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Exploring the Relationship Between Internationalization and Entrepreneurial University: The Mediating Effect of Education in University of Tehran, Sharif University of Technology, and Tarbiat Modares University

Mehdi Tajpour¹ | Babak Ziyae^{2*} | Mohammad Hasan Mobarki³ | Mehran Rezvani⁴

1. Faculty of Entrepreneurship, University of Tehran, Tehran, Iran. Email: tajpour@ut.ac.ir
2. Corresponding Author, Faculty of Entrepreneurship, University of Tehran, Tehran, Iran. Email: bziyae@ut.ac.ir
3. Faculty of Entrepreneurship, University of Tehran, Tehran, Iran. Email: mhmobaraki@ut.ac.ir
4. Faculty of Entrepreneurship, University of Tehran, Tehran, Iran. Email: m.rezvani@ut.ac.ir

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ABSTRACT

Internationalization is one of the most critical indicators for universities, and universities are the main players in entrepreneurial ecosystems. Although many studies have focused on the components of internationalization, so far off little attention has been paid to the role of entrepreneurship in university development simultaneously with the mediating role of education. Therefore, the present study set out to investigate whether internationalization affects the entrepreneurial university with the mediating role of education in Iranian universities or not. To collect data, a questionnaire was distributed among 171 individuals, including managers and faculty members in the fields of international activities and entrepreneurship. The findings suggest that the components of internationalization, including technology, human resources, finance, communications, and innovation, all have a positive impact on an entrepreneurial university as mediated by education. The human resource management component has the greatest impact on an entrepreneurial university with a mediating role of education. In addition, findings show that universities need to focus on the internal activities, more resources, and executive agents to find a better position. In this way, they can identify significant resources that can be used to develop universities.

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1. Introduction

Internationalization has now become an important strategic priority for many institutions and governments. In addition, internationalization worldwide is increasingly motivated by profits rather than by government policy (Liu & Liu, 2020). Therefore, governments and institutions are investing heavily in internationalization (Zaman & Mohsin, 2014). As a result, one of the most critical issues in the entrepreneurship discussion is internationalization (Perényi & Losoncz, 2018). Wu and Zhou (2018) believe that this is a new type of internationalization of more heightened education at home and abroad based on the spread of innovations such as knowledge, culture, more elevated education models, and norms (Wu & Zhou, 2018). It also entices the awareness of many investigators to study internationalization, emphasizing its resources and capacities for conquest in global markets (Navarro-García et al., 2016). According to scholars, concepts like theoretical possibilities and the international environment are causal preconditions for the internationalization of a university with an entrepreneurial approach. They bring about outcomes such as dynamic capacities, innovation centers, and international participation (Jørgensen & Novotny, 2020). One of the main priorities of developing countries is entrepreneurship development (Salamzadeh & Tajpour, 2021; Ziyae et al., 2020). In addition, entrepreneurship validates the growth of innovative investments and is made up of cultural, political, economic, and social factors (Cunningham et al., 2019).

Universities have always represented where knowledge is disseminated and talents are cultivated; therefore, they provide education in assorted professions and areas. As society is changing, however, the role of universities is becoming more comprehensive and convoluted, outshining their primary occupation of providing education. It is worth mentioning that internationalization is allocated a reasonably small share in entrepreneurship universities and education, and there is still room for improving internationalization (Fanea-Ivanovici & Baber, 2022). Entrepreneurial university plays an important pattern in the growth of universities because meeting the economic and social needs of society is one of the criteria for evaluating universities (Mobarki et al., 2021; Taucean et al., 2018). Entrepreneurial university is involved in the growth and transmutation of higher education institutions (Altbach, 2014; Tajpour, 2021). The transformation of classical education and the creation of favorable environmental conditions are the most important processes and mechanisms for the advancement of the entrepreneurial university. Existing approaches must be effectively implemented to achieve strategic interaction between government, industry, and academia. Nonetheless, entrepreneurship is still recognized as the most important educational field in different countries (Tayauova, 2018). In this regard, researchers have stated that the entrepreneurial university, by changing the people's mindset and perception of innovation, improves the economic and social situation of society to create the process of creating a business (Ratten, 2017).

