

## **The transition of developing countries to the fourth-generation university: A strategic model**

**By**

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### **Abstract**

The higher education system of any country is its driving force for socioeconomic development. The research mainly aimed to identify and determine the relationships between the pillars and components of the fourth-generation university in developing countries. The methodology was exploratory mixed-methods (qualitative-quantitative) in terms of data type. The statistical population was composed of academic and organizational experts in the qualitative phase and managers, deputies, administrative staff, and postgraduate students at the Department of Entrepreneurship, Tehran University in the quantitative phase. The participants for the qualitative phase were selected by the purposive (judgmental) method, and the interviews were continued until reaching theoretical saturation, which happened at the 12<sup>th</sup> interview. The statistical sample size for the quantitative phase was determined to be 273 by Cochran's formula and the participants were selected by simple randomization. Data were collected through semi-structured interviews and a researcher-designed questionnaire. The validity and reliability were assessed and confirmed for both qualitative and quantitative phases. Data in the qualitative phase were analyzed by content analysis method through the three steps of open, axial, and selective coding using the MAXQDA2020 software package. In the second phase, data were analyzed by confirmatory and exploratory factor analysis using the SmartPLS and SPSS software packages. Based on the results, the factors underpinning the transition of developing countries to the fourth-generation university were studied in four domains of macro-level, intermediate-level, organizational-level, and micro-level factors. Also, the pillars of the fourth-generation university were found to include "responsiveness to society needs", "entrepreneurship", "social responsibility", and "responsive research".

**Keywords:** developing countries, fourth-generation university, university

### **Introduction**

Universities play a key role in regional dynamism and growth. On the one hand, they are grand economic factors and influence economic and local activities directly and on the other hand, they help the cultural ecosystem and natural environment of the region that they belong (Ribeiro et al., 2020). Today, universities are the key players in knowledge-intensive economies and are not only the hub of new knowledge generation but also strengthen entrepreneurship and derive regional economic development (Teixeira et al., 2020). Higher education development is considered an almost unconstrained strategy for coping with different forms of social, political, economic, and geographical injustice in low-income and less-developed countries (Datzberger, 2018). Universities are currently the main factor forging national and regional environments. These organizations have undergone dramatic

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transformations during the third and fourth academic revolutions. The emergence and development of entrepreneurial universities and fourth-generation universities is an ongoing process whose dynamism can be measured by quantitative and qualitative indices of social and economic development in developing countries.

Universities can accomplish their missions through three paths. The first path is “teaching” by which they can provide a practical learning experience, thereby influencing the life of people and regional organizations and serving the regional needs by supplying skillful and capable human resources. The second path is “research”, which leads to the motivation of opportunity discovery in the short run and forms the basis of education in the long run. However, this path can deeply be affected by macro-level factors, such as government, industry, media, and the academic people themselves. The third path, which presently is more in focus, encompasses a wide range of activities that show the commitment of the universities to contributing to meeting the needs of society more directly, such as holding practical and general courses for the benefit of local communities and fostering informal or formal relationships with industries. This path is “production, exploitation, application, and sharing of knowledge outside the academic campus”. In other words, the third path is the interaction between the universities and the rest of society. Universities can develop innovation, and innovation can influence local competitive advantage and consequently economic development depending on regional potential and society needs (Amarante & Crubellate, 2020). All these happen in fourth-generation universities. These universities are mainly characterized by their tendency to seek development and transcendence, to be demand-centered, and to contribute to local development. Accordingly, this research aims to identify the relationships between the pillars and factors influencing the transition of developing countries to the fourth generation of universities.

Given these challenges, the main question that arises is what factors influence the transition of developing countries to fourth-generation universities and how they are related to one another.

## **Theoretical Framework and Literature Review**

There is no doubt about the vital role of universities in the development of countries. Universities have been founded to educate creative and innovative experts that can open new horizons for society. The more capable this institution is in achieving its goals, the more novel perspectives the society will have. In other words, the prosperity and dynamism of universities have a direct relationship with the transcendence and development of any country, and any interruption in the functions and goals of the university will cause society to struggle with numerous issues and problems. These issues and problems will sustain if universities stay at the first to third generations, but the transition to fourth-generation universities can alleviate them.

