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Developing the Administration of the University of Ha'il in Light of the Fourth Industrial Revolution Requirements

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Abstract: The current research aimed to identify the needs for developing the University of Ha'il (UoH) administration in light of the requirements of the fourth industrial revolution by discussing the potential obstacles and challenges that the administration may encounter in meeting these demands, as well as the potential mechanisms for resolving them from the perspectives of academic leaders and teaching staff, and to determine the existence of statistically significant differences in the responses of academic leaders and faculty members regarding the most important challenges facing the development of the administration of Ha'il University and the mechanisms for dealing with them. A cross-sectional/descriptive and analytical method was used to analyze, describe, investigate, and acknowledge the obstacles that prevent the development of university administration to meet the requirements of the fourth industrial revolution and to derive the proposed mechanisms to overcome these obstacles from both academic leaders' and teaching staff's points of view. This study's findings confirmed that the UoH administration faces a number of challenges, such as the lack of regulations governing the use of technologies and software, the lack of a clear and specific plan to employ the technologies of the fourth industrial revolution in the development of university administration, the delayed maintenance of devices on which the software and technologies are installed, and the lack of acceptance by some administrators of the idea of using the techniques of the fourth industrial revolution in the development of university administration out of fear of losing their jobs. By addressing these challenges and embracing some potential mechanisms, the university can effectively navigate the complexities of the 4IR. Therefore, this study suggests implementing cloud computing, artificial intelligence applications, and new technologies to develop the administrative work system at the University of Ha'il. This can lead to development and excellence in administrative performance.

Keywords: strategy; developing; administration; requirements; fourth industrial revolution

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1. Introduction

In fact, the society of the twenty-first century has witnessed alarming changes that may affect all aspects of life. These progressions have made us remain near the very edge of an innovative upheaval that will, on a very basic level, adjust the way we live, work, and identify with each other. In its scale, degree, and unpredictability, the change will not be normal for anything mankind has encountered previously. We do not yet know exactly how it will unfurl; however, one thing is clear: the reaction to it should be coordinated

and exhaustive, including all partners of the worldwide commonwealth, from people in general and private segments to the scholarly world and common society.

Universities and other educational institutions around the world have long struggled with environmental changes. However, over the past 10 years, new public regulations, technological breakthroughs, and shifting cultural expectations have presented institutions with an unprecedented set of obstacles. These collegiate demands and the associated opportunities are prominent features of the present wave of responsibility. It is required of universities to address issues of affordability, quality, effectiveness, and accessibility. Among the institutional adaptation dimensions that universities urgently need to implement are retrenchment, restructuring, improved performance, redefined missions, reorganization, mandated change, governmental reforms, institutional autonomy and accountability, fund diversification, strengthened administrative core, entrepreneurial periphery, transformational leadership, and quality management.

One of the most remarkable changes that have been intensely debated during the last years is the issue of the fourth industrial revolution, and several aspects of this new phase or cycle of industrial progress were introduced by various creators who think this period of modern advancement is starting now and is "portrayed by a significantly more omnipresent and versatile web, by littler and all the more remarkable sensors that have gotten less expensive, and by computerized reasoning and AI", and one may see its development in a world wherein virtual and physical frameworks are interwoven in assembling, administrations, and other human exercises. A significant part of the conversation in Davos concentrated on the negative effects of the new advances instead of on their constructive outcomes (Schwab, 2015, p. 2).

The characteristics of this revolution have been reflected in the Saudi universities and hence require its speedy response for it to keep up with the educational innovations that resulted from it. As a result, the success of universities depends, to a great extent, on their abilities to respond effectively to the changing nature of the fourth revolution that imposes some considerable consequences and impacts on university education institutions, which require a comprehensive review of the educational system, its objectives, philosophy, and its relation with the outside community in order to cope with the nature of the changing world. Therefore, Saudi universities need to have more effective and efficient management staff that will be able to lead them to success and progress in the era of the fourth revolution. Moreover, the effectiveness of academic leaders is based on their abilities and competencies to use technology in managing universities and leading the faculty to accomplish an excellent performance through supporting them in different situations.

The fourth industrial revolution (4IR) has been revolutionizing industries with technological advancements such as the Internet of Things (IoT), artificial intelligence (AI), augmented reality, remote sensing, and others. These technologies are expanding the boundaries of traditional fields and have started to influence higher education institutions (HEIs). The 4IR represents a time when digital technologies, smart networks, sensors, and automated machines interact and communicate with each other and people in real-time, creating cyber-physical systems that merge the physical, virtual, and biological worlds (Vijayalekshmi et al., 2023).

Industry 4.0, often referred to as the "fourth industrial revolution", is a term used to describe the combination of several major innovations in digital technology that are transforming the energy and manufacturing sectors in the twenty-first century. Industry 4.0 is bringing about major changes in industry and the way things are made. Innovations such as advanced robotics, artificial intelligence, cloud computing, digital fabrication (3D printing), smartphones, and self-driving cars are combining to change the way factories and businesses operate. Industry 4.0 is being spurred by the move toward digitization

and the development of smart factories, which will change the way manufacturing is done (Laura, 2024).

The very fact is that developing university administration requires the use of some current managerial approaches, including e-management and digital management, as they function with several technologies such as applications involving artificial intelligence and information technology systems in an interactive internal environment through the intranet and external environment through the extranet. They clearly represent an open technique to facilitate the carrying out of different virtual processes and activities.

Specifically, university digital management depends on specific ongoing methods. It conveys strong information to improve various fields in financial matters and to acknowledge perpetual human turns of events. Advanced administration remains a basic device in the universe of innovations and changes. Ability and seriousness remain two principal factors for both enormous organizations and little ones. This has resulted in another model for contenders to challenge each other and to urge clients to become increasingly efficient.

