Identification and Validation of Entrepreneurial University Model Indicators for the University of Tabriz

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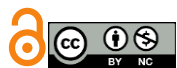*** Corresponding author email address**: Hamdullahhabibi@yahoo.com

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ABSTRACT

Objective: The aim of this research is to identify and validate the indicators of the entrepreneurial university model for the University of Tabriz.

Methodology: The research methodology is a mixed-methods approach. This research is applied in terms of its objective and descriptive-survey in terms of data collection. The statistical population of the study included all the elites in the field of entrepreneurship at the University of Tabriz, all faculty members of the University of Tabriz, and all employees of the University of Tabriz, totaling 1,557 individuals. For sampling in the qualitative section, 14 individuals were selected using a purposive sampling method, and in the quantitative section, 308 individuals were selected using the Krejcie-Morgan table and simple random sampling. Data collection tools included researcher-constructed open-ended questions in the qualitative section and a researcher-constructed questionnaire, designed based on qualitative research results, in the quantitative section. For data analysis, coding methods were used in the qualitative section. In the quantitative section, the Kolmogorov-Smirnov test was used to check the normality of variable distributions; the one-sample t-test was used to determine the level of core category, main, and sub-components; and second-order confirmatory factor analysis was used to examine construct validity and model validation.

Findings: The findings indicate that the developed model, comprising 14 main components categorized into four major factors—knowledge application, human, managerial, and environmental—has a good fit and is effective for transforming the University of Tabriz into an entrepreneurial university.

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Conclusion: This model can also be cautiously applied to other universities, considering their specific conditions and criteria.

Keywords: *Entrepreneurial University, University of Tabriz, Inductive Qualitative Content Analysis, Third Generation University.*

1   Introduction

As Honnon et al. (2006) have stated, entrepreneurship is a crucial subject in the economy of a country, and entrepreneurial groups play a supportive and decisive role in the progress or decline of that economy. The growth of entrepreneurship leads to extraordinary economic growth, and any country with more entrepreneurs will see more significant economic improvement (Lu et al., 2021). Recently, the heightened attention of researchers and policymakers to entrepreneurship has caused some concern. The primary reason for this concern is the increasing need for entrepreneurs who accelerate economic development by generating new ideas and transforming them into profitable ventures (Salamzadeh et al., 2013; Seifi et al., 2024).

Currently, investment in entrepreneurship in higher education is recognized as very important because it is a primary driver for supporting innovation and changing the mindset of the university environment to create entrepreneurial behavior. The entrepreneurial university is seen as an ongoing phenomenon, with the number of these transformations increasing due to reductions in university budgets by the government (Domingas de Fatima & Astri, 2022). Entrepreneurship, considering its significant impacts on economic growth, social development, and ensuring innovation and competition in business, has long been recognized as the backbone of a country's social development. The role of higher education institutions in promoting entrepreneurship cannot be underestimated. It is argued that if university graduates receive the necessary support from their institutions, they are more likely to become successful entrepreneurs (Rostami et al., 2023).

The rapid advancement of technologies in today's world has added to the responsibilities of universities, defining another crucial goal besides producing knowledge: becoming entrepreneurial universities (Seifi et al., 2024). Every year, various international institutions rank universities worldwide based on specific indicators related to entrepreneurship and modern technologies, with Times Higher Education Magazine, Shanghai (ARWU), K.U.S, and ISC being particularly notable in the global ranking of universities. According to the Times Higher Education Magazine ranking, the University of Tabriz ranks 19th among 58 domestic universities in the "Industry Income" (Knowledge Transfer) index and 601st among global universities (Times Higher Education Magazine website, 2023). According to the Center for Science and Technology Studies at Leiden University (CWTS), the University of Tabriz ranks 9th among 46 domestic universities and 477th among global universities in the "Technology and Innovation" index (Domingas de Fatima & Astri, 2022; Rostami et al., 2023; Zare Davijani et al., 2023).

Based on the US News ranking system, published in 2022, the University of Tabriz scored 47.1, securing a global rank of 684. Additionally, in this global ranking system, the university ranks 155th in Asia and 7th in Iran (News Site of Tabriz University, 2023). For the first time in September 2019, the Entrepreneurship and Innovation Index for universities was introduced by the Uniref database. Uniref is a reference database for Iranian universities, operating based on data collected from Iranian scientific and research centers. It extracts and analyzes basic information to evaluate the entrepreneurship and innovation indices of universities and research centers in collaboration with the Iranian entrepreneurship ecosystem. This index, which indicates the importance of entrepreneurship and innovation in each university, is based on: 1) the number of innovation centers; 2) the number of science and technology parks; 3) the number of accelerators; 4) the number of incubators; 5) co-working spaces; 6) the number of startups; 7) the number of knowledge-based companies. According to the latest statistics listed in the "Reference Database of Iranian Universities," the University of Tabriz ranks 7th (Uniref Site, 2023). In 2022, according to the ISC evaluation report, the University of Tabriz ranked between 51-74 among 2,422 universities from 111 countries and 6 continents (Rostami et al., 2023).

However, no comprehensive research has been conducted in this regard concerning the University of Tabriz. Given that developing an appropriate model for transforming the University of Tabriz and other traditional universities into entrepreneurial universities or third-generation universities would take significant and essential steps towards national development, this would also provide benefits for the University of Tabriz, such as: 1) industrial development, 2) achieving the goals of the country's top-level documents, 3)

increasing the competitive ability of the University of Tabriz compared to other universities nationally and globally, 4) reducing the unemployment rate of graduates, and 5) fostering innovation and creativity. Additionally, since the author of this scientific-research article is an employee in the educational department of one of the faculties at the University of Tabriz and closely interacts with professors and students, it is observed that many elite students remain unemployed after graduation and are sometimes forced to work in jobs unrelated to their academic training. This is while significant costs are incurred by both the students' families and the government during their university education. A logical consideration of the total expenses by the government and families for each student would suggest that with a fraction of these costs, a move towards an entrepreneurial university could be achieved. According to a report published by the National Portal of the Iranian Statistics Center, the share of "educated unemployed population out of the total unemployed population of the country" is 40.3% (https://www.amar.org.ir/news, 2023). This means that over 40% of the country's unemployed individuals are university graduates, a trend that can be curbed by providing validated entrepreneurial university models. Thus, the question arises: What is the appropriate entrepreneurial university model for the University of Tabriz, and what components does it comprise? Consequently, the researcher of this scientific-research article finds the importance of transforming the University of Tabriz into an entrepreneurial university to be crucial and considers developing and validating a suitable model for this transformation to be significant. Therefore, the primary question in this article, considering the mixed-methods nature of the present research, is: What is the appropriate entrepreneurial university model for the University of Tabriz, and what level of fit and validity does the developed model possess?

2   Methods and Materials

This study is theoretical-applied in nature with a mixed-methods approach (qualitative and quantitative). To answer the first research question, a qualitative research method was used, and to answer the second question, a quantitative research method was employed. Initially, qualitative data were collected based on the results of in-depth and semi-structured interviews. Subsequently, quantitative methods were used to validate the qualitative data results. The statistical population in the qualitative section included all

university professors, experts, and knowledgeable individuals in the field of entrepreneurship who have authored books, articles, or inventions, and top entrepreneurs from the past two years who have received a tracking code from the "Best Entrepreneurs System of the Entrepreneurship Development and Employment Department" affiliated with the Ministry of Cooperatives, Labor, and Social Welfare. The sample in the qualitative section was purposively and non-randomly selected through interviews with elites possessing the aforementioned conditions, reaching theoretical saturation at the fourteenth person. The statistical population in the quantitative section comprised all faculty members of the University of Tabriz with a minimum of two years of teaching experience and all employees of the University of Tabriz with a minimum of three years of work experience, totaling 1,557 individuals. The sample size in the quantitative section was determined to be 308 individuals using the Krejcie-Morgan table, with an equal number of employees and faculty members selected through simple random sampling during the 2023-2024 period. The data collection tool in the qualitative section consisted of open-ended researcher-constructed questions, with validity and reliability confirmed by advisors. In the quantitative section, the data collection tool was a researcher-constructed questionnaire designed based on qualitative study results. The validity of the tool in the quantitative section was confirmed by experts after three stages of revision and modification, and the reliability of the tool was confirmed with a Cronbach's alpha coefficient of 0.80 through a pilot test on 30 individuals from the statistical population. To examine the normality of variable distributions, the Kolmogorov-Smirnov test was used; to determine the level of core category, main, and sub-components, the one-sample t-test was used; and for construct validity and model validation, second-order confirmatory factor analysis was employed. For qualitative data analysis, inductive qualitative content analysis was used, and for quantitative data analysis, descriptive statistics (frequency and percentage) and inferential statistics using SPSS and AMOS software, Kolmogorov-Smirnov test, one-sample t-test, and second-order confirmatory factor analysis were used.

3   Findings and Results

To answer this question, the data analysis process from the interviews was conducted using inductive qualitative content analysis. Initially, all raw data were collected and

recorded by the researcher in collaboration with the advisor (as an expert). Subsequently, all text files of the interviews were carefully reviewed to match the audio files, and open and axial coding was performed on the files. A total of 92 initial codes were extracted from the interview texts. After eliminating 18 duplicate codes, a total of 74 initial codes were classified based on their similarities and differences into similar categories. Then, an initial label (sub-components) was assigned to similar codes in each category. These sub-components were further classified based on their similarities and differences, resulting in 14 secondary labels (main components). Finally, the main components were categorized into four overall categories (major categories) as shown in Table 1.

Table 1

Components of the Entrepreneurial University Model for Transforming the University of Tabriz

Major Categories	Main Components	Sub-Components
Knowledge Application Factors: K1	Community and Market Needs Recognition: A1	Solving Community Problems: C1
		Acquiring Skills and Moving towards the Job Market: C2
		Attention to Community Needs: C3
		Barriers to Meeting Real Community Needs: C4
		Implementing Operational Strategy: C5
		Applied Research: C6
	Commercializing Science and Knowledge: A2	The Role of Research in an Entrepreneurial University: C7
		Attention to Global Trade: C8
		Commercializing Research: C9
		Providing the Basis for Commercializing Research: C10
		Implementing Technological Collaborative Projects: C11
		Industrial Development: C12
		Providing the Basis for Productive Employment: C13
	Maintaining University-Industry Relations: A3	Industry-University Relations: C14
		Factors Ensuring the Continuity of University-Industry Relations: C15
		Expanding Industrial Facilities: C16
		Relations with Growth and Innovation Centers: C17
	Developing Knowledge-Based Centers: A4	Establishing Knowledge-Based Centers and Incubators: C18
		Creating Innovation Hubs: C19
		Strengthening Science and Technology Parks, Innovation Hubs, and Incubators: C20
		Supporting University Growth and Innovation Centers: C21
Human Factors of an Entrepreneurial University: K2	Entrepreneurship Education: A5	Encouraging Innovation and Entrepreneurship: C22
		Integrating Education and Research to Create Entrepreneurship: C23
		Education Combined with Skill Acquisition: C24
		Education and Attitude Reform towards Entrepreneurship: C25
		Concern for Entrepreneurship: C26
		Necessity for Familiarity of All University Elements with the Entrepreneurial University: C27
		Entrepreneurship Education: C28
		Increasing Entrepreneurship Motivation and Encouraging Students: C29
		Increasing Student Awareness: C30
		Acquiring Techniques: C31
	Having Team-Building and Capable Faculty Members: A6	Utilizing Successful Professors: C32
		Strengthening Professors' Entrepreneurial Attitude: C33
		Role of University Academic Groups Professors: C34
		Strengthening and Supporting Teamwork: C35
		Professors and Officials Agreement on Entrepreneurship: C36

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Managerial Factors of an Entrepreneurial University: K3	Promoting Organizational Entrepreneurial Culture: A7	Creating an Entrepreneurial Culture throughout the University: C37
		Strengthening the Entrepreneurial University Culture: C38
	Entrepreneurial University Management: A8	Necessity for a Manager with a Systemic Thinking: C39
		Creating an Agile Management System: C40
		Holding Apprenticeship Courses for Emerging Entrepreneurs: C41
		Management's Attitude Reform towards Entrepreneurship: C42
		Increasing Effectiveness and Efficiency of the University's Organizational Staff: C43
		Employing and Guiding Entrepreneurial Human Resources: C44
		Exemplary Officials of the Growth and Technology Centers of the University of Tabriz: C45
		Role of High-Ranking Officials in University Entrepreneurship: C46
		Addressing and Resolving Student Issues: C47
	Structural Management Reforms: A9	Implementing Reforms in University Structures: C48
		Reforms in the Education System: C49
		Eliminating Centralization: C50
		Creating a Flexible Organizational Structure: C51
	Identifying and Addressing Internal Organizational Barriers to Entrepreneurship: A10	Political Barriers of the Entrepreneurial University: C52
		Existing Barriers in the Faculty Domain: C53
		Barriers and Weaknesses in Organizational Culture: C54
		Barriers in the Education Domain: C55
		Barriers in the Financial Domain: C56
		Barriers in the Cultural Domain: C57
		Barriers in the Research and Technology Domain: C58
		Barriers in the Management Domain: C59
		Structural Barriers: C60
	Financial and Economic Factors: A11	Financial Outcomes of Transforming the University of Tabriz into an Entrepreneurial University: C61
		Funding Research Projects: C62
	Developing Hardware Infrastructure: A12	Equipping Laboratories with Modern Technology: C63
		Developing New Technologies: C64
		Advancing Scientific Boundaries: C65
		Utilizing New Methods and Tools: C66
		Creating Necessary Infrastructure: C67
Environmental Factors: K4	Executive Power (Government) Factors: A13	Educational Policy and Planning: C68
		Collaboration with Other Ministries: C69
		Enhancing the University of Tabriz's Status: C70
		Interest in Employment in Government Organizations: C71
	External Organizational Barriers: A14	Weak Knowledge-Based Economy: C72
		Macro-Policy Barriers: C73
		Role of Organizations Outside the University: C74

To answer the second research question, a researcher-constructed questionnaire was designed based on the qualitative research results to validate the entrepreneurial university model for the University of Tabriz, using a five-point Likert scale. The validity of the questionnaire was confirmed by experts, and to measure the reliability of the data collection tool, the questionnaire was initially distributed to 30 members of the statistical population. Then, using the Cronbach's alpha coefficient test, the reliability of the tool was confirmed with a value of $\alpha = 0.789$. Subsequently, to analyze the 305 collected questionnaires using SPSS and AMOS software, the mean and standard deviation of the research variables, whose scores ranged from 1 to 5, were calculated. The normal distribution of variables was also determined using the Kolmogorov-Smirnov test. Using the one-sample t-test, the level of the core category and main and sub-components were calculated at a significance level of 0.05. Finally, construct validity and model validation were measured using second-order confirmatory factor analysis.

The mean, standard deviation, skewness, kurtosis, minimum, and maximum scores for the research variables

were calculated. Scores ranged from 1 to 5 and are presented in Table 6. The results indicate that the variable "Community and Market Needs Recognition" had the highest frequency and "Promoting Organizational Entrepreneurial Culture" had the highest standard deviation.

Table 2

Descriptive Statistics of Research Variables

Variables	N	Mean	Std. Deviation	Skewness	Kurtosis	Minimum	Maximum
Entrepreneurial University	305	4.36	0.59	-0.72	0.07	2.29	5
Knowledge Application Factors	305	4.37	0.65	-0.96	0.57	2	5
Community and Market Needs Recognition	305	4.46	0.66	-1.52	2.87	1.2	5
Commercializing Science and Knowledge	305	4.30	0.75	-1.07	1.11	1	5
Maintaining University-Industry Relations	305	4.41	0.73	-1.44	2.25	1	5
Developing Knowledge-Based Centers	305	4.27	0.78	-0.77	-0.38	1.67	5
Human Factors of an Entrepreneurial University	305	4.36	0.68	-0.88	-0.10	2.25	5
Entrepreneurship Education	305	4.38	0.71	-1.01	0.23	1.83	5
Having Team-Building and Capable Faculty Members	305	4.35	0.72	-0.91	-0.13	2	5
Promoting Organizational Entrepreneurial Culture	305	4.32	0.86	-1.05	0.29	1	5
Managerial Factors of an Entrepreneurial University	305	4.39	0.65	-1.11	1.09	1.67	5
Entrepreneurial University Management	305	4.40	0.68	-1.35	2.09	1.2	5
Structural Reforms	305	4.24	0.83	-0.81	-0.21	1.5	5
Identifying and Addressing Internal Organizational Barriers to Entrepreneurship	305	4.39	0.79	-1.07	0.22	2	5
Financial and Economic Factors	305	4.44	0.74	-1.22	0.85	1.5	5
Developing Hardware Infrastructure	305	4.45	0.71	-1.24	1.00	1.5	5
Environmental Factors	305	4.31	0.67	-0.81	-0.12	1.83	5
Executive Power Factors	305	4.25	0.78	-0.92	-0.43	1.33	5
External Organizational Barriers	305	4.36	0.68	-0.97	0.26	2	5

The results of the one-sample t-test are shown in Table 3, where the overall mean of the components is 4.36 and the significance level of the test is 0.001. Given that the significance level is less than 0.05, the null hypothesis is rejected. Moreover, since the mean is greater than 3, it is concluded that the level of the core category (transforming the University of Tabriz into an entrepreneurial university) is significantly higher than average. Additionally, the levels of the main and sub-components are significantly above average ($p < 0.05$, $m > 3$).

Table 3

One-Sample t-Test Results for Core Category and Main and Sub-Components (Test Value = 3)

Variables	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	Mean Difference
Entrepreneurial University	305	4.36	0.59	40.12	304	0.001	1.36
Knowledge Application Factors	305	4.37	0.65	36.86	304	0.001	1.37
Community and Market Needs Recognition	305	4.46	0.66	38.89	304	0.001	1.46
Commercializing Science and Knowledge	305	4.30	0.75	30.49	304	0.001	1.30
Maintaining University-Industry Relations	305	4.41	0.73	34.01	304	0.001	1.41
Developing Knowledge-Based Centers	305	4.27	0.78	28.33	304	0.001	1.27
Human Factors of an Entrepreneurial University	305	4.36	0.68	34.91	304	0.001	1.36
Entrepreneurship Education	305	4.38	0.71	34.12	304	0.001	1.38
Having Team-Building and Capable Faculty Members	305	4.35	0.72	32.88	304	0.001	1.35
Promoting Organizational Entrepreneurial Culture	305	4.32	0.86	26.85	304	0.001	1.32
Managerial Factors of an Entrepreneurial University	305	4.39	0.65	37.59	304	0.001	1.39
Entrepreneurial University Management	305	4.40	0.68	36.00	304	0.001	1.40
Structural Reforms	305	4.24	0.83	26.20	304	0.001	1.24
Identifying and Addressing Internal Organizational Barriers to Entrepreneurship	305	4.39	0.79	30.88	304	0.001	1.39
Financial and Economic Factors	305	4.44	0.74	34.16	304	0.001	1.44

		305	4.45	0.71	35.87	304	0.001	1.45
Developing Hardware Infrastructure		305	4.45	0.71	35.87	304	0.001	1.45
Environmental Factors		305	4.31	0.67	34.08	304	0.001	1.31
Executive Power Factors		305	4.25	0.78	28.23	304	0.001	1.25
External Organizational Barriers		305	4.36	0.68	34.87	304	0.001	1.36

The chi-square test statistic's significance level is 0.001, which, given the criterion considered (greater than 0.05), is not acceptable. However, since the significance level is sensitive to the sample size and is almost always significant in large samples, other indices were used to evaluate model fit. The critical ratio to degrees of freedom (CMIN/DF) is 3.71, the goodness of fit index (GFI) is 0.90, the Tucker-Lewis index (TLI) is 0.94, the comparative fit index (CFI) is 0.95, and the parsimonious normed fit index (PNFI) is 0.74. All these indices fall within the acceptable fit range. The root mean square error of approximation (RMSEA) is also 0.094, which, given its slight difference from the considered criterion, is acceptable. Therefore, overall, it can be concluded that the confirmatory factor analysis model presented in Table 4, has an acceptable fit.

Table 4

Confirmatory Factor Analysis Results for the Final Model of the Entrepreneurial University

Sub-Component	Main Component	Estimated Coefficient	Standard Error	Critical Ratio	p	Standardized Coefficient (Factor Load)
	Knowledge Application Factors	1			0.001	0.885
	Human Factors of an Entrepreneurial University	1.278	0.076	16.711	0.001	0.987
	Managerial Factors of an Entrepreneurial University	1.094	0.073	14.953	0.001	0.913
	Environmental Factors	1.034	0.087	11.877	0.001	0.777
Community and Market Needs Recognition	Knowledge Application Factors	1			0.001	0.850
Commercializing Science and Knowledge	Knowledge Application Factors	1.222	0.057	21.39	0.001	0.912
Maintaining University-Industry Relations	Knowledge Application Factors	1.135	0.057	19.738	0.001	0.870
Developing Knowledge-Based Centers	Knowledge Application Factors	1.079	0.067	16.041	0.001	0.767
Entrepreneurship Education	Human Factors of an Entrepreneurial University	1			0.001	0.906
Having Team-Building and Capable Faculty Members	Human Factors of an Entrepreneurial University	1.029	0.04	25.789	0.001	0.918
Promoting Organizational Entrepreneurial Culture	Human Factors of an Entrepreneurial University	1.118	0.055	20.474	0.001	0.831
Entrepreneurial University Management	Managerial Factors of an Entrepreneurial University	1			0.001	0.868
Structural Reforms	Managerial Factors of an Entrepreneurial University	1.208	0.06	20.117	0.001	0.864
Identifying and Addressing Internal Organizational Barriers to Entrepreneurship	Managerial Factors of an Entrepreneurial University	1.057	0.061	17.305	0.001	0.793
Financial and Economic Factors	Managerial Factors of an Entrepreneurial University	1.01	0.056	17.923	0.001	0.811
Developing Hardware Infrastructure	Managerial Factors of an Entrepreneurial University	0.993	0.053	18.686	0.001	0.831
Executive Power Factors	Environmental Factors	1			0.001	0.847
External Organizational Barriers	Environmental Factors	0.847	0.061	13.815	0.001	0.815

4   Discussion and Conclusion

The results of the present study consist of sub-components, main components, and overall factors. The overall factors include: 1) Knowledge Application Factors; 2) Human Factors; 3) Managerial Factors; 4) Environmental Factors of the Entrepreneurial University, aligning with the model by Clark (2005) concerning the "Managerial Factors"

with the "Element of Strong Leadership" and the "Environmental Factors of the Entrepreneurial University" with the "Element of Organizational Environment Development." Additionally, the study's results in terms of main components align with the model extracted by Samadi Miyar Kalaei et al. (2013), where the "Entrepreneurial University Management" corresponds to the "Element of University Governance and Administration," "Entrepreneurship Education" aligns with the "Element of Entrepreneurial Education," and "Structural Reforms" align with "Organizational Structure and Design."

Furthermore, the study's results regarding the main factors (the fourteen factors) are consistent with the findings by Seifi et al. (2024), where "Entrepreneurial University Management" corresponds to "Managerial Elements," "Entrepreneurship Education" aligns with the "Element of Increased Hours of Entrepreneurial Education at the University," and "Structural Reforms" align with the "Element of Flexibility." Moreover, the findings align with the model extracted by SerYazdi Modarresi et al. (2019) concerning the main factors, where "Entrepreneurial University Management" corresponds to the "Element of Entrepreneurial Leadership," "Structural Reforms" align with the "Flexible Structure," "Financial and Economic Factors" with the "Element of Economic Activity," "Culture" with the "Element of Promoting Organizational Entrepreneurial Culture," and "Hardware Development" with the "Element of Networking."

Additionally, the results of this study align with the findings by Jameson & O'Donnell (2015) in terms of main components, where "Entrepreneurial University Management" corresponds to the "Element of Strong Command and Organization," and "Financial and Economic Factors" with the "Element of Financial Resources." The findings also align with the model extracted by Yadollahi Farsi et al. (2012), where "Identifying and Addressing Internal Organizational Barriers to Entrepreneurship" and "External Organizational Barriers" correspond to the "Element of Barriers." (Yadollahi Farsi et al., 2012).

Moreover, the study's findings align with the model extracted by Faramarzi Nia et al. (2015), where "Financial and Economic Factors" correspond to the "Element of Economic Factors," and "Promoting Organizational Entrepreneurial Culture" aligns with the "Element of Cultural Factors." (Faramarzi et al., 2016). The results also align with the prior findings (Rostami et al., 2023; Ruiz et al., 2020; Salamzadeh et al., 2013; Zare Davijani et al., 2023), where "Entrepreneurial University Management"

corresponds to the "Element of University Leadership and Management," "Promoting Organizational Entrepreneurial Culture" aligns with the "Element of Organizational Culture," "Maintaining University-Industry Relations" aligns with the "Element of University-Industry Relations," "Financial and Economic Factors" align with the "Element of Economic Issues," and "External Organizational Barriers" align with the "Element of Interaction with the Surrounding Environment." Additionally, from the four main factors of this study, "Human Factors" align with the "Element of Human Resource Management," and "Financial and Economic Factors" align with the "Element of Financial Support."

The study's findings also align with the model extracted by Salamzadeh et al. (2021), where "Community and Market Needs Recognition" aligns with the "Element of Prompt and Appropriate Response to Community Needs," "Maintaining University-Industry Relations" aligns with the "Element of Creative Interaction of the University with the World of Work and Industry," "Promoting Organizational Entrepreneurial Culture" aligns with the "Element of Innovative and Responsible Organizational Culture," "Structural Reforms" align with the "Element of Transformative Structure," "Entrepreneurial University Management" aligns with the "Element of Responsible Leadership," and "Developing Knowledge-Based Centers" aligns with the "Element of Developmental Educational and Curriculum Programs." (Salamzadeh et al., 2013).

Moreover, from the four main factors of this study, "Environmental Factors of the Entrepreneurial University" align with the "Element of Environmental Factors," and "Human Factors" align with the "Element of Individual Factors." From the fourteen main components, "External Organizational Barriers" align with the "Element of Organizational Factors," aligning with the prior findings (Ala et al., 2021).

From the four overall factors and fourteen main components in the study's findings, it can be concluded that the components of the model align with most of the components found in previous research. For instance, the overall factor "Managerial Factors" includes five main components: 1) Entrepreneurial University Management; 2) Financial and Economic Factors; 3) Structural Reforms; 4) Identifying and Addressing Internal Organizational Barriers to Entrepreneurship; and 5) Hardware Development.

The first main component of managerial factors, "Entrepreneurial University Management," aligns with components such as "Strong Leadership Core,"

"Entrepreneurial Leadership," "University Governance and Administration," "University Leadership and Management," "Responsible Leadership," "Strong Command and Organization," and has been recognized as a key component for achieving an entrepreneurial university in previous research (Graham, 2014; Guerrero et al., 2016; Seifi et al., 2024; Yokoyama, 2006). This indicates that the management and leadership of an entrepreneurial university are crucial. Also, Faramarzi et al. (2015) emphasized the importance of "Managerial Solutions in Transitioning to an Entrepreneurial University." (Faramarzi et al., 2016).

The second main component of managerial factors, "Financial and Economic Factors," aligns with components such as "Economic Factors," "Economic Activity," "Economic Issues," "Financial Support," and "Financial Resources" in previous research, highlighting the importance of government financial support and economic experts in advancing university entrepreneurship to help develop the country's economy. Entezari (2018) believes that the goal of education, research, and entrepreneurship in universities is to provide new technologies to the job market and achieve maximum financial resources for development (Entezari, 2018). Zare Davijani et al. (2024) concluded in their research that the economic environment and financial factors, including the university's infrastructure and managerial environment, impact the entrepreneurship of students and graduates (Zare Davijani et al., 2023). Barcik et al. (2017) also believe that the primary activity of modern universities is the production of knowledge and useful new technologies for achieving economic development (Barcik et al., 2017). Studies by Ala et al. (2020) have shown that entrepreneurship drives economic development by increasing productivity, creating employment, ensuring social welfare, and enhancing universities' roles in sustainability, thus contributing to the country's economic growth. This is particularly important in the current complex environment) Ala et al., 2021(. Other researchers (Bronstein & Reihlen, 2014; Guerrero et al., 2015; Guerrero et al., 2006; Guerrero & Urbano, 2012; Guerrero et al., 2016; Rezaei et al., 2013; Yokoyama, 2006) have also discussed topics such as national economic development documents, transitioning to a private economy, and institutionalizing a knowledge-based economy as influential factors for achieving an entrepreneurial university.

Faramarzi et al. (2015) suggested ways to diversify financial resources in their research, such as increasing the sale of university products, producing and commercializing educational content, decentralizing financial resources for university officials, allocating sufficient research budgets for entrepreneurship, increasing universities' share in research projects, creating special opportunities for entrepreneurial students and professors, eliminating financial resources for university officials, implementing tax restrictions, and providing insurance plans for entrepreneurs, expanding university campuses, offering virtual education, and attracting foreign students to secure the financial resources needed by the university (Faramarzi et al., 2016).

The third main component of managerial factors, "Structural Reforms," aligns with components such as "Organizational Structure and Design," "Flexible Structure," and "Transformative Structure" in previous studies. In Iran, the higher education system is centralized, increasing hierarchy and complexity in the structure, which hinders flexibility and transformation, essential components for creating an entrepreneurial university. Salamzadeh et al. (2011) found that one of the most important inputs for achieving an entrepreneurial university is a "dynamic structure." (Salamzadeh et al., 2011). Kornaeej et al. (2012) concluded in their research titled "Characteristics of an Entrepreneurial University at Tarbiat Modares University" that the university lacks suitable entrepreneurial and financial independence structures. They suggested that to achieve an entrepreneurial university, a decentralized structure within the Ministry of Science, Research, and Technology (higher education) should be established to reduce bureaucracy (Kornaeej et al., 2012).

The fourth main component of managerial factors, "Identifying and Addressing Internal Organizational Barriers to Entrepreneurship," aligns with components such as "External Organizational Barriers," "Barrier Elements," and "Environmental Factors" in previous research. Internal barriers are crucial because addressing internal problems is necessary for external support to be effective in university entrepreneurship. Rezaei & Pajouhan (2019) identified 17 factors (12 internal and 5 external) that hinder Razi University from becoming an entrepreneurial university (Rezaei et al., 2013). Faramarzi et al. (2015) highlighted two barriers in their research: "Barriers related to leadership and management in transitioning to an entrepreneurial university" and "Barriers in university communication and organizational environment development." (Faramarzi et al., 2016). Guerrero & Urbano (2012) focused on "formal and informal environmental factors" for developing an entrepreneurial university (Guerrero & Urbano, 2012).

The fifth main component of managerial factors, "Hardware Development," aligns with components such as

"Networking" in previous research. Salamzadeh et al. (2011) found that "networking" is one of the most important processes for achieving an entrepreneurial university (Salamzadeh et al., 2011).

In conclusion, the summary of the results, based on the research findings, is as follows: The elements and components of the conceptual framework and the extracted model of this study, considering the conditions, cultural background, and specific organizational culture of the University of Tabriz, are essential for creating an entrepreneurial university at the University of Tabriz. Therefore, the extracted model can be used for transforming the University of Tabriz into an entrepreneurial university, and with caution, considering their specific conditions and criteria, it can also be applied to other universities. Additionally, the model validation results using the AMOS test showed that the extracted model has a good fit. The research findings indicate that among the four main categories, "Human Factors" had a standardized coefficient of 0.987, and among the fourteen main components, the "Commercializing Science and Knowledge" component had a standardized coefficient of 0.902, "Entrepreneurship Education" had a standardized coefficient of 0.96, "Hardware Development" had a standardized coefficient of 0.954, and "External Organizational Barriers" had a standardized coefficient of 0.993, showing the highest correlation with entrepreneurship at the University of Tabriz.

One of the limitations of the present research is that its results are generalizable to the users and researchers of the University of Tabriz. If there is a need to generalize to other users and researchers, it should be done with caution and sufficient knowledge. Therefore, future researchers are advised to conduct similar studies at other universities and compare the results. In line with the findings and results of the present study, the following practical recommendations can be made:

Government institutions and other forces should take appropriate policies and financial support to transform the University of Tabriz and other traditional and research-oriented universities into entrepreneurial universities.

With the cooperation of entrepreneurship experts, all internal and external barriers to transforming the University of Tabriz into an entrepreneurial university should be identified and removed.

All physical tools and necessary infrastructure for entrepreneurship at the University of Tabriz should be changed and developed.

Structural reforms should be made at the University of Tabriz to promote decentralization, flexibility, and the removal of cumbersome hierarchies.

The president of the University of Tabriz should be selected from among individuals with high abilities, especially in entrepreneurship.

The criteria for recruiting faculty members at the University of Tabriz should be revised to focus on recruiting talented and team-building professors.

Authors' Contributions

All authors have contributed significantly to the research process and the development of the manuscript. This article is derived from the doctoral dissertation of the first author at the Islamic Azad University of Tabriz, titled "Identification and Validation of Entrepreneurial University Model Indicators for the University of Tabriz."

Declaration

In order to correct and improve the academic writing of our paper, we have used the language model ChatGPT.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

In this research, ethical standards including obtaining informed consent, ensuring privacy and confidentiality were observed.

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