In summary, this study contributes to the mainstream literature in three ways: First, it extends the internationalization literature and relates it to the entrepreneurial university, which is an innovative move per se. It also emphasizes that universities may use knowledge, communication, technology, and external resources for development at the entrepreneurial university. It also covers the need to relate components of internationalization to some concepts including the entrepreneurial university. Third, through examining the mediating effect of education, it contributes to the components of internationalization and entrepreneurial university. In fact, no prior research has been done on the underlying factors that can act as mediator in the above-mentioned relationship. Therefore, the main purpose of this study was to investigate whether internationalization affects an entrepreneurial university with the mediating role of education in Iran's top universities.

In the paragraphs to come in this research, the theoretical foundation and the background of internationalization and the entrepreneurial university with the mediating role of education have been considered. After that, the research method and hypotheses are presented along with the study and analysis of the impact of internationalization factors on the entrepreneurial university with the mediating role of education. Then, the discussion and conclusions will be presented in the final section.

2. Theoretical Background

Nowadays, entrepreneurship is recognized as a pillar of economic development in all societies and plays a critical role in increasing employment and income in developing societies (Roopchund, 2020). Entrepreneurship includes social, political, economic, and cultural components in an area developed

based on the investment. It supports creativity and innovation (Cunningham et al., 2019). Internationalization is a common strategic goal in modern higher education for graduates with global skills (Hahn et al., 2020). Therefore, key effects such as internationalization, policies and regulations, resources, and staff development have attracted less attention in entrepreneur university (Markuerkiaga et al., 2014). In the same vein, global experience in this regard shows that universities working in the field of internationalization are more responsive to the needs of innovation in the society, business education, research, and industrial centers (Tayauova, 2018). Accordingly, internationalization is a set of activities related to the expansion of cooperation and international relations, with the aim of providing an educational environment in universities (Altbach, 2014). Internationalization is also the process of adapting entrepreneurial and business operations in terms of strategy, structure, and resources related to international environments (Li, 2015). Indeed, universities can support the internationalization with an entrepreneurial approach by removing organizational barriers, training skilled staff and entrepreneurs, and supporting investment programs such as entrepreneurial culture and networks (Bischoff et al., 2018; Wright et al., 2017). Therefore, new challenges must be met to meet the expectations for entrepreneurial development in the international environment through cooperation among education, research, and entrepreneurship (Lahikainen et al., 2019; Tajpour et al., 2020). Entrepreneurial universities, through the association of academic establishments, are also institutions that convey new visions and technologies to life in entrepreneurship, which has been introduced as an essential element in the entrepreneurial ecosystem (Schillo, 2018). Education can be an important component of the internationalization of an entrepreneurial university. Based on the arguments and discussions, the main hypotheses of this research are as follows:

H1. The components of internationalization have a meaningful effect on entrepreneurial university.

H2. The components of internationalization have a meaningful effect on entrepreneurial university, considering education as a mediator variable.

The reciprocal relationship between the university and industry through knowledge exchange has become a global trend (Kalar & Antoncic, 2015). Since the early 1990s, environmental changes desired to stimulate the university's role in technology, and knowledge transfer has spread across the world (Grimaldi et al., 2011). Moreover, a lot of countries have presented modifications and approach initiatives to promote and enhance university technology (Petruzzelli, 2011). In addition, there is a need for an additional research on information technology and knowledge transfer (Audretsch et al., 2019). There are numerous activities through which universities transfer their new technology or knowledge (Bekkers & Freitas, 2008). Few studies have investigated aspects that permit a more profound understanding of an academic's key player in the technology (Jain et al., 2009). Accordingly, all activities of one university, revealed as well as unrevealed, should be considered (Landry et al., 2010). A study carried out by Errasti et al. (2018) indicates that the activities of universities are centralized, and there is a need for an extensive presence of students in this process (Errasti et al., 2018). Most initial studies focused on disclosed academic activities (Philpott et al., 2011), which underestimated the academics' overall involvement in technology transfer (Grimaldi et al., 2011). Universities need to mobilize various initiatives and projects to meet the variety of technological opportunities and new investments (Dalmarco et al., 2018). Entrepreneurial university has been identified as a source of new technology and knowledge as well as a natural incubator for knowledge commercialization (Alexander & Evgeniy, 2012). As a result, in improving the performance of the entrepreneurial university, cooperation with organizations outside the university and the transfer of new technologies has a special function (Ahmad et al., 2018). Therefore, the development of technology-based service capabilities affects the internationalization of the university (Jones et al., 2017). In addition, technology and global development have a close relationship in their practical application and implementation (Fejerskov, 2017). According to Teixeira and Coimbra (2014), who has worked significantly on network theory to address the role of university support in the internationalization of academic corporations, university companies that support the Department of Technology Transfer or other scientific and technological infrastructures have been international (Teixeira & Coimbra, 2014). Technological advancements, including the proliferation of social media,

faster communications, and access to large amounts of data, have created new ways of doing business (Gentina & Parry, 2020). In the developing countries, the only institutions that can produce knowledge and transfer new technology are universities, and they can support a knowledge-based economy. In addition, innovation and technology are important determinants of firm performance (Tajeddini, 2016). The evolution of classical education to ensure strategic interaction in the government-university-industry relationship is the most important mechanism for the success of the entrepreneurial university. In this regard, entrepreneurship is the most influential field of education (Tajpour et al., 2021; Tayauova & Bektas, 2018). According to the previous arguments and studies, the sub-hypotheses are as follows.

H1a. Technology component has a meaningful effect on entrepreneurial university.

H2a. Technology component has a meaningful effect on entrepreneurial university, considering education as a mediator variable.

Using relevant educational processes for all human resources of the university can lead to the success of the entrepreneurial university in the international arena. Manpower not only affects the ability of individuals to discover, evaluate, and exploit entrepreneurial opportunities, but also affects the entrepreneurial behavior of individuals. In this regard, Hindle et al. (2009) stated that the internationalization of university is a process that is formed by human resources. Researchers' findings show that universities should strengthen international competition in their teaching and research activities. They should also develop educational systems that can create or attract quality human resources and enable graduates of these universities to work globally, not just locally (Take & Shoraku, 2018). It can be argued that resource-based theory assumes that resources and capabilities are heterogeneously distributed across occupations, and that such heterogeneity may persist over time. Resource-based theory is also an important theoretical pioneer for entrepreneurship (Newbert, 2007). This theory states that competitive advantage represents the basis for the development of business capabilities (Hosseini & Sabokro, 2021). Acemoglu (2012) also stated that human resources increase people's ability to discover and take advantage of opportunities in the university and help people acquire new knowledge and skills (Acemoglu, 2012). Thus, according to Bhayani (2015), achieving competitive advantage via reorganizing human resources strategy through offering competitive payment structures with motivation, it makes universities more attractive to achieve a competitive advantage. According to the mentioned arguments and studies, the other related sub-hypotheses are as follows.

H1b. Human resources component has a meaningful effect on entrepreneurial university.

H2b. Human resources component has a meaningful effect on entrepreneurial university, considering education as a mediator variable.

Financial support is an essential need to promote internationalization at the university level. In particular, higher education institutions must be prepared to provide international financial services with the help of other priorities (Chang & Lin, 2018). In this regard, financial resources are also established in an entrepreneurial university because this factor represents the independence of a university (Guerrero, 2008). Academic activities in the international arena, diverse financial resources, and high rates of research and development are among the characteristics of an entrepreneurial university (Budyldina, 2018). Hu (2009) found that both public and private funding resources support an entrepreneurial university (Hu, 2009). In this factor, it is necessary to differentiate research and training budgets in the field of entrepreneurship and budgets for entrepreneurship projects and companies and organizations. Financial support is a critical need to promote internationalization at the institutional level (Chang & Lin, 2018). Entrepreneurship education is the evolution of skills that create long-term benefits for society. Skills that construct behavior, knowledge, and attitudes allow people to play a role in the economy (Rae & Wang, 2015). The universities' tough pecuniary status has been critical in the absence of adequate knowledge production and valorization, dissemination, and application in the universities' (Yong, 2022). Similarly, an individual's age and amount of financial assistance to university activities are regarded as strong crucial factors related to the role of the stakeholder (Verger, 2014). Moreover, given the entrepreneurial university's financial limitation, there is a general view of the lack of capacity and low motivation for universities with independent

financial statuses to bring forth quality research or function within the relevant needs of their community. Constrained by limited state financial resources, they increase efforts for secondary resources (research councils, grants, contracts, etc.) (Yong, 2022). This endeavor enables them to learn faster from diverse interactions and enhances the opportunity for quicker actions than waiting for slow-paced and complex system-wide enactments that come with standardized rules attached. Nonetheless, Jessop (2017) believes that contemporary universities now act more like competing companies, which are more interested in gaining more prestige and extraordinary financial achievements than “public institutions” (Jessop, 2017). This is in line Verger (2014) that regarding human, material, and financial resources, besides the technical know-how, non-state actors have the capacity and drive some national governments to take on particular education policies without orthodox consideration of contexts (Verger, 2014). In addition, Tajeddini and Mueller (2019) believe that for firms competing in a highly dynamic environment, the positive effect of an entrepreneurial orientation on financial performance is enhanced. As a result, financial and other constraints on universities prevent them from efficaciously pursuing their goals to this day (Yong, 2022). According to the above arguments and studies, the other related sub-hypotheses are as follows:

H1c. Financial component has a meaningful effect on entrepreneurial university.

H2c. Financial component has a meaningful effect on entrepreneurial university, considering education as a mediator variable.

It is necessary to possess communication tools to strengthen trust and cooperation in universities that focus on entrepreneurship and internationalization (Guerrero et al., 2018). For this reason, internationalization is the development of scientific cooperation and academic exchanges at the international level (Altbach, 2014). At the same time, considering the social networks can help internationalize new investments by providing connections and opportunities in foreign markets through accessing the desired resources and receiving the necessary information to enter and compete international arena (Ellis et al., 2011). In this vein, it can be stated that proper social communication is one of the important measures to pave the way for the development of the country and entrepreneurial universities (Bruhn, 2016). Staff training plays an important role in the development of an entrepreneurial university. Hence, transparency and cooperation between the industry and academia show greater value in the knowledge transition between academics (Miller et al., 2018). To promote entrepreneurship, universities also need to offer their employees more support in relation to entrepreneurial activities such as knowledge and education on patenting processes, formation of university-industry collaboration, and company creation (Dahlborg et al., 2017). Wynn and Jones (2017) have shown that universities have been able to enhance the entrepreneurial process through existing knowledge-based companies’ communication in order to commercialize and transfer knowledge. In fact, by creating flexible structures with a low hierarchy, communication and information exchange barriers are minimized. Given that the concept of the entrepreneurial university is one of the hallmarks of internationalization, it can be said that the entrepreneurial university is considered as a catalyst for facilitating the entrepreneurship of the university (Centobelli et al., 2019). It can be stated that the concept of entrepreneurial university aims to transfer scientific knowledge to companies, which in turn, strengthens social and economic development (Dalmarco et al., 2018). The faculty members of the entrepreneurial university are also looking for opportunities to support educational and research goals with the participation of business partners through formal interaction (Miller et al., 2018). At the same time, communication can provide new investment for internationalization by creating opportunities in foreign markets through accessing desirable resources for internationalization and receiving the information needed to enter and compete abroad (Ellis et al., 2011). In addition, university culture needs to be open to change, for example with the help of role models and increased communication concerning entrepreneurial activities (Schnurbus & Edvardsson, 2022). Based on the above arguments and studies, the other related sub-hypotheses are as follows.

H1d. Communication component has a meaningful effect on entrepreneurial university.

H2d. Communication component has a meaningful effect on entrepreneurial university, considering education as a mediator variable.

In recent decades, more attention has been paid to creativity and innovