

# The Impact Of Artificial Intelligence On The Correct Application Of Cyber Governance In Jordanian Commercial Banks

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**Abstract:** The study aimed to demonstrate the impact of artificial intelligence on the correct application of cyber governance in Jordanian commercial banks. The analysis unit of the study consisted of workers in auditing offices in Jordan with a long track record in the field of auditing for commercial banks. The study population reached (13) Jordanian commercial banks, a questionnaire was prepared for the purposes of this study, 100 questionnaires were distributed to the workers in those offices, 83 questionnaires were retrieved, but 3 questionnaires were neglected due to lack of objectivity and seriousness of the respondents in answering them, the (Skewness & Kurtosis) test was used as well as (VIF) test to ensure the absence of the problem of multiple linear relationships (multiple correlation) between the study variables, the study reached many results, the most important of which was the impact of artificial intelligence represented by (expert systems, neural networks, genetic algorithms, and Intelligent agent) on the correct application of cyber governance in Jordanian commercial banks, the study reached many recommendations, the most important of which was that Jordanian banks, before making a change in their information and communications technology environment, operations or procedures, or after any event that affects their security, must insure whether a change is needed or enhancements to the cybersecurity policy and program in order to suit its artificial intelligence applications.

**Keywords**—Artificial intelligence, cyber governance, Jordanian commercial banks

## 1. INTRODUCTION

Artificial intelligence aims to know the nature of human intelligence by making computer programs capable of simulating human behavior, which are characterized by intelligence and the ability to process operations electronically and providing stakeholders with the information they need to help them in making various decisions quickly and in a timely manner. Thus, there must be such applications that rely on technology and simulate the human mind, and have a high speed in providing the required information and the capabilities that exceed that of humans in terms of speed and accuracy, there must be special control frameworks to control the mechanism of the work of these applications and this will be in the presence of what is known as Cyber Governance.

## 2. THE IMPORTANCE OF STUDY

The importance of this study stems from the novelty of the subject of artificial intelligence and its fields of application, technological development in accounting systems on one hand, and the unity of competition between Jordanian commercial banks in light of the applications of cyber governance frameworks on the other hand, the idea of this study came to the advantages provided by artificial intelligence in various fields And the quality of its decisions through its technical systems and advanced programs in light of cyber governance applications, to know its influential role in developing the performance of commercial banks and improving the efficiency of the automatic application of artificial intelligence in them.

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## 3. THE PROBLEM OF THE STUDY

Artificial intelligence is a new topic and is extremely important, as it changes the performance of pioneering banks, as they are a fertile environment for applying artificial intelligence in light of developments in information technology, but in contrast there is ambiguity in the concept of artificial intelligence for Jordanian commercial banks and its scientific and practical effects on them in the correct application of cyber governance in them, hence the problem of the study is meant to answer the following questions.

The first major problem:

Is there an impact of artificial intelligence on the correct application of cyber governance in Jordanian commercial banks: The following sub-questions are branched from it:

The first sub- problem:

Is there an impact of expert systems on the correct application of cyber governance in Jordanian commercial banks?

The second sub-problem:

Is there an impact of neural networks on the correct application of cyber governance in Jordanian commercial banks?

The third sub-problem:

Is there an impact of genetic algorithms on the correct application of cyber governance in Jordanian commercial banks?

The Fourth sub-problem:

Is there an impact of intelligent agent on the correct application of cyber governance in Jordanian commercial banks?

#### 4. STUDY HYPOTHESES

Based on the questions of the study problem, its hypothesis crystallizes with the following:

The first major hypothesis:

There is no impact of artificial intelligence on the correct application of cyber governance in Jordanian commercial banks: The following sub-questions are branched from it:

The first sub hypothesis:

There is no impact of expert systems on the correct application of cyber governance in Jordanian commercial banks?

The second sub- hypothesis:

There is no impact of neural networks on the correct application of cyber governance in Jordanian commercial banks?

The third sub- hypothesis:

There is no impact of genetic algorithms on the correct application of cyber governance in Jordanian commercial banks?

The fourth sub- hypothesis:

There is no impact of Intelligent agents on the correct application of cyber governance in Jordanian commercial banks?

