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Research Article

Restructuring and Transformation of Arab Educational Institutions into Fourth-Generation Universities

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Abstract: Over the years, technological development has transformed the role of universities in society and resulted in many changes in university education. New educational techniques are being shaped by the constantly changing personal characteristics from generation to generation. This study aims to understand the transformation of existing universities to fourth-generation universities in the Arab states. The study present a literature review of the technological advancements in education and the characteristics of fourth-generation universities, which are viewed as dynamic universities that interact with the surrounding environment through four mehanacims namely, knowledge transfer, knowledge creation, knowledge application and Leaders of change in the local and international environment. The study designed a survey form and distributed it to 463 faculty members at Arab universities, analysing 400 valid forms. The findings revealed the requirements of fourth-generation Arab universities. However, these findings need to be further developed and improved. The study also revealed the variables required for the transformation of Arab universities to the fourth-generation, as an independent variable that supports the competitive position of the universities from the faculty perspective.

Keywords: Higher education, fourth-generation universities, Arab universities, restructuring education.)

1. Introduction

Research states that the current generation may develop their intellectual abilities and research skills quicker than previous generations due to easier access to a variety of knowledge resources (Akdemir & Konakay, 2014, 2015). Alvarez (2016) advocated that they experience continuous mobility and training throughout their careers and are capable of organising and transmitting the information.

Since the time period for knowledge doubling curves is shorter, as promulgated by Buckminster Fuller, and because construction industry skills are becoming predominantly technology-oriented, there is a need to study the information technology (IT) and infrastructure required to support education (Wang et al., 2018). Teaching programs have been found to be insufficient in their response to the demands of new generations, suggesting that the educational environments and programmes need to be updated (Somyurek, 2014). The technology-oriented life of recent generations creates a demand for more interactive and technology-based education compared to previous generations.

In response to the changing contemporary business environment, technological developments, and competition, especially from non-university institutions, there has been a rising trend in the transformation of Arab universities towards becoming fourth-generation universities. This is in line with the aspirations of many countries such as Egypt and the Kingdom of Saudi Arabia in their plans for achieving sustainable development, to fulfil their 2030 vision and goals.

Organisational restructuring is one of the most complicated aspects to work out in enterprises (Vance, 2009). It comprises areas including customer relations, product development, sales and marketing, economic analyses, organisational change, stakeholder management, and technical management. Lazonick (2004) recommended a three-stage organisational restructuring approach as follows:

A. Diagnosis section, that aims to include an analysis of the company's strategic position, and its financial, operational, legal, and macroeconomic due diligence.

B. Planning segment, where goals and strategies are defined, and strategic and tactical plans for commercial enterprise advancement are adopted.

C. Implementation section, for implementing the restructuring programmes, along with monitoring, and, if necessary, methods of corrective actions.

For restructuring to succeed, it must be practical and feasible for the precise situation in which the organisation is functioning. The goals, approach, and intensity of structural changes can then be tailored to the management's capabilities and methods. A restructuring technique centred on the improvement of effectivity and effectiveness of business operations could be applied primarily based on the following alternate idea (Erić & Stošić, 2013):

A. First phase – This includes analysing the recognised target business roles in a new market, examining the present-day development strategy, thinking about business portfolio attractiveness, the competitive position, and competitors of the enterprise. Furthermore, there is an exact analytical image of business operations, aided by an in-depth evaluation or due diligence. Finally, this section must also encompass a strategic analysis, a universal assessment of the entire commercial enterprise, a strengths, weaknesses, opportunities, and threats (SWOT) analysis of the company, and a connection with the evaluation of success and the cost chain.

B. Second segment – This includes planning the change, (re)defining the vision and the mission statements and the set of restructuring goals, and deciding the fundamental instructions of restructuring, i.e. designing and choosing the strategies and measures required for the desired change. It is necessary to define and correctly evaluate one-of-a-kind alternatives for reaching the goals, and ensure proper budgeting in this phase. Furthermore, given that the success of restructuring relies on internal management and capabilities, it is necessary to create a graph for changes in this domain.

C. Third section – This comprises the implementation and monitoring of the restructuring program. It consists of measures for one-of-a-kind capabilities, know-how, and competence, institutionalisation of the new management style, and the advent of a precise commercial enterprise subculture to overcome resistance and implement measures effectively. Furthermore, a developed climate and capability to continue monitoring the implementation of adjustments with the aid of permanent enhancement of commercial enterprise and the conceivable revisions for the adopted restructuring method are essential for success in business.

Restructuring cannot be implemented only through financial ruin and liquidation. Much can be accomplished through aggressive restructuring, selective investments in modernising unique production capacities, and the merchandising of different varieties of cooperation with renowned partners from abroad. Some corporations and their personnel cannot be left alone to face the negative consequences of restructuring. Like the European Union (EU), restructuring must be carried out in a socially responsible manner with the help of the state (European Restructuring Monitor, 2012)

Profitable restructuring requires a sequence of crucial changes of the enterprise surroundings and company culture. This implies obtaining a total array of new skills, expertise, and capabilities in key spheres of doing business (production, finances, lookup and development, management, organisation, human sources structure, etc.) and forming a primarily exclusive organisational way of life which participates in the shaping of different factors of the employer and administration through its impact on interpretative schemes and behaviour of the individuals of the organisation. Depending on the values and norms embedded in the organisational culture, the pinnacle administration chooses the method and designs the organisational structure, managers structure their management style, and employees outline their motivation and desires (Janićijević, 2012).

