ACTIVATING THE ROLE OF SAUDI UNIVERSITIES IN THE RENAISSANCE AND DEVELOPMENT OF INTERDISCIPLINARY SCIENTIFIC RESEARCH BETWEEN VARIOUS HEALTH AND HUMAN SCIENCES TO EMPOWER ACHIEVEMENTS OF INNOVATION AND INVENTION AND SOLVE CHAINS OF SOME DISEASES SUCH AS AUTISM USING ARTIFICIAL INTELLIGENCE

Aida Albasalah[1], Razan Alarnous[2], Saleh M. Alsalehi[2], Samar Zuhair Alshawwa[3*], Elham Alhifthy[4], Munira Muhammad Al-Murab[5] and Ghazi Chakroun[6,7]

[1] Arabic Language Department, Arts College, Princess Nourah bint Abdulrahman University, Riyadh-Saudi Arabia

[2] Child Development Center, King Abdullah bin Abdulaziz University Hospital, Princess Nourah bint Abdulrahman University, Riyadh-Saudi Arabia

[3] Department of Pharmaceutical Sciences, College of Pharmacy, Princess Nourah bint Abdulrahman University, Riyadh-Saudi Arabia

[4] Department of Clinical Sciences, College of Medicine, Princess Nourah bint Abdulrahman University, Riyadh-Saudi Arabia

[5] Department of Psychology, College of Education, Princess Nourah bint Abdulrahman University, Riyadh-Saudi Arabia

[6] Department of Psychology, Faculty of Letters and Humanities, King Abdelaziz University, Riyadh-Saudi Arabia

[7] Department of Psychology, Faculty of Letters and Humanities, University of Sfax, Sfax-Tunisia

***Corresponding author:**
Dr. Samar Z. Alshawwa, Department of Pharmaceutical Sciences, College of Pharmacy, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia.
Email: szalshawwa@pnu.edu.sa

Abstract

Artificial Intelligence "AI" has become a vital area of research in all fields in the 21st century: science, engineering, education, business, medicine, accounting, marketing, finance, economics, law, stock market, among others. The array of artificial intelligence has increased extremely since the intelligence of machines with machine learning abilities has produced immense impacts on governments, society and business. AI also influences the larger developments in worldwide sustainability. The primary aim of the present study is to evaluate the obstacles to activating artificial intelligence and exploitation of information revolution in scientific research in the fields of health sciences and humanities, to empower achievements of innovation and invention and solve chains of some diseases such as autism. The objectives of scientific research in the fields of health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities, the mechanisms for activating scientific research for students to empower achievements of innovation and invention and solve chains of some diseases such as autism in the universities by using the artificial intelligence, the obstacles to activating the role of scientific research directed to serve health and human sciences to empower achievements of innovation and invention and

solve chains of some diseases such as autism using technology and artificial intelligence as well as the correlation between these variables. A simple random sampling technique was utilized for this study. A structured questionnaire was administered to individuals associated with Universities in Saudi Arabia. The data sample consisted of 257 respondents. The collected data was statistically analyzed using Statistical Package for Social Science (SPSS) version 20. The study showed that the objectives of scientific research using artificial intelligence in universities are a significant positive predictor of obstacles to activating artificial intelligence and exploiting the information revolution in the health and human scientific research in Saudi universities. The study also revealed that there is statistical significant ($p < 0.05$) correlation between each of the variables.
Keywords: artificial intelligence, information revolution, machine learning, Scientific technology, Interdisciplinary research, autism, health sciences, human sciences, scientific research, Saudi Arabia universities.

Introduction

Innovative solutions are required in smart production systems to boost the sustainability and quality of manufacturing processes while plummeting costs. Against this backdrop, driven technologies by artificial intelligence (AI), influenced by "I4.0 Key Enabling Technologies" (e.g., Advanced embedded systems, internet of thing, cloud computing, big data, virtual and augmented reality, cognitive systems), are set to engender novel industrial models (Gupta, 2017). In this context, it is fascinating to remember that John McCarthy, the father of artificial intelligence (McCarthy *et al*., 2006), in the 1990s, defined artificial intelligence as "artificial intelligence is the science and engineering of making intelligent machines, especially intelligent computer programs". Generally, the expression "AI" is used when functions that humans associate with other human minds, such as learning and solving problem are simulated by a machine (Moore, 2017).

In a largely general sense, the fields of AI are categorized into sixteen classes (Becker, Bar-Yehuda and Geiger, 2000; Singer, Gent, and Smaill, 2000; Chen and Van Beek, 200;1 Hong, 2001; Stone *et al*., 2000). These include programming, reasoning, artificial life, data mining, belief revision, distributed AI, genetic algorithms, expert systems, systems, machine learning, knowledge representation, natural language understanding, theorem proving, neural networks, theory of computation and constraint satisfaction (Peng, and Zhang, 2007; Zhou *et al*, 2007; Wang *et al*,. 2007). Artificial Intelligence has become a vital area of research in all fields in the 21stcentury: science, medicine, engineering, education, business, medicine, accounting, marketing, finance, economics, law, stock market, among others (Halal, 2003; Masnikosa, 1998; Metaxiotis, 2003; Raynor, 2000; Stefanuk, and Zhozhikashvili, 2002; Tay and Ho, 1992; Wongpinunwatana, Ferguson and Bowen, 2000.). The array of artificial intelligence has increased extremely since the intelligence of machines with machine learning abilities has produced immense impacts on governments, society and business (Oke, 2008). AI also influences the larger developments in worldwide sustainability. AI can be valuable to solve important problems for sustainable production for instance, logistics, optimization of energy resources, waste management, supply chain management, etc.

It should also be taken into consideration that machine learning and artificial intelligence have changed many industries in the last decade. The vast technology of artificial intelligence is making it faster and easier to automate numerous processes. AI-based technologies are being

created and used in the academic publishing industry to facilitate both publishers and authors in solving problems related to searching published content, peer review, identifying data fabrication and detecting plagiarism. Therefore, artificial intelligence can assist to accelerate scientific communication in all scientific fields well as lessen human bias.

In like manner, the application of artificial intelligence in health scientific research has risen massively, focusing on automation of techniques of research from developing a hypothesis to carrying out experiments. Really, researchers are currently being able to solve multifarious problems in drug combinations, predicting diseases, biomedical sciences, finding treatment for new diseases such as autism decoding complex codes and computing languages using artificial intelligence.