An important point is the bilateral effects of the university and the environment. Indeed, the relationship between the university and the environment is not unilateral but bilateral. In other words, when universities engage in entrepreneurship to a greater extent, their behavior influences the institutional environment, creates new pressures, and makes necessary new conditions and standards, and this continuous cycle makes development possible (Fonseca and Salomaa, 2020). This is the reason why the transition to the fourth-generation university is regarded as a strategic approach. In knowledge-based economies, emphasis is put on the cooperation of three pillars (universities and R&D organizations, the industrial sector, and the

government) for technology development. A policy adopted by governments for reinforcing this cooperation is to design and create intermediate institutions. Various categorizations have been present for the models of the relationships between the university and the industry in recent periods, according to which universities have been divided into four main generations characterized by simple and linear to complicated and networked features. Many countries have coordinated their national science, technology, and innovation system by triple helix models and have gradually developed them based on environmental factors, conditions, and requirements. In this regard, Quinn et al. (2009) argue about key academic stakeholders that while students are the most obvious and important customers of higher education, there are other stakeholders, e.g., parents, the government, society, employers, scientific communities, validators, and faculty members, that are regarded as the customers of higher education (cited from Jamali et al., 2013). Thus, the university as an accountable institution must be responsive to customers' requirements, but this responsiveness is tough and needs cooperation and interaction (universities, industries, the government, and society).

In this regard, Nibedita Saha (2020) describes the strategic perspectives of entrepreneurial universities and their impact on a regional innovation system. Neeta (2020) argues that the collection of appropriate frameworks, perspectives, and theoretical models from university stakeholders creates all-inclusive knowledge that lays the ground for providing practical solutions for the development of geography-based academic entrepreneurship. Fonseca Salomaa (2020) addresses the role of universities in the innovation and entrepreneurial performance of a region with a smart professional strategic plan. Teixeira et al. (2020) deal with the effect of universities on regional competitiveness and expresses that this process is influenced by factors like indigenous growth perspective, technology transfer, commercialization, and institutional factors. Similarly, Irina Pavlova (2020) states that institutions and universities are the main factors shaping national and regional environments and that the mission of universities is to ensure the dynamism and enhance the impacts of socioeconomic development in regions and territories quantitatively and qualitatively. Benneworth (2018) also expresses that entrepreneurial universities build frameworks that allow academic players to build new types of regional institutions, thereby positively participating in collective development activities (e.g., technology transfer clusters or networks). He emphasizes that continuous communication between academia and the regional people and stakeholders is critical to ensure constructive cooperation. Eatmon (2018) emphasizes knowledge commercialization through transnational education and interactive processes, which can strengthen regional development and have implications for socioeconomic development. Lopez et al. (2020) studied students' entrepreneurship intention in deprived and central regions. According to them, the students in marginal areas are more likely to become entrepreneurs. They, therefore, proposed to provide the infrastructure required for developing and grasping entrepreneurial opportunities. Charlene et al. (2020) state that the dynamism and success of incubators depend on the environment and geographical, political, economic, cultural, and social ecosystem. According to Amarante and Crubellate (2020), entrepreneurship development in universities depends on institutional work and is the result of the crossing between intra-organizational and extra-organizational forces, which is formed by a historical and regressive interaction between surveillance, normative, and cultural structures. Sergey (2020) reports that the development of a regional innovation ecosystem is based on a triple helix composed of the industry, the government, and universities. Accordingly, the top universities play a more important role in this regard. Bernardi and Azucar (2020) express that universities today are considered the main elements in providing practical training including social and interactive techniques, training for employment creation, and access to diverse networks and proper markets for reinforcing opportunity recognition capability for keen

entrepreneurs. Del Monte et al. (2019) researched the historical roots of regional entrepreneurship with a focus on the role of knowledge and creativity and reported that a history and culture of regional entrepreneurship and a social environment that lead to the formation of startups could imply the dependence of the regional entrepreneurship pathway. According to Astebro et al. (2019), people with an academic background are less likely to get involved in entrepreneurship than people with no academic background. This finding is important for redefining university missions. Jung et al. (2019) argue that Korea needs to make radical changes in its industrial structure and higher education systems to be ready to enter the potential years of technology unemployment. The government, the industry, and universities will play a key role in creating the knowledge and skills required for these changes. Allahar et al. (2019) acknowledge that the application of the triple helix and development steps can pave the way for the progress of universities towards achieving their development mission. This process can be accelerated by more potent leadership and more participation of internal and external stakeholders. Etzkowitz et al. (2019) point to the regional innovation clusters branched from the university and mentioned it as the first step of regional development. Similarly, Sanchez et al. (2019) note the good interaction of universities with the government and industry and state that universities play a special role in the region by exploiting incentives and interacting with the environment along the educational and research goals. Based on Fuster et al. (2019), commercial ecosystems can be strengthened by developing regional ecosystems of entrepreneurial universities, which will play a strategic role as a key factor in regional economic growth. Salomaa (2019) conducted a structural evaluation of the entrepreneurial university in rural areas and stated that universities should be responsive to regional needs in certain fields. Accordingly, the institutional response of the universities to the environment is their third mission. Atta et al. (2019) state that academic activities lay the ground for the penetration of global knowledge to the surrounding regions, which will create mechanisms to accelerate the flow of knowledge. Based on Protopopov et al. (2018), innovation in higher education as a tool for regional socioeconomic development plays an undeniable role in regional innovation development. In a research study on the relationship between higher education planning and regional development of science and technology, Hosseini et al. (2018) state that in addition to scrutinizing the current status of higher education and its adaptation to pioneering higher education systems in the world, it is necessary to consider higher education planning for the regional development of science and technology as a decisive factor in improving higher education quality and efficiency. Bakhtiyari et al. (2019) investigated the application of the scientometric method in higher education planning for the development of academic entrepreneurship. According to their report, the role of the university in the new higher education horizon is to develop entrepreneurial skills for the improvement of graduates' capabilities and their conversion into entrepreneurs. Higher education planning aims to develop plans that are tailored to society's requirements and are responsive to regional needs given regional conditions, talents, and considerations. The researchers reported that diverse research studies had addressed academic entrepreneurship and higher education planning in the world, but limited research has been conducted on the relationship between these two concepts. This is an emerging research field with a significant research gap.

## **Methodology**

This research aimed to present a model for the transition of developing countries to the fourth-generation university. It was an exploratory mixed-methods (qualitative-quantitative) study based on data type, a sectional study based on data collection time, and a survey based on data collection method and nature. The statistical population was composed of academic and organizational experts in the qualitative phase and the administrative managers, deputies,

staff, and postgraduate students at the Department of Entrepreneurship, Tehran University in the quantitative phase. The participants for the qualitative phase were selected by the purposive (judgmental) technique, and the interviews continued until reaching theoretical saturation, which happened at the 12<sup>th</sup> interview. The sample size for the quantitative phase was determined to be 273 using Cochran's formula, and they were taken by simple randomization. Data were collected through semi-structured interviews and a researcher-designed questionnaire. The validity of the instrument in the qualitative phase was checked by data source triangulation, peer-review, and review by participants, and its reliability was checked by inter-coder reliability and test-retest. The validity of the questionnaire was checked by face, content, and construct validity, and its reliability was checked by calculating Cronbach's alpha and composite reliability, which all were confirmed. Data in the qualitative phase were analyzed by the content analysis method through three steps of coding, including open, axial, and selective coding, using MAXQDA2020. In the second phase, data were analyzed by inferential and quantitative methods and the research questions were answered using structural equation modeling, confirmatory factor analysis, and exploratory factor analysis using the SmartPLS and SPSS software suites.

## Results

The tables of selective, axial, and open codes were extracted from the results of coding with MAXQDA2020.

**Table 1.** *Coding the pillars of fourth-generation universities*

Selective code	Axial code	Open code
Fourth-generation university pillars	Providing services tailored to society's needs	Indeed, external efficiency means meeting higher education needs tailored to society's needs.
	Entrepreneurship	A fourth-generation university is concerned with entrepreneurship and employment. The student is also a concern of the fourth-generation university, but in a more comprehensive way; i.e., it goes toward evolution and aims to be responsive to society's needs. So, entrepreneurship training and scientific education on entrepreneurship can be helpful. Life in the contemporary world can be partially education, partially research, and partially entrepreneurship.
	Research	The second-generation university was research-centered, which is still on agenda in the fourth-generation university. Research and, indeed, entrepreneurship are important and are all influential on society.
	Social responsibility	As you know, the fourth-generation university is related to the university's social responsibility. The fourth generation is the university's social responsibility.

Figure 1 presents the output of the MAXDQA2020 software for identifying the pillars of the fourth-generation university.

<b>Social responsibility</b>	<b>Providing services tailored to society's needs</b>
Research	Entrepreneurship

Figure 1. The key pillars of the fourth-generation university: the output of MAXQDA2020

**Table 2.** Coding to identify the factors underpinning the fourth-generation university

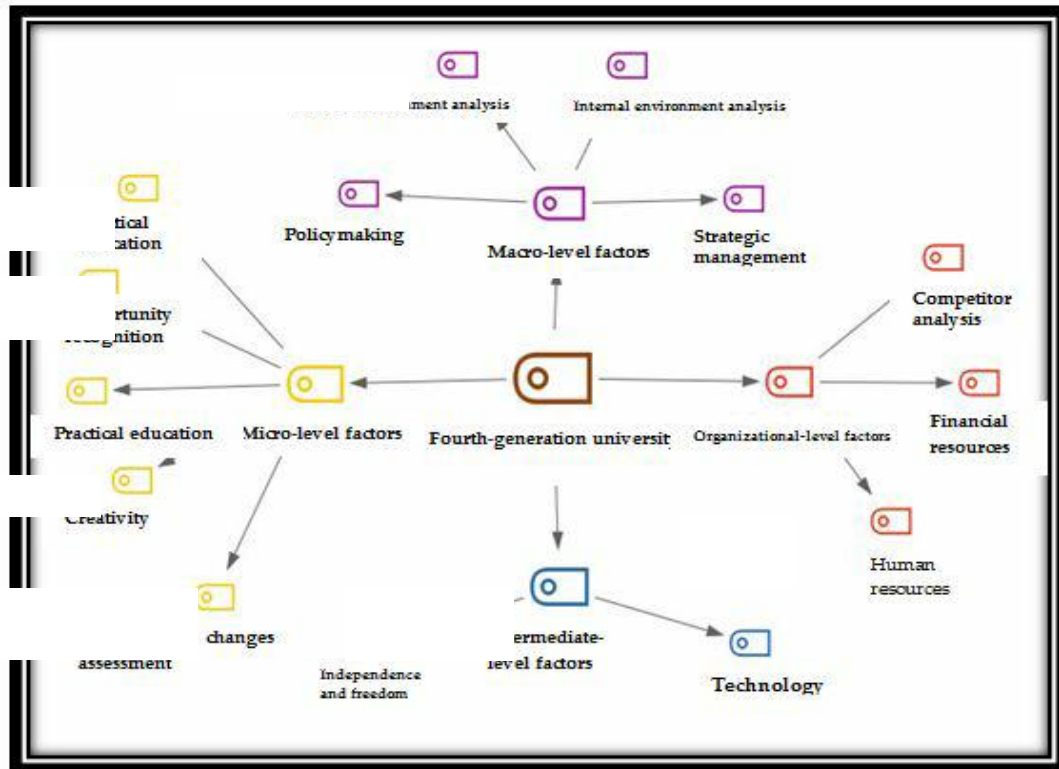
Selective code	Axial code	Open code
	Practical education	<p>The fourth-generation university focuses on purposive and responsive education. Awareness should be raised so that people do not enroll only to get a graduation certificate. A university is a place for people who really seek to gain expertise in a certain field and use the professional information of the university.</p>
	Assessment of content changes	<p>Education agents should develop content tailored to changes and developments. Skill-based materials and contents are included in the curricula. The current educational content matches modern changes in education.</p>
Micro-level factors	Creativity	<p>The university has a focus on creativity and innovation consistent with society's needs. The university can guide research by employing people's creativity and performing teamwork. Creativity in making science practical can pave the way for the development of the university towards the goals of the fourth-generation university.</p>
	Being skill-centered	<p>Training and skill acquisition should be addressed at the university to meet society's needs. Research should be purposeful and emphasize skill acquisition. Training should match educational approaches to make science practical.</p>
	Opportunity recognition	<p>The university can recognize and grasp opportunities. The university should be able to convert limitations to opportunities. Existing opportunities should be identified and utilized by the university.</p>

		Faculty members should be individually trained to convey the skills to the students.
	Human resources	Human resource empowerment is an academic priority for development.
		Financial supply can be important for costs, equipment, and technology.
	Financial resources	Budget allocation is an empowering factor of high importance.
Organizational-level factors		This university puts importance on financial and capital resources.
		Competitors and ways to gain competitive advantages should be identified.
	Competitor analysis	The university should be able to use the weaknesses and strengths of its competitors for improving its stance.
		The weaknesses and strengths of competitors can help realize the goals of the fourth-generation university in developing countries.
		There are specific classifications in the fourth-generation university regarding technology, relationship with the industry, and university industrialization.
	Technology	The technology that is used can lay the ground for scientific and financial support between the university and the intermediate institutions.
		The use of modern educational methods and useful instruments and techniques is effective in providing mature education in various fields.
		The university is independent and can influence its community.
Intermediate-level factors	Independence and freedom	Freedom and scientific and social responsibility can be regarded as effective components.
		It is of importance in these new-generation universities to observe basic human rights including free speech, scientific freedom, and freedom of research.
		The university's commitment to protecting the future can be one of the most important goals of fourth-generation universities.
	Foresight	The university has a role to play in foresight and future studies.
		Given its role in protecting the future as one of its key commitments, the fourth-generation university can be effective in developing future employment.

	Culture building	<p>The fourth-generation university is effective in changing and establishing culture.</p> <p>The development of an innovative culture is the mission of the university.</p> <p>The improvement and enrichment of the culture have a direct relationship with growth and development.</p>
	Strategic management	<p>The fourth-generation university considers the strategic approach of globalization.</p> <p>Policies and strategies must be effective in institutionalizing innovation in the academic system.</p> <p>Committees in fourth-generation universities act based on strategic planning.</p> <p>The strategic perspective is a factor in success.</p>
Macro-level factors	Policy-making	<p>Effective policies and strategies are selected to establish innovation in the academic system.</p> <p>The university's macro-policies should be based on empowering the university and ensuring its freedom of action.</p> <p>The university's macro-policies should somehow engage the management at the intermediate and operational levels.</p>
	Analysis of internal environment	<p>The university identifies its weaknesses and strengths for the analysis of the internal environment.</p> <p>There are some weaknesses in the present universities that should be converted into strengths.</p> <p>The internal environment of the organization can help the university managers to implement the fourth-generation university strategies.</p>
	Analysis of external environment	<p>In the fourth-generation university, the analysis of the external environment and society can be helpful economically, politically, and culturally.</p> <p>External environment analysis is important in the political, economic, social, and cultural sense.</p> <p>External environment analysis can help the key pillars of the university to achieve the goals of the fourth-generation university.</p>

Figure 3 depicts the output of the MAXQDA2020 software package for identifying the underlying factors.





**Figure 3.** The underlying factors as identified in the output of the MAXQDA2020 software package

Figure 4 is the final output as a cloud diagram.



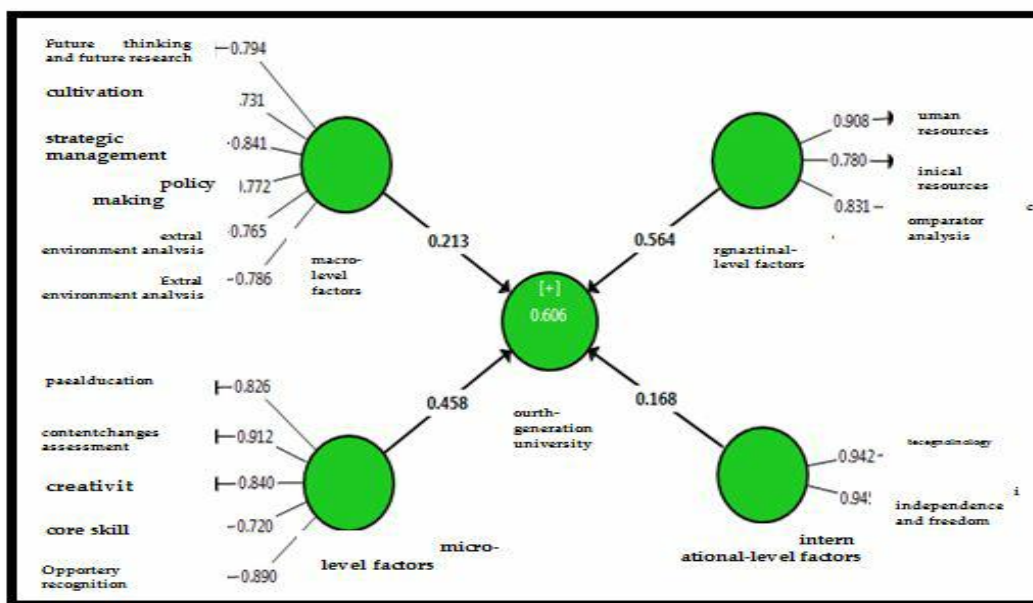
**Figure 4.** The factors underpinning the fourth-generation university as a cloud diagram: The output of the MAXQDA2020 software

Based on the results, the main themes of the fourth-generation university were identified as “entrepreneurship”, “social responsibility”, “providing services tailored to society’s needs”, “research”, and “accountability”. The factors influencing fourth-generation universities were studied in four domains: macro-level factors, intermediate-level factors, organizational-level factors, and micro-level factors.

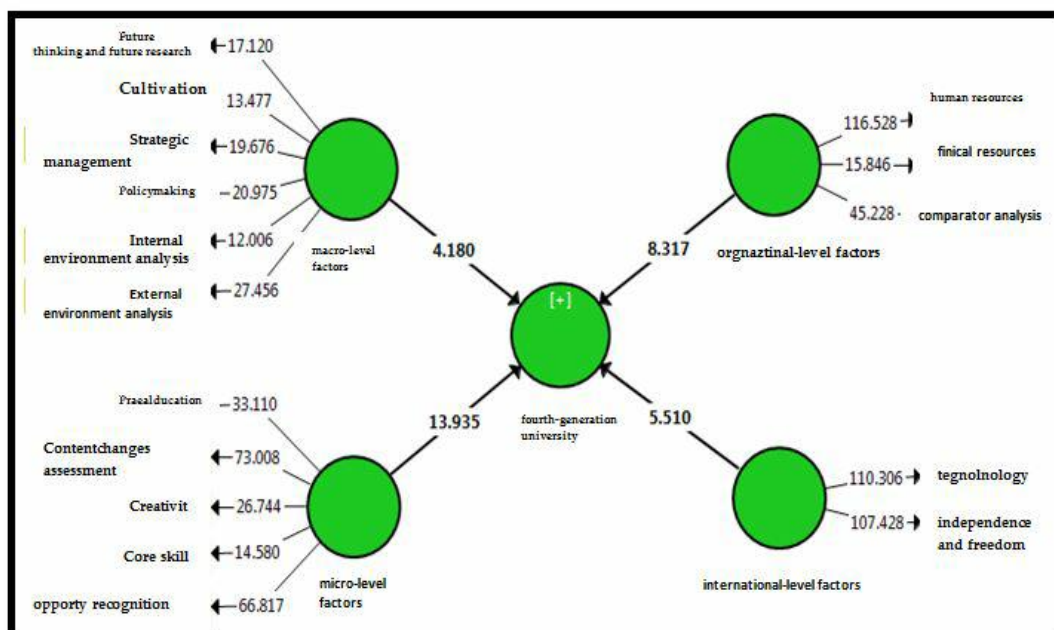
To test the model and the quantitative phase of the research, the factors influencing fourth-generation universities were studied in four domains: macro-level factors, intermediate-level factors, organizational-level factors, and micro-level factors. Accordingly, the organizational factors include “human resources”, “financial resources”, and “competitor  
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analysis”, the micro-level factors include “practical education”, “assessment of content changes”, “creativity”, “being skill-centered”, and “opportunity recognition”, the macro-level factors include “foresight”, “culture building”, “strategic management”, “policy-making”, “analysis of internal environment”, and “analysis of external environment”, and finally, the intermediate-level factors include “technology” and “independence and freedom”.

Figure 5 depicts the results of the analysis of the research model. Also, Figure 6 displays the t-scores for the model’s relationships.



**Figure 5.** The standard coefficients for testing the research model



**Figure 6.** The t-scores for testing the research model

**Coefficient of determination (R<sup>2</sup>)**

The main criterion to assess indigenous hidden variables in the path model is the coefficient of determination (R<sup>2</sup>). This index represents how much variance of the indigenous

variable is accounted for by the exogenous variables. The  $R^2$  values of 0.19, 0.33, and 0.67 for indigenous (dependent) hidden variables in a structural path model (indigenous) describe weak, moderate, and significant values, respectively. If the indigenous hidden variable is captured by just one or two exogenous variables, the moderate values of  $R^2$  will be acceptable too. Table 3 presents the indigenous and exogenous variables, as well as relevant  $R^2$  values.