2. Literature Review

Recently, Arab universities have realised that global competition between universities has led to healthy competition. Arab universities competing to transform into fourth-generation universities also encourage creativity and scientific research. The need to transform is necessary given the globalisation challenges and continued technology changes. There is also a need to improve the output (fresh graduates and postgraduates) to fit the changing labour market.

The process of transformation includes traditional and non-traditional teaching methods such as distance learning and digital learning technologies. Among these, the study mentioned that digital technologies are scalable. Moreover, in the training sector, the place large instructions remains a popular teaching method worldwide due to its price efficiency (Yardi, 2008). Technology is increasingly being used in lecture rooms to assist lecturers in attaining a variety of pedagogical goals, with scalable technologies serving these targets more effectively (Becker et al., 2018).

The classroom response system (CRS), which is also regarded as pupil response systems, personal response systems, immediate response systems, and digital response systems, and make use of clickers and target audience response systems, are popular amongst educators (Hunsu et al., 2016). A CRS allows lecturers to pose multiple choice questions before, during, and after their lecture, which students can respond to on their personal digital devices. The answers are aggregated in real-time to display the results to individual students or the entire class. This enables lecturers to monitor the students' understanding of matters (Caldwell, 2007) and, if necessary, focus on points that students found difficult. Due to its anonymity, CRS helps shy and hesitant college students to overcome their inhibitions in class (Graham et al., 2007). Moreover, because the interest span of students lasts for around 20 minutes (Burns, 1985), lecturers can use CRS to break up lengthy presentations, while allowing students to actively use their study content. Meta analyses have highlighted 'small' consequences on cognitive outcomes, and 'medium' results on non-cognitive outcomes (Cain et al., 2009; Castillo-Manzano et al., 2016).

Recording lectures is popular at many fourth-generation universities (Brockfeld et al., 2018; Liu & Kender, 2004). This includes providing students with recordings, permitting personal reviewing of content, and learning at their own pace (Demetriadis & Pombortsis, 2007). Moreover, e-lectures are popular among students, and beneficial to them when they are absent due to illnesses or other reasons (Gormley et al., 2009). However, there are conflicting views on the impact of e-lectures (Demetriadis & Pombortsis, 2007; Jadin et a;., 2009; Spickard et al., 2002).

Arab universities equipped with these technologies witness an increased quality of education, and this represents the transformation to fourth-generation universities.

2.1 Definition of fourth-generation universities

A fourth-generation university is defined as a dynamic university that interacts with the surrounding environment through three methods, namely, knowledge transfer (the mission of education), knowledge creation (the mission of scientific research), and knowledge application (the mission of society service). In addition to leadership change in the local and international environment, these methods use innovation and creativity to minimise costs while maximising productivity. They also help identify unconventional self-financing sources by marketing products within long-term relationships between educational institutions, governmental sectors, business units, and non-profit organisations to create a flow of benefits to stakeholders at the domestic, regional, and international levels. Fourth-generation universities' traits are based on four dimensions as illustrated in Figure 1. New graduates and is reflected in society's and government's efforts to sustain the society and economy.

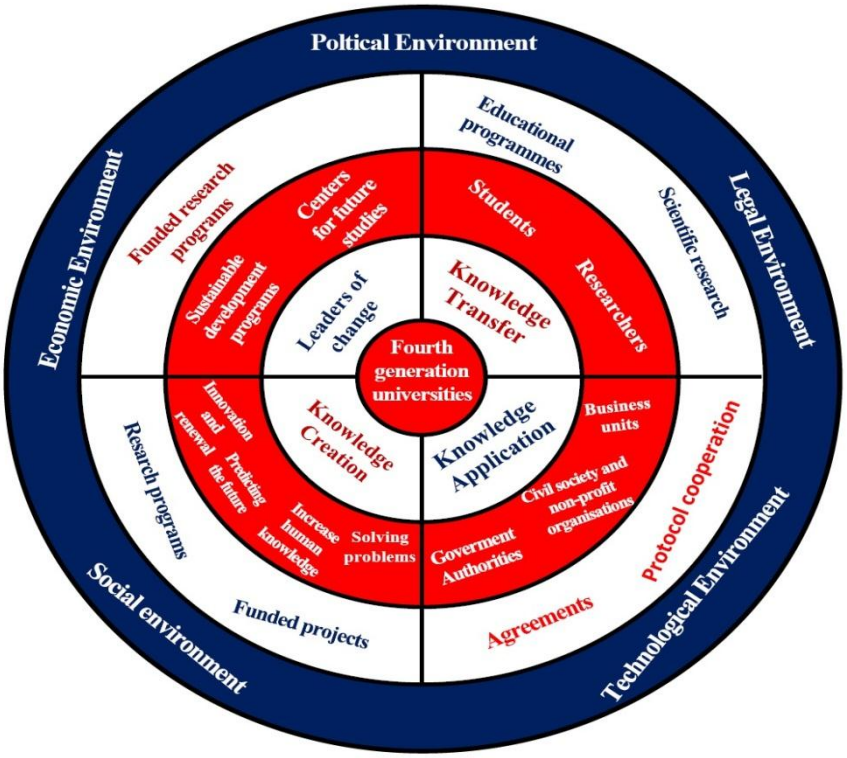

Figure 1: Missions of fourth-generation universities.

The third dimension builds on creating knowledge. Fourth-generation universities compete with each other on the creation of knowledge using the latest methods and encourage creativity and innovation. These enable universities to predict future needs and requirements, adapt to problems, and solve them.