In this context, some research and studies confirmed the development of the administration of universities to be able to face the dynamic nature of digital democracy and the fourth industrial revolution, as Al-Khathlan's study aimed to develop a suggested perception for the development of university management in Saudi universities in order to achieve competitive advantage, as well as to identify the reality of the role of university administration in Saudi universities in order to achieve the competitive advantage from the perspective of university leaders at Prince Sattam bin Abdulaziz University as a model. According to the report, Saudi universities' actual involvement of university administration in gaining a competitive edge was mediocre. Additionally, it was discovered that the variables of years of experience and gender did not cause any statistically significant variances.

The study of El-hendawy (2021) aimed at investigating the idea of artificial intelligence and its applications in university administration, find the best practices and international models for using AI applications to advance university administration, and find reasons and significance for applying AI applications in Egyptian university administration. The report offered a vision for the advancement of university management using artificial intelligence.

The study of Mohammed (2020) aimed at exploring the reality of institutional governance systems in Egyptian universities, define the experience of implementing them at Melbourne University in Australia, and improve management in Egyptian universities in line with these systems. The study confirmed that developing the management of Egyptian universities, policies, laws, and standards that support the application of university governance in universities must be adopted. Additionally, the infrastructure and technology required for institutional governance within universities must be developed, and partnerships between the university and the local and global community must be activated.

Also, Zidan (2015) investigated the role of cloud computing in developing university administration and reached the conclusion that universities should prepare plans for transforming to the new society of the fourth revolution by establishing data centers, using virtual technology, and applying artificial intelligence and cloud computing.

Furthermore, Abu-Labhan (2019) conceived a proposal for moving Egyptian universities to University 4.0 in light of the fourth industrial revolution. Also, Abd Elrazik (2019) confirmed the development of the policies of the universities in light of the fourth industrial revolution through setting some alternative scenarios and the need to support these universities with all different capabilities that enable them to cope with the requirements of that revolution.

Moreover, the study of Deja (2023) attempted to identify the university administration's information culture. Even though the university administrative labor is sometimes

linked to bureaucracy, it is actually a bureaucracy of people, where staff members exhibit a set of competitive group information behaviors centered on information use and knowledge exchange in daily duties. The results confirmed that three parallel information cultures that are part of the research model support the professional bureaucracy culture, which is the predominant feature of university administrations' information behavior. Internalization of information, external networking, and behavioral openness (socialization) must all be encouraged to foster the growth of professional bureaucracy.

The fact is that universities are a key part of the rapidly developing knowledge clusters in their country that are becoming a magnet for a new generation of industry and research. Therefore, universities are supposed to create interdisciplinary research and build the necessary links with industry to underpin the fourth industrial revolution (Dodd, 2017). As a result, the Ministry of Education in the Kingdom of Saudi Arabia sought to develop universities by supporting them with information technology, but these attempts did not achieve the expected outcomes because of a lack of digital culture, a lack of independence, centralized management, the inability of some academic leaders to use information technology, and advanced applications in managing universities (Meawed, 2013, p. 192). Consequently, the current research attempts to clarify how the administration of the University of Ha'il, as one of the Saudi universities, can be developed in light of the fourth industrial revolution requirements.

1.1. Research Problem

The research problem can be stated in the following question:

How can the administration of the University of Ha'il be developed in light of the fourth industrial revolution requirements?

This main question can be divided into sub-questions as follows:

1. What are the main challenges that may face the administration of the University of Ha'il to cope with fourth industrial revolution requirements?
2. What are the potential mechanisms for overcoming them from both academic leaders' and teaching staff's points of view?
3. Are there statistical differences in the academic leaders' and teaching staff's points of view concerning the challenges that may face the administration of the University of Ha'il to cope with the revolution requirements and the potential mechanisms for overcoming them?

1.2. Research Objectives

The current research aimed to clarify how the administration of the University of Ha'il can be developed in light of the fourth industrial revolution requirements. This can be done through:

1. Defining the potential requirements for developing the administration of Saudi universities in light of the fourth industrial revolution requirements implemented at the University of Ha'il as a model.
2. Acknowledging the challenges that may face the administration of the University of Ha'il to cope with fourth industrial revolution requirements and the potential mechanisms for overcoming them from both academic leaders' and teaching staff's points of view.
3. Determining the statistical differences in the academic leaders' and teaching staff's points of view concerning the challenges that may face the administration of the University of Ha'il to cope with the revolution requirements and the potential mechanisms for overcoming them.

1.3. Research Significance

The significance of the current research ranges from focusing on developing the administration of UoH through some current orientations and techniques to enable them to cope with the different challenges of the fourth industrial revolution. Furthermore, it keeps up with the local and worldwide trends that assert the necessity for developing the university organization, and this requires improving both managerial and leadership competencies of academic and administrative leaders, determining alternative options for futuristic developments of managerial policies to master the dynamic nature of the fourth revolution era, and guiding decision-makers in Saudi universities regarding the available and potential relationship related to the urgent need to develop university administration and the changes that can be made in order to transform to smart management. In addition, this is considered the first study that focuses on developing university administration in light of the requirements of the fourth industrial revolution.

1.4. Research Terms

The current research depended on the following terms:

1- The fourth industrial revolution

The fourth industrial revolution (4IR), also known as Industry 4.0, is typically spoken of in relation to the industrial and manufacturing industries. This phrase emphasizes the revolution's emphasis on integrating digital technology into the core of business to build smart factories that represent the merging of the digital and physical realms. It is a new era of development that is characterized by the convergence of digital, physical, and biological systems, which is radically altering economies, society, and industries.

This revolution stands out for its unparalleled pace, scale, and impact on human life; it presents enormous chances for advancement but also presents formidable obstacles, such as moral dilemmas and the possibility of greater inequality. Schwab (2017) contends that this period offers a chance to assist leaders, legislators, and individuals from all socioeconomic backgrounds and countries in utilizing convergent technologies to build a human-centered, inclusive future. It is not merely a technological advancement. According to Schwab, this revolution differs from all others in terms of its size, scope, and complexity. The advancements, which are marked by a variety of new technologies that are merging the digital, biological, and physical realms and having an impact on all fields, economies, businesses, and governments. They are even casting doubt on preconceived notions about what it means to be human.

