Journal of Information Systems Engineering and Management
2025, 10(26s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

The Role of Legal Laws and Intellectual Property Rules in the Era of using Artificial Intelligence in Scientific Publications

Mohamed Hadi Al Najdawi[1], Zainab Al Ghurabli[2], Ahmad Aburayya[3], Fanar Shwedeh[4], Brihan Fatin Yehia[5]
[1]*Associate Professor, City University Ajman, UAE, m.najdawi@cu.ac.ae*
[2]*Associate Professor, City University Ajman, UAE, z.ghurabli@cu.ac.ae*
[3]*Assistant Professor, City University Ajman, UAE, f.brihan@cu.ac.ae*
[4]*Assistant Professor, City University Ajman, UAE, s.fanar@cu.ac.ae*
[5]*Assistant Professor, City University Ajman, UAE, f.brihan@cu.ac.ae*

ARTICLE INFO

Received: 28 Dec 2024

Revised: 10 Feb 2025

Accepted: 28 Feb 2025

ABSTRACT

This study emphasizes the necessity of Jordanian legislation and intellectual property regulations in regulating the use of artificial intelligence in scientific research. A review of AI adoption barriers and drivers shows a need for stronger legal and regulatory frameworks to keep up with technology. Jordanian intellectual property laws are needed to protect researchers and institutions and promote scientific innovation. The study found that Jordanian legal frameworks promote innovation, protect IP, and ensure compliance. The Copyright Protection Law and Patent Law of Jordan provide a solid legal framework for AI research limits. The biggest problem is updating frameworks to stay up with rapid technology advancements. The study shows that data privacy and intellectual property regulations are needed to promote AI in scientific research. Therefore, Jordanian lawmakers should clarify and transparently regulate AI intellectual property rules to ensure responsible use and preserve researchers' rights. The report suggests that Jordanian academic institutions and regulatory bodies must work together to improve governance and connect legislation with technological advances. To react to rapid AI sector innovations, existing legislation must be revised. This study concludes that Jordanian policymakers must improve collaboration and implement adaptable legislation to regulate AI use in scientific research. Efficacy depends on balancing innovation and intellectual property rights.

Keywords: Artificial Intelligence, Legal Laws, Intellectual Property Rules, Scientific Publications.

1. Background

The relationship between man and machine is not a new relationship, but rather a relationship based on continuous progress and development related to the progress and development of industry, but it did not go beyond the scope of the relationship between man and inanimate objects, as man is the inventor of the machine and its operator, and it works with his knowledge and he is the beneficiary of it, but recently an unparalleled technological development has emerged that has imposed itself on the entire world, starting with the emergence of the computer and the Internet, reaching "artificial intelligence", the science that transformed the machine from something that does not work except with human intervention to something that enjoys some independence and performs work that imitates human work, and where humanity has gone through many industrial revolutions since the first industrial revolution in the seventeenth century AD and the transition from manual production to the use of electrical energy through the communications revolution, reaching the fourth industrial revolution that we are in now, which depends on artificial intelligence technologies and its tools in various areas of life from cultural, social, scientific, economic, military, and legal, in addition to the Internet of Things, robots, facilities and smart cities (Abdallah et al., 2022; Shwedeh, Salloum, Aburayya, Fatin, et al., 2024a).

The period between 1940 and 1950 is considered the beginning of the first steps of artificial intelligence, with the creation of the first neural networks, as the work of two neuroscientists, Warren McCulloch and Walter Pitts, led

to a logical calculation of the basic ideas in neural activity, and to the first mathematical model of the biological nerve and the artificial nerve (Alkashami, Mohammad, et al., 2023; Hadi Al Najdawi et al., 2024; Shwedeh, Aburayya, et al., 2024). After that, a new term called "artificial intelligence" began to appear for the first time, at that time, this term meant simulating the human mind, by creating a set of programs that work like neural networks in the brain and linking them together to perform a specific learning process. From development to development, it reached the robot, which is one of the most prominent areas of artificial intelligence, such as robots in the military and medical fields, as well as legal robots (Shwedeh, 2024a; Shwedeh et al., 2021; H. Yas, Aburayya, et al., 2024). Since intellectual property is the product of human inventions, innovations, industrial machines, songs and books, and the term intellectual property applies to any human innovation, artificial intelligence applications have affected intellectual property rights in all these areas (S. A. Salloum, Almarzouqi, Aburayya, Shwedeh, Fatin, Ghurabli, Elbadawi, et al., 2024; Shwedeh et al., 2020; N. Yas, Dafri, et al., 2024). Accordingly, all countries, whether developing or developed, have been interested in applying special laws to protect intellectual property, which has made the Jordanian legislator keen to protect ideas and innovations in all their forms and shapes, as they have always been the first to legislate laws to protect intellectual property rights (Shwedeh, 2024b; Shwedeh, Adelaja, et al., 2023; Shwedeh, Dabash, et al., 2024).

Artificial intelligence applications have affected the intellectual property system, as modern technology has provided us with new types of intellectual creativity. It was imperative for the legislator to develop rules and laws for protecting intellectual property to keep pace with this development (El Nokiti et al., 2022; Ravikumar et al., 2022; Shwedeh, Nour, et al., 2024; Shwedeh, Salloum, Aburayya, Kaur, et al., 2024). Therefore, the importance of the research lies in knowing the nature and concept of intellectual property, the extent of its protection within artificial intelligence software, and the legal methodology followed in this regard (Khadragy et al., 2022; Shwedeh, Salloum, Aburayya, Fatin, et al., 2024c).

2. Literature Review

2.1 Artificial Intelligence (AI)

Defining the artificial intelligence (AI), system is one of the most important topics that I saw that we should start this research with, especially because of the similarity of the definitions and concepts of different artificial intelligence (AI), and their overlap with each other, which may confuse the reader's understanding of this research and other research that talks about protecting computer programs (Aburayya et al., 2023; S. A. Salloum, Almarzouqi, Aburayya, Shwedeh, Fatin, Ghurabli, Dabbagh, et al., 2024; Shwedeh, Aburayya, et al., 2022).

Modern science has not settled on a specific definition of artificial intelligence (AI),, but many definitions have been included in it, which are that it is an integral part of computer science that is concerned with specialized systems for these devices, and these systems are characterized by high characteristics and capabilities that simulate the human mind in many characteristics such as learning, thinking, language, decision-making and problem solving (Ibrahim, E., Sharif, H., & Aboelazm, K. S., 2025). Artificial intelligence (AI), was named by this name because it arose from the work of natural humans and the use of their skills in programming computer systems, meaning that artificial intelligence (AI), is created by humans and innovated using different computer processes that lead to specific results according to laws and axioms known in software science (Dahu et al., 2022; Ravikumar et al., 2023; S. Salloum, Al Marzouqi, et al., 2023). However, artificial intelligence (AI), differs from human intelligence in that human intelligence is the one that invented artificial intelligence (AI), envisioned it and set its limits, and the human mind is always innovating and inventing, while artificial intelligence (AI), is limited to the data given to it by natural humans (Shwedeh, Aldabbagh, et al., 2023; Shwedeh, Salloum, Aburayya, Fatin, et al., 2024b; Shwedeh, Yas, et al., 2024).