#### 5. THE SCIENTIFIC AND INTELLECTUAL CONCEPT OF ARTIFICIAL INTELLIGENCE

This science works on a fundamental fact that relies on understanding the nature of human intelligence by making computer programs that are able to simulate human behavior characterized by intelligence, so the intellectual definition of artificial intelligence is embodied as (a computer application interested in building programs capable of studying and implementing repetitive activities That a person performs), so this science aims to understand the complex mental processes that the human mind performs while practicing the thinking process, Then translating these mental processes into the equivalent accounting processes that increase the ability of the computer to solve complex problems, so (Copeland, 2018) defines it as a field of study that studies how to create computers and computer programs capable of smart behavior. But (Elaine R, 2017) defines it as how to make computers do things better than humans and so are systems that think like humans and systems that act like humans. He looks at artificial intelligence as the ability of a device to do activities that only one would expect from the human brain. These activities include the ability to know, and the ability to acquire knowledge. Also includes the ability to govern, understand relationships and produce original ideas. Artificial intelligence aims to make a smart machine that can interact in ways similar to humans and then is seen as a simulation of the human brain. The researchers believe that this science embodies the language of simulation between intelligent human behaviors and between computers and its goal is to reach the intellectual leadership of computing used by companies and organizations aimed at local and global entrepreneurship.

#### 5.1 TYPES OF ARTIFICIAL INTELLIGENCE

Artificial intelligence implanted in entrepreneurial companies includes the following types: (Agam, 2108)

1. Expert systems: are computer programs that imitate the procedures of experience in solving difficult problems. Experts' knowledge is transferred to expert systems for the benefit of users in solving problems.
2. Neural networks: They are also called industrial networks that try to simulate the way the brain works, in a way that the nerves are arranged in levels consisting of a large network, and the network function defined by both learning and communication.
3. Genetic Algorithms: The algorithm is a set of instructions that are repeated to solve a problem. Genetic refers to the behavior of algorithms that can resemble the biological processes of evolution.
4. Intelligent Agents: It is a knowledge-based experience system implanted within computer-based information systems or its components to make them smarter. It is an end-user program or method for accomplishing events.

The researchers believe that for the readiness of the pioneer companies to adopt the applications of artificial intelligence, it is necessary to employ a set of indicators that can be counted as starting points and then foundations that can be used to stimulate the adoption process and confirm its success. These indicators were represented in the following:

1. The driving force towards technical developments
2. The desire for technical excellence
3. Support provided by decision makers
4. Fear of being left behind

This does not happen unless there is a special framework for cyber governance, which is considered important to manage the risks of information technology in light of the application of artificial intelligence and also important for each of the managers and users in understanding the information technology systems that belong to their companies and their banks, as well as helps, and guides to choose the level of security and control necessary to protect Corporate assets, efficiently and effectively. The researchers see that there is a logical necessity of having real frameworks trying to protect this modern technology, which is embodied here in the presence of cyber governance frameworks for the correct implementation of artificial intelligence applications. Therefore, the Central Bank of Jordan has worked to issue special instructions to banks to try to confront the risk of using information technology, which led to finding a solution By the Central Bank through using what is known as cyber governance, and it was in accordance with the following conditions and instructions: (Central Bank of Jordan, 2018)

- A. That the board of directors include in its membership and whoever delegates from its committees and senior executive management, people who have the appropriate skills and knowledge to understand and manage cyber risks.
- B. The Council or whoever delegates from its committees should handle the following responsibilities and tasks, each according to its location:
  1. Adopting a Cyber Security Policy.

2. Approval of the Cyber Security Program.
  3. Examining compliance with cybersecurity policy and program
- C. The senior executive management shall assume the following responsibilities and tasks
1. Ensuring the implementation and updating of the cybersecurity policy.
  2. Ensuring the implementation of the cyber security program.
  3. Ensuring a comprehensive record of cyber risks (Internet risk register)
  4. Checking and monitoring the level of cyber risks on an ongoing basis.
  5. Approving lists of authorities related to security and cyber risks management in terms of identifying the responsible entity, person or parties that are primarily responsible, those that are ultimately responsible (Accountable), those that are consulted, and those that are informed, for all operations Management and control of those risks.