2- University administration

The term "university administration" describes the operational and managerial practices that have been developed to include business models for organizing, funding, and supervising academic endeavors. To fulfill the demands of a changing higher education landscape, it entails the commercialization of research and teaching as well as the implementation of new governance techniques (Tierney et al., 2022).

2. Literature Review

The administration of universities has been extensively studied nationally and internationally in the last decades; however, acknowledging the characteristics and impacts of the fourth revolution is still of little attention in the focus of researchers. The Al-Zoubi et al. (2024) study attempted to investigate a number of models associated with University 4.0 and the fourth industrial revolution as a whole and to examine how engineering educators view the phrase "University 4.0." from their perspective. The results favor continuance with specific changes (dubbed University 4.0) as opposed to an important shift like higher

education (dubbed University 4.1). The goal of a University 4.0 overview is to start a conversation about what the future holds for the next generation.

Moreover, the current educational issue of the fourth industrial revolution (4IR), which is influenced by a complex environment caused by numerous ways and difficulties, was examined in Otara's study from 2024. Using a methodical methodology that incorporates a literature review, it investigates how education around the world has responded to the 4IR. The study emphasized the need for fair access to education and inclusivity. By highlighting how technology, especially artificial intelligence (AI), virtual reality (VR), and augmented reality (AR), is revolutionizing learning experiences, this has been accomplished.

The study by Truong and Trần (2024) looks at how IT is changing teaching methods at the college and university levels and how schools are using IT tools like big data analytics, artificial intelligence, and immersive technologies to improve student learning. Improved student engagement, individualized learning pathways, and the development of future-ready skills necessary in a digital economy are just a few advantages of adopting IT, according to the study, but issues like teacher training and infrastructure preparedness continue to be major obstacles.

Okunlola et al. (2024) aimed to demonstrate global evidence from a systematic literature review on the impact of digital leadership during the COVID-19 pandemic on organizational characteristics like performance, relationship, satisfaction, collaboration, expertise, effectiveness, and efficiency. The results showed that the organizational variables are affected by digital leadership and that demonstrating digital technology-focused leadership is necessary to adapt to the fourth industrial revolution.

The study of Lliashenko et al. (2023) sought to identify and categorize promising directions and issues of the development of higher education institutions in the context of the fourth industrial revolution (IR4.0), considering the influence of its main technologies and the innovations created on their basis for both the labor market and the personal training system. The findings demonstrated that the opportunities and risks to the growth of institutions of higher learning brought about by the adoption of IR4.0 technologies have been recognized and categorized.

The Singaram et al. (2023) study aimed to find out what the leaders thought about the opportunities and challenges that the 4IR offered South African higher education. The results showed that during times of transition to a more technologically sophisticated learning environment, HEI leaders need to be aware of their leadership preferences and style. Along with the needs, expectations, opportunities, and challenges of the new workplaces, they must also be aware of the new skill sets needed in the 4IR.

According to the study by Vijayalekshmi et al. (2023), HEIs are essential in facilitating the 4IR by acting as innovation test sites and teaching the upcoming generation of professionals with 4IR knowledge and abilities. The study's findings demonstrated that for other nations to be competitive in the global economy, they must invest in the development of 4IR capabilities.

The Pereira et al. (2023) study aimed to describe the effects of the current changes in social, economic, ethical, and academic terms, as well as the role of creative learning in this transformative process. It also sought to reflect on the changes that are occurring today, taking them into account from various angles. The findings validate that the various social institutions must come together in a collaborative paradigm where more innovative, effective, and sustainable solutions and knowledge are brought about by the free exchange of knowledge, the allocation of resources, and the focus on shared issues using various approaches and by various players.

The study of Yende (2021) sought to address and increase the awareness of the imperative shift towards the fourth industrial revolution (4IR) in the South African higher

education sector. It concluded that the enhancement and application of the 4IR in institutions located in rural areas are strongly correlated with government support.

Jisun's study, based on a document analysis, explored the following question: What are the current challenges for South Korea's higher education sector in light of likely shifts in knowledge production due to the fourth industrial revolution? It will be argued that Korea has multiple challenges in terms of its overall industrial structure, labor market, and higher education and will have to upgrade the roles of its government, industry, and universities in knowledge creation and skill formation to adapt.

The study of Serkina and Logvinova (2019) aimed to exactly validate the hypothetical examination of the essentials, difficulties, and patterns of innovation causing worldwide changes in the administration arrangement of present-day colleges. The outcomes broke down the potential advantages and negative results of the unreasonable development of authoritative practice in advanced education. They remember decreased enthusiasm for work, diminished imaginative movement, and constrained open doors for innovativeness; the picture of action to the detriment of genuine action; the quantitative development of the administration device; nepotism and preference; the infringement of the respectability of data streams; the unjustified formalization of inner procedures; and the loss of trust in the initiative.

Al-Yagazy's (2019) study aimed to identify the use of artificial intelligence applications in supporting university education in Saudi Arabia and employing technology in developing the educational process and confirmed that improving university education requires holding conferences and lectures in electronic form as well as reviewing information technology related to artificial intelligence and training teaching staff and faculty to develop their skills to use information technology.

In their study, Malek and Asem (2019) aimed to determine the competencies of the educational administration and the educational technology required for the teams of professional learning communities, considering the skills of the twenty-first century and the foundations of the fourth industrial revolution, and to know the degree of practicing these competencies. The expert agreement results in a few competencies for each member of the team. There are several competencies that must be available to all individuals. The results showed that most competencies practiced by teams in schools are related to the field of planning and management, and that few competencies are practiced related to the fields of design, development, availability, and communication. In light of the research results, the researchers recommended the development of accurate criteria for the formation of teams of professional learning communities.

The study of Mao (2018) aimed to design and implement an effective university administration management information system, which is of great value for modern university management. Therefore, the researcher proposed a novel and efficient university administration management information model. To design an effective information system, the researcher utilized the B/S mode to develop the proposed system. In particular, the B/S structure refers to three layers in a distributed system, which includes a web server, database server, and application server. Next, the proposed system can be used for the administrative departments at all levels to use the requirement and realize the office network and information network. The experimental results show that the proposed university administration information is easy to use and can achieve both lower CPU and memory utilization rates.

Moreover, Ali's (2018) study aimed to analyze economic literature that has discussed the importance of education quality for economic growth through competitive industrial performance. The study depends on the comparative analytical framework to test the hypotheses of "the education quality has a positive impact on the competitive industrial

performance and economic growth.". The study compares Singapore's experience with the case of Egypt in improving education quality, improving the competitiveness of the manufacturing sector, and improving growth rates. There are a variety of axes of comparison for education quality and competitive industrial performance in this study. In conclusion, the role of education quality in improving competitive industrial performance and economic growth rates is very important, especially with the challenges of the fourth industrial revolution.

El-Mazroey (2018) investigated the impact of the technologies of the fourth industrial revolution on the development of technical education and vocational training to meet the challenges faced by Omani youth in the labor market. The paper presented the main challenges faced by Omani youth in the labor market. It then touched upon technical education and vocational training in the Sultanate of Oman. The paper then discussed the technologies of the fourth industrial revolution that could contribute to the development of technical education and vocational training using augmented and virtual reality, the Internet of things, blockchain, and 3D printing.

Using big data analysis, Guan and Wang (2021) sought to determine the variables influencing university administration effectiveness. The study examines BD in colleges and universities in brief before delving deeply into the variables influencing university administration effectiveness in the context of big data analysis. The experimental findings show that the school's administrative efficiency level is high when big data technology is used.

The study of Li et al. (2017) attempted to study the innovation specialties of every sort and mechanical drivers behind the fourth modern insurgency and afterward assessed the effects of this transformation on worldwide mechanical, financial, and social turns of events and finally proposed potential mechanisms and approaches for the two foundations and governments to adapt to the progressions brought by the fourth mechanical upheaval.

Also, Prisecaru (2016) endeavored to present the main features of the fourth industrial revolution based on some expert opinions, the most important papers being delivered and debated at the Davos World Economic Forum in 2016 on the theme of this revolution, and some estimations regarding the impact/effects of this last phase of industrial development in the world.

Meawed (2013) aimed to develop university administration in the Arab world in line with contemporary administrative trends using descriptive analytical methods, including several investigations that acknowledge some contemporary trends in the administrative field and their impact on university administration, such as total quality management, change management, knowledge management, and reengineering, and attempts to develop university administration in some Arab universities as represented in the research on strategies, development projects, the expansion of management information systems, administrative development units, and decision support, considering strategic planning and setting a number of proposed mechanisms for the development of university administration with respect to administrative independence, patterns, organizational structures, the selection and training of university leaders, and funding sources.

Based on the literature review, it is obvious that developing the administration of university education institutions requires adopting change and development. Deja (2023) confirmed that university leaders must comprehend their institution's internal culture, including its information culture, considering the industrial revolution. Without understanding the information behavior of the staff members who will be directly handling such organizational issues, it is challenging to modify the internal information policy in university administration to new technological solutions and information management pro-

cedures or to the continuously shifting demographic, financial, political, and technological conditions in the organization's environment.

Yende (2021) asserted that the fourth industrial revolution has become the main driving force in improving higher education worldwide. In university education, it is believed that the rapid advancement of technology has created an efficient teaching and learning environment in the twenty-first century.

The fourth industrial revolution is transforming universities through advancements in robotics, IoT, Web3, blockchain, quantum computing, and particularly artificial intelligence, reshaping teaching and learning methods while emphasizing the ethical governance of AI across various disciplines and regions. It can foster social inclusivity and integration, particularly for learners with disabilities and those from disadvantaged backgrounds, by leveraging emerging technologies to enhance educational experiences and promote mainstream classroom participation (Truong & Trần, 2024).

Moreover, ICT can help create economic viability for tomorrow's workers, accelerate, deepen, and enrich skills, engage and motivate students in the classroom, help connect school experiences to work practices, help bring about radical changes in education, improve teaching, and create opportunities for connections between the classroom and the outside world. When implemented properly, technology may revolutionize the teaching and learning environment and offer a wealth of pedagogical affordances. In an attempt to establish an atmosphere where students and their teachers can collaborate and access information, higher education institutions worldwide have been implementing ICT teaching and learning tools (Egoeze et al., 2018).

According to Krishnaveni and Meenakumari (2010), general administration, staff administration, and student administration are the three primary areas that are important to the management of higher education institutions. The following items were identified for student administration: student inquiries about admission, online applications for admission, student registration and enrollment, course allocation, electronic access to information such as timetables and class schedules, attendance tracking, and information regarding hostel accommodations.

The fact is that many approaches can be used to develop the administration of the Saudi universities to cope with the fourth industrial revolution. Total quality management can be considered one of the most effective approaches in developing the performance of the administration of universities. It depends on satisfying the customers' needs, developing teamwork skills, improving business processes and procedures, detecting and reducing or eliminating errors in work, and activating the participation of both academic and administrative leaders. This will lead to enhancing the quality and productivity of the university (Suskie, 2015).

The increasing digitalization of university education institutions in general has triggered a veritable explosion in the amount of so-called digital management made accessible, to be used and investigated in the advancement of university management. Digital management represents an open approach to managing virtual business and activities, which differs from all the foundations, principles, and mechanisms in modern management with a narrow spatial approach. It also represents a completely new work philosophy, from a modern perspective, and digital management consists of fundamental variables in which information technology and its management play a fundamental role. These variables are the university strategy, individuals, institutional culture, and information technology within the framework of the internal interactive environment through the intranet and the rapidly changing environment through the extranet.

In practice, it is a contemporary administrative model for the development of administrative work in the university institution. It is procedurally defined as depending on the

use of electronic technologies, various information technologies, and advanced communications to facilitate administrative processes, such as organizing, planning, controlling, and leading, electronically, in the quickest amount of time and at the lowest cost, while also improving customer service and achieving efficiency and effectiveness in work performance. Digital business model innovation (DBMI) and disruptive business innovation both heavily rely on the use of digital technologies and digitalization in innovation. Additionally, the "practices, processes, and principles that underlie the effective orchestration of digital innovation" are referred to as digital innovation management (Aagaard, 2019).

Another approach that can help to enable the university leaders to cope with the requirements of the fourth revolution is strategic management. It focuses on establishing objectives and goals for the university and preserving a set of relationships between the university and the environment that (a) allow it to pursue its objectives, (b) are consistent with the organizational capabilities, and (c) continue to be responsive to environmental demands. The strategic manager's concerns include identifying and implementing strategic change inside the business, building an organizational structure that supports strategic change, and choosing and nurturing managers and employees who are driven and equipped to implement strategic change (Ansoff et al., 2019).

2.1. Methodology

2.1.1. Research Method

A cross-sectional/descriptive and analytical method was used to analyze, describe, investigate, and acknowledge the obstacles that prevent the development of university administration to meet the requirements of the fourth industrial revolution and to derive the proposed mechanisms to overcome these obstacles from both academic leaders' and teaching staff's points of view. This helped the researchers to determine some requirements for developing the administration of the UoH in light of the fourth industrial revolution requirements.

2.1.2. Research Population and Sample

The research population consisted of 2157 members. A total number of 232 participated in the research, representing 10.7% of the total number of the teaching staff, including 133 male and 99 female with different experiences and academic degrees and from eight colleges located at the University of Ha'il: College of Medicine, College of Applied Sciences, College of Nursing, College of Sciences, College of Engineering, College of Business Administration, College of Education, and College of Art. The sample was randomly chosen. It included 76 academic leaders (8 deans, 27 vice deans, and 41 department heads) representing 32.8% and 156 teaching staff representing 67.2%.

2.1.3. Research Tool

A questionnaire of university staff was conducted to identify the obstacles that one may face in the process of developing the university administration to meet the requirements of the fourth industrial revolution and the proposed mechanisms to overcome the obstacles therein. The questionnaire was prepared by reviewing the research instruments found in the literature, which included studies and research on the characteristics of the fourth industrial revolution, its educational requirements, and the growth of university administration. Additionally, the study's theoretical foundation was examined. In its original form, the questionnaire had thirty-three phrases. These were shown to a group of arbitrators in the field of educational administration to obtain their opinions on how appropriate the questionnaire was for its intended use and whether the phrases belonged to its two main axes. Following their revisions and recommendations for additions and deletions, the questionnaire was made up of 24 items arranged along two major dimensions. The first

dimension was composed of 12 items and focused on the obstacles to the development of the university administration to meet the requirements of the fourth industrial revolution, while the second consisted of 12 items and focused on the proposed mechanisms to overcome the obstacles therein.

Data were collected from April 2024 to June 2024 with the aid of a web application. The prepared questionnaire contained multiple-choice questions that were calculated based on a five-point scale (strongly agree, agree, neutral, disagree, and strongly disagree). Some statistical techniques, such as weighted mean, standard deviation, and SPSS 21.0 software, were used for the statistical analysis of the data compiled through surveys. Moreover, the research purpose and procedures were explained to the participants, and informed consent was taken upon enrollment. The research protocol was approved by the Research Ethics Standing Committee of the University of Ha'il on 3 January 2024.

Validity of the Research Tool: The Pearson correlation was used to calculate the internal validity between each item and the total degree of dimension to which it belongs. Coefficients were calculated between each dimension and the total degree of the questionnaire, and the results showed that the correlation coefficients ranged from 0.658 to 0.852. They were high and statistically significant at the level of 0.01, indicating the validity of the questionnaire.

Reliability of the Research Tool: Cronbach's alpha was calculated to verify the reliability of the questionnaire, and the results showed high values, being 0.859 for the first dimension and 0.878 for the second dimension. This indicates the validity of the questionnaire in its final form, its trustworthy application, and thus the reliability of the results.

2.2. Research Results

In this section, the author presents the key findings regarding the obstacles to the development of university administration to meet the requirements of the fourth industrial revolution and the proposed mechanisms for dealing with them. These findings can be displayed as follows:

2.3. Analysis of the Questionnaire Dimensions

1. Obstacles to the development of university administration to meet the requirements of the fourth industrial revolution:

The researchers attempted to acknowledge the most important obstacles that prevent the development of university administration from meeting the requirements of the fourth industrial revolution from the academic leaders' and teaching staff's points of view. The following table shows the responses of the research sample concerning the most important obstacles that prevent the development of university administration from meeting the requirements of the fourth industrial revolution.

The findings shown in Table 1 and Figure 1 illustrate that 3.60 of the academic leaders and teaching staff agreed that the administration of the University of Ha'il faces some obstacles that may hinder the development of the university administration to meet the requirements of the fourth industrial revolution. The findings analysis revealed that the administration of UoH faces several challenges in meeting the demands of the fourth industrial revolution. Weak financial appropriations allocated to provide systems and technologies, a lack of human cadres trained to use the software and techniques, a lack of a clear and specific plan to employ the technologies of the fourth industrial revolution in the development of university administration, and the slow development of infrastructure supporting the use of technologies and applications of the fourth industrial revolution in the development of university administration are some of these obstacles.