Scientists seek to understand how people, society and nature works. In order to achieve this, they develop hypotheses, devise experiments, and gather data, with the objective of analyzing and understanding physical, social, and natural phenomena better.

Data gathering and analysis is a center constituent of the scientific method, and scientists have utilized statistical techniques to facilitate their work for long. For instance, in the early 1900s, the discovery of the t-test presented researchers with a new instrument to pull out facts from data in order to test the genuineness of their hypotheses. Such mathematical structures were important in getting as much information as possible from data that had frequently taken noteworthy money and time to produce and gather.

The development of techniques of artificial intelligence gave more instruments for mining insights from data.

Throughout the 1940s, papers by Alan Turing FRS struggled with the thought of machine intelligence. In 1950, he asked the question "can machines think?", and recommended a test for machine intelligence – subsequently referred to as the "Turing Test – in which a machine might be called intelligent, if its responses to questions could convince a person that it was human".

AI methods grew rapidly in the years that followed, focusing on symbolic methods in the 1970s and 1980s that aimed to develop human-like representations of logic search and problems, as well as expert systems that worked from datasets codifying human practice and knowledge to automate decision-making. Subsequently, these gave way to reappearance of interest in neural networks, wherein strata of minute computational components are linked in a manner that is inspired by the way the brain is wired. However, the principal challenge with all these methods was "scalability" (they became incompetent when faced with even reticent sized data sets).

The 1980s and 1990s witnessed a strapping advancement of statistical machine learning and machine learning theory, the former particularly motivated by the escalating amount of data gathered, for instance from gene sequencing and other related health, medical, engineering and linguistic research. Then, the 2000s and 2010s birthed developments in machine learning, a subdivision of artificial intelligence that enables computer programs to gain knowledge from data instead of following "hard-coded rules", in areas cutting across mastering multifaceted games to providing knowledge about basic science.

Thus, the term "artificial intelligence" is currently used as an umbrella expression. It refers to "a suite of technologies that can perform complex tasks when acting in conditions of uncertainty, including visual perception, speech recognition, natural language processing, reasoning, learning from data, and a range of optimization problems".

Currently, artificial intelligence technologies are employed in an array of fields of

interdisciplinary scientific research in which different sciences collaborate in order to achieve broad and accurate knowledge. For instance:

- The use of genomic data to predict protein structures: Having the understanding of the shape a protein is vital to knowing the function it performs in the body. Scientists can identify proteins that play a role in diseases especially the unknown cause diseases among scientists, such as autism by predicting these shapes, thus improving diagnosis and facilitating the development new treatments. The process of identifying the structures of protein is both labor-intensive as well as technically difficult, yielding roughly one hundred thousand known structures till date (Lee, Freddolkino, and Zhang, 2017). Although, recent advancements in genetics have yielded well-off data sets of DNA sequences, identifying the shape of a protein from its corresponding genetic sequence (the protein-folding challenge) is an intricate job. To facilitate the understanding of this process, researchers are building machine learning methods that can envisage the 3D structure of proteins from DNA sequences. "The Alpha Fold project at Deep Mind, for example, has created a deep neural network that predicts the distances between pairs of amino acids and the angles between their bonds, and in so doing produces a highly-accurate prediction of an overall protein structure" (DeepMind, 2018).
- Gaining understanding the impact of climate change on regions and cities: Environmental science integrates the need to analyze huge amounts of documented data sets with multifaceted systems modeling like is required to understand the impacts of climate change. To guide decision-making at a local or national level, it is important to understand worldwide climate forecast models in terms of their consequences for regions or cities; for instance, forecasting the number of summer days in which temperatures rise above 30°C in a city within a period of 20 years' time (Banerjee and Monteleoni, 2014). Local areas of this sort might possess access to comprehensive assessable data concerning local climatic conditions (from weather stations, for instance) it is however not easy to generate precise forecasts from only these, considering the underlying variations occurring due to climate change. AI (Machine learning) is capable of assisting to close the gap between these two kinds of information. Machine learning can combine the low-resolution outputs of climate models with comprehensive, but local, assessable data; the resultant hybrid breakdown would enhance the models of climate developed by contemporary approaches of analysis, thereby giving a better comprehensive depiction of the local effects of climate change. For instance, a present research project at the "University of Cambridge" is aiming to understand the way "climate variability in Egypt is likely to change over coming decades, and the impact these changes will have on cotton production in the region". The ensuing hypotheses can then be employed to render mechanisms for developing climate toughness that will reduce the effects of climate change on agriculture in the region.
- Finding patterns in astronomical data: Studies in astronomy produce enormous amounts of data sets and a primary issue is to identify important signals or features from the racket, and to allocate these to the appropriate phenomenon or category. For instance, the "Kepler mission" is aiming to find out "Earth-sized planets orbiting other stars, collecting data from observations of the Orion Spur, and beyond, which could indicate the presence of stars or planets". Not all of this data however is useful; it can be rendered unclear by the action of thrusters aboard, by changes

in activity of stellar, or other methodical tendencies. These so-called influential artifacts need to be isolated from the system before the data can be analyzed. To assist in solving this problem,

researchers have developed an AI (machine learning) system capable of recognizing these artifacts and removing them from the system, cleaning it for later analysis (Roberts *et al*., 2013). AI (machine learning) has as well been employed to find-out novel astronomical events, for instance, detecting the properties of supernovae (Lochner *et al*., 20160 and stars (Miller, 2015); discovering new pulsars from previous data sets (Morello *et al*., 2014); and appropriately categorizing galaxies (Banerji, 2010). AI (machine learning) has become an important instrument for researchers across fields to analyze huge data sets, identifying formerly unanticipated models or mining unpredicted knowledge.

The primary aim of the present study is to evaluate the obstacles to activating artificial intelligence and exploitation of information revolution in multidisciplinary scientific research to serve the health and human sciences. The study also aims to assess the objectives of scientific research using artificial intelligence in universities, the mechanisms for activating scientific research for students in the universities by using the artificial intelligence, the obstacles to activating the role of directed scientific research oriented to serve the health and human sciences using technology and artificial intelligence as well as the correlation between these variables

Research Method

To facilitate the collection data for this study, a structured questionnaire was administered to individuals associated with Universities in Saudi Arabia. Two hundred and fifty seven (257) appropriately filled questionnaires were retrieved. The respondents in the study were students (university students, master's and doctoral), members of teaching staff and administrative board members of universities in Saudi Arabia.