## 6. STUDY POPULATION AND SAMPLE:

The study population reached (13) Jordanian commercial banks, a questionnaire was prepared for the purposes of this study, 100 questionnaires were distributed to the workers in those offices, 83 questionnaires were retrieved, but 3 questionnaires were neglected due to lack of objectivity and seriousness of the respondents in answering them and were not valid for statistical analysis, thus the number of valid questionnaires for the analysis reached (80) questionnaires.

### 6.1 CHARACTERISTICS OF THE STUDY SAMPLE:

Table No. (1) Shows the distribution of sample members according to the personal variables of the study sample:

TABLE 1

OF SAMPLE MEMBERS ACCORDING TO THE PERSONAL VARIABLES

variables	Level	Repetition	Percentage
Educational Qualification	BSc	50	62.5
	MSc	25	31.3
	Ph.D	5	6.3
	<b>Total</b>	<b>80</b>	<b>100</b>
Academic specialization	Accounting	30	37.5
	Finance and Banking	20	25.0
	IT	30	37.5
	Economics and Management	0	0.0
	<b>Total</b>	<b>80</b>	<b>100</b>
	CPA	5	6.3
	CMA	15	18.8
	JCPA	30	37.5
	other	30	37.5
	<b>Total</b>	<b>80</b>	<b>100</b>
Years of work experience	Less than 5 years	5	6.3
	5-10 years	23	28.8
	10-15 years	22	27.5
	15-20 years	13	16.3
	More than 20 years	17	21.3
	<b>Total</b>	<b>80</b>	<b>100</b>

Table (1) shows the following:

1. The highest percentage of the sample's distribution according to the variable of the educational qualification was (62.5%) for the educational qualification (Bachelor's), while the lowest percentage is (6.3%) for the educational qualification (PhD) which is a relatively small percentage, and this indicates The company's focus is on employing the first university degree holders as they have a good cultural level, which makes the study sample eligible to answer the questionnaire items and rely on them.
2. The highest percentage of the sample's distribution according to the academic specialization variable was (37.5%) for the major (Accounting and IT), while the lowest percentage (0.0%) was for the (economics and management) the highest percentage of the accounting major indicates that the focus is on the specialty of accounting and IT because the complementarily between them can be implanted in this field, and thus the study sample has concepts, foundations and methods of accounting and technology during their university stage that increases their awareness of the importance of the subject of this study, and therefore can be relied upon in their answers.
3. The highest percentage of the sample's distribution according to the variable of who did not have a professional certificate (JCPA and others) reached (37.5%), which is a high percentage compared to those who hold another professional certificate. Perhaps this percentage for carrying the professional certificate indicates the great interest of the sample by encouraging its employees to qualify and appoint professional certificates, as it shows the companies management's direction towards first university degrees holders and their training and their sufficient experience.
4. The highest percentage of the sample's distribution according to the variable of years of work experience in companies was (28.8%) for the period of experience (5-10 years), while the lowest percentage was (6.3%) for the period of experience (less than 5 years), and these percentages indicate that The study sample has sufficient experiences, especially if it is covered with the scientific specialization and academic qualifications, which enhances and strengthens the results of this study.

## 7. THE VALIDITY AND RELIABILITY TEST OF THE STUDY TOOL:

The content of the tool used in the study has been verified by presenting it to a group of faculty members with experience and competence and departments in companies and banks, to express an opinion on each field of study, phrasing paragraphs and the extent to which each paragraph relates to its field, as some questions were modified Others were deleted and new questions were added to accommodate the arbitrators' proposals and observations, The study tool consistently means the stability, reliability and predictability of the results, that is, the extent of compatibility or consistency in the results of the questionnaire, as it was applied more than once in similar circumstances. To calculate the stability of the study tool, the study tool was divided into six areas to measure

stability for each field and for the tool as a whole, and the internal consistency test (Cronbach Alpha) was used for the answers of the study sample that was obtained, "Alpha" can also be interpreted as the internal stability parameter between the answers, and its high value indicates a high degree of stability, The statistically acceptable value for this measure is (60%) or more (Sekaran & Roger, 2013), and in other studies the statistically acceptable value is (70%) or more, and it is clear from the results of data analysis in Table No. (2) that the result of the study paragraphs is stable.