Table 1. The obstacles to the development of university administration to meet the requirements of the fourth industrial revolution.

#	Items	Weighted Mean	Standard Deviation	Degree of Agreement	Rank
1	The absence of regulations governing the use of technologies and software of the fourth industrial revolution in the development of university administration.	3.59	0.759	agree	7
2	Lack of a clear and specific plan to employ the technologies of the fourth industrial revolution in the development of university administration.	4.85	0.892	Strongly agree	1
3	Weak financial allocations are allocated to provide systems and technologies of the fourth industrial revolution.	4.75	0.885	Strongly agree	3
4	Scarcity of Arabic versions of the fourth industrial revolution software that supports the development of university administration.	3.54	0.753	agree	8
5	Weak conviction of some leaders of the usefulness of the technologies of the fourth industrial revolution in the development of university administration.	2.65	0.625	neutral	9
6	Weak acceptance of some administrators of the idea of using the techniques of the fourth industrial revolution in the development of university administration for fear of losing their job positions.	4.65	0.761	Strongly agree	5
7	Slow development of infrastructure supporting the use of technologies and applications of the fourth industrial revolution in the development of university administration.	4.72	0.871	Strongly agree	4
8	Lack of human cadres trained to use the software and techniques of the fourth industrial revolution in the development of university administration.	4.81	0.889	Strongly agree	2
9	Weakness of the security system necessary to protect the database of university administration transactions.	2.60	0.615	neutral	10
10	The difficulty of understanding the university's administrative organization of the technologies and applications of the fourth industrial revolution.	1.75	0.585	Disagree	11
11	Delayed maintenance of devices on which the software and technologies of the fourth industrial revolution depend in the development of university administration.	4.62	0.749	Strongly agree	6
12	The work of the university administration is suspended when the technical systems of the fourth industrial revolution are disrupted.	1.37	0.566	Strongly disagree	12
	Overall average	**3.60**		**agree**	

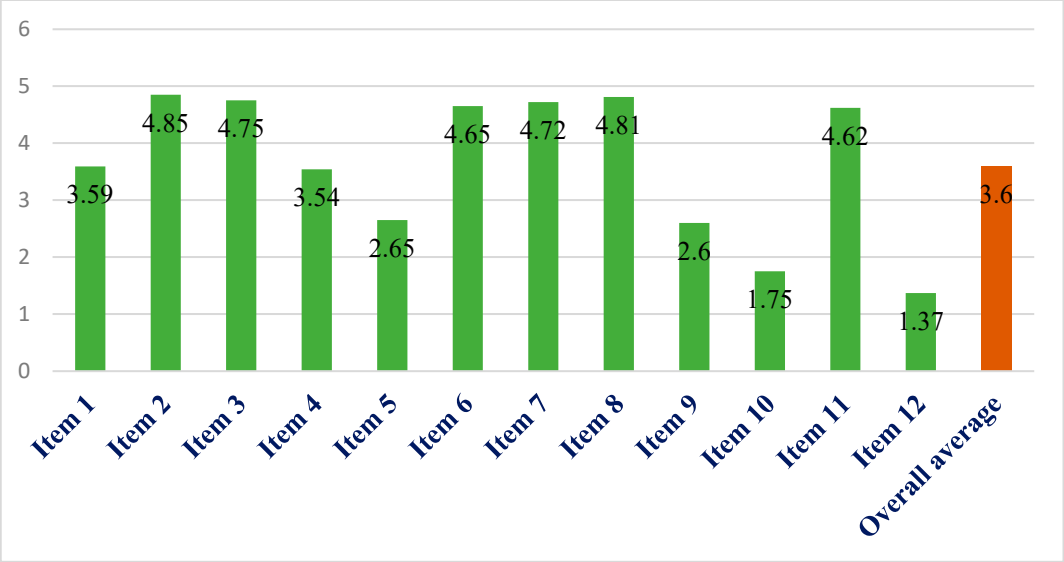

Figure 1. The obstacles to the development of university administration to meet the requirements of the fourth industrial revolution.

It was also discovered that the UoH administration faces a number of challenges, such as the lack of regulations governing the use of technologies and software, the lack of Arabic versions of the fourth industrial revolution software that supports the development of university administration, the delayed maintenance of devices on which the software and technologies are installed, and the lack of acceptance by some administrators of the idea of using the techniques of the fourth industrial revolution in the development of university administration out of fear of losing their jobs.

According to the results of the responses identified as strongly agree and agree, the University of Ha'il must create an administrative climate and provide the necessary components to use these applications in the development of its university administration. It must also direct all of its capabilities to provide an electronic administrative system based on the fourth industrial revolution's applications in an integrated manner without effort or human intervention. These difficulties prevent the University of Ha'il from benefiting from the applications of the fourth industrial revolution in the development of university administration. These results align with the research conducted by Suganya (2017), which exposed the difficulties brought about by the fourth industrial revolution's effects on universities and looked for ways to identify future technological advancements that would help them overcome these difficulties by giving system participants a variety of administrative skills, including the ability to use digital devices to complete tasks, use digital data to solve administrative issues, archive and classify digital information, and more.

Furthermore, the results clearly demonstrate that, despite numerous obstacles that prevent the University of Ha'il from reaping the benefits of applying the fourth industrial image to the advancement of its university administration, the institution has a digital transformation plan that could contribute to the trend in this direction given the fourth-generation model and to meeting the challenges of the fourth industrial revolution. The University of Ha'il may be unique in addressing these issues due to its administrative structure that encourages the use of applications of this revolution in enhancing performance in different university sectors. However, there are certain factors that have contributed to the University of Ha'il being excluded from some of the challenges of the fourth industrial revolution.

The analysis of these findings shows that the lack of a clear and specific plan to employ the technologies of the fourth industrial revolution in the devaluing university administration is the most frequent challenge or problem, while the suspension of the university administration in the case of the disruption of the technical systems is the least frequently presenting challenge.