The fourth dimension is the leadership of change. Universities find policy makers and build strategies in societies, as they contain centres for future studies that work to achieve sustainable development not only at the local level, but also at the international level.

According to the literature, there is no scientific consensus regarding the exact definition of fourth generation universities. Today, modern universities have to face global competition and be able to proactively influence the socioeconomic processes of the region in which they are located. These processes and effects can contribute to the competitiveness of the region through complex direct and indirect systems on a diverse scale when it comes to regions with various levels of development (Lukovics & Zuti, 2017).

While there is no scientific consensus yet regarding fourth generation universities or the definition, a logical approach to this concept may advance our thinking regarding university-focused economic development. Eurostat (2014) concluded that the biggest distinguishing factor of these universities is proactiveness. Higher education institutions crucially affect the transitions of local economy and society, given the needs of knowledge-based society. The logic of 'fourth-generation' universities is broader than 'third-generation' universities, with respect to their potential effect on the local economy and society. The former actively shape their socioeconomic environment, requiring emphasis on responsible innovation, a function clearly identified with fourth-generation universities.

In this concept, the escalation of the strategic approach and the innovative, flexible organisational culture also play a crucial role. These days, it is necessary to effectively and strategically plan the future. The universities in less developed regions must be proactive-thinking, and broaden their profile with activities that result in success, while abandoning stiff organisational structures. The essence of fourth-generation universities can be tapped in the present era, with the interdependence of economy, society, globalisation processes, and information technology. Thus, universities need to position themselves accurately on local, regional/national, and global levels. The creation of an excellent workforce, the utilisation of innovation results, and participation in networks are crucial factors.

Table 1: Some characteristics of first-, second-, third-, and fourth-generation universities.

Aspect	First-generation universities	Second-generation universities	Third-generation universities	Fourth-generation universities
Goal	Education	Education and research	Education, research, and utilisation of knowledge	Education, research, and utilisation of knowledge and proactive economic development
Role	Protection of truth	The cognition of nature	Creation of added value	Creation of strategic aims, and the role of the engine in the local economy
Output	Professionals	Professionals and scientists	Professionals, scientists, and entrepreneurs	Professionals, scientists, entrepreneurs, and the competitive local economy
Language	Latin	National	English	Multilingual (national and English)
Management	Chancellor	Part-time scientists	Professional management	Professional management and local experts

Source: Prepared by the authors based on Wissema (2009)

Besides education, research, and the utilisation of knowledge, proactive, future-oriented economic development is also a significant goal of these universities. The university is both the catalyst and driver of economy. It has a great role in highlighting strategic aims. It also creates and forms a community of experts, researchers, and entrepreneurs. The multilingual operation here becomes necessary because of international corporations and networks. Professional management is responsible for important strategic and operative activities. Here, the role of locally experienced and informed economic development experts is emphasised.

Within this new paradigm for growth, universities are central stakeholders capable of underpinning societal transformation. Their standing allows them to prepare leaders of the future, generate knowledge that underpins sustainable economic growth and sustainability industries, transform into sustainable organisations, and most significantly, embed sustainability as a value in regional governance systems. As such, they can be key instruments of societal thought leadership and transformation.

The fourth-generation university focuses on combining research, teaching, and enabling sustainable development, with stakeholders located within and outside its institutional boundaries. Since it is geographically embedded, the balance and execution of programmes may vary.

Universities in developing countries must fulfil the needs and demands of knowledge-based society. Since internationally-acknowledged universities are attached to the local economy, they interact daily with local actors. A question inevitably emerges: what conditions must universities fulfil to be able to evolve locally and create and maintain a global presence?

2.2. Characteristics and elements of fourth-generation universities

With an analysis of the competitive role, the potential economic development effects, and the economic-social environment of universities, the study can create a virtual model of successful fourth-generation universities. The characteristics of successful universities can be determined, as contemporary global higher education rankings have their own criteria and methodology regarding successful universities. The success factors can be determined by the analysis of university strategies. Table 2 illustrates the characteristics and distinctive features of fourth-generation universities.

Table 2. Characteristics and distinctive features of fourth-generation universities.

Properties	Elements
Social Orientation	-Personalising education and building individual education cards (smart card) -Effective communication and cooperation in education -Application of design technology and games in education -Communication and cooperation via social networking services (SNS)
Mobility	-Access to scientific content through mobile devices and its use in scientific research -Payment transactions - Obtaining feedback from faculty or administration members -Access of faculty members and students to educational services anywhere, anytime
Accessibility	-Easy access to information resources and services -Use of e-learning resources -Easy access to databases and media library - Easy access to all online resources
Technological effectiveness	Increase the efficiency of the university's technological infrastructure through cloud technologies, and innovative virtual simulation techniques based on principles of simplicity, modularity, and scalability
Openness	-Providing open databases containing educational materials to support e-learning courses and providing training for students -Access to scientific articles and their results, and conducting research

Source: Prepared by the authors based on Morze et al. (2013)

The characteristics that distinguish fourth-generation universities from third-generation universities are beyond the characteristics of the fourth industrial revolution which can be reviewed as follows:

2.2.1. Adopting digitalisation

Fourth-generation universities are characterised by the trend towards digital technologies, with the aim of ensuring employment, development, and change. This requires digital training for all employees of educational institutions to develop digital skills, i.e. a mixture of the digital mentality of devices, information, programs, security, innovation, and systems, and knowledge regarding analysis, theories, skills, competencies, and trends such as beliefs and values (e.g. creativity, independence, individual will, integrity, trust, and cooperation) (Gekara et al., 2017).

The main obstacles to achieving digitalisation trends are the following (Geissbauer et. al., 2016):

A. Lack of a clear vision for digital transformation;
B. High financial requirements;
C. Lack of familiarity with the privacy and security of external data and information;
D. Insufficient existing skills;
E. The lack of digital standards;
F. Lack of cooperation in the field of digital solutions; and
G. Fear and resistance to change.

2.2.2. Physical preparations

The services provided by fourth-generation universities are characterised by high technological levels which must include classrooms equipped with computers, Internet networks, and advanced technological systems, as well as visual and audio devices necessary to teach students at the university, and those who live far from the university headquarters. The digital equipment also include smart interactive panels; large display screens to display students' pictures and their activities through the Internet; a number of video cameras to capture various activities; software systems for facial, voice, and motion recognition; digital content repositories; learning resources; hosting and shaping systems; group discussions evaluation; and security systems for recording safe entry and exit (Colleen & Uskov, 2018).

Each faculty member needs a tablet to run presentations, video, and audio clips, as well as a smart board to write equations, formulas, etc. Moreover, they require a document camera, presence and attendance analysis systems, and analytical systems to analyse class performance and results. Each student needs a tablet or laptop computer, equipped with the necessary software applications with Internet connections (Colleen & Uskov, 2018).

2.2.3. New educational software

Fourth-generation universities offer educational programmes with different characteristics compared to traditional educational programmes. They are usually short-term with the aim of acquiring various professional competencies that respond to industry changes and the needs of the labour market, enable rapid development with the changing needs of the workforce, and facilitate a graduate to increase their professional skills. Universities also act as mediators between supporters, mentors, potential financiers, and young entrepreneurs (Benešová & Tupa, 2017).

2.2.4. Teaching and learning

Fourth-generation universities are working on qualifying and preparing human elements with digital skills, to invest in modern devices and technologies, provided by the fourth industrial revolution. This is achieved in an educational environment that improves the quality of learning, teaching, and training at any time and place, and imposes a trend to change the way of learning while promoting innovation, and providing incentives (Marwala & Xing, 2017).

Fourth-generation universities utilises digital communication, learning by playing, project-based learning, cooperative learning, blended learning, and direct learning as the virtual environment provides great educational value through access to knowledge processes at low costs, enhancement of interactive participation, and improvement in education. Direct learning also contributes to the development of analytical expressions, creative and social skills, and problem-solving abilities. Therefore, modern technologies must be included in university education systems (Frey & Osborne, 2015; Marwala & Xing, 2017).

Alongside the fourth-generation universities adopting virtual education through open platforms for free and flexible educational courses is edx.org, a model of free educational global platforms. Virtual education can also conduct assessments several times until the required competency is obtained or new skills are acquired, thereby improving the quality of education (Frey & Osborne, 2015; Marwala & Xing, 2017).

Teaching and learning in fourth-generation universities are characterised by complete flexibility (choosing educational programmes/scientific sources/evaluation date), as students have complete freedom in achieving their educational goals, and choosing from among various groups of educational programmes, means of education, and experiences according to their interests, abilities and needs.

2.2.5. Scientific Research

Scientific research processes in fourth-generation universities are characterised by the timeliness of research projects, the promotion of innovative research with the aim of creating new theories and ideas as well as the global character of scientific research, which is evident in the international cooperation between researchers and universities conducting scientific research and research projects. This is detailed in the Protection Policies for Intellectual Property Assets against Digital Fraud (Saxena et. al., 2017; Marwala & Xing , 2017).

Advanced technologies have also mandated fourth-generation universities to research the rationale and ethical reasons for new practices within society, and thus re-design and rebuild moral systems, such as the ethics of artificial intelligence, as well as cultural and social ethics in new societies (Efimov & Lapteva, 2017).

2.2.6. Internationalisation

The double or joint grades system is a system in which the foreign and domestic education providers cooperate to provide programmes with the aim of obtaining a common qualification and blended learning. The providers offer programmes to enrol students in different and mixed forms such as e-learning and online learning, learning through sites, international research collaboration, and international community engagement.

2.2.7. Lifelong learning

Given the need to spread the culture of lifelong learning, these universities must develop infrastructure that allows continuous education and provide training in a smooth manner at any time, in conjunction with the rapid technological developments occurring in the global labour market with increased technological and digital skills (Leopold et al., 2017).

This requires flexible structures for its programs so that students are enrolled in educational programmes for life according to their needs, and programmes must be designed in such a way that there are not only graduates, but students who are continuing education for life, while allowing exit and return to educational programmes to continuously develop the skills they need during their professional lives. (Saxena et.al., 2017).

3. Methodology and data analysis

The study used a qualitative approach to analyse the reality of Arab universities. The Arab world consists of 22 countries, with approximately 435 universities distributed over the 22 Arab states, categorised as governmental, private, and non-profit. There is variation in the level of these universities, as the level of many of them has declined while that of others has progressed rapidly in some Arab countries, such as Egypt, Iraq, Lebanon, Saudi Arabia, the United Arab Emirates (UAE), Jordan, Morocco, and Algeria. Questionnaires were used as a data collection tool, and these were sent to the participants via online Google forms. These questionnaires were prepared according to the Likert scale (1–5). The survey started with questions regarding general information. The participants were then asked about the application requirements for fourth-generation universities, obstacles faced in applying to these universities, and the future of technology.