TABLE 2

INTERNAL STABILITY COEFFICIENTS (CRONBACH ALPHA) FOR EACH FIELD OF THE STUDY TOOL AND FOR THE TOOL AS A WHOLE

Field	Numbers of Paragraphs	Cronbach Alpha
Expert systems	4	81.8
Neural networks	4	85.4
Genetic algorithms	4	76.1
Intelligent agent	4	75.4
Cyber security governance requirements	7	95.1
Cyber security program	8	82.6
Cyber security policy	8	91.0
Cyber Information Security Department	8	86.2
Cyber risk assessment and management	6	87.1
The tool as a whole	53	95.3

It appears from Table No. (2) that all values of the Cronbach alpha coefficients were high, and that the stability of the study paragraphs as a whole was high, reaching (95.3), which indicates that the study tool is of high credibility (reliability).

## 8. NORMAL DISTRIBUTION:

Table No. (3) Shows the results of the normal distribution of data test. (Skewness & Kurtosis) test was used. The results were as follows:

TABLE 3

THE NORMAL DISTRIBUTION OF DATA TEST (SKEWNESS & KURTOSIS)

Variable	Skewness	Kurtosis
Expert systems	-0.585	-0.218
Neural networks	-0.732	-0.385
Genetic algorithms	-0.787	0.297
Intelligent agent	-0.043	-1.528
Cyber security governance requirements	-1.891	6.048
Cyber security program	-0.837	1.633
Cyber security policy	-0.403	-1.109
Cyber Information Security Department	-0.735	-0.126
Cyber risk assessment and management	-1.425	2.271

It appears from Table No. (3) that the test value of Skewness is between (1.96 ±) and the value of the Kurtosis test is between (± 2.85), so the data distribution is subject to the normal distribution

## 9. INTERFERENCE TEST BETWEEN INDEPENDENT VARIABLES

The first hypothesis

The VIF test was used to ensure that there is no linear multiplicity (multiple correlation) problem, because it is considered a problem as one of the problems facing the statistical estimation of regression coefficients, and Table No. (4) Shows the results of the test for VIF:

TABLE 4  
THE RESULTS OF THE VIF TEST

Field	VIF	Tolerance
Expert systems	1.03	0.97
Neural networks	1.10	0.91
Genetic algorithms	1.46	0.69
Intelligent agent	1.44	0.69

The table above shows that there is no multiple correlation problems between the independent variables being less than 5, thus accepting the level of variance in each of the independent variables.

## 10. RESULTS

Discussion of the study results:

The first main hypothesis:

The impact of artificial intelligence on the correct application of cyber governance in Jordanian commercial banks

To test this hypothesis, multiple regression analysis was used to identify the relationship between artificial intelligence represented by (expert systems, neural networks, genetic algorithms, and intelligent agent) on the correct application of cyber governance in Jordanian commercial banks, and Table (5) shows that relationship:

TABLE 5  
REGRESSION ANALYSIS- ARTIFICIAL INTELLIGENCE ON THE CORRECT APPLICATION OF CYBER GOVERNANCE

Independent variable	value β	value t	Statistical significance
constant	0.68	1.94	0.056
Expert systems	0.16	3.58	0.001
Neural networks	0.17	3.71	0.000
Genetic algorithms	0.27	4.41	0.000
Intelligent agent	0.28	4.81	0.000
value F	34.520	Statistical significance for F	0.000
Adj. R2	62.9%	R2	64.8%
Durbin-Watson	1.885	Number of views	80

The table shows a strong and statistically significant relationship between the first main hypotheses: The impact of artificial intelligence represented by (expert systems, neural networks, genetic algorithms, and intelligent agent) on the correct application of cyber governance in Jordanian commercial banks, where the value of F is (34,520) and statistical significance of (0,000), where Adj. R2 reached (62.9%), which represents the strong influence of the

independent variable (artificial intelligence) on the dependent variable (cyber governance), thereby rejecting the first major null hypothesis and accepting the alternative hypothesis.