A simple random sampling technique was utilized for this study. The survey design included questions in relation to socio-demographic characteristics; obstacles to activating artificial intelligence and exploiting the information revolution in multidisciplinary scientific research to serve the health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme); the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and to solve chains of some diseases, such as autism,using artificial intelligence in universities (second theme); mechanisms for activating scientific research to serve health and human sciences to empower achievements of innovation and invention and to solve chains of some diseases, such as autism,for students in the universities by using the artificial intelligence (third theme); and obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and to solve chains of some diseases, such as autism, using the technology and artificial intelligence in Saudi universities (fourth theme).

The collected data was statistically analyzed using Statistical Package for Social Science (SPSS) version 20. Descriptive statistics were used to report the frequencies and percentages for definite variables. Missing data were omitted on a basis analysis-by-analysis and valid percentages were reported. A non-parametric method was utilized in the analysis since our data set are not normally distributed (*see in appendix*), The data was also subjected to regression (ordinal regression) and correlation (Spearman's rank) analysis to determine the relationship between the four themes (expatiated in the *APPENDIX*).

Results and Discussion:

The ready availability of very huge data sets, together with novel algorithmic techniques and

facilitated by rapid and extremely parallel computer power, has largely increased the power of current artificial intelligence technologies. Technical advancements that have facilitated the success of artificial intelligence currently include, the reinforcement learning which is a system for discovering best possible approaches for an environment by exploring several possible situations and assigning credit to various moves according to performance. Convolutional neural networks, is multifaceted 'deep' neural networks, which are especially modified for the tasks of image categorization by being able to recognize the important characteristics needed to solve the problem. As well as, transfer learning, which is an old initiative of using concepts learned in one field on an unknown new one, this notion has engendered the use of deep convolutional nets taught on labeled data to transmit already-discovered visual features to categorize images from various fields without labels. And finally, the generative adversarial networks "this continues the concept of pitching the computer against itself by co-evolving the neural network classifier with the difficulty of the training data set".

The following paragraphs show the major results obtained from this research.

Table 1: Socio-demographic Characteristics of the Respondents

Variable	Frequency	Percentage
Gender		
Male	40	15.6
Female	212	82.5
Missing System	5	1.9
Total	257	100
Age		
18 – 24yrs	27	10.5
25 – 34yrs	40	15.6
35 - 44yrs	88	34.2
45 – 54yrs	65	25.3
55 yrs and above	32	12.5
Missing System	5	1.9
Total	257	100
Job Title		
Student/University Student	55	21.4
Member of Teaching Staff	151	58.8
Administrative Board Member	34	13.2
Master/PhD Student	12	4.7
Missing System	5	1.9
Total	257	100.0
Position		
Professor	51	19.8
Assistant Professor	55	21.4
Co-Professor	24	9.3
Lecturer	38	14.8
Teaching Assistant	11	4.3

Total	179	69.6
Missing System	*78*	*30.4*
Total	**257**	**100.0**

Presented in Table 1 are the socio-demographic characteristics of the respondents in this study. Clearly illustrated are the gender of the respondents, age, job title and the position they occupy. As stated earlier, "missing data were omitted on a basis analysis-by-analysis and valid percentages were reported". 5 (1.9%) of the 257 respondents data on their socio-demography were unfilled (this was indicated by *Missing System* as seen in table 1). However, all 257 respondents gave appropriate responses to all the variables which answers the research questions

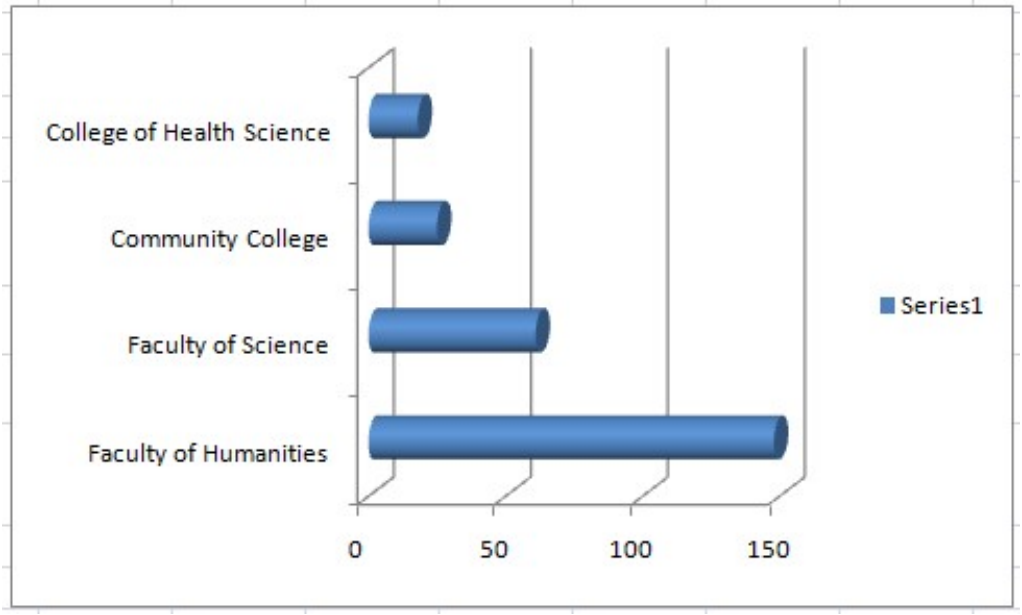

Figure 1: Socio-demographical Feature showing Specialization of Respondents

Figure 1 presents the specialization of the respondents. Most (57.6%) of the respondents were from the faculty of humanities; this was followed by 23.7% (61) and 9.7% (25) who were from the faculty of science and community college respectively. the least represented was the College of Health Science being 7.0% (18) of the respondents.

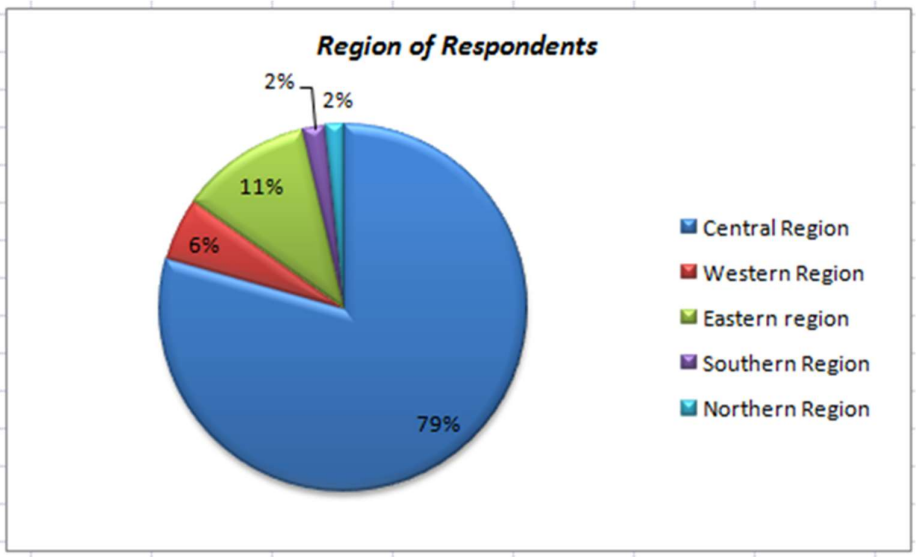

Figure 2: Socio-demographical Feature showing Region of Respondents

As seen in Figure 2, most (200) of the respondents were from the central region of Saudi Arabia While the rest were scattered from across other regions – western (14), eastern (29), southern (5), northern (4)

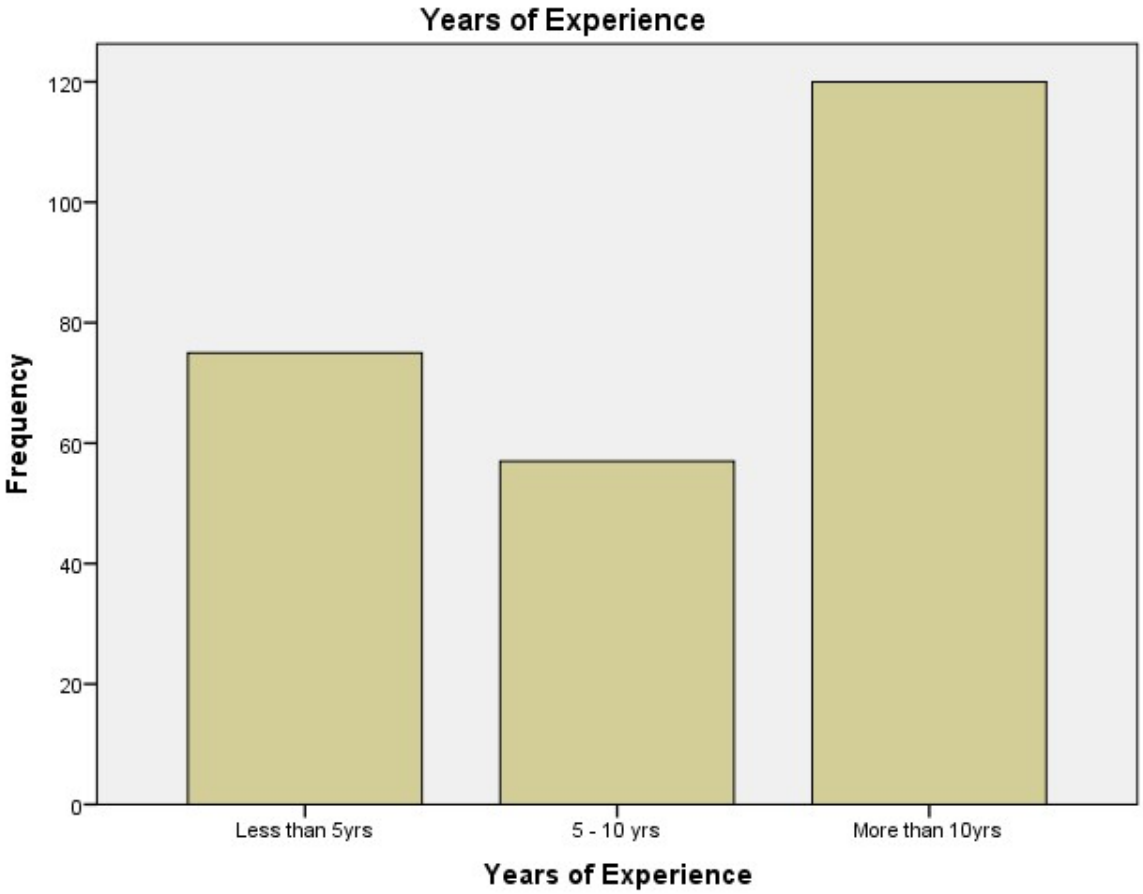

Figure 3: Years of Experience of Respondents

From Figure 3 above, most, 120 (46.7%) of the respondents had more than ten (10) years of

experience, this was followed by 75 (29.2%) of the respondents who had less than five (5) years of experience. 57 (22.2%) of the respondents had between five (5) to ten (10) years of experience.

Table 2: Parameter Estimates

Parameter Estimates

		Estimate	Std. Error	Wald	df	Sig.	95% Confidence Interval	
							Lower Bound	Upper Bound
Threshold	[F_T = 2.12]	4.960	1.270	15.255	1	.000	2.471	7.449
	[F_T = 2.24]	5.702	1.113	26.248	1	.000	3.521	7.883
	[F_T = 2.29]	6.175	1.055	34.236	1	.000	4.106	8.243
	[F_T = 2.41]	6.517	1.028	40.228	1	.000	4.503	8.531
	[F_T = 2.47]	6.780	1.012	44.862	1	.000	4.796	8.764
	[F_T = 2.65]	7.171	.997	51.721	1	.000	5.217	9.125
	[F_T = 2.76]	7.467	.990	56.861	1	.000	5.526	9.408
	[F_T = 2.82]	7.597	.988	59.084	1	.000	5.660	9.534
	[F_T = 2.88]	7.925	.986	64.621	1	.000	5.993	9.857
	[F_T= 2.94]	8.020	.986	66.205	1	.000	6.088	9.952
	[F_T= 3.00]	8.418	.988	72.657	1	.000	6.482	10.353
	[F_T= 3.06]	8.869	.994	79.660	1	.000	6.921	10.817
	[F_T = 3.12]	8.928	.995	80.557	1	.000	6.979	10.878
	[F_T= 3.18]	9.252	1.002	85.344	1	.000	7.289	11.215
	[F_T= 3.24]	9.449	1.006	88.177	1	.000	7.477	11.422
	[F_T= 3.29]	9.675	1.012	91.354	1	.000	7.691	11.659

	[F_T= 3.35]	9.840	1.017	93.641	1	.000	7.847	11.833
	[F_T= 3.41]	10.027	1.022	96.201	1	.000	8.024	12.031
	[F_T= 3.47]	10.129	1.025	97.577	1	.000	8.119	12.139
	[F_T= 3.53]	10.377	1.033	100.896	1	.000	8.352	12.402
	[F_T= 3.59]	10.663	1.042	104.680	1	.000	8.620	12.705
	[F_T= 3.65]	11.011	1.054	109.240	1	.000	8.946	13.076
	[F_T= 3.71]	11.193	1.060	111.600	1	.000	9.116	13.270
	[F_T= 3.76]	11.468	1.069	115.142	1	.000	9.374	13.563
	[F_T= 3.82]	11.660	1.075	117.582	1	.000	9.552	13.767
	[F_T= 3.88]	11.874	1.083	120.277	1	.000	9.752	13.996
	[F_T= 3.94]	12.062	1.089	122.627	1	.000	9.927	14.197
	[F_T= 4.00]	12.398	1.101	126.739	1	.000	10.240	14.557
	[F_T= 4.06]	12.546	1.107	128.527	1	.000	10.377	14.715
	[F_T= 4.12]	12.844	1.118	132.095	1	.000	10.654	15.034
	[F_T= 4.18]	12.996	1.123	133.914	1	.000	10.795	15.197
	[F_T= 4.24]	13.233	1.132	136.733	1	.000	11.015	15.451
	[F_T= 4.29]	13.479	1.141	139.679	1	.000	11.244	15.715
	[F_T= 4.35]	13.748	1.150	142.924	1	.000	11.494	16.001
	[F_T= 4.41]	14.090	1.162	147.159	1	.000	11.814	16.367
	[F_T= 4.47]	14.352	1.170	150.488	1	.000	12.059	16.645

	[F_T= 4.53]	14.760	1.182	155.817	1	.000	12.443	17.078
	[F_T= 4.59]	14.896	1.186	157.630	1	.000	12.571	17.221
	[F_T= 4.65]	15.040	1.191	159.554	1	.000	12.706	17.373
	[F_T= 4.71]	15.192	1.195	161.598	1	.000	12.850	17.534
	[F_T= 4.76]	15.603	1.207	167.009	1	.000	13.237	17.970
	[F_T= 4.82]	15.961	1.219	171.381	1	.000	13.571	18.350
	[F_T= 4.88]	16.316	1.233	175.077	1	.000	13.899	18.733
	[F_T= 4.94]	16.812	1.259	178.362	1	.000	14.345	19.280
	S_T	**1.592**	**.323**	**24.237**	**1**	**.000**	**.958**	**2.226**
Location	**T_T**	**-.965**	**.348**	**7.682**	**1**	**.006**	**-1.648**	**-.283**
	FT_T	**2.329**	**.232**	**100.492**	**1**	**.000**	**1.874**	**2.784**

Link function: Logit.

F_T = First Theme: *Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research to serve health and human sciences in Saudi Universities; S_T =* ***Second Theme:*** *the objectives of scientific research to serve health and human sciences using artificial intelligence in universities; T_T =* ***Third Theme:*** *Mechanisms for activating scientific research to serve health and human sciences for students in the universities by using the artificial intelligence; FT_T =* ***Fourth Theme:*** *Obstacles to activating the role of directed scientific research to serve health and human sciences by using the technology and artificial intelligence in Saudi universities*.

From Table 2, it is revealed that the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities was a significant positive predictor of Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities. Thus, for every one unit increase in the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities (the second theme), there is a predicted increase of 1.592 in the log odds of being at a higher level in Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme).

Mechanisms for activating scientific research to serve health and human sciences for students to empower achievements of innovation and invention and solve chains of some diseases such as autism in the universities by using the artificial intelligence (third theme) was a negative significant predictor of the Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research to serve health and human sciences in Saudi Universities to empower achievements of innovation and invention and solve chains of some diseases such as autism (first theme). The negative coefficient (value of -0.965) shows that for every one unit increase in Mechanisms for activating scientific research for students in the universities to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the artificial intelligence to serve health and human sciences (third theme), there is a predicted decrease of 0.965 in the log odds of being at the higher level on Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme).

Obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities (fourth theme) was a significant positive predictor (2.329) of obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme). Thus, for every one unit increase in the obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities (fourth theme), there is a predicted increase of 2.329 in the log odds of being at a higher level in obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme).

Table 3: Correlation among the Four (4) Variables

Correlations

Spearman's rho		First_Theme	Second_Theme	Third_Theme	Fourth_Theme
First_Theme	Correlation Coefficient	1.000	.543**	.450**	.684**
	Sig. (2-tailed)	.	.000	.000	.000
	N	257	257	257	257
Second_Theme	Correlation Coefficient	.543**	1.000	.828**	.579**
	Sig. (2-tailed)	.000	.	.000	.000

	N	257	257	257	257
Third_Theme	Correlation Coefficient	.450**	.828**	1.000	.603**
	Sig. (2-tailed)	.000	.000	.	.000
	N	257	257	257	257
Fourth_Theme	Correlation Coefficient	.684**	.579**	.603**	1.000
	Sig. (2-tailed)	.000	.000	.000	.
	N	257	257	257	257

**. Correlation is significant at the 0.01 level (2-tailed).

First Theme: *Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities;* ***Second Theme:*** *the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities;* ***Third Theme:*** *Mechanisms for activating scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism for students in the universities by using the artificial intelligence;* ***Fourth Theme:*** *Obstacles to activating the role of directed scientific research to serve health and human sciences* to *empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities*.

From Table 3 above, the correlation between the first and second theme is 0.543 indicating a moderate relationship between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme) and the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities (second theme). It has a p-value of 0.000 (less than 0.05) indicating that there is a statistically significant correlation between the dependent variable (first theme) and the independent variable (second theme).
Spearman correlation value of the first and third theme is 0.450 also indicating a moderate correlation between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism to serve health and human sciences in Saudi Universities (first theme) and mechanisms for activating scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism for students in the universities by using the artificial intelligence (third theme). The p-value (0.000) is less than 0.05 indicating that the correlation coefficients between the two variables (first theme – dependent variable and third theme – independent variable) are significant.

There is a strong correlation (rho = 0.684) between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities (first theme) and the obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities (fourth theme). There is a statistically significant correlation between the two variables (first and fourth theme) as p-value (0.000) is less than 0.05.

There is a very strong correlation (rho = 0.828) between the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities (second theme) and mechanisms for activating scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism for students in the universities by using the artificial intelligence (third theme) The p-value (0.000) is less than 0.05 indicating that the correlation coefficients between the two variables (second theme – dependent variable and third theme – independent variable) are significant.

The correlation between the second and fourth theme is 0.579 indicating a moderate relationship between the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities (second theme) and the obstacles to activating the role of directed scientific research by to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using the technology and artificial intelligence in Saudi universities (fourth theme). It has a p-value which is less than 0.05, indicating that there is a statistically significant correlation between the dependent variable (second theme) and the independent variable (fourth theme).

There is a strong correlation (rho = 0.603) between mechanisms for activating scientific research to serve health and human sciences for students to empower achievements of innovation and invention and solve chains of some diseases such as autism in the universities by using the artificial intelligence (third theme) and the obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities (fourth theme). There is a statistically significant correlation between the two variables (third and fourth themes) as the p-value (0.000) is less than 0.05.

The objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities are line with the responses of Thilagam (2018) and Slyusar (2020) who were affirmative that artificial intelligence is applicable in virtually scientific research objectives. This is also consistent with the article “How Artificial Intelligence Will Impact Scientific Research” by Shrestha (2019) where he stated that “we are entering a new age of scientific research where mundane research tasks will be carried out by machines letting scientists focus on bigger questions of research and development”. Furthermore, Al-Haddabi (2011) and Mohammed, Ali & Alharbi (2021) reiterated the objectives of using artificial intelligence techniques (in education). The obstacles of A.I. in scientific research also relates to

the study of Schmitt (2019) on “Speciesism” which is about A.I been subject to bias which will be of disadvantage to them, in the same vein, research that is accomplished by artificial intelligence and in cooperation with other researchers is not counted in a single research unit when a member applies for promotion. They are also in line with the challenges presented by UNESCO (2019), one of which was stated by Mohammed, Ali & Alharbi (2021) as “the weakness of scientific research in the field of developing and integrating artificial intelligence techniques in education: as a result of poor funding for educational research, it leads to ambiguity about the importance and reality of using artificial intelligence techniques in education”. Being a mechanism for activating scientific research for students in the universities by using the artificial intelligence, directing the students' or researchers' interest under the supervision of faculty members, and by involving postgraduate students in developing research in various fields, and establishing a mechanism to find out the reasons for students' reluctance to do so, is consistent with the studies carried out by Hinojo-Lucena et al. (2019) and Mohammed, Ali & Alharbi (2021) who recommended a similar path to using artificial intelligence. Some of the obstacles to activating the role of directed scientific research to serve health and human sciences by using the technology and artificial intelligence in Saudi universities were: lack of awareness of the universities with research on the use of artificial intelligence to uplift them; lack of interest in theoretical departments in the first place in terms of qualifying them to engage in this type of research because most departments rely on research using traditional methods or encourage the applied scientific departments at the expense of the theoretical departments. This result is consistent with the study carried out by Mohammed, Ali & Alharbi (2021) who reported lack of interest of college administration and lack of awareness of faculty members of the importance of using artificial intelligence amongst others as obstacles to activate the reality of using artificial intelligence.

Conclusion

Some of the obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities were identified as the lack of qualified faculty members to prepare interdisciplinary research using artificial intelligence in Saudi universities; the lack of educational means and modern educational technology provided by the university, which impedes the application of the skill; exclusivity of the university's subscribed information bases; weak training of faculty members to use modern technology in education, and research through websites; failure to follow up and maintain the university's technological means; Such as phonics, teaching and radio laboratories, and the Learning Resource Center; the lack of supportive bodies in universities that provide everything related to scientific research through the means of intelligence; weak effectiveness of some courses, conferences and workshops on scientific research using artificial intelligence in terms of poor selection of trainers; the number of young students at the university is not commensurate with the number of devices available that help achievement by using the means and techniques of artificial intelligence, and with the capabilities of the university available to them; and some faculty members give high priority to the traditional research method because of its ease and familiarity, ignoring modern research strategies through artificial intelligence means. The study has shown that the objectives of scientific research interdisciplinary research using

artificial intelligence in universities is a significant positive predictor of obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi universities. Thus, increase in the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities, will result to increase in obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi universities.

In addition, the study shows that mechanisms for activating scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism for students in the universities by using the artificial intelligence was a negative significant predictor of the obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi universities. The study further revealed that obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities was a significant positive predictor of obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities.

Lastly, the study indicated a moderate relationship between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities and the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities, a moderate correlation between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research in Saudi Universities and mechanisms for activating scientific research to serve health and human sciences for students in the universities by using the artificial intelligence, a strong correlation between obstacles to activating artificial intelligence and exploiting the information revolution in scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in Saudi Universities and the obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities, a very strong correlation between and the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities and mechanisms for activating scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism for students in the universities by using the artificial intelligence; a moderate relationship between

the objectives of scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism using artificial intelligence in universities and the obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities as well as a strong correlation between mechanisms for activating scientific research for students to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism in the universities by using the artificial intelligence and the obstacles to activating the role of directed scientific research to serve health and human sciences to empower achievements of innovation and invention and solve chains of some diseases such as autism by using the technology and artificial intelligence in Saudi universities.

Abbreviations

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Authors' contribution

All authors were responsible for the initiation, conceptualization and leadership of the guideline development process. AA and SA were responsible for the data statistical analysis and interpretation of results. RA was the primary author of the manuscript. All co-authors were responsible for writing, reviewing, and revising the manuscript for important intellectual content. All authors read and approved the final manuscript.

Ethics approval and consent to participate

Ethics approval was obtained for this study from the International Review Board (IRB) in Princess Nourah bint Abdulrahman University. Riyadh, Saudi Arabia with IRB Log Number: 20-0523. The IRB has determined that the proposed project poses no more than minimal risk. Therefore, the proposal has been deemed exempt from IRB review.

Consent for publication

Not applicable.

Competing of interests

The authors declare that they have no competing interests.

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Appendix

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
First_Theme	.044	257	.200*	.983	257	.004
Second_Theme	.143	257	.000	.903	257	.000
Third_Theme	.151	257	.000	.883	257	.000
Fourth_Theme	.110	257	.000	.946	257	.000

*. This is a lower bound of the true significance.

a. Lilliefors Significance Correction

Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Log(First_Theme)	.072	257	.003	.955	257	.000
Log(Second_Theme)	.160	257	.000	.875	257	.000
Log(Third_Theme)	.165	257	.000	.853	257	.000
Log(Fourth_Theme)	.150	257	.000	.886	257	.000

a. Lilliefors Significance Correction

Model Fitting Information

Model	-2 Log Likelihood	Chi-Square	df	Sig.
Intercept Only	1789.477			
Final	1609.028	180.449	3	.000

Link function: Logit.

Pseudo R-Square

Cox and Snell	.504
Nagelkerke	.505
McFadden	.098

Link function: Logit.

VARIABLE	**DESCRIPTION**
First Theme: Obstacles to Activating Artificial Intelligence and Exploiting the Information Revolution in Scientific Research in Saudi Universities	
1	The lack of qualified faculty members to prepare research using artificial intelligence in Saudi universities.

2	The lack of educational means and modern educational technology provided by the university, which impedes the application of the skill
3	Exclusivity of the university's subscribed information bases.
4	Weak training of faculty members to use modern technology in education, and research through websites.
5	Failure to follow up and maintain the university's technological means; Such as phonics, teaching and radio laboratories, and the Learning Resource Center
6	Weakness of the importance of using artificial intelligence culture for scientific and applied research in universities at the level of faculty members and staff
7	The lack of supportive bodies in universities that provide everything related to scientific research through the means of intelligence
8	Weak effectiveness of some courses, conferences and workshops on scientific research using artificial intelligence in terms of poor selection of trainers, Determine the time and themes to which everyone is committed and enrich their knowledge.
9	The number of young students at the university is not commensurate with the number of devices available that help achievement by using the means and techniques of artificial intelligence, and with the capabilities of the university available to them
10	Some faculty members give high priority to the traditional research method because of its ease and familiarity, ignoring modern research strategies through artificial intelligence means.
11	Exhausting the faculty member by increasing the (teaching load) as well as the administrative work, which affects his active participation in the development of scientific research skill using intelligence and during teaching and in teaching method and his interest in theoretical work only.
12	The practical hours of the course for the professor in some specializations are not calculated by the number of hours of the theoretical course, which leads to the reluctance of some members from scientific research in general, and rhetorical research using artificial intelligence in particular because it needs more of the teacher's time and effort.
13	Not including electronic courses that require research, analysis, hypotheses and theories and their application, in the light of modern science. Consequently, the professor is forced to take advantage of scientific intelligence in research and teaching.
14	There are no incentive prizes for members who are distinguished by research that uses artificial intelligence and gives new results and solutions, and is described as distinguished and extensive research.
15	Research that is accomplished by artificial intelligence and in cooperation with other researchers is not counted in a single research unit when a member applies for promotion.
16	Failure to set rewards for distinguished professors, to encourage them to pursue scientific research using the means of artificial intelligence.
17	Universities neglecting the role of a research-training university professor by using the latest research methods and techniques, in line with the Kingdom’s vision that supports this aspect, and paying attention to the teaching role only

18	Ignoring the role of real university education, which is to promote scientific research to solve the problems of the homeland at all levels, students have a lot of general and specialized knowledge.
	Additions
Second Theme: the objectives of scientific research using artificial intelligence in universities	
1	Instilling values and principles that enhance the importance of advanced scientific research, using artificial intelligence, programming languages, data mining, etc., in serving the country and solving its problems (socially, economically and developmentally. etc).
2	Directing the academic and scientific activities of the university youth and professors towards the discovery, production and development of knowledge in accordance with the constants of Saudi society using artificial intelligence.
3	Training students on how to use different learning resources using analyzers, software, automated statistics and applications in preparing research scientifically in line with scientific and technological development.
4	Establishing academic and research cooperation relationships between university departments and faculties through joint research using technology, computer programs, and computational mathematical thinking for exploration, research, and invention to achieve sustainable development.
5	Linking the educational process in university courses to scientific research, science and knowledge, information technology, and various means of communication, leading to cognitive research integration.
6	Defining scientific research topics based on reading, inference, classification and examination analysis with the help of artificial intelligence in the field of security and logistics research, data mining and medical diagnosis and technology industry, marine and environmental research ... etc. to participate in the Kingdom's research priorities
7	Encouraging students and professors in Saudi universities and integrating them in the research process, especially in the issues of women's empowerment and rights and enabling them to be sustainable and competitive, and in issues of the homeland and equal opportunities for citizenship and Islam
8	Linking the teaching process at different levels, and in theoretical and practical courses, to scientific research and the use of digital technology, especially research that leads to solving the Kingdom's problems and addressing contemporary issues of the homeland.
9	Providing channels for scientific exchange with foreign universities in developed countries, and communicating with local and international research centers using artificial intelligence, To train students to participate in research through the expertise of the professors.
10	Increasing the university's outputs of invention, innovation, research and practical written and recorded books, and enriching the Arab and international library with purposeful literature and classifying them in a way that enriches knowledge and global thought
11	Motivating faculty members and researchers, both affiliated with and non-affiliated with the university, to exchange knowledge, openness to others, and convergence of civilizations (professors and students) by exploiting the means of technology and artificial intelligence.
12	Encouraging students and faculty to attend and participate in local and international conferences (and joint research) using computers and online meetings.