3.1. Hypothesis No.1

Based on the observation and discussion with stakeholders in Arab universities, this study tested following null hypothesis:

H_0: There is no significant difference among the universities (public/private/ non-profit) regarding the fourth era of transformation impediments, from the point of view of faculty members.

To determine the extent of difference in the impediments of transition to the fourth generation among universities from the point of view of faculty members, the study implemented Kruskal Wallis Test (Aaker et al., 2014; Malhotra, 2011). The test results are shown in Table 3 as follows:

Table 3. Kruskal Wallis Test (Test Statistics[a,b])

Sig. (p-value)	(χ^2)	df	Mean Rank		
			Non-profit	Private	Public
.083	4.973	2	180.75	202.90	213.58

[a]Kruskal Wallis Test
[b]Grouping Variable: University (public/private/non-profit)

Table 3 indicates that there is no significant difference in the impediments to the fourth-generation transition among universities from the point of view of the faculty members at a level of statistical significance (5%) The p-value is equal to .083. The results show the convergence of the average ranks among universities according to the ownership pattern, as it reached 213.58 in public universities, 202.90 in private universities and 180.75 in non-profit universities.

3.2 Hypothesis No.2

Based on the observation and discussion with stakeholders in Arab universities, the study tested the following null hypothesis:

> ***H_0: There is no significant difference between obstacles to the transformation of the fourth-generation universities among the Arab countries from the viewpoint of the faculty members.***

Table 4 below shows the results of the Kruskal Wallis Test

Table 4. Kruskal Wallis Test

Countries	N	Mean Rank
Egypt	40	244.93
Saudi Arabia	40	68.65
Kuwait	40	61.68
UAE	40	57.66
Yemen	40	279.44
Morocco	40	239.56
Algeria	40	241.36
Jordan	40	268.33
Syria	40	252.74
Iraq	40	290.66
Total	400	
chi-square	253.098	
df	9	
Asymp. Sig.	<.001	

The results in Table 4 indicate that there is a significant difference in the impediments to the transformation of the fourth-generation universities among the Arab countries from the point of view of the faculty members. The p-value was <.001. The disparity in the average ranks among Arab countries was 57.66 in the UAE, while the average in Iraq is 290.66, As per Table 4, there is a decrease in the percentage of handicaps in Saudi Arabia, Kuwait, and UAE and the average ranks converging between them, and this may be due to the researchers' point of view regarding the availability of financial resources and capabilities in these three countries. While the obstacles were moderate in some countries such as Egypt, Morocco, Algeria, and Jordan, the obstacles were high in Yemen, Syria, and Iraq. The political conditions in these countries may be among the factors that greatly affect the occurrence of these obstacles. The study reject the hypothesis that there is no significant difference between the obstacles to the transformation of the fourth-generation universities among the Arab countries from the point of view of the faculty members, implying that there are moral differences among the Arab countries towards the obstacles to the transformation of Arab universities to the fourth generation.

3.3. Hypothesis No.3

The study tested the following null hypothesis:

> ***H_0: There is no significant difference between the requirements for transition to the fourth generation among universities (public/private/non-profit) from the point of view of faculty members.***

Table 5 shows the results of the Kruskal Wallis Test.

Table 5. Kruskal Wallis Test (Test Statistics[a,b])

Sig. (p-value)	(χ^2)	df	Mean Rank		
			Non-profit	Private	Public
.075	5.192	2	181.25	201.16	215.24

[a]Kruskal Wallis Test
[b]Grouping Variable: University (Public/private/ non-profit)

The results in Table 5 show that there was no significant difference in the requirements for fourth-generation transition among universities from the point of view of faculty members at a level of statistical significance of 5% (according to the Kruskal Wallis Test). The results of this test show that the p-value is equal to .075. Also, it shows the convergence of the average ranks among universities according to the ownership pattern, with 215.24 in public universities, 201.16 in private universities, and 181.25 in non-profit universities.

3.4. Hypothesis No.4

Study tested the following null hypothesis:

H_0: There is no significant difference between the transition requirements for fourth-generation universities among Arab countries from the point of view of faculty members.

Table 6 shows the results of the Kruskal Wallis Test.

Table 6**. Kruskal Wallis Test**

Countries	N	Mean Rank
Egypt	40	200.55
Saudi Arabia	40	80.05
Kuwait	40	73.08
UAE	40	60.98
Yemen	40	342.84
Morocco	40	178.70
Algeria	40	185.36
Jordan	40	218.70
Syria	40	320.71
Iraq	40	344.04
Total	400	
chi-square	117.766	
df	9	
Asymp. Sig.	<.001	

The results in Table 6 show that there is a significant difference in the transition requirements for fourth-generation universities among Arab countries from the point of view of the faculty members, at a level of statistical significance of 1% (according to the Kruskal Wallis Test). The p-value was <.001. The difference in the average ranks among Arab countries is 60.98 in the UAE and 342.84 in Yemen. There is a low percentage of requirements in Saudi Arabia, Kuwait, and United Arab Emirates and the convergence of the average ranks between them, and this may be due to the availability of financial capabilities and resources in these states. While the requirements were moderate in some countries, including Egypt, Morocco, Algeria, and Jordan, they were high Yemen, Syria, and Iraq, possibly due to the political and economic conditions in these countries. Therefore, there are moral differences between the Arab countries towards the requirements of the transformation of Arab universities to the fourth generation.