#### 10.1 RESULTS FOR THE FIRST SUB-HYPOTHESIS:

There is no effect of expert systems on the correct application of cyber governance in Jordanian commercial banks, The result of the multiple regression showed that there is a direct relationship between expert systems on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that an increase of the independent variable by 1% leads to an increase in the dependent variable by (0.16) units, thereby rejecting the null hypothesis and accepting The alternative hypothesis.

#### 10.2 RESULTS FOR THE SECOND SUB-HYPOTHESIS:

There is no effect of neural networks on the correct application of cyber governance in Jordanian commercial banks, The result of the multiple regression showed that there is a direct relationship between the neural networks on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that the increase of the independent variable by 1% leads to an increase in the dependent variable by (0.17) units, thus rejecting the null hypothesis and accepting The alternative hypothesis.

#### 10.3 RESULTS FOR THE THIRD SUB-HYPOTHESIS:

There is no effect of genetic algorithms on the correct application of cyber governance in Jordanian commercial banks The result of the multiple regression showed that there is a direct relationship between the genetic algorithms on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that the increase of the independent variable by 1% leads to an increase in the dependent variable by (0.27) units, thus rejecting the null hypothesis and accepting The alternative hypothesis.

#### 10.4 RESULTS FOR THE FOURTH SUB-HYPOTHESIS:

There is no effect of the intelligent agent on the correct application of cyber governance in Jordanian commercial banks. The result of the multiple regression showed that there is a direct relationship between the intelligent agent on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that the increase of the independent variable by 1% leads to an increase in the dependent variable by (0.28) units, thus rejecting the null hypothesis and accepting The alternative hypothesis.

TABLE 6

THE PREDICTION OF THE IMPACT OF ARTIFICIAL INTELLIGENCE REPRESENTED BY (EXPERT SYSTEMS, NEURAL NETWORKS, GENETIC ALGORITHMS, AND INTELLIGENT AGENT) ON THE REQUIREMENTS OF CYBER SECURITY GOVERNANCE.

Independent variable	value $\beta$	value t	Statistical significance
constant	0.59	0.87	0.385
Expert	0.18	2.01	0.048

<b>systems</b>			
<b>Neural networks</b>	0.19	2.17	0.033
<b>Genetic algorithms</b>	0.31	2.57	0.012
<b>Intelligent agent</b>	0.24	2.07	0.042
<b>value F</b>	9.509	Statistical significance for F	0.000
<b>Adj. R2</b>	30.1%	R2	33.6%
<b>Durbin-Watson</b>	1.876	Number of views	80

TABLE 7

THE PREDICTION OF THE IMPACT OF ARTIFICIAL INTELLIGENCE REPRESENTED BY (EXPERT SYSTEMS, NEURAL NETWORKS, GENETIC ALGORITHMS, AND INTELLIGENT AGENT) ON THE CYBER SECURITY PROGRAM.

Independent variable	value $\beta$	value t	Statistical significance
constant	0.88	2.33	0.023
Expert systems	0.10	2.06	0.043
Neural networks	0.12	2.55	0.013
Genetic algorithms	0.29	4.31	0.000
Intelligent agent	0.33	5.11	0.000
<b>value F</b>	30.390	Statistical significance for F	0.000
<b>Adj. R2</b>	59.8%	R2	61.8%
<b>Durbin-Watson</b>	1.655	Number of views	80

TABLE 8

THE PREDICTION OF THE IMPACT OF ARTIFICIAL INTELLIGENCE REPRESENTED BY (EXPERT SYSTEMS, NEURAL NETWORKS, GENETIC ALGORITHMS, AND INTELLIGENT AGENT) ON THE CYBER SECURITY POLICY.

