition, because they move from a product and sales philosophy to a marketing philosophy, which gives a company a better chance of outperforming competition (Kotler, 2006).

CS is more likely to repeat buying products or services. They will also tend to say good things and to recommend the product or service to others. On the other hand, dissatisfied customers respond differently. Dissatisfied customers may try to reduce the dissonance by abandoning or returning the product, or they may try to reduce the dissonance by seeking information that might confirm its high value (Kotler, 2006).

CS is a standard to identify the actual feeling of a customer about quality of service or product. It is not only about the direct impression about product or service quality, but also shows how the product or

service meet customer's expectation or demand. CS measures a customer's feelings and expectations while CL reflects the behavior of purchasing and commitment of purchasing in the future. The survey of CS shows the opinions and feelings about previous purchasing experience, i.e. it can only reflect the past behavior. It cannot be used as a reliable prediction for future behavior. However, the survey of CL can predict what the most favorite product or service is. (Woodcock et al. 2003).

CS is certain psychological satisfaction. It is an attitude which is shown after the purchasing behavior. However, CL is a behavior of continuing transaction. It is also a progress for repeating purchasing (Woodcock et al. 2003).

CS will probably talk to others about their good experiences. This fact is more important; especially in the Middle Eastern cultures; the social life has been shaped in a way that social communication enhances society. (Jamal & Naser, 2002).

CS is a key factor in the formation of a customer's desire to purchase future products. CS is considered as the corporate level strategy and it is a source of successful entrepreneurship. Regarding CS, there are some differences in the definitions. There are three general components: response, focus and time. CS is a response pertaining to a particular focus. It occurs at a particular moment (Sureshchandar et al , 2002).

CS is an overall customer attitude or behavior towards a service provider, or an emotional reaction towards the difference between what customers expect and what they receive, regarding the fulfillment of some desire, need or goal (Hansemark, & Albinsson, 2004; Hoyer, & MacInnis, 2001).

CS is a key factor in the formation of customer's desires for future purchase (Mittal & Kamakura, 2001).

CS fosters loyalty to the extent that it is a prerequisite for maintaining a favorable relative attitude and for recommending and repurchasing from the bank. Once customers recommend a financial institution, it fosters both repurchase and loyalty towards that financial institution. The key to generating loyalty is to get customers to recommend a service provider to others. Also, customers are likely to recommend a service provider when they are satisfied with the services and when they have a favorable relative attitude towards that service (Sivadas & Baker-Prewitt, 2000).

2.2.2. Customer Satisfaction Dimension

There are three dimensions of CS. They are satisfaction with the proceedings, employees, and services (Athanassopoulos, et al, 2001).

1. **Satisfaction with the progress of the procedures:** The facilities that characterize the bank include its design, location, number of branches, ease of communication, and explanatory signs for the activities of the bank. The internal design of the bank facilitates smooth flow of transactions. There is more than one bank branch to meet your need, the bank offers special facilities, the bank does not make mistakes when it tells me about the progress, the clarity of the signs of the facilities and offices in the bank, and it is easy to contact the bank by telephone and via e-mail.

2. **Satisfaction with the Employees:** This is the degree of satisfaction of the customer about the bank staff for their good treatment and their cooperation in providing services to him. The bank staff is characterized by elegance, the staff in the bank are polite and their treatment is unique and distinguished with the customer, bank staff are well aware of the activities and work of the bank, bank staff have the knowledge to serve you immediately, bank staff work freely with me when I have a problem, and employees in the bank do not hesitate to find the time necessary to provide the best service to the customer.

3. **Satisfaction with the services of the organization:** It reflects the view of the general satisfaction of the customers about the services provided to him in terms of multiplicity and rapid submission and solving problems they may face. If there is a problem, the bank will be willing to discuss this with me, the bank provides services to customers in secret, good relations between staff and bank, and the bank offers a wide variety of services to meet your needs.

3. Research Model

Figure (1) shows that there is one independent variable of AI. There is one dependent variable of CS.

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

CS is measured in terms of satisfaction with the conduct of the proceedings, satisfaction with the employees, and satisfaction with the services of the organization (Athanassopoulos, et al, 2001).