3.5 Hypothesis No.5

The following null hypothesis was tested:

H_0: There is no significant difference in the relative importance of the fourth-generation transition requirements among Arab universities from the viewpoint of the faculty members.

To determine the relative importance of the fourth-generation transition requirements among Arab universities from the point of view of faculty members, the Relative Importance Index (RII) measurement was used, and the results of the analysis are shown in Table 7.

Table 7. Relative importance of faculty members in transformation requirements for fourth-generation universities

No.1	Requirements	Mean	Standard deviation	RII
1	One of the determinants of the success of providing digital products to universities is the identification of the needs, desires, and opinions of the target customers.	4.979	0.143	H
2	It is important for the university to know the trends of international universities to offer similar digital products to its customers.	4.960	0.219	H
3	Providing technology requirements is one of the determinants of transformation for successful fourth-generation universities.	4.947	0.222	H
4	Providing security requirements is one of the determinants of successful fourth-generation universities' transformation	4.911	0.412	H
5	The process of assessing the compatibility of the organisational structure, job description, and technological capabilities is important, so that the university can offer digital products to its customers.	4.590	0.547	H
6	Transformation management for fourth-generation universities is one of the determinants of successful university transformation.	4.282	0.681	H
7	The university's success in providing digital products to its target customers requires identifying the human and technological resources that support the provision of these products (the resource gap). .	4.049	0.921	H

No.1	Requirements	Mean	Standard deviation	RII
8	The university should adopt and announce a strategy for the transformation of the fourth-generation universities, to provide digital products to the university's customers.	4.041	0.304	H
9	.One of the determinants of the success of providing digital products to universities is to analyse the return and cost of the digital products that are alleged to be provided to the customers, so that the university does not suffer a loss.	4.047	0.211	H
10	The university's success in providing digital products to its target customers requires the development and modernisation of processes, whether customer-oriented or employee-oriented (the operations gap).	3.874	1.120	H-M
11	The university's success in completing the transformation to fourth-generation universities requires defining the digital products that must be offered to the target customers (the output gap).	3.762	1.254	H-M
12	The provision of human requirements is one of the determinants of transformation for successful fourth-generation universities.	3.705	0.758	H-M
13	The provision of financial allocations to finance the necessary human and financial needs and requirements is one of the determinants of a successful digital transformation.	3.691	0.625	H-M
14	Spreading the culture of transformation for fourth-generation universities among employees is one of the determinants of successful digital transformation.	2.822	0.821	M
Transformation requirements for fourth-generation universities		4.190	-	-

Table 7 indicates that Arab universities are clearly seeking to convert to fourth-generation universities, with an overall arithmetic average of 4.190. The Arab universities identify the needs, desires, and opinions of the target customers (the arithmetic average = 4.979), and the trends of international universities that offer similar products (the arithmetic average = 4.960). They seek to provide technology requirements, one of the determinants of transformation for successful fourth-generation universities, with an arithmetic mean of 4.947. However, there is a deficiency in the role of Arab universities with regard to spreading the culture of transformation for fourth-generation universities among university employees (the arithmetic mean = 2.822).

3.6. Hypothesis No.6

Study tested the following bull hypothesis

H_0: There is no significant impact of obstacles and requirements on the transformation of Arab universities to the fourth-generation among Arab countries enhancing their competitive position from the viewpoint of the faculty members.

Based on an analysis of the stationary series of data, ensuring that the mean and variance are invariant according to the unit root test, the study found the stationary of the series of the basic independent and dependent indicators at level zero. The study conducted the Augmented Dickey-Fuller (ADF), Philips–Perron (PP), Im, Pesaran and Shin W-stat (IPSW), Levin, Lin and Chu t (LLC) tests at a significance level less than .05, and found the Tau-statistic and Z-statistic criteria at a significance level less than .05.

Table 8. Panel Data Analysis

	Coefficient	*Std. Error*	*t-ratio*	*p-value*	
const	4.68275	0.0808478	57.92	<0.0001	***
X1	−0.0606951	0.0220938	−2.747	0.0063	***
X2	0.00168178	0.0279224	0.06023	0.9520	

Mean dependent var	4.477250	S.D. dependent var	0.264352
Sum squared resid	23.53885	S.E. of regression	0.246307
LSDV *R*-squared	0.155798	Within *R*-squared	0.037472
LSDV *F* (11, 388)	6.509622	*P*-value(*F*)	5.71e-10
Log-likelihood	−1.012976	Akaike criterion	26.02595
Schwarz criterion	73.92353	Hannan-Quinn	44.99401
rho	−0.034902	Durbin-Watson	2.028220

Note: Model 1 represents fixed effects, using 400 observations, included 10 cross-sectional units. Number of attitudes per sectional unit= 40. Dependent variable: Y.

Joint test on named regressors Test statistic: *F* (2, 388) = 7.55267 with *p*-value = *P* (*F* (2, 388) > 7.55267) = 0.000605561.

Test for differing group intercepts - Null hypothesis: The groups have a common intercept, where the test statistic: *F* (9, 388) = 6.10926, with *p*-value = *P* (*F* (9, 388) > 6.10926) = 4.76673e-008.

The variables of requirements of the transformation of Arab universities to the fourth generation as an independent variable to support the competitive position were accepted. However, the findings rejected the obstacles of the transformation of Arab universities to support their competitive position from the viewpoint of the faculty members.