The term artificial intelligence (AI), dates back to the 50th century, specifically in the fifties, when the world was now conducting the Turing test, which means evaluating intelligence on a computer and classifying it as intelligent if it is able to simulate the human mind (Salameh et al., 2022; Shwedeh, Aburayya, et al., 2023; N. Yas, Elyat, et al., 2024). After the Turing test appeared in 2011, Christopher Strachey created the first artificial intelligence (AI), program, and he was the head of programming research at Oxford University, who played and developed the game Checkers through the computer and Anthony Oettinger, Cambridge University designed a simulation experiment with a computer for human shopping in more than one store and designed to measure the computer's learning ability.

It was the first successful experiment in machine learning (Alkashami, Hussain, et al., 2023; Shwedeh, 2021, 2024c; Shwedeh, Malaka, et al., 2023).

We mentioned earlier that a specific definition of artificial intelligence (AI), was not settled on, but that we mention some of the definitions that were said, as Alan Turing defined "artificial intelligence (AI), as the ability to act as if a human is the one who acts by trying to deceive the questioner and appear as if a human is the one who answers the questions asked by the questioner" as well The American scientist Marvin Minsky, one of the founding scientists of artificial intelligence (AI), defined it as "the science by which machines can do things that would require intelligence if done by humans" (Alimour et al., 2024; S. Salloum, Shwedeh, et al., 2023; Shwedeh, Hami, et al., 2022; H. Yas, Dafri, et al., 2024). The Artificial intelligence (AI), Institute Now, a research institute affiliated with New York University that specializes in studying the social effects of artificial intelligence (AI), defined it as "a constellation of technological processes that enable computers to complete or replace specific tasks that humans would otherwise perform, such as decision-making and problem-solving".

Artificial intelligence (AI), can be classified according to its capabilities into three different types as follows:

1. Limited or narrow artificial intelligence (AI),: Limited or narrow artificial intelligence (AI), is one of the types of artificial intelligence (AI), that can perform specific and clear tasks, such as self-driving cars, or even speech or image recognition programs, or the chess game on smart devices. This type of artificial intelligence (AI), is considered the most common and available type at the present time.

2. General artificial intelligence (AI),: In English: It is the type that can work with a capacity similar to the human ability in terms of thinking, as it focuses on making the machine able to think and plan on its own and in a manner similar to human thinking, but there are no practical examples of this type. All that exists so far are just research studies that require a lot of effort to develop and transform them into reality (Al-Najdawi, 2022a). The artificial neural network method is one of the methods of studying general artificial intelligence (AI),, as it is concerned with producing a neural network system for the machine similar to that contained in the human body.

3. Super Artificial intelligence (AI),: Super artificial intelligence (AI), is considered the type that may exceed the level of human intelligence, and which can perform tasks better than a specialized and knowledgeable human being. This type has many characteristics that it must include; such as the ability to learn, plan, communicate automatically, and make judgments. However, the concept of super artificial intelligence (AI), is considered a hypothetical concept that does not exist in our current era (Hadie Al Najdawi, 2022).

Artificial intelligence (AI), is also a double-edged sword, as despite providing benefits to individuals in a faster and more effective way, on the other hand, it may cause much more harm to individuals than other technologies. Accordingly, artificial intelligence (AI), technologies have many advantages as well as many disadvantages.

First: Some advantages of artificial intelligence (AI), systems

1. Artificial intelligence (AI), is distinguished from human intelligence in that it is not affected by emotions that affect its decisions like human intelligence, as it is just data that leads to specific results. It is also characterized by the ease and speed of knowledge transfer and does not require a lot of training and transfer of experiences like humans.
2. Artificial intelligence (AI), helps enhance health services and facilitate life for people with special needs through applications that help them in various needs. It also helps make government services more efficient, as well as mitigate climate change and predict natural disasters.

Second: Some disadvantages of artificial intelligence (AI), systems

1. The machine always depends on the information it is fed, which results in a lack of innovation in the solutions it issues, which leads to a lack of creativity unless the machines are fed with algorithms that can self-develop.
2. Expectations indicate that artificial intelligence (AI), will greatly affect the nature of jobs and industries, which will result in an increase in the unemployment rate as human labor is replaced by industrial machines, such as in the case of using fully self-driving cars, this will threaten a large segment of drivers in the future,

and the implementation of artificial intelligence (AI), systems requires expensive machines, not to mention that these systems lack the morals and feelings that human elements possess.

2.2 Intellectual Property Rights

Intellectual property rights or moral rights were not of great economic and social interest, but the economic, commercial and cultural development of societies, and the accompanying globalization, spread of technology and cultural communication at all levels, led to a civilizational revolution that followed the industrial revolution (Aboelazm, K. S., Tawakol, F., Ibrahim, E., & Ramadan, S. A., 2025). By the nature of innate human relations, there is aggression and theft of benefits and interests, infringement of rights and competition in their monopolization and investment, especially non-material moral rights that can be copied, transferred and retained with ease, even without the consent of their owner (Aburayya et al., 2020; Al-Najdawi, 2022b). All of this raised the fear of the inventor for his inventions, the innovator for his innovations, the artist for his artistic creations, and the author for his scientific and literary works. Therefore, there had to be controls, standards and rules that control and organize these rights, and this was done through some international agreements and laws related to intellectual property, which we will explain later.

The term intellectual property rights constitutes the general framework that includes all moral and literary rights, which must be recognized by law, protected and prevented from being violated by all procedures, whether administrative, which aim to regulate, criminal, which aim to deter, or civil, which are based on compensation and redress for damages (Hadi Al Najdawi et al., 2024).

Some jurists refrain from defining this contemporary term for intellectual property because the definition must be comprehensive and exclusive, but that did not prevent some from defining it in light of the characteristics and rules of this property. Some defined it as:

Intellectual property is a direct authority that the law gives to a person over all the products of his mind and thinking, and it gives him the ability to monopolize and benefit from the financial returns that these ideas generate for the legally specified period and without dispute or objection from anyone (Aboelazm, K. S., 2024).

The definition of intellectual property also states: “It is the legal rules established to protect intellectual creativity contained in tangible works (artistic and literary intellectual property) or to protect the moral elements of industrial and commercial projects (industrial property).

Some of them said that intellectual property is: a group of rights that protect human thought and creativity and include patents, trademarks, industrial designs and models, geographical indications, copyright, and other intellectual property rights.” The common definitions of intellectual property try to show the characteristics of this property so that the definition is comprehensive, and the characteristics that the intellectual property right or moral right in general gives to the owner are represented by two aspects:

First: Moral authority or what is called the right of exclusivity that grants the owner of the intellectual right the right to attribute the intellectual creativity or invention to him as an extension of his personality.

Second: Material authorities or what is called the right of investment, whereby the owner of the intellectual or literary right or what is called the work of authorship, invention, creativity or theater...) can invest and benefit from his work by using and exploiting this intellectual production and scientific, industrial or commercial creativity, from the financial aspect such as selling his right to the authorship or allowing others to benefit under specific conditions and for a specific period of time from this work such as renting some industrial or artistic innovations, etc.

The intellectual property right is stipulated in Article 27 of the Universal Declaration of Human Rights, which recognized the right to benefit morally and materially from works of authorship and scientific, literary and artistic creativity.

Article (2) of the Jordanian Copyright and Related Rights Protection Law No. 22 of 1992 defined the work as: any literary, artistic or scientific creativity protected in accordance with the provisions of Article (3) of this law.