Figure (1) Proposed Comprehensive Conceptual Model
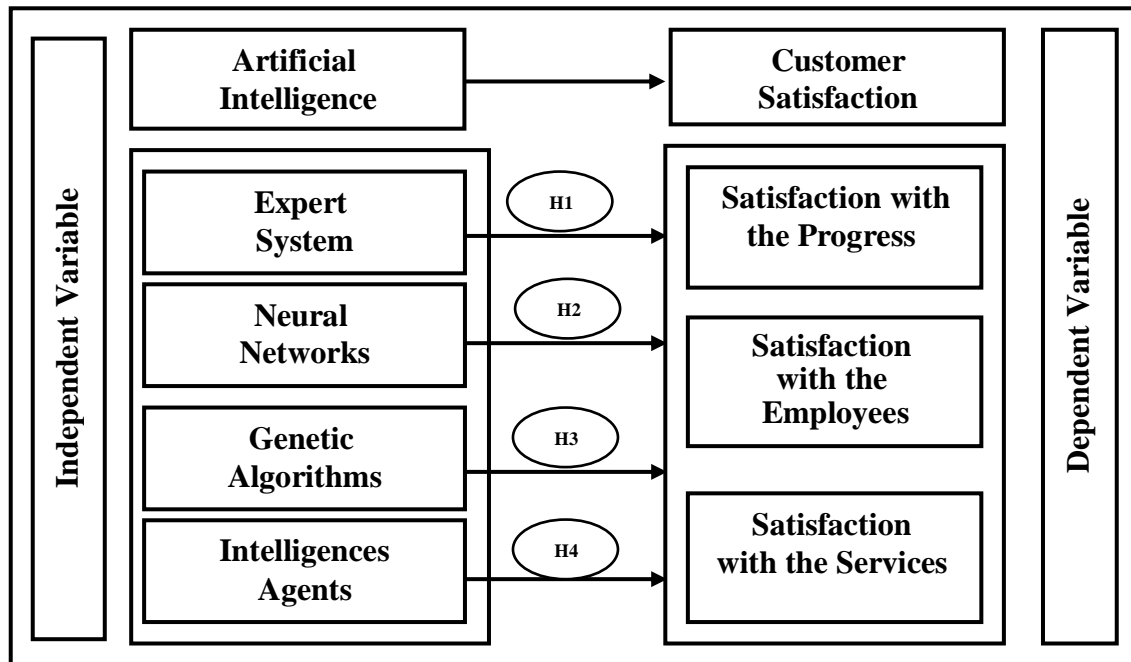
4. Research Questions

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 relationship between AI and CS. The second source is the pilot study. The researcher found several indicators notably the blurred important role that could be played by AI in affecting CS. The research questions of this study are as follows:

Q1: What is the relationship between AI (Expert Systems) and CS at commercial banks in Egypt?

Q2: What is the nature of the relationship between AI (Neural Networks) and CS at commercial banks in Egypt?

Q3: What is the extent of the relationship between AL (Genetic Algorithms) and CS at commercial banks in Egypt?

Q4: What is the nature and extent of the relationship between AL (Intelligence Agents) and CS at commercial banks in Egypt?

5. Research Hypotheses

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

H1: There is no statistically significant relationship between AI (Expert Systems) and CS at commercial banks in Egypt.

H2: AI (Neural Networks) has no significant effect on CS at commercial banks in Egypt.

H3: There is no relationship between AI (Genetic Algorithms) and CS at commercial banks in Egypt.

H4: AI (Intelligence Agents) has no significant impact on CS at commercial banks in Egypt.

6. Research Population

The total population of at commercial banks in Egypt is 734 employees. Due to the small number of the research community, it was decided to use complete numeration or census. The research population is illustrated in Table (1).

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

Accordingly, the sample size has become 322 employees at commercial banks in Menoufia Governorate.

Table (1) Distribution of the Sample Size on the Population

Job Category	Number	Percentage	Size of Sample
National Bank of Egypt	245	34%	322 X 34% = 109
Banque Misr	317	43%	322 X 43% = 138
Banque Du Caire	172	23%	322 X 23% = 75
Total	**734**	**100%**	**322 X 100% = 322**

Source: Personnel Department at Commercial banks in Menoufia Governorate, 2019

Table (2) Frequency Distribution Table of Demographics

Demographic Variables		Frequency	Percentage
1- Job Title	General Manager	10	3%
	Agent General Manager	50	17%
	Deputy Manager	35	12%
	Controller	40	13%
	Excellent Banker	50	17%
	Banker A/B	115	38%
	Total	**300**	**100%**
2- Marital Status	Married	190	63%
	Single	110	37%
	Total	**300**	**100%**
3- Age	From 30 to 45	150	50%
	More than 45	150	50%
	Total	**300**	**100%**
4- Educational	University Education	200	67%
	Post Graduate Studies	100	33%
	Total	**300**	**100%**
5- Experience	From 5 to 10	185	62%
	More than 10	115	38%
	Total	**300**	**100%**

7. Procedure

The goal of this study was to identify the significant role of AI in affecting CS. A survey research method was used to collect data. The questionnaire included three questions, relating to AI, CS and biographical information of employees at commercial banks in Egypt. About 400 survey questionnaires were distributed. Multiple follow-ups yielded 300 statistically usable questionnaires. Survey responses were 75%.

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 18-item scale CS section is based on Athanassopoulos, et al, 2001. There were six items measuring satisfaction with the conduct of the proceedings, six items measuring satisfaction with the employees, and six items measuring satisfaction with the services of the organization.

9. Data Analysis and Hypotheses Testing

9.1. Coding of Variables

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	Customer Satisfaction	Satisfaction with the Progress of the Procedures	6	Athanassopoulos, et al, 2001
		Satisfaction with the Employees	6	
		Satisfaction with the Services of the Organization	6	
		Total CS	**18**	

According to Table (3) the research consists of two main variables. The first is AI (independent variable). The second is CS (dependent variable). Each variable consists of sub-variables.

9.2. Construct Validity

9.2.1. Artificial Intelligence

The researcher used Confirmatory Factor Analysis (CFA) for AI. This variable consists of five dimensions. The total number of AI is 26 statement. This can be illustrated by the following figure:

Figure (2) CFA For AI
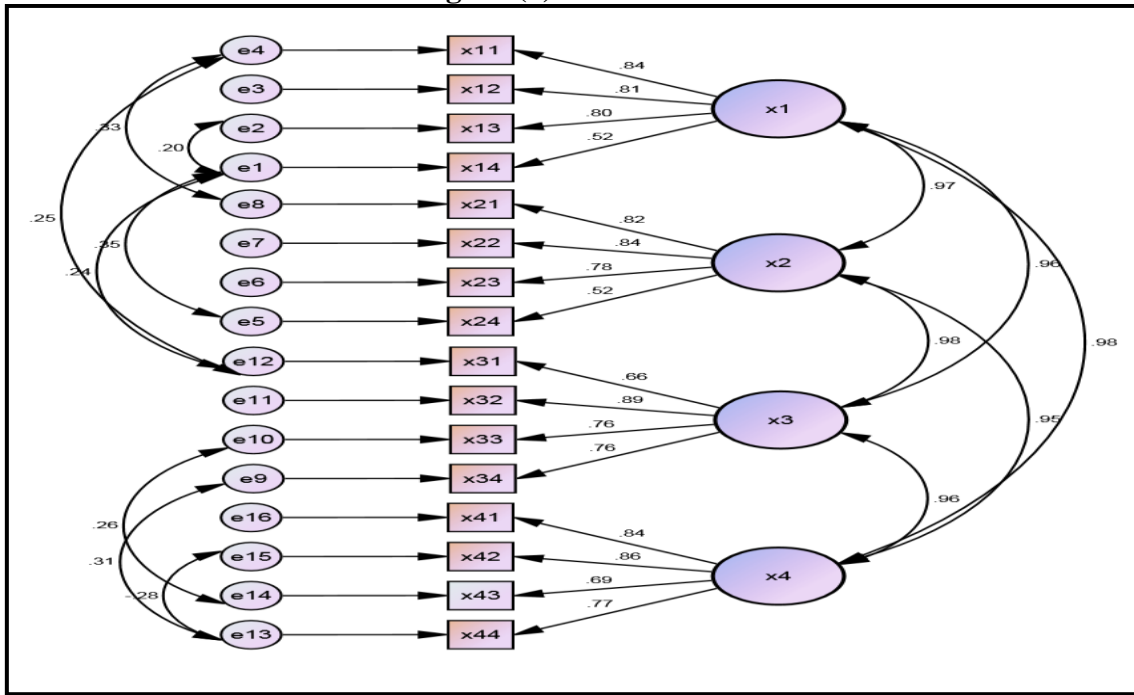
Source: AMOS, V.23

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

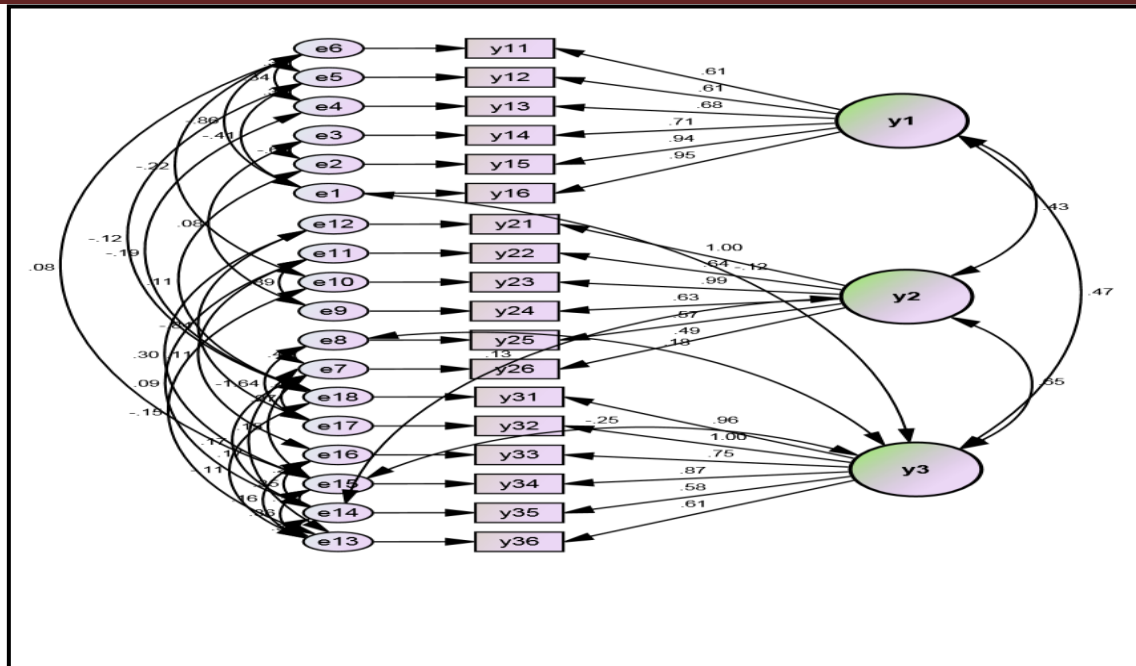| Test the Quality of the Model Acceptance Condition (Daire et al., 2008)	Test Value
X^2 / Degree of freedom > 5	224.383
P. value > 0.5	0.000
Goodness of fit Index (GFI) > 0.90	0.911
Tuker-Lewis Index (TLI) > 0.95	0.951
Comparative Fit Index (CFI) > 0.90	0.963
Normed Fit Index (NFI) > 0.90	0.941
Incremental Fit Index (IFI) > 0.95	0.964
Relative Fit Index (RFI) > 0.90	0.921
Root Mean Square Residual (RMR) < 0.5	0.043
Root Mean Square Error of Approximation (RMSEA) < 0.5	0.071

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. Customer Satisfaction

The researcher used CFA for CS which consists of five dimensions. The total number of CS is 15 statement. This can be illustrated in Figure (2).

Figure (3) CFA For CS

Source: AMOS, V.23, 2015

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

Table (5) Quality Indicators for CS Using AMOS Analysis

Test the Quality of the Model Acceptance Condition (Daire et al., 2008)	Test Value
X^2 / Degree of freedom < 5	294.748
P. value > 0.5	0.000
Goodness of fit Index (GFI) > 0.90	0.904
Tuker-Lewis Index (TLI) > 0.95	0.947
Comparative Fit Index (CFI) > 0.95	0.967
Normed Fit Index (NFI) > 0.90	0.952
Incremental Fit Index (IFI) > 0.95	0.967
Relative Fit Index (RFI) > 0.90	0.923
Root Mean Square Residual (RMR) < 0.5	0.129
Root Mean Square Error of Approximation (RMSEA) < 0.5	0.083

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 CS

Variables	The Dimension	Mean	Standard Deviation
Artificial Intelligence	Expert Systems	2.72	0.940
	Neural Networks	2.75	0.936
	Genetic Algorithms	2.69	0.948
	Intelligence Agents	2.74	0.919
	Total Measurement	**2.72**	**0.877**
Customer Satisfaction	Satisfaction with the Progress of the Procedures	2.81	0.868
	Satisfaction with the Employees	2.68	0.821
	Satisfaction with the Services of the Organization	2.50	0.897
	Total Measurement	**2.66**	**0.744**

According to Table (6), most of the respondents identified the presence of expert systems (M=2.72, SD=0.940), neural networks (M=2.75, SD=0.936), genetic algorithms (M=2.69, SD=0.948), intelligence agents (M=2.74, SD=0.919), and total AI (M=2.72, SD=0.877).

Regarding to CS, most of the respondents identified the satisfaction with the proceedings (M=2.81, SD=0.868), satisfaction with employees (M=2.68, SD=0.821), satisfaction with services (M=2.50, SD=0.897), and total CS (M=2.66, SD=0.744).

9.4. Evaluating Reliability

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 0.836. The 4 items related to neural networks, are reliable because the ACC is 0.826 while the 4 items of genetic algorithms are reliable because the ACC is 0.851. The 4 items related to intelligence agents, are reliable because the ACC is 0.862. Thus, the internal consistency of AI can be acceptable.

Table (7) Reliability of AI and CS

Variables	Dimension	Number of Statement	ACC
Artificial Intelligence	Expert Systems	4	0.836
	Neural Networks	4	0.826
	Genetic Algorithms	4	0.851
	Intelligence Agents	4	0.862
	Total Measurement of PsyCon	**16**	**0.955**
Customer Satisfaction	Satisfaction with the Progress of the Procedures	6	0.886
	Satisfaction with the Employees	6	0.912
	Satisfaction with the Services of the Organization	6	0.920
	Total Measurement	**18**	**0.942**

The 18 items of CS are reliable because the ACC is 0.942. The satisfaction with the proceedings, which consists of 6 items, is reliable because the ACC is 0.886. The 6 items related to satisfaction with employees are reliable because the ACC is 0.92. The 6 items related to satisfaction with services are reliable because the ACC is 0.920. Thus, the internal consistency of CS 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	CS
Artificial Intelligence	2.72	0.877	1	
Customer Satisfaction	2.66	0.744	0.663**	1

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

Table (8) shows correlation coefficients between AI and CS. AI is (Mean=2.72; SD=0.877), while BD is (Mean=2.66; SD= 0.744). Also, the correlation between AI and CS is (R=0.663; P <0.01).

9.6. The Correlation between AI and CS

Table (9) Correlation Matrix between AI and CS

Research Variables	1	2	3	4	5
Expert Systems	1				
Neural Networks	0.846**	1			
Genetic Algorithms	0.835**	0.838**	1		
Intelligence Agents	0.835**	0.816**	0.854**	1	
Customer Satisfaction	0.736**	0.737**	0.739**	0.728**	1

Note: ** Correlation is significant at 0.01 level.

Based on Table (9), correlation between AI (expert systems) and CS is 0.736 whereas AI (neural networks) and CS shows correlation value of 0.737. Also, AI (genetic algorithms) and CS is 0.739 whereas AI (intelligence agents) and CS shows correlation value of 0.728. The overall correlation between AI and CS is 0.663.

9.6.1. Artificial Intelligence (Expert Systems) and CS

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

Artificial Intelligence (Expert Systems)	Beta	R	R^2
1. Expert systems rely on rare experiences in solving complex problems.	0.409**	0.681	0.463
2. Expert systems act as a consultant to end-users to contribute to decision-making.	0.269**	0.631	0.398
3. Expert systems contribute to acquiring knowledge in special fields to support senior management.	0.002	0.567	0.321
4. Expert systems assist top management in thinking processes, not just providing it with information.	0.233**	0.524	0.274
▪ MCC	0.755		
▪ DC	0.570		
▪ Calculated F	97.632		
▪ 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 (10) proves, the MRA resulted in the R of 0.755 demonstrating that the 4 independent variables of AI (Expert Systems) construe CS significantly. Also, the 4 independent variables of AI can explain 0.57% of the total factors in CS. Hence, 43% are explained by the other factors. So, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Expert Systems) and CS.

9.6.2. Artificial Intelligence (Neural Network) and CS

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

Artificial Intelligence (Neural Network)	Beta	R	R^2
1. Neural networks help organizations carry large amounts of information.	0.392**	0.665	0.442
2. Neural networks act as human nerves and the way information is processed.	0.227**	0.644	0.414
3. Neural networks adopt the feature of education, as in humanitarian cases.	0.060	0.563	0.316
4. Neural networks provide organizations with multiple options for their high ability to analyze information.	0.236**	0.510	0.260
▪ MCC	0.749		
▪ DC	0.561		
▪ Calculated F	94.207		
▪ 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 (11) proves, the MRA resulted in the R of 0. 0.749. This means that CS has been significantly explained by the 4 independent variables of AI (Neural Network). The four independent variables of AI justified only 56% of the total factors in CS. Hence, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Neural Network) and CS.