4. Conclusion

The previous results indicated that there was no significant difference in the impediments to the fourth-generation transition between universities (public/private/non-profit) from the point of view of the faculty members at a level of statistical significance of 5% (according to the Kruskal Wallis Test). For the first and second hypotheses, the results indicated that there was a significant difference in the impediments to the transformation of the fourth-generation universities among the Arab countries from the point of view of the faculty members. The p-value was <.001, and the disparity in the average ranks among Arab countries ranged from 57.66 in the UAE, to 290.66 in Iraq. The third hypothesis result showed that there is no significant difference in the requirements for fourth-generation transition among universities from the point of view of faculty members at a level of statistical significance of 5%, while the fourth hypothesis result showed that there is a significant difference in the transition requirements for fourth-generation universities among Arab countries from the point of view of the faculty members, at a level of statistical significance of 1%. The p-value is <.001, and the difference in the average ranks between Arab countries was apparent, as it reached 60.98 in the UAE, while the average in Yemen reached 342.84. The fifth hypothesis results indicated that Arab universities are clearly seeking to convert to fourth-generation universities with an arithmetic average of 4.190. The Arab universities identified the needs, desires, and opinions of the target customers (the arithmetic average = 4.979) and the trends of international universities that offer similar products (the arithmetic average = 4.960). They seek to provide technology requirements, one of the determinants of transformation for successful fourth-generation universities (arithmetic mean = 4.947).

However, there was a deficiency in the role of Arab universities with regard to spreading the culture of transformation for fourth-generation universities among university employees (arithmetic mean = 2.822). Finally, the sixth hypothesis results showed that the variables of requirements of the transformation of Arab universities to the fourth generation as an independent variable to support the competitive position were accepted.

The Arab nations have realised that the development of the higher education system and universities is an urgent necessity to be able to maintain pace with global improvement in various fields such as competition in the local and worldwide labour market. Innovation and modernisation facilitate the transference of information of giant universities in Europe and the USA and following the steps of these universities would strengthen the instructional approach.

Finally, the transformation of Arab universities to fourth-generation universities by restructuring is a mission that has many obstacles and tasks that vary among Arab countries. Among the most important characteristics of the fourth -generation of quality in university education institutions are the following:

A. Equipping the educational institution with modern digital technology

The educational institution that achieves the fourth generation of quality is equipped with smart and advanced digital technologies, in order to keep pace with the rapid changes in the era of digital transformation and have the ability to follow the latest developments, identify new methods of acquiring the information, and open new horizons for innovation (Sisodia & Forero, 2020). These would greatly contribute to improvement in the level of educational institutions, their developments, and quality enhancement.

B. Dealing with and handling enormous data in smart ways

By providing the educational institution with many smart devices and advanced technologies, a huge amount of data on the various elements of the educational institution will be collected rapidly, and analysed and processed using high-performance computer programs. Thereafter, one can obtain the information required for the processes of developing the educational institution and improving its quality, as it may be beneficial in the effectiveness of decision-making and the speed of its adoption in a timely manner (Emblemsvåg, 2020)

C. Integration between the elements of the educational institution and linking them with technology

Attention is given to linking the units and departments of the educational institution with technology and achieving integration between them through managing databases, creating websites, and relying on the Internet to handle and send data. This is in contrast to departments and units within the educational institution that achieve horizontal integration, as well as link the different units and divisions to achieve hierarchical vertical integration, relying on centralised storage of data digitally via the Internet (Sony et al., 2020)

D. Achieving a competitive advantage for the educational institution

One of the characteristics of achieving the fourth generation of quality in educational institutions is that they obtain a competitive advantage that distinguishes them from their rivals by providing high-quality educational services using advanced digital technologies which may contribute to raising the level of the educational institution's international ranking in the field of university education (Sisodia & Forero, 2020)

E. Contribution of all individuals to continuous improvement processes

Everyone shares the responsibility of achieving the highest level of quality in the educational institution. The use of smart technologies in sharing information among the various departments and units for the development of the educational institution, with the availability of transparency and accountability in the event of default, and identifying the interest of individuals to self-learn and adapt to various developments are included among the improvement processes (Radziwill, 2020).

4. Recommendations

4.1 The education sector is a promising field for investment in the Arab world, and particularly in Egypt and Jordan due to an increase in the population and high demand for educational services for both undergraduate and postgraduate students. Private sector universities, specifically fourth-generation entities experience growing and rapid demand for their services, and they are continuously expanding for this reason.

4.2 Governments must enhance and invest in the education sector, specifically fourth-generation universities, as they are considered as drivers of growth. This can be achieved by knowledge transfer of educational programmes, applying knowledge through partnerships with the governmental and private sectors, and encouraging scientific research in addition to funding and supporting research centres that may be involved in future decision- and policymaking.

4.3 The management and executives of universities must take the initiative of switching to fourth-generation universities even if they do not have the necessary resources and funding available. Management teams should think 'out of the box' to determine new ways of funding by providing quality education and this can be achieved through associations and partnerships with first line academic institutions.

4.4 For further research, researchers should figure out the potential fields for future educational programmes in addition to determining methods of unconventional funding for universities.