These findings are consistent with several studies, such as Singaram et al. (2023) and Benesova and Tupa (2017), which found several obstacles that prevent benefiting from the applications of the fourth industrial revolution, such as high financial costs and the lack of skilled employees capable of using these applications.

2. Proposed mechanisms to overcome obstacles to the development of university administration to meet the requirements of the fourth industrial revolution:

The following table shows the responses of faculty members related to the most important proposed mechanisms to overcome obstacles to the development of university administration to meet the requirements of the fourth industrial revolution:

With a weighted mean of 4.62, the results in Table 2 and Figure 2 demonstrate that academic leaders and teaching staff firmly agree that certain suggested techniques can be used to overcome the challenges of transforming the UoH administration to satisfy the demands of the fourth industrial revolution.

Furthermore, the findings analysis shows that in order for university administration to evolve to meet the demands of the fourth industrial revolution, it is necessary to allocate a portion of the university budget to provide modern systems and technologies, create an executive plan to use these technologies, and provide ongoing training for those involved in using advanced technologies in managing universities, while examining and creating administrative rules and processes that guarantee the use of these technologies, implementing information technology governance to address the challenges of the fourth industrial revolution, earning the ministry's support and approval to use digital technologies in management, adjusting the university's organizational structures and administrative practices to meet the demands of the digital revolution, offering a comprehensive and integrated system to safeguard university administration data and information from threats and intrusions, raising awareness among university leaders of the significance of implementing the demands of the fourth industrial revolution in the development of university administration, and implementing smart university building management systems based on fourth industrial revolution applications like artificial intelligence.

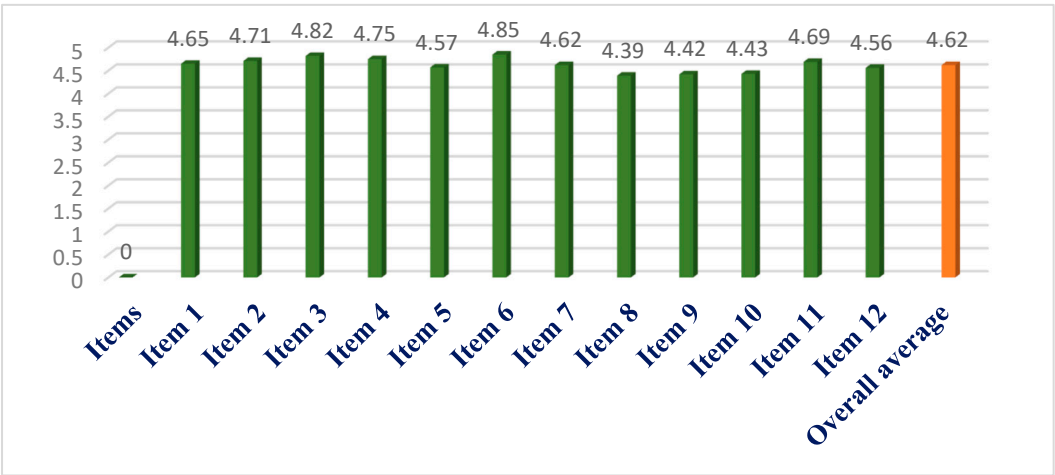

Figure 2. Proposed mechanisms to overcome obstacles to the development of university administration to meet the requirements of the fourth industrial revolution.

Table 2. Proposed mechanisms to overcome obstacles to the development of university administration to meet the requirements of the fourth industrial revolution.

#	Items	Weighted Mean	Standard Deviation	Degree of Agreement	Rank
1	Obtaining the support and endorsement of the ministry to employ the technologies of the fourth industrial revolution in the development of university administration.	4.65	0.856	Strongly agree	6
2	Developing administrative regulations and procedures that ensure the use of fourth industrial revolution technologies in the development of university administration.	4.71	0.875	Strongly agree	4
3	Building an executive plan to employ the applications and technologies of the fourth industrial revolution in the development of university administration.	4.82	0.891	Strongly agree	2
4	Allocating part of the university's budget to provide the systems and technologies of the fourth industrial revolution used in the development of university administration.	4.75	0.886	Strongly agree	3
5	Rebuilding the university's organizational structures and administrative procedures in line with the requirements of the fourth industrial revolution.	4.57	0.841	Strongly agree	8
6	Providing continuous training for those concerned with using the applications of the fourth industrial revolution in the development of university administration.	4.85	0.899	Strongly agree	1
7	Intensifying efforts to Arabize systems related to the use of fourth industrial revolution technologies in the development of university administration.	4.62	0.855	Strongly agree	7
8	Adopting smart university building management systems based on the applications of the fourth industrial revolution such as artificial intelligence.	4.39	0.722	Strongly agree	12
9	Benefiting from the pioneering university experiences in the field of using the applications of the fourth industrial revolution in the development of university administration.	4.42	0.749	Strongly agree	11
10	Developing the awareness of university leaders of the importance of employing the requirements of the industrial revolution in the development of university administration.	4.43	0.759	Strongly agree	10
11	The university administration's interest in activating information technology governance to meet the challenges of the fourth industrial revolution.	4.69	0.870	Strongly agree	5
12	Providing a comprehensive and integrated system to protect the data and information of the university administration from threats and intrusions.	4.56	0.832	Strongly agree	9
	Overall average	**4.62**		**Strongly agree**	

These findings are obviously in line with the findings of some studies including Lliashenko et al. (2023) and Kayembe and Nel (2019), which showed that the education

sector is confronted with the challenges of the fourth industrial revolution and that the South African government must make investments in the development of infrastructure, human, technical, and financial capacity to ensure that the education system is developed to effectively participate in the fourth industrial revolution and its various applications. Furthermore, the findings of this dimension might partially account for the consistent findings of certain research, such as Deja (2023) and Mao (2018), which emphasized the significance of utilizing cutting-edge information technology in the advancement of institutional administration.

3. Differences in the Academic Leaders' and Teaching Staff's Responses

This research attempted to verify the extent of the existence of statistically significant differences in the averages of the study sample regarding the most important obstacles that prevent the development of the university administration to meet the requirements of the fourth industrial revolution and the proposed mechanisms to overcome those obstacles attributed to the gender variable (male, female). The researchers used the weighted mean and *t*-test. The following table illustrates the findings.

The findings in Table 3 show that there are no statistically significant differences in the averages of the study sample regarding the most important obstacles that prevent the development of university administration to meet the requirements of the fourth industrial revolution and the proposed mechanisms to overcome those obstacles attributed to the gender variable (male, female). The researchers attribute this to the fact that academic leaders live in the same climate and organizational environment and are all affected by decisions related to developing their performance. This result is consistent with the results of Al-khathlan (2024) that confirmed there is no statistical differences due to gender variable.

Table 3. Statistical differences in the averages of the study sample attributed to the gender variable (male, female).

Dimensions	Sex	No	Weighted Mean	Standard Deviation	*t*-Test	Sig.
1	M	133	3.54	0.81	0.722	0.449
	F	99	3.67	0.89		
2	M	133	3.12	0.74	0.731	0.458
	F	99	3.25	0.81		
Total	M	133	3.46	0.76	0.738	0.463
	F	99	3.52	0.79		

4. Discussion

After presenting the results of the two dimensions, the researchers tried to identify the actual state of the UoH administration and to assess and identify the barriers that would prevent it from adapting to the fourth industrial revolution. On the other hand, this study concentrated on several methods that can be applied to improve the UoH administration's performance and support its capacity to handle the dynamic nature of this revolution. Based on the findings, the researchers confirm that the University of Ha'il's administration can be developed in light of the fourth industrial revolution by utilizing artificial intelligence applications and promoting digital transformation as part of the university's strategic directions in the management of Ha'il University, as well as using cloud computing and emerging technologies to develop the administrative work system, including the development of the university administration and improving administrative performance in the strategic directions of Ha'il University; offering some training programs to develop admin-

istrative capabilities and skills among academic and administrative leaders at the university and enhancing their sustainable professional development; and putting the university's developed structure into practice in a way that supports functional relations between all academic and administrative units, achieves organizational flexibility, and improves the university administration's ability to meet the demands of the digital revolution.

In addition, the process of developing the UoH administration requires developing the administrative regulations and systems in effect at the university, reviewing its executive rules in a manner consistent with the future direction of supporting innovation, enhancing innovative leadership practices, and reformulating them in a manner consistent with the processes of developing the performance of academic leaders, empowering them and granting them the power, authority, and complete independence to help them develop innovative solutions to university problems, and providing an effective administrative system that influences the behavior of employees and supports the work independence of academic leaders at Ha'il University.

Considering these results, the researchers recommend developing managerial competencies among university leaders to empower them to use the current technological tools and artificial intelligence applications, utilizing business intelligence and multidimensional data analysis in managing the business processes, and providing the technological infrastructure needed for digital transformation.

Research Implications and Limitations

The research attempted to develop the administration of the UoH in light of the requirements of the 4IR. It confirmed that UoH faces some challenges that may hinder the process of developing the university administration. Some implications and limitations can be summarized as follows:

- The fourth industrial revolution (IR4.0) has a great impact on universities because it emphasizes digital transformation and calls for using and utilizing current administrative approaches and techniques to cope with its dynamic nature.
- There may be limitations on how academic leaders can modify their managerial practices to integrate IR4.0 technology in the university, as the deployment of various administrative techniques and methodologies must comply with university rules.
- Academic leaders, faculty, the community, and the government must all make sacrifices for universities to implement IR4.0, suggesting that these groups may face new difficulties and burdens as a result of the shift.
- The issue of technological infrastructure preparation is a major barrier that may prevent the university from successfully integrating information technology and artificial intelligence. It is impossible to completely utilize the potential benefits of IT tools without a sufficient technological foundation.
- The necessity of professional development and training for academic and administrative leaders is another limitation that has been brought to light. This is because leaders need to be prepared to use digital management tools and artificial intelligence to manage the university and transfer to smart universities. The successful implementation of creative administration techniques that make use of technology may be hampered by ongoing professional development.
- UoH leaders must adapt their plans, strategies, management, and organizational structures to the opportunities, difficulties, and demands of the 4IR. Academic leaders within universities need to adjust their visions, plans, organizational structures, and management regarding the demands, challenges, and opportunities of developing the administration of the university.

Future studies are thought to examine the current managerial approaches, strategies, and techniques that academic leaders and university administration can use to successfully meet the demands of IR4.0, improve institutional performance, and provide high-quality education. In order to better integrate digital innovations in teaching and learning, future research may look at the difficulties and barriers that institutions, students, and educators have when implementing IR4.0 technologies in higher education. It may also look for possible ways to overcome these difficulties.

5. Conclusions

Twenty-first century society is witnessing tremendous and multiple changes, both locally and globally, that have paved the way for the emergence of what is known as the fourth industrial revolution, which has significantly affected the management of Saudi universities and which requires them to respond quickly to these changes in a way that enables them to adapt by improving the performance of academic and administrative leadership, reconsidering the methods and strategies employed by university administration, and adopting advanced administrative approaches. One of the rare examples of research on the fourth industrial revolution is the study that is being presented. The fact that it takes into account the difficulties UoH might encounter in overseeing the organization of work is both a constraint and an opportunity. This study underscored the pressing necessity of employing various approaches to enhance UoH's managerial effectiveness. This is crucial for enhancing the university's performance and growing its administration. In actuality, this will have an impact on the caliber of research, academics, and community performance.

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