13	Monitoring issues, phenomena and problems that hinder the development of the Kingdom and its active participation in sustainable development, and overcoming them by providing solutions through a large network of professors, students, researchers and artificial intelligence
14	Establishing a program for international scientific communication with international universities, by using artificial intelligence and modern technology to define the role of joint research between the professor and the student and its great place in spreading civilizations and exchanging experiences with them (and presenting distinguished students for scholarships) .
15	Establishing an Arab world observatory to be concerned with studies, scientific research, joint invention between students and professors, and between professors and peers, using modern technologies, and using artificial intelligence..
16	Guiding young people to make use of time, technology, means of communication and informational openness, to serve the country with what industrial intelligence provides in terms of speed, accuracy and ease in scientific research.
17	Investing students and professors as beneficial human resources that contribute to cognitive integration and sustainable development with the presence of artificial intelligence.
	Additions
Third Theme: Mechanisms for activating scientific research for students in the universities by using the artificial intelligence	
1	Raising young people's awareness of the importance of scientific research by using the artificial intelligence
2	Activating the role of the university professor in developing the ethics of the scientific research among students.
3	Activating the role of the university professor in encouraging students to learn and research important topics and issues with supervision and follow-up during the implementation of research by using the artificial intelligence.
4	Defining standards and measures of excellence and creativity against which students' performance in research is measured, through courses, and their ability to make a positive change towards community issues and problems.
5	Direct the students to literature for the preparation of scientific research by using the industrial intelligence, research, methods of quotation, the selection of appropriate scientific materials and the necessary collection and analysis, and to write the research at scientific conferences and seminars and publish it at the arbitration sessions.
6	Providing support programs for university youth by providing computer programs and scientific research techniques; To research the contemporary challenges facing the state using various sources: such as central libraries, and Arab and foreign electronic digital information bases.
7	Establishing research chairs for scientific research based on artificial intelligence in innovation, invention and problem solving; Its efforts focus on developing research and supports volunteer work and endowments.
8	Adopting centers of excellence in scientific research for awards that support joint research between professor and student and between different sciences and between universities

	using artificial intelligence, which is characterized by being distinguished research.That ends with distinguished publication, creativity and invention.
9	Providing the opportunity for young people and faculty members to conduct collective (team research) or (joint) research that addresses the Kingdom's research priorities in light of artificial intelligence systems and techniques and to facilitate their attendance at various forums.
10	Directing the students' researchers' interest under the supervision of faculty members, and by involving postgraduate students in developing research in various fields, and establishing a mechanism to find out the reasons for students' reluctance to do so.
11	Directing the interest of student researchers and under the supervision of faculty members, and with the involvement of graduate students, to develop the authorship of scientific books directed at their service to help them excel, using artificial intelligence for indexing, mind mapping and categorization, it also benefits the strata of society.
12	Establishing student research sites and centers by using the artificial intelligence, which work on making a positive public opinion towards community issues and creating a scientific reference to support youth activities and a comprehensive database on their efforts to foresee their future and their developmental role.
13	Conducting exploratory studies via communication platforms and using modern technology to know the training needs of young people at the university level on co-authoring as an experiment and ways to succeed.
14	Publishing the research of joint faculty members with students and peers internally and externally, collecting members' efforts in international journals and translating them by the university, and building a public bank of knowledge in all specializations and by using the artificial intelligence.
15	Establishing intellectual scientific clubs, and applied camps on artificial intelligence and information digitization and computing, and its programs, in which ideas and opinions are exchanged.
16	Allocating material scientific prizes to participating students and professors with the best research, studies, innovations and inventions through the exploitation of intelligence and work to publish these researches through various media.
17	Holding an annual global conference to discuss the problems of scientific research globally in light of the problems facing the world that limit the utilization of artificial intelligence and the contemporary challenges thereof and facilitating the procedures for nominating the participation and attendance of students and faculty members for this conference.
18	Holding workshops, courses and research seminars to develop students' critical thinking, and the ability to scrutinize information in the era of the knowledge explosion, to immunize young people against attempts at dissolution, moral disorganization, and inappropriate thief by using the artificial intelligence..
19	Working in groups (research teams) and joint cooperation in conducting scientific research and inventions through the facilities provided by the Kingdom through the use of technology and information and knowledge bases.
20	Establishing electronic scientific vessels that serve as an integrated container (banks) containing files and scientific research for university professors and students, and issuing scientific periodicals So that university employees from the departments can submit their

	research and scientific papers to be shown to everyone so that they can benefit from them and share them with peers from other universities through artificial intelligence products.
21	Activate specialized scientific research on the Kingdom's research priorities from the point of view of citizenship, and its great position in Islam and through the large and encouraging financial support for students and professors by reducing the requirements and costs of using technology, computers and programs in the field of scientific research.
	Additions
Fourth Theme: Obstacles to activating the role of directed scientific research by using the technology and artificial intelligence in Saudi universities.	
1	Scarcity of the budget allocated to scientific research and its financing.
2	The small number of researchers (both professors and students) who are highly qualified for scientific research through the means and techniques of intelligence.
3	Weakness and lack of scientific exchange channels with advanced and pioneering universities in artificial intelligence to exchange professors, students and successful experiences.
4	The difficulty of participating and attending international conferences for students and professors in terms of commitment to study, high cost, and long difficult routine procedures.
5	Weak knowledge of the skills of dealing with modern technology, computers and applications by faculty members and students.
6	large number of routine (teaching and administrative) burdens contained in the organizing regulations and placed on the faculty member in Saudi universities.
7	Adopting traditional methods of teaching when making plans in departments and universities, neglecting applied scientific research, using technology and research that ends with classified publication. And research qualified to develop hypotheses and derive theories, innovation, and invention.
8	The lack of financial and moral incentives in universities for students who master the use of modern research in line with the development of technology and technology
9	The lack of quality university libraries in terms of updating, classification, lending and allowing the use of computers and software Analysis and statistics - free of charge Or at discounted competitive prices, for researchers, in addition to the lack of libraries in some faculties affiliated with universities
10	Low motivation of some researchers (both professors and students) because of not investing the results of their research in tackling educational issues, social problems...etc., and because they are not encouraged, or honored
11	Loss of motivation and continuous honoring of distinguished members in exploiting artificial intelligence to produce research that contributes to the service of society.
12	The faculty members should not be separated between a researcher and a teacher by universities, and provide them with the skill of research using technology and technical.
13	Universities' lack of awareness with research on the use of artificial intelligence to uplift them

14	Universities are not interested in theoretical departments in the first place in terms of qualifying them to engage in this type of research because most departments rely on research using traditional methods. Or encourage the applied scientific departments at the expense of the theoretical departments.
15	The scarcity of spreading this practice and culture among students and teachers, so that it is mandatory in all courses, The student graduates after four years with the skill to do scientific research by using the artificial intelligence means, so that he wins for once at the university level in a specialized course he prefers.
	Additions

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