4.5 Fourth generation universities must be entrepreneurship institutions, and this can only be done through integrated efforts, and they must provide added value to stakeholders (Wagdi and Hasaneen, 2019). The executive plan aims for Arab universities to keep pace with the elements of transformation for fourth-generation universities, based on four main axes, namely, the first axis (the founding capacity of a university), the second axis (the most important characteristics of the fourth-generation universities), the third axis (the most important international trends in the field of educational services, according to the fourth-generation universities), and the fourth axis (an implementation plan for universities to meet the requirements of the fourth-generation universities). Thus, the importance of the proposed plan is embodied in that it works to fill three gaps. The input gap is the current available resource gap for the university with the expectations of the requirements of the fourth-generation universities. The operations gap is the gap of practices that take place within the university with the requirements of fourth-generation universities. Finally, the output gap is the educational and research output gap, considering the requirements of the fourth industrial revolution.

Table 9. Executive layout for advance action plan for universities

No.	Stage	Description	Implementation responsibility	Mechanism	Expected duration	Budget
1	Adopting and announcing the strategy for fourth-generation transformation in the university.	Adopting and imposing a strategic plan at the level of university which works to strengthen human and material abilities and abilities inside the university. This method should include support for the senior management of the digital transformation programme, and the participation of all educational staff of the university in formulating the digital transformation strategy. This includes deciding the extent of the digital divide in the university, formulating, stating, and activating the digital transformation policy, defining responsibilities, how to control and reveal it, and reviewing the implementation of the approach and its operational plan.	Top management	Decision from university's board and published as a statement	One month	**According to the university's size and the type of its activity**
2	Self-assessment of the university.	Identifying each of the human and financial resources under the control of the university, in addition to the organisational traits of the university. These consist of the traits of the organisational structure, the degree of organisational conflict, the prevailing organisational lifestyle in the university, and the overall performance assessment of both the stage of the banking unit as a whole, or the organisational sectors.	Committee of top management, operations manager, and stakeholders.	Market research and SWOT analysis Pestle analysis Porter analysis	Three months	
3	Identify the main traits in supplying digital educational products and research.	Identifying the leading practices at the regional and worldwide stages associated with the provision of digital educational products to university.	Committee of marketing experts	Workshops and brainstorming sessions with stakeholders	Three months	

No.	Stage	Description	Implementation responsibility	Mechanism	Expected duration	Budget
4	Determining the digital gap of the university.	Comprises three gaps, namely: the enter gap (or the useful resource gap) which estimates the sources required to set off digital merchandise inside the university; the operations gap which determines the extent of distinction between the present day practices inside the university actually, and the approaches that must be on hand to spark off the digital educational products; and the output gap which is the extent of distinction between the educational products furnished by the university and the digital merchandise that the university desires to provide to its goal stakeholder.	Committee of top management, operations manager, stakeholders, and technology and organisational experts	Workshops, brainstorming sessions with stakeholders, and identifying the training programs required	One month	
5	Providing economic allocations to finance the human and financial needs.	Providing economic allocations to finance the human and financial wants and necessities fundamental to gain the digital transformation of the university, provided that these resources are sustainable.	Committee of top management, operations manager, stakeholders, and financial experts	Capital budgeting Funding resources Private equity funds Sponsorships Agreements Research projects funded by business units and non-profit organisations .	One month	
6	Spreading the culture of digital transformation among the personnel of the university.	Informing the staff of the things that occur inside the university on a regular basis, with emphasis on training. This enables using technological equipment to meet a variety of desires for the digital transformation process.	Top management and human resources experts	Workshops and brainstorming sessions with stakeholders (the academic staff members, and non-academic staff)	Three months	

No.	Stage	Description	Implementation responsibility	Mechanism	Expected duration	Budget
7	Managing digital transformation.	Supplying the organisational structures with university flexibility, as a substitute to altering the job description cards, given the need for a human skill that can innovate, instead of changing instructions among administrative facilities and levels.	Committee of top management, operations manager, stakeholders, and technology and organisational experts	New organisational structure New educational programmes New faculties and research centres New websites Transforming documents to digital Training for human factors	Three months	**According to the university's size and the type of its activity**
8	Achieving human requirements for supplying digital merchandise to university.	The availability of a human component capable of dealing with technology in university devices is the most important issue in digital transformation. It represents intellectual capital and undertakes strategic planning for the factors of digital management and their implementation, and overcomes their problems. The university acquires its goals, even if they possess the most contemporary equipment, machines, and electronic devices.	Top management and human resources experts	Check list of human resources requirements	One month	
9	Achieving the technical requirements for supplying digital educational products to university.	The digital transformation in a university requires presenting the infrastructure for that transformation by offering appropriate factors of contact between the management and their departments. Additionally, they may employ technological know-how in offering digital merchandise that meet the wishes of stakeholder. The university should be provided with software programmes, and communication networks linked to the inner and external statistics network, alternatively of digital authentication systems.	Top management and technology experts	Check list of technical resources requirements	One month	

No.	Stage	Description	Implementation responsibility	Mechanism	Expected duration	Budget
10	Achieving protection necessities for imparting digital educational products to university.	The provision of security techniques and processes is of the utmost significance in university. This is in view of the technological revolution and the spread of many tries to penetrate laptop structures worldwide, with the intent of stealing or destroying information. Methods include using digital protection equipment for educational products, associated databases and associated communication networks.	Top management and technology experts	Check list of technical resources requirements	One month	**According to the university's size and the type of its activity**
11	Feedback and inspect stability	Follow the university's activities	Top management	Applied benchmark approach	One year	
12	Corrective actions	Using the benchmark between the planned activities and actual.	Committee of top management, operations manager, and stakeholders.	Create a new action plan	Three months	

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