**Table 3.** *The exogenous and indigenous variables and the relevant  $R^2$*

Indigenous variable	Relevant exogenous variables	$R^2$	Assessment
Fourth-generation university	Macro-level factors	0.606	Moderate
	Micro-level factors		
	Intermediate-level factors		
	Organizational-level factors		

**The predictive relevance index or Stone-Geisser  $Q^2$**

Table 2 presents the results for the predictive relevance index (Stone-Geisser  $Q^2$ ) of the indigenous variables.

**Table 4.** *The predictive relevance index (Stone-Geisser  $Q^2$ ) for the indigenous variables*

Predicting exogenous variables	Predicted indigenous variable	Stone-Geisser $Q^2$	Model's predictive relevance
Macro-level factors	Fourth-generation university	0.670	Strong
Micro-level factors			
Intermediate-level factors			
Organizational-level factors			

According to Table 4,  $Q^2$  is assessed to be strong for the indigenous variable of the fourth-generation university. It can, therefore, be said that the studied structural model has good quality, the observed variables are well reconstructed, and the model can optimally predict the indigenous hidden variable.

Another index of fitting, which has been presented by Tenenhaus and colleagues, is the goodness of fit (GOF), which is estimated by calculating the geometric mean of communality and  $R^2$  as follows:

$$GOF = \sqrt{\text{communality} \times R^2}$$

This index acts like Lisrel fit indices and takes a value between 0 and 1. The closer it is to 1, the higher the quality of the model is. However, it should be noted that like  $\chi^2$ -based indices in Lisrel models, this index does not address the fit of the theoretical model with the collected data; rather, it checks the model's predictive relevance and whether the tested model has been successful in predicting the indigenous hidden variables.

**Table 5.** *The results of the overall fitness of the model using the GOF index*

GOF	Communality	$R^2$
$= \sqrt{\text{Communalities} \times R^2}$		
0.518	0.431	0.606

As is evident in Table 4, the mean communality value is 0.431 and the mean  $R^2$  is 0.606. Accordingly, GOF was estimated at 0.518, which is greater than the threshold value of 0.3 and shows the predictive capacity of the model for the indigenous hidden variable of the research.

### *Path coefficients*

Table 5 presents that all coefficients are significant at the 95% level.

**Table 5.** *The path coefficients and t-value for the research model*

From	Path	To	Path coefficient ( $\beta$ )	Sig. (t-value)	Test result
Macro-level factors			0.231	4.180	Confirmed
Micro-level factors	Fourth-generation university		0.458	13.935	Confirmed
Intermediate-level factors			0.168	5.510	Confirmed
Organizational-level factors			0.564	8.317	Confirmed
Strategic management			0.841	19.676	Confirmed
External environment analysis			0.786	27.456	Confirmed
Internal environment analysis	Macro-level factors		0.765	12.006	Confirmed
Culture building			0.731	13.477	Confirmed
Foresight and future research			0.794	17.120	Confirmed
Policymaking			0.772	20.975	Confirmed
Creativity			0.840	26.744	Confirmed
Content change assessment			0.912	73.008	Confirmed
Practical education	Micro-level factors		0.826	33.110	Confirmed
Opportunity recognition			0.890	66.817	Confirmed
Being skill-centered			0.720	14.580	Confirmed
Technology	Intermediate-level factors		0.942	110.306	Confirmed
Independence and freedom			0.945	107.428	Confirmed
Competitor analysis			0.831	45.228	Confirmed
Financial resources	Organizational-level factors		0.780	15.846	Confirmed
Human resources			0.908	116.528	Confirmed

## **Discussion and Conclusion**

The recent developments in the mission of universities have triggered motivations for research on the effect of universities at the regional level. This research has been focused on the effect of universities on regional development, competition, knowledge dissemination, indigenous growth, technology transfer, and interaction with institutions, reflecting the effect of third and fourth-generation universities, i.e., technology commercialization and local community development (Valero and van Reenen, 2019). In this respect, researchers have considered various academic activities, strategic planning at the university aligned with regional advantages, revisions in university missions, and changes in educational content and methods (Teixeira et al., 2020). Since universities in developing countries have not moved towards fourth-generation university (entrepreneurial university) and the missions of the fourth-generation university, which is based on commercialization and maximal use of environmental resources and potential for responding to society's needs, yet, the present study aimed to present a model of the fourth-generation university for these countries in order to provide an insight in this respect. The next subsections discuss the analysis of the research model and the effect of the studied factors on the fourth-generation university based on the research results.