2.3 Intellectual property protection within artificial intelligence software

The legal user of artificial intelligence applications wonders whether the information, texts and data provided by the device, which may be quoted from various and multiple scientific and literary references and sources of authors, enjoy intellectual property rights, and what is the mechanism followed in this regard? In our era of advanced technology, the digital literary and scientific work has emerged, and there is no difference in name and principle from the traditional paper work, except that the carrier is what has changed. The carrier was the paper on which the words are written, and it has become digital, written by the keyboard, to be saved in the computer's memory, and the result is an electronic text that the computer is able to retrieve by converting the phrases entered from the natural language into a language that the computer understands.

In this capacity, WIPO held a discussion on artificial intelligence and intellectual property, a meeting of stakeholders, member states, and others, to consider the impact of artificial intelligence on intellectual property policy, with the aim of developing a unified formula for questions that policymakers should ask. At the end of the discussion, Mr. Gray stated that WIPO would initiate an open-ended work to develop a list of issues related to the impact of artificial intelligence on intellectual property, to serve as a basis for organizing future discussions (Khudhair, H. Y., Jusoh, A., Mardani, A., Nor, K. M., & Streimikiene, D., 2019).

From this standpoint, it can be said that the issue is open for study and research to develop the necessary treatments, or to develop a protection approach, in a way that ensures the preservation of intellectual rights within the framework of artificial intelligence, and since artificial intelligence is based on data and its feeding, is it protected? The classical intellectual property system may be viewed as actually providing certain types of protection for data, as data that represents new, non-obvious, and useful inventions is subject to protection under patents, and data that represents innovative industrial designs, independently, and is considered new, or original is also subject to protection, and an example of this is data that represents original literary or artistic works (Yas, H., Mardani, A., & Alfarttoosi, A., 2020).

2.3 The Jordanian legislator's position on artificial intelligence

The Jordanian legislator's position on artificial intelligence means the Jordanian legislation regulating artificial intelligence, in terms of defining the concept of artificial intelligence and its nature in Jordanian legislation.

Referring to Jordanian legislation in general, we find that until now, no specialized legislation has been issued regulating the provisions of artificial intelligence and its applications. However, it should be noted that artificial intelligence applications overlap in many fields, which means that they are subject to specific specialized legal legislation, and thus there is no concept of artificial intelligence in Jordanian legislation. The researcher also finds that the concept of the electronic intermediary contained in the Artificial Intelligence Law does not apply; The article defines it as "the electronic program used to implement a procedure or respond to a procedure automatically with the intention of creating an information message or electronic transactions, sending or receiving them (Saeed, M. D., & Khudhair, H. Y., 2024). It should be noted that despite the Jordanian legislator's lack of awareness of the importance of artificial intelligence due to the lack of specialized legislation in this regard, the Jordanian Ministry of Digital Economy and Entrepreneurship has issued the National Charter on the Ethics of Artificial Intelligence, with the aim of developing the artificial intelligence system in the Hashemite Kingdom of Jordan. The researcher finds in this charter a preliminary step towards issuing legislation specific to artificial intelligence.

Regarding the legal basis for artificial intelligence in Jordanian legislation, artificial intelligence has not been recognized as a legal personality in most legislations, including Jordanian legislation - until this moment, which means that artificial intelligence is still treated as things.

2.3.1 Recognition of artificial intelligence as a legal personality

The issue of the legal nature of artificial intelligence has raised a major problem in legal jurisprudence and a reference for their disagreement over the extent to which the intelligent artificial application enjoys legal personality or not. Before we show the opinions of jurisprudence on this and the legal analysis Logically, these opinions require us to first define what is meant by legal personality and legal persons according to Jordanian legislation (Yas, H., Alkaabi, A., ALBaloushi, N. A., Al Adeedi, A., & Streimikiene, D., 2023).

Legal personality means the ability to acquire rights and bear obligations, and the general principle is that legal personality is granted only to humans; however, the necessities of life necessarily required the assumption of a legal personality for other beings called moral personality, and moral persons are “groups of natural persons or funds brought together for one purpose, and this group has a legal personality necessary to achieve this purpose from the personality of its constituents or beneficiaries”.

Legal persons are defined exclusively in Jordanian legislation, according to the text of Article (50) of the Jordanian Civil Code, which states: “Legal persons are:

1. The state and municipalities under the conditions specified by law, public institutions and other establishments that the law grants a legal personality.
2. Religious bodies and sects that the state recognizes as legal personality.
3. Endowments.
4. Commercial and civil companies.
5. Associations and institutions established in accordance with the provisions of the law.
6. Any group of persons or funds that are proven to have a legal personality in accordance with the text of the law” (Jordanian Civil Code No. (43) of 1976).

Accordingly, a legal personality cannot be granted to any entity except by a legal text, and a legal person enjoys a set of characteristics, the most important of which are legal capacity, financial liability, legal capacity, domicile, name, etc.

There is a legislative gap in regulating the use of artificial intelligence, particularly in the realm of scientific research, given the stance taken by Jordanian lawmakers on the subject. Although the "National Charter for Artificial Intelligence Ethics" was issued as a beginning in the right direction to regulate this technology, the absence of explicit laws governing its applications raises issues with legal liability and intellectual property protection (Aboelazm, K. S., & Afandy, A., 2019).

Thus, it is imperative to create a thorough legal framework that protects intellectual property rights pertaining to artificial intelligence research applications. In order to promote innovation and guarantee adherence to the highest legal and ethical standards, this legislative framework should address topics like researchers' rights, liability for innovations brought about by artificial intelligence, and governance of data used in this research.

3. Research Methodology

This study examines the desired goals utilizing a primary data source, concentrating on examining the connection between the use of AI in scientific research and the degree of adherence to legal requirements and intellectual property laws. A pre-made questionnaire was sent to academic and research institutes in the United Arab Emirates that use AI technology in their work as part of the survey research approach used in this study. The purpose of the questionnaire was to record the difficulties in safeguarding inventions and maintaining legal compliance, as well as to investigate how intellectual property laws and policies affect the application of AI. The study's theoretical framework, which is founded on technical and legal governance theory, is further supported by a literature review.

3.1 Research Design and Data Collection

The concepts in this research were measured through different assertions (variables) derived from previous studies. These statements were evaluated using a 5-point Likert scale, where (1 = strongly disagree; 2 = disagree; 3 = neutral; 4 = agree; 5 = strongly agree).

3.2 Measuring legal compliance and intellectual property protection in scientific research

The actions made by educational and research institutions to guarantee the preservation of intellectual property rights and adherence to laws pertaining to artificial intelligence are referred to in this context as the function of legal legislation and intellectual property regulations. This involves adhering to the highest legal and ethical standards in scientific research and guaranteeing compliance with laws governing the use of artificial intelligence. The study intends to evaluate the ways in which a number of elements, such as laws and confidence in intellectual property protection, support a secure and long-lasting research environment in the participating universities.

The sample size used in the study was determined through the following equation:

$$\sqrt{\frac{\tau \times L}{N}} = \frac{\%\varepsilon}{2}$$

- N represents the sample size.
- %ε is the margin of error allowed in estimating the sample size, expressed as a percentage.
- L represents the number of elements that do **not** have the characteristics of the population (i.e., elements that do not match the population's features).
- τ\tauτ represents the number of elements that **do** have the characteristics of the population.