Independent variable	value $\beta$	value t	Statistical significance
constant	-0.09	-0.14	0.887
Expert systems	0.19	2.35	0.021
Neural networks	0.16	2.03	0.046
Genetic algorithms	0.33	2.98	0.004
Intelligent agent	0.35	3.30	0.001
<b>value F</b>	14.781	Statistical significance for F	0.000
<b>Adj. R2</b>	41.1%	R2	44.1%
<b>Durbin-Watson</b>	1.685	Number of views	80

TABLE 9

THE PREDICTION OF THE IMPACT OF ARTIFICIAL INTELLIGENCE REPRESENTED BY (EXPERT SYSTEMS, NEURAL NETWORKS, GENETIC ALGORITHMS, AND INTELLIGENT AGENT) ON THE CYBER INFORMATION SECURITY DEPARTMENT.

Independent variable	value $\beta$	value t	Statistical significance
constant	0.42	0.71	0.482
Expert systems	0.20	2.60	0.011
Neural networks	0.21	2.72	0.008
Genetic algorithms	0.23	2.22	0.029
Intelligent agent	0.29	2.82	0.006
value F	12.464	Statistical significance for F	0.000
Adj. R2	36.7%	R2	39.9%
Durbin-Watson	1.852	Number of views	80

TABLE 10

THE PREDICTION OF THE IMPACT OF ARTIFICIAL INTELLIGENCE REPRESENTED BY (EXPERT SYSTEMS, NEURAL NETWORKS, GENETIC ALGORITHMS, AND INTELLIGENT AGENT) ON THE CYBER RISK ASSESSMENT AND MANAGEMENT.

Independent variable	value $\beta$	value t	Statistical significance
constant	1.59	3.06	0.003
Expert systems	0.14	2.07	0.042
Neural networks	0.15	2.20	0.031
Genetic algorithms	0.20	2.16	0.034
Intelligent agent	0.22	2.50	0.015
value F	9.616	Statistical significance for F	0.000
Adj. R2	30.4%	R2	33.9%
Durbin-Watson	1.743	Number of views	80

## 11. RESULTS:

1. The presence of impact of artificial intelligence represented by (expert systems, neural networks, genetic algorithms, and intelligent agent) on the correct application of cyber governance in Jordanian commercial banks, where the value of F is (34,520) and statistical significance of (0,000) , where Adj. R2 reached (62.9%), which represents the strong influence of the independent variable (artificial intelligence) on the dependent variable (cyber governance).
2. The result of the multiple regression showed that there is a direct relationship between expert systems on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the

result indicates that an increase of the independent variable by 1% leads to an increase in the dependent variable by (0.16) units.

3. The result of the multiple regression showed that there is a direct relationship between the neural networks on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that the increase of the independent variable by 1% leads to an increase in the dependent variable by (0.17) units.
4. The result of the multiple regression showed that there is a direct relationship between the genetic algorithms on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that the increase of the independent variable by 1% leads to an increase in the dependent variable by (0.27) units.
5. The result of the multiple regression showed that there is a direct relationship between the intelligent agent on the correct application of cyber governance in Jordanian commercial banks and is statistically significant, as the result indicates that the increase of the independent variable by 1% leads to an increase in the dependent variable by (0.28) units.

## 12. RECOMMENDATIONS

1. Jordanian banks, before making a change in their information and communications technology environment, operations or procedures, or after any event that affects their security, must make sure whether there is a need for changes or improvements in the cybersecurity policy and program to suit the applications of artificial intelligence in them.
2. Keeping up with commercial banks in Jordan to progress and development in the environment of expert systems through providing modern and developed devices to operate various programs and applications of expert systems, with the aim of increasing the level of support provided by those applications on the efficiency of banking work in them in light of the existence of the correct mechanism applied to cyber governance.
3. Commercial banks in Jordan are more dependent on advanced systems for operating neural networks technology, and using computer hardware and equipment and programs that are characterized by modernity and rely on neural network technologies in order to follow the progress of business and tasks according to its goals in order to achieve the goals of the bank that are previously planned.
4. Increasing the use of genetic algorithms in the bank's control process because of its role in supporting the supervisory agencies in conducting calculations to obtain accurate, faster and more reliable results, and helping them to find quick solutions in the changing environment.
5. Activating the role of the intelligent agent more in providing data and information in the bank with the data that serve the control process, and achieving efficiency and effectiveness in the monitoring process of the bank in light of the correct application of cyber governance in it.

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