9.6.3. Artificial Intelligence (Genetic Algorithms) and CS

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

Artificial Intelligence (Genetic Algorithms)	Beta	R	R^2
1. Genetic algorithms help organizations find quick solutions in a changing environment.	0.232**	0.586	0.343
2. Genetic algorithms can be used to access options in non-digital issues.	0.281**	0.674	0.454
3. The evolution of genetic algorithms themselves and their adaptation to the environment to keep pace with regulatory developments.	0.119**	0.584	0.341
4. Genetic algorithms are an excellent way to help management reach fast results.	0.257**	0.614	0.376

▪ MCC	0.743
▪ DC	0.552
▪ Calculated F	90.855
▪ Degree of Freedom	4, 295
▪ Indexed F	3.31
▪ Level of Significance	0.000

** $P < .01$

As Table (12) proves, the MRA resulted in the R of 0.743 demonstrating that the 4 independent variables of AI (Genetic Algorithms) construe CS significantly. Also, the 4 independent variables of AI can explain 0.55% of the total factors in CS. Hence, 45% are explained by the other factors. So, there is an empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Genetic Algorithms) and CS.

9.6.4. Artificial Intelligence (Intelligences Agents) and CS

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

Spiritual Leadership (Intelligences Agents)	Beta	R	R^2
1. The intelligences agents helps organizations make decisions based on their knowledge base.	0.244**	0.647	0.418
2. The intelligences agents reduces the time used to reach the desired goal.	0.268**	0.649	0.421
3. The intelligences agents assists the organization in making decisions.	0.110*	0.547	0.299
4. The intelligences agents can be used as a substitute for human agents to reduce transaction costs.	0.240**	0.608	0.369
▪ MCC	0.733		
▪ DC	0.538		
▪ Calculated F	85.791		
▪ Degree of Freedom	4, 295		
▪ Indexed F	3.31		
▪ Level of Significance	0.000		

** $P < .01$

As Table (13) proves, the MRA resulted in the R of 0. 0.733. This means that CS 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 (Intelligences Agents) justified only 53% of the total factors in CS level. Hence, there is enough empirical evidence to reject the null hypothesis that it said there is no relationship between AI (Intelligences Agents) and CS.

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 commercial banks by solving complex problems and contributing to making different decisions within the Egyptian banking sector.

2. NN as one of the dimensions of AI is concerned with downloading large amounts of information that are used to provide Egyptian commercial banks with multiple options due to their high capabilities in analyzing and processing information.

3. GA as one of the dimensions of AI helps commercial banks to find quick solutions to the problems they face in light of the changing environment conditions, with the aim of helping the management of these banks to reach quick results.

4. IA as one of the dimensions of AI helps commercial banks 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 Egyptian commercial banks 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. Egyptian commercial banks still do not use advanced AI technologies to the degree that they are used in international commercial banks 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 in Egyptian commercial banks 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. The Egyptian commercial banks 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 on the one hand, or the widespread use of smart machines in banking work from another side.

9. The problem of not using advanced AI techniques in Egyptian commercial banks 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 banking work and in achieving the competitive advantage of commercial banks within the Egyptian banking sector.

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 commercial banks' need for each type of AI to advance the banking sector to a better level.

2. The necessity of introducing leaders in the Egyptian banking sector 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 commercial banks within the Egyptian banking sector.

4. Paying attention to the role of ES and IA in the departments of commercial banks due to their great and vital impact in enhancing the applications of AI.

5. Focusing attention on NN within the different departments of commercial banks. NN plays a great role in improving and enhancing performance in general, and applications of AI in particular.

6. Commercial banks should rely on AI technologies. It plays a significant role in achieving an appropriate level of service provision on the one hand, and achieving customer satisfaction on the other hand.

7. Commercial banks 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 Egyptian banking sector.

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 banking services on the one hand, and satisfying the desires and needs of customers on the other hand.

9. An integrated information system should be built, based on achieving customer satisfaction, keeping pace with technological developments and improving decision-making within the Egyptian banking sector.

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, besides massive financing and 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. 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 to 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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