The equation demonstrates how to calculate N based on the required percentage and the allowed margin of error. In the example provided below the equation:

- The values are substituted into the equation:

$$\frac{97 - 3}{2} = \frac{0.05}{2}$$

leading to the result:

$$N = 47 \text{ individuals}$$

The researcher distributed 50 questionnaires directly to the sample members by hand, 48 valid questionnaires were retrieved, with a response rate of 96%, the following table shows the distributed and retrieved questionnaires.

Table (1) Lists of questionnaires distributed and returned according to the sample

Study sample	**Distributed forms**	**Correct forms**		
		Number	**Response rate**	**Percentage of total**
1. Academics and Researchers	**20**	**19**	**95%**	**40%**
2. Lawyers and Legal Experts	**15**	**15**	**100%**	**31%**
3. Developers and AI Experts	**15**	**14**	**93%**	**29%**
Total	**50**	**48**	**96%**	**100%**

3.3 Data collection methods

The researcher relied on the questionnaire list method to collect data to achieve the field study objective and test the study hypotheses. The questionnaire list included a set of inquiries that included many phrases that reflect the study objective. The five-dimensional Likert scale was used to design the questionnaire list by giving a relative weight to the answers to each phrase ranging from one to five degrees. The list was divided into three groups as follows:

1. **The first group**: Challenges facing the application of artificial intelligence in scientific research, which includes six phrases related to legal, ethical, regulatory, and organizational challenges that may hinder the use of artificial intelligence in scientific research.

2. **The second group**: Factors for the success of the application of artificial intelligence in scientific research. This group includes five phrases related to the legal and regulatory factors that contribute to the success of the use of artificial intelligence in scientific research.

3. **The third group**: The impact of the use of artificial intelligence on scientific research. This group consists of nine phrases related to the impact of the use of artificial intelligence on research results, innovation, and intellectual property.

3.4: Data processing and analysis methods.

To achieve the objectives of the research, the following statistical methods were used in addition to the above-mentioned Likert method:

1- Calculating the reliability and validity coefficient (Alpha, Cronbach).

2- Descriptive statistics for data (arithmetic mean and standard deviation).

- Inferential statistics (Chisquare test).

The researcher used the statistical analysis program for social sciences (17.Spssv) and the statistical analysis program (16.Minitapv) to analyze the data collected by the survey forms to select the research hypotheses.

3.5 Testing the validity and reliability of the questionnaire list.

This is done through the (Alpha Cronbach's) scale to measure the validity, stability and internal consistency of the questionnaire list statements, in order to know the extent of reliability in the responses of the study sample to the questionnaire list questions, and thus to the three study hypotheses and the extent of the possibility of generalizing its results to the study community. As follows:

Table No. (2) Results of the validity and reliability test for the three study hypotheses

Study assumptions	Number of statements	Reliability coefficient	Validity coefficient
1. There are no statistically significant differences between the opinions of the study sample regarding the challenges facing the application of artificial intelligence in scientific research.	**6**	**0.923**	**0.964**
2. There are no statistically significant differences between the opinions of the study sample regarding the factors that contribute to the success of using artificial intelligence in scientific research.	**5**	**0.952**	**0.970**
3. There are no statistically significant differences between the opinions of the study sample regarding the impact of using artificial intelligence on the results of scientific research.	**9**	**0.867**	**0.896**
Toltal	**20**	**0.985**	**0.989**

It is clear from the previous table that the reliability coefficient of the questionnaire statements ranges between (0.867 - 0.952), which in turn reflects the validity coefficient, which ranges between (0.896-0.982), meaning that the alpha value for all hypotheses statements is greater than (0.5), which indicates the validity of the questionnaire statements and that they cover the important points under study and the possibility of generalizing the sample results to the study community.

3.6 Analysis of the study results and testing the hypotheses.

By using descriptive statistics methods (arithmetic mean and standard deviation) and arranging the relative importance of the research sample responses and using inferential statistics through the (Ka) test to determine the validity of the research hypotheses as follows:

3.6.1 Testing the first hypothesis:

There are no statistically significant differences between the opinions of the study sample regarding the challenges facing the application of artificial intelligence in scientific research.

By measuring the opinion of the study sample categories regarding the statements of the first hypothesis, the arithmetic mean and standard deviation were calculated, and a test was conducted for the statements of the first hypothesis, and the results were as shown in the following table:

Table No. (3) Responses of the study sample regarding the statements of the first hypothesis

First assumption phrases	Study sample response					Descriptive statistics		Degree of approval	Ka² test		Arrangement
	Totally agree	Agree	Neutral	Disagree	Strongly disagree	Arithmetic mean	Standard deviation		Ka² value	Significance level	
1	17	13	4	8	6	3.5	0.80	Agree	21.5	0.123	5
	35%	28%	8%	16%	13%						
2	20	13	3	5	9	3.7	1.4	Agree	18.1	0.145	3
	41%	25%	5%	10%	19%						
3	15	16	9	4	4	4	0.75	Agree	35.2	0.121	1
	31%	33%	18%	8%	8%						
4	22	15	8	3	2	3.6	0.92	Agree	40.1	0.181	4
	46%	31%	17%	5%	1%						
5	19	17	4	5	3	3.8	1.07	Agree	30.2	0.121	2
	40%	35%	8%	10%	7%						
6	20	12	8	3	5	3.4	0.82	Agree	28.1	0.152	6
	41%	25%	17%	7%	10%						
Overall average						3.7	0.96	Agree	-	-	-

Table No. 3 shows that the degree of agreement on all the statements of the first hypothesis is (agree), which means that all the statements of the first hypothesis are acceptable from the point of view of the study sample, and that the sixth statement (researchers lack awareness of the laws related to artificial intelligence) was approved in first place, and that the general average of the responses to the first hypothesis was (3.7) with a standard deviation of (0.96) and that the value of the significance level of the chismare test for all the statements of the first hypothesis is greater than the significance level (0.05), which indicates that there are no statistically significant differences between the opinions of the study sample on the statements of the first hypothesis, which indicates the validity of the first hypothesis of the study.

3.6.2 Testing the second hypothesis:

There are no statistically significant differences between the opinions of the study sample on the factors that contribute to the success of using artificial intelligence in scientific research.

By measuring the opinion of the study sample categories on the statements of the first hypothesis, the arithmetic mean and standard deviation were calculated, and a test was conducted for the statements of the first hypothesis, and the results were as shown in the following table:

Table No. (4) Responses of the study sample regarding the statements of the second hypothesis

Second assumption phrases	Study sample response					Descriptive statistics		Degree of approval	Ka^2 test		Arrangement
	Totally agree	Agree	Neutral	Disagree	Strongly disagree	Arithmetic mean	Standard deviation		Ka^2 value	Significance level	
1	18	20	6	3	1	4	1.21	Agree	12.6	0.142	
	37%	42%	12%	7%	2%						
2	15	16	9	6	2	3.9	1.20	Agree	11.7	0.210	3
	31%	33%	19%	12%	4%						
3	20	16	5	5	2	4.1	1.11	Agree	19.2	0.240	1
	41%	33%	11%	11%	4%						
4	6	8	15	10	9	2.8	0.97	Disagree	17.1	0.191	5
	12%	17%	31%	21%	19%						
5	21	15	4	5	3	3.7	1.31	Agree	29.2	0.182	4
	44%	31%	9%	11%	5%						
Overall average						3.7	1.61	Agree	-	-	-

Table No. 4 shows that the degree of agreement on the statements of the second hypothesis was all (agree) except for the fourth statement (transparency in artificial intelligence applications enhances trust between researchers and society) and that the third and specific statement (cooperation between academic and governmental institutions is necessary to develop an effective regulatory framework) came in first place in terms of agreement and that the general average of the statements of the second hypothesis was (3.7) and the standard deviation was (1.61) and that the value of the significance level for each statement of the second hypothesis was greater than the significance level (0.05), thus proving the validity of the second hypothesis of the study.