### ***Macro-level factors***

According to Table 4, the significance statistic between the variables of the macro-level factors and the fourth-generation university is 4.180, which is greater than 1.96 and shows their significant relationship at the 95% level. Also, the path coefficient between these two variables is 0.213, which reflects the positive impact of the macro-level factors on the fourth-generation university. In other words, one unit of change in these factors will increase the fourth-generation university by 0.213 units. This means that the macro-level factors have a positive and direct impact on the fourth-generation university.

Also, the factor loadings reveal that the factor “strategic management” with a factor loading of 0.841 is in the first rank of effectiveness followed by the factor “foresight and future research” with a factor loading of 0.794 and the factor “external environment analysis” with a factor loading of 0.786 in the next ranks, respectively. The factor “culture building” with a factor loading of 0.731 is in the last rank.

### ***Micro-level factors***

It is observed in Table 4 that the significance statistic is 13.935 between the micro-level factors and the fourth-generation university. Since it is greater than 1.96, these two variables are related to one another significantly at the 95% level. Also, the path coefficient is 0.458 between these two variables, reflecting the positive effect of the micro-level factors on the fourth-generation university. So, the fourth-generation university will increase by 0.458 units if the micro-level factors are increased by one unit. This shows the positive and direct effect of these factors on the fourth-generation university.

It is also understood from the factor loadings that the factors “content change assessment”, “opportunity recognition”, and “creativity” are at the top of effectiveness with factor loadings of 0.912, 0.890, and 0.840, respectively. The least influential factor is “being skill-centered” with a factor loading of 0.720.

### ***Intermediate-level factors***

Based on Table 4, the significance statistic is 5.510 between the variables of the intermediate-level factors and the fourth-generation university. This value is greater than 1.96, so the relationship between these two variables is significant at the 95% confidence level. Furthermore, the path coefficient is 0.168 between these two variables, showing the positive effect of the intermediate-level factors on the fourth-generation university. In other words, one unit of increase in the intermediate-level factors will increase the fourth-generation university by 0.168 units. This means that the intermediate-level factors have a positive and direct impact on the fourth-generation university.

According to the factor loadings, the factor “independence and freedom” with a factor loading of 0.945 is in the first rank and the factor “technology” with a factor loading of 0.942 is in the second rank of effectiveness in the four-generation university.

### ***Organizational-level factors***

According to Table 4, the significance statistic between the variables of the organizational-level factors and the fourth-generation university is 8.317, showing their significant relationship at the 95% confidence level as it is greater than 1.96. Also, the path coefficient is 0.564 between these two variables, so the organizational-level factors have a positive impact on the fourth-generation university. One unit of increase in these factors will, therefore, increase the fourth-generation university by 0.564 units. This reflects the positive and significant effect of the organizational-level factors on the fourth-generation university.

Based on the factor loadings, the first, second, and third ranks of effectiveness in the fourth-generation university are related to the factors “human resources”, “competitor analysis”, and “financial resources” with factor loadings of 0.908, 0.831, and 0.780, respectively.

## **Recommendations**

The following practical recommendations can be drawn from the results for higher education managers and policymakers.

1. Given the increasing environmental changes, the universities need mechanisms to align the dynamism of their goals and mission with environmental changes. The identification, analysis, and formulation of these mechanisms can provide valuable insights into the development of higher education.
2. The role of the institutional environment, the development of an institutional ground, and the management of the institutional gap can provide managers and policymakers with precious insight into the development of academic universities.
3. Given the significance of how to achieve the fourth-generation university, it is recommended to explore the development of a regional ecosystem and a technology ecosystem for the development of university generations.
4. Given the role of future research policymaking, it is recommended to consider these factors in the upstream regulations and documents for the development of university generations.

## **Limitations and Recommendations for Future Research**

Like other research, this research has been subject to some limitations, which opens the horizon for future studies. They can be summarized as below:

- The research essentially adopted a mix-method approach in which the optimal point was studied. It is recommended to compare the current status with the optimal status and provide corrective actions in future research.
- The research was conducted as a sectional study with deep exploratory interviews and document analysis. Studies like our work are constrained by the lack of full confidence in the cause-and-effect relationships of the research variables and constructs. A multi-sectional study over time can provide better confidence in the cause-and-effect relationships inferred from the model.

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