3.6.2 Testing the third hypothesis

There are no statistically significant differences between the opinions of the study sample about the impact of using artificial intelligence on the results of scientific research.

The study sample's response to the statements of the third hypothesis was as shown in the following Table No. 5:

Table No. (5) Responses of the study sample to the statements of the third hypothesis

Third assumption phrases	Study sample response					Descriptive statistics		Degree of approval	Ka² test		Arrangement
	Totally agree	Agree	Neutral	Disagree	Strongly disagree	Arithmetic mean	Standard deviation		Ka² value	Significance level	
1	18	15	4	5	6	4.1	1.21	Agree	40.1	0.101	1
	38%	31%	8%	11%	12%						
2	16	18	5	3	6	3.5	1.11	Agree	71.2	0.98	7
	33%	38%	11%	6%	12%						
3	12	17	9	6	4	3.6	1.31	Agree	52.1	0.64	6
	25%	35%	19%	12%	8%						
4	20	18	2	5	3	3.9	1.41	Agree	64.1	0.17	3
	41%	38%	4%	11%	6%						
5	22	16	2	4	4	4	1.01	Agree	23.8	0.14	2
	46%	33%	4%	8%	8%						
6	21	17	3	4	3	3.4	1.21	Agree	19.7	0.65	8
	44%	35%	6%	8%	6%						
7	20	16	4	3	5	3.7	1.41	Agree	23.4	0.28	5
	41%	32%	8%	6%	11%						
8	10	8	2	14	14	2.7	1.20	Disagree	12.1	0.29	9
	21%	17%	4%	29%	29%						
9	23	15	7	2	1	9.8	1.51	Agree	27.2	0.24	4
	48%	31%	15%	4%	2%						
Overall average						3.6	1.41	Agree	-	-	-

Table No. 5 shows that the degree of agreement on all the statements of the third hypothesis is agreement, with the exception of the eighth statement (artificial intelligence enhances the ability of researchers to make new contributions), and that the first statement (the use of artificial intelligence raises issues related to intellectual property rights) came in first place in terms of agreement, and that the general average of the statements of the third hypothesis was (3.6) with a standard deviation of (141), and that the value of the significance level for each statement of the third hypothesis is greater than the significance level (0.05), and thus there are no statistically significant differences between the opinions of the study sample regarding the statements of the third hypothesis, which proves the validity of this hypothesis.

4. Theoretical Implications

The study's theoretical ramifications highlight the significance of socio-technical systems theory as a fundamental framework for comprehending the difficulties posed by the application of AI in scientific research, particularly in view of legal and intellectual property constraints. These ramifications advance scientific and applied knowledge, which advances our understanding of how technical advancements interact with the need for ethical and legal compliance in the research community. In the scholarly discussion of how to control the application of AI in scientific research to maintain legal compliance and safeguard intellectual property, these theoretical ramifications are crucial.

First, the first hypothesis's validity, which points to the existence of both technological and legal difficulties related to the use of AI in research, validates the crucial role that laws and regulations play in controlling this technology. This study aligns with the tenets of socio-technical systems theory since it emphasizes how crucial legal regulation is to fostering AI-based research, which improves its capacity to innovate and advance science without jeopardizing privacy or intellectual property.

However, the second hypothesis's negligible result—that there is a misalignment between the factors impacting the success of the application of AI in scientific research and the rules already in place—offers crucial insights. This suggests a disconnect between the advancement of technology and current regulations, necessitating a review of legal frameworks to guarantee their conformity with the swift advancements in artificial intelligence while guaranteeing the preservation of intellectual property rights and adherence to the law.

Furthermore, the evidence supporting the third hypothesis highlights the critical role that ethics and trust play in the use of AI. This hypothesis focuses on how the usage of AI affects scientific research outcomes and intellectual property concerns. The findings emphasize how crucial it is to increase openness and confidence in the responsible application of AI, which aligns with the fundamental ideas of socio-technical systems theory, which emphasize the human element and the interplay between technology and moral and legal issues.

Last but not least, the findings pertaining to the theories concerning how laws and regulations affect the connection between the adoption of technology and confidence in scientific research emphasize how important laws are in controlling artificial intelligence. These ramifications highlight the necessity of changing legal frameworks to promote innovation while guaranteeing adherence to intellectual property laws and to achieve equilibrium between the advancement of technology and the defense of intellectual property rights and privacy in scientific research. In light of ethical and legal considerations, regulatory frameworks ought to be adaptable and sensitive to technology advancements.

5. Practical Implications

The study's practical consequences highlight how crucial it is to use AI in scientific research with awareness and consideration, in the presence of robust legal frameworks, well-defined regulatory rules, and measures to foster trust and data governance. While safeguarding intellectual property rights in the realm of scientific research, these insights can assist research institutions and decision-makers in utilizing AI's potential to improve innovation and legal compliance.

The study's findings have important ramifications for policymakers as well as educational institutions. First, this study shows how regulating AI use and safeguarding intellectual property rights are inextricably linked, which emphasizes the possible advantages of incorporating AI technologies into scientific research. This means that, while taking intellectual property laws and regulations into consideration, research institutions must think about

implementing AI-based technologies to enhance the caliber and effectiveness of their work. Institutions may need to make investments in developing technical and legal capabilities, such as educating researchers on how to properly apply regulatory frameworks and adhere to new regulations, in order to reap these benefits.

Second, the study's findings suggest that laws and rules pertaining to intellectual property and artificial intelligence need to be reexamined in order to better accommodate the quick advancement of technology. Therefore, to make sure that current legal and regulatory frameworks are compatible with the use of AI in scientific research, legislators should examine and update them. Research institutions, regulators, and stakeholders working together could result in the creation of more effective data governance regulations that take intellectual property laws and privacy issues into consideration.

Furthermore, the crucial role that trust plays in resolving concerns of data security and intellectual property emphasizes how crucial it is to establish and preserve the confidence of researchers and research institutions in AI legal frameworks. This can be accomplished by making data processing more transparent, making sure robust data security measures are in place, and making intellectual property policies more clear. To guarantee the protection of researchers' rights and sensitive research-related data, institutions should invest in cybersecurity technologies and give ethical data management first priority.

Last but not least, the effects of laws and rules on the application of AI in scientific research show that legal frameworks have the power to either promote or impede technological advancement. Therefore, regulatory frameworks should be created by policymakers to guarantee legal compliance while promoting creativity and the ethical application of AI in research. Research organizations and regulatory agencies working together can help establish a regulatory framework that safeguards intellectual property rights and advances technology in a responsible and safe way.

6. Conclusion

With an emphasis on Jordanian legislation as a significant regulatory framework in this context, this paper emphasizes the critical role that legal regulations and intellectual property laws have in controlling the application of artificial intelligence in scientific research. It is evident from examining the theories about the obstacles and variables influencing the adoption of AI that more and more effective legal and regulatory frameworks are required in order to keep up with the advancement of technology. Ensuring the protection of researchers' and institutions' rights while fostering scientific innovation requires Jordanian legislation, particularly intellectual property regulations.

The study's findings demonstrated that legislative frameworks in Jordan serve as a tool for promoting innovation and guaranteeing the protection of intellectual property rights in addition to assuring compliance. Current Jordanian laws, such the Copyright Protection Law and the Patent Law, make it clear that there is a solid legal foundation upon which to construct regulations governing the application of AI in research. The largest obstacle, nonetheless, is enhancing these frameworks to stay up with the quick advancement of technology.

The study also demonstrates that in order to encourage the use of AI in scientific research, confidence in regulatory frameworks pertaining to data protection and intellectual property is crucial. Therefore, in order to guarantee responsible use and safeguard the rights of researchers, Jordanian legislative authorities ought to improve the clarity and transparency of intellectual property legislation pertaining to AI.

Furthermore, the study shows that in order to enhance governance and guarantee that regulations are in line with technology advancements, collaboration between Jordanian academic institutions and regulatory agencies is crucial. This calls for updating current laws to make them more adaptable and sensitive to the quick changes occurring in the AI space.

This study concludes by confirming that there are both opportunities and challenges associated with regulating the use of AI in scientific research through Jordanian laws and intellectual property regulations. The success of research efforts in this area depends on striking a balance between fostering innovation and defending intellectual property rights, which calls on Jordanian policymakers to strengthen collaboration and enact flexible legislation that keeps up with technological advancements while upholding moral and legal standards.

6.1 Results

1. The study demonstrated that Jordanian laws pertaining to intellectual property rights protection, including the Patent Law and the Copyright Law, offer a solid legal foundation to guarantee the defense of researchers' and research institutions' rights. However, since current legislation has not adequately addressed the growing challenges associated with artificial intelligence, such as data protection and regulating the use of artificial intelligence in scientific research, it is imperative that regulatory frameworks be developed that address the rapid developments in the field and its use in scientific research.
2. The complete application of AI in scientific research is hampered by legal issues, according to the report. These issues include a lack of knowledge about pertinent legislation and unclear regulations governing AI use in scientific research. This suggests that the legal framework needs to be strengthened in order to support the provision of protection that strikes a balance between innovation and intellectual property rights.
3. The study's findings demonstrated that fostering trust among researchers, academic institutions, and regulatory agencies is crucial to the effective use of AI in research. It was emphasized that in order to guarantee legal compliance and prevent infractions related to the use of cutting-edge technology, transparency and data governance must be improved.
4. Although intellectual property laws are in place, the findings showed a disconnect between technological advancement and the regulatory capabilities of Jordan's current laws, necessitating a reassessment of the role that legal and regulatory frameworks play in keeping up with these developments.

6.2 Recommendations

1. The report suggests that in order to incorporate artificial intelligence concerns into scientific research, Jordan should either create new regulations or change its current ones. These laws should encourage innovation in academic and research domains and regulate the application of AI in a manner that protects intellectual property rights while improving security and privacy.
2. The study suggests stepping up efforts to inform Jordanian researchers about intellectual property and artificial intelligence laws. This can be accomplished by planning training sessions and workshops that emphasize the legal considerations and regulations around the application of AI in scientific research.
3. According to the study, a national committee including legal, technical, and academic specialists should be established in order to create a thorough regulatory framework for the application of AI in research. This committee ought to be involved in making policy recommendations and making sure Jordanian laws keep up with advancements in technology around the world.
4. Improving collaboration between government agencies and academic institutions: In order to guarantee the successful application of legislation pertaining to artificial intelligence, the study suggests promoting collaboration between government agencies and research institutes. Creating alliances between academic institutions, research centers, and legislators can strengthen this collaboration and guarantee ongoing adaptation to technological advancements.
5. The report suggests finding a balance between promoting innovation and defending intellectual property rights. Jordanian laws should protect stakeholders' rights while permitting researchers to employ AI technologies in a variety of ways.
6. With an emphasis on safeguarding research and personal data and making sure local and global privacy regulations are followed, the study suggests creating explicit data governance standards for scientific research utilizing AI.
7. According to the report, legal frameworks should support the ethical and responsible application of AI. By offering incentives and institutional support for research initiatives that rely on artificial intelligence, policies should prioritize intellectual property protection while also promoting innovation in research domains.

References:

[1] Abdallah, S., Al Azzam, B., El Nokiti, A., Salloum, S., Aljasmi, S., Aburayya, A., & Shwedeh, F. (2022). A COVID19 Quality Prediction Model based on IBM Watson Machine Learning and Artificial Intelligence Experiment. *Computer Integrated Manufacturing Systems*, *28*(11), 499–518. https://doi.org/10.24297/j.cims.2022.11.037

[2] Aburayya, A., Alshurideh, M., Albqaeen, A., Alawadhi, D., & Ayadeh, I. (2020). An investigation of factors

affecting patients waiting time in primary health care centers: An assessment study in Dubai. *Management Science Letters*, *10*(6), 1265–1276. https://doi.org/10.5267/j.msl.2019.11.031

[3] Aboelazm, K. S., & Afandy, A. (2019). Centralization and decentralization of public procurement: Analysis for the role of General Authority for Governmental Services (GAGS) in Egypt. Journal of Advances in Management Research, 16(3), 262-276.

[4] Aburayya, A., Salloum, S., Alderbashi, K. A., Shwedeh, F., Yara, S., Raghad, A., awsan JM, Malaka, S., & Khaled, S. (2023). SEM-machine learning-based model for perusing the adoption of metaverse in higher education in UAE. *International Journal of Data and Network Science*, *7*(2), 667–676. https://doi.org/10.5267/j.ijdns.2023.3.005

[5] Al-Najdawi, M. H. Y. (2022a). BALTIC JOURNAL OF LAW & POLITICS. *A Journal of Vytautas Magnus University*, *15*(3). https://doi.org/10.2478/bjlp-2022-00003

[6] Al-Najdawi, M. H. Y. (2022b). The Role of the Legislative and Legal Framework in Promoting Scientific Research in the Arab World between Current Reality and Future Prospects.(A Case Study, United Arab Emirates). *Baltic Journal of Law & Politics*, *15*(3), 2069–2087. https://doi.org/10.2478/bjlp-2022-002142

[7] Alimour, S. A., Alnono, E., Aljasmi, S., El Farran, H., Alqawasmi, A. A., Alrabeei, M. M., Shwedeh, F., & Aburayya, A. (2024). The quality traits of artificial intelligence operations in predicting mental healthcare professionals' perceptions: A case study in the psychotherapy division. *Journal of Autonomous Intelligence*, *7*(4). https://doi.org/10.32629/jai.v7i4.1438

[8] Alkashami, M., Hussain, S., Ibrahim, S. B., Hamid, O. H., Alaya, A., Shwedeh, F., Albqaeen, A., & Aburayya, A. (2023). THE MODERATING IMPACT OF "EXTRAVERSION" ON THE RELATIONSHIP BETWEEN PROJECT MANAGERS' COMPETENCIES AND THE EFFECTIVE SUPPLY OF INNOVATION IN PROJECT-BASED HEALTHCARE PROVIDERS IN THE UAE. *Journal of Modern Project Management*, *11*(3), 2–11. https://doi.org/10.19255/JMPM03301

[9] Alkashami, M., Mohammad, Taamneh, A., Khadragy, S., Shwedeh, F., Aburayya, A., & Salloum, S. A. (2023). AI different approaches and ANFIS data mining: A novel approach to predicting early employment readiness in middle eastern nations. *International Journal of Data and Network Science*, *7*(3), 1267–1282. https://doi.org/10.5267/j.ijdns.2023.4.011

[10] Aboelazm, K. S., Tawakol, F., Ibrahim, E., & Ramadan, S. A. (2025). The Legal Framework for BOT Contracts in Egypt and the United Arab Emirates. Journal of Lifestyle and SDGs Review, 5(2), e03286-e03286.

[11] Aboelazm, K. S. (2024). The role of judicial review in the settlement of state contracts disputes. Corporate Law & Governance Review, 6(3), 122-134.

[12] Dahu, B. M., Aburayya, A., Shameem, B., Shwedeh, F., Alawadhi, M., Aljasmi, S., Salloum, S. A., Aburayya, H., & Aburayya, I. (2022). The Impact of COVID-19 Lockdowns on Air Quality: A Systematic Review Study. *South Eastern European Journal of Public Health*, *5*. https://doi.org/https://doi.org/10.11576/seejph-5929

[13] El Nokiti, A., Shaalan1, K., Salloum2, S., Aburayya, A., Shwedeh, F., & Shameem3, B. (2022). Is Blockchain the answer? A qualitative Study on how Blockchain Technology Could be used in the Education Sector to Improve the Quality of Education Services and the Overall Student Experience. *Computer Integrated Manufacturing Systems*, *28*(11), 543–556. https://doi.org/10.24297/j.cims.2022.11.039

[14] Hadi Al Najdawi, M., Shwedeh, F., Mokhtar Abdelmoghies, M., Kitana, A., & Ali, A. (2024). Applying artificial intelligence in predicting educational excellence in higher education institutions: A case study in Jordanian universities. *Edelweiss Applied Science and Technology*, *8*(6), 7273–7289. https://doi.org/10.55214/25768484.v8i6.3579

[15] Hadie Al Najdawi, M. (2022). Empowering Women in the Arab World between the Requirements of Law and the Requirements of Reality. *Academic Journal of Research and Scientific Publishing| Vol*, *3*(35).

[16] Khadragy, S., Elshaeer, M., Mouzaek, T., Shammass, D., Shwedeh, F., Aburayya, A., Jasri, A., & Aljasmi, S. (2022). Predicting Diabetes in United Arab Emirates Healthcare: Artificial Intelligence and Data Mining Case Study. *South Eastern European Journal of Public Health*, *5*. https://doi.org/https://doi.org/10.56801/seejph.vi.406

[17] Khudhair, H. Y., Jusoh, A., Mardani, A., Nor, K. M., & Streimikiene, D. (2019). Review of scoping studies on service quality, customer satisfaction and customer loyalty in the airline industry. Contemporary Economics, 375-386.

[18] Ravikumar, R., Kitan, A., Taamneh, A., Aburayya, A., Shwedeh, F., Salloum, S., & Shaalan, K. (2023). The Impact of Big Data Quality Analytics on Knowledge Management in Healthcare Institutions: Lessons

Learned from Big Data's Application within The Healthcare Sector. *South Eastern European Journal of Public Health*, *5*. https://doi.org/https://doi.org/10.56801/seejph.vi.309

[19] Ravikumar, R., Kitana, A., Taamneh, A., Aburayya, A., Shwedeh, F., Salloum, S., & Shaalan, K. (2022). Impact of knowledge sharing on knowledge Acquisition among Higher Education Employees. *Computer Integrated Manufacturing Systems*, *28*(12), 827–845. https://doi.org/10.24297/j.cims.2022.12.58

[20] Salameh, M., Taamneh, A., Kitana, A., Aburayya, A., Shwedeh, F., Salloum, S., Shaalan, K., & Varshney, D. (2022). The Impact of Project Management Office's Role on Knowledge Management: A Systematic Review Study. *Computer Integrated Manufacturing Systems*, *28*(12), 846–863. https://doi.org/10.24297/j.cims.2022.12.59

[21] Salloum, S. A., Almarzouqi, A., Aburayya, A., Shwedeh, F., Fatin, B., Ghurabli, Z. Al, Dabbagh, T. Al, & Alfaisal, R. (2024). Redefining Educational Terrain: The Integration Journey of ChatGPT. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 157–169). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_11

[22] Salloum, S. A., Almarzouqi, A., Aburayya, A., Shwedeh, F., Fatin, B., Ghurabli, Z. Al, Elbadawi, M. A., & Alfaisal, R. (2024). Embracing ChatGPT: Ushering in a Revolutionary Phase in Educational Platforms. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 171–183). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_12

[23] Salloum, S., Al Marzouqi, A., Alderbashi, K. A., Shwedeh, F., Aburayya, A., Al Saidat, M. R., & Al-Maroof, R. S. (2023). Sustainability Model for the Continuous Intention to Use Metaverse Technology in Higher Education: A Case Study from Oman. *Sustainability*, *15*(6), 5257. https://doi.org/https://doi.org/10.3390/su15065257

[24] Salloum, S., Shwedeh, F., Alfaisal, A. M., Alshaafi, A., Aljanada, R. A., Al Sharafi, A., Alfaisal, R., & Dabash, A. (2023). Understanding and Forecasting Chatbot Adoption: An SEM-ANN Methodology. *Migration Letters*, *20*(S11), 652–668. https://doi.org/https://doi.org/10.59670/ml.v20iS11.5717

[25] Ibrahim, E., Sharif, H., & Aboelazm, K. S. (2025). Legal Confrontation of the Cyber Blackmail: a Comparative Study. Journal of Lifestyle and SDGs Review, 5(2), e04039-e04039.

[26] Shwedeh, F. (2021). *THE IMPACT OF SMART CITY POLICY TIMELINESS AND TECHNOLOGY READINESS ON SMART CITY PERFORMANCE IN DUBAI: THE MODERATING EFFECT OF FINANCIAL AVAILABILITY*.

[27] Shwedeh, F. (2024a). Designing Delight: Exploring the Nexus of Interactive Design, User Experience, and Psychological Theory in Banking Chatbot. *Nanotechnology Perceptions*, *20*(S4), 378–398. https://doi.org/https://doi.org/10.62441/nano-ntp.v20iS4.28

[28] Shwedeh, F. (2024b). Harnessing digital issue in adopting metaverse technology in higher education institutions: Evidence from the United Arab Emirates. *International Journal of Data and Network Science*, *8*(1), 489–504. https://doi.org/10.5267/j.ijdns.2023.9.007

[29] Shwedeh, F. (2024c). The Integration of Artificial Intelligence (AI) Into Decision Support Systems Within Higher Education Institutions. *Nanotechnology Perceptions*, *20*(S5), 331–357. https://doi.org/https://doi.org/10.62441/nano-ntp.v20iS5.26

[30] Shwedeh, F., Aburayya, A., Gbemisola, O., & Adelaja, A. A. (2024). Assessing the role of augmented reality in enhancing employee operational engagement and knowledge retention in UAE business training. *Global Knowledge, Memory and Communication*, *6*(4), 301–323. https://doi.org/https://doi.org/10.1108/GKMC-05-2024-0287

[31] Shwedeh, F., Aburayya, A., & Mansour, M. (2023). The Impact of Organizational Digital Transformation on Employee Performance: A Study in the UAE. *Migration Letters*, *20*(S10), 1260–1274. https://doi.org/https://doi.org/10.59670/ml.v20iS10.5710

[32] Shwedeh, F., Aburayya, A., Raghad, A., Adelaja, A. A., Ogbolu, G., Abid, A., & Salloum, S. (2022). SMEs' Innovativeness and Technology Adoption as Downsizing Strategies during COVID-19: The Moderating Role of Financial Sustainability in the Tourism Industry Using Structural Equation Modelling. *Sustainability*, *14*(23), 16044. https://doi.org/https://doi.org/10.3390/su142316044

[33] Shwedeh, F., Adelaja, A. A., Ogbolu, G., Kitana, A., Taamneh, A., Aburayya, A., & Salloum, S. (2023). Entrepreneurial innovation among international students in the UAE: Differential role of entrepreneurial education using SEM analysis. *International Journal of Innovative Research and Scientific Studies*, *6*(2), 266–280. https://doi.org/https://doi.org/10.53894/ijirss.v6i2.1328

[34] Shwedeh, F., Aldabbagh, T., Aburayya, A., & Uppilappatta, H. (2023). The Impact of Harnessing Total Quality Management Studies on the Performance of Smart Applications: A Study in Public and Private Sectors in the UAE. *Migration Letters*, *20*(S11), 934–959. https://doi.org/https://doi.org/10.59670/ml.v20iS11.5892

[35] Shwedeh, F., Dabash, A., Dabbagh, T. Al, & Aburayya, A. (2024). Enhancing Marketing Personalized Shopping Recommendations in the UAE: Leveraging Logic Mining and Advanced Technologies. *Foundations of Management*, *16*(1), 345–358. https://doi.org/10.2478/fman-2024-0021

[36] Shwedeh, F., Hami, N., & Abu Bakar, S. Z. (2021). Dubai smart city and residence happiness: A conceptual study. *Annals of the Romanian Society for Cell Biology*, *25*(1), 7214–7222. https://www.annalsofrscb.ro/index.php/journal/article/view/891

[37] Shwedeh, F., Hami, N., Abu Bakar, S. Z., Yamin, F. M., & Anuar, A. (2022). The Relationship between Technology Readiness and Smart City Performance in Dubai. *Journal of Advanced Research in Applied Sciences and Engineering Technology*, *29*(1), 1–12. https://doi.org/https://doi.org/10.37934/araset.29.1.112

[38] Shwedeh, F., Hami, N., & Abu Baker, S. Z. (2020). Effect of leadership style on policy timeliness and performance of smart city in Dubai: a review. *Proceedings of the International Conference on Industrial Engineering and Operations Management Dubai, UAE, March 10-12, 2020*, 917–922. https://www.researchgate.net/publication/366970073

[39] Shwedeh, F., Malaka, S., & Rwashdeh, B. (2023). The Moderation Effect of Artificial Intelligent Hackers on the Relationship between Cyber Security Conducts and the Sustainability of Software Protection: A Comprehensive Review. *Migration Letters*, *20*(S9), 1066–1072. https://doi.org/10.59670/ml.v20iS9.4947

[40] Shwedeh, F., Nour, M. A., & Akour, I. (2024). Optimizing augmented reality adoption in higher education: A comprehensive analysis of factors impacting data management efficiency. *Journal of Infrastructure, Policy and Development*, *8*(9), 6232. https://doi.org/https://doi.org/10.24294/jipd.v8i9.6232

[41] Shwedeh, F., Salloum, S. A., Aburayya, A., Fatin, B., Elbadawi, M. A., Ghurabli, Z. Al, & Dabbagh, T. Al. (2024a). AI Adoption and Educational Sustainability in Higher Education in the UAE. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 201–229). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_14

[42] Shwedeh, F., Salloum, S. A., Aburayya, A., Kaur, P., Mohammad, I., Mazharul, M., Fatin, B., Elbadawi, M. A., & Ghurabli, Z. Al. (2024). Metaverse in Supply Chain Management: Predicting Suppliers' Intention to Use Metaverse for Educating Suppliers Through Perceived Usefulness, Training Value and Ease of Use (A Case Study in UAE). In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 457–469). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_28

[43] Shwedeh, F., Salloum, S. S., Aburayya, A., Fatin, B., Elbadawi, M. A., Ghurabli, Z. Al, Muhammad, D., Alnuaimi, A., & Akkass, M. A. (2024b). The Impact of Educating Managers in Adopting AI Applications on Decision Making Development: A Case Study in the UAE. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 591–603). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_37

[44] Shwedeh, F., Salloum, S. S., Aburayya, A., Fatin, B., Elbadawi, M. A., Ghurabli, Z. Al, Murad, A., Abueleyan, A., & Ismail, B. (2024c). Prediction of Retailer's Intention to Use Chat-GPT in Educating Retailers: A Case Study in the UAE. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 389–402). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_24

[45] Shwedeh, F., Yas, N., Abdijabar, Z., Flayyih, N., Fadli, A., Yas, H., & Allouzi, A. S. (2024). The impact of intellectual property rights and the level of information sensitivity on information security in the United Arab Emirates. *Journal of Infrastructure, Policy and Development*, *8*(8), 6303. https://doi.org/https://doi.org/10.24294/jipd.v8i8.6303

[46] Yas, H., Aburayya, A., & Shwedeh, F. (2024). Education Quality and Standards in the Public School and the Private School-Case Study in Saudi Arabia. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 563–572). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_35

[47] Yas, H., Dafri, W., Sarhan, M. I., Albayati, Y., & Shwedeh, F. (2024). Universities Faculty's Perception of E-learning Tools: Filling the Gaps for Enhanced Effectiveness. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 573–588).

https://link.springer.com/chapter/10.1007/978-3-031-52280-2_36

[48] Yas, N., Dafri, W., Yas, H., & Shwedeh, F. (2024). Effect of e-Learning on Servicing Education in Dubai. In *Artificial Intelligence in Education: The Power and Dangers of ChatGPT in the Classroom* (pp. 623–639). https://link.springer.com/chapter/10.1007/978-3-031-52280-2_40

[49] Yas, N., Elyat, M. N. I., Saeed, M., Shwedeh, F., & Lootah, S. (2024). The Impact of Intellectual Property Rights and the Work Environment on Information Security in the United Arab Emirates. *Kurdish Studies*, *12*(1), 3931–3948. https://doi.org/10.58262/ks.v12i1.282

[50] Yas, H., Mardani, A., & Alfarttoosi, A. (2020). The major issues facing staff in islamic banking industry and its impact on productivity. Contemporary Economics, 14(3), 392.

[51] Yas, H., Alkaabi, A., ALBaloushi, N. A., Al Adeedi, A., & Streimikiene, D. (2023). The impact of strategic leadership practices and knowledge sharing on employee's performance. Polish Journal of Management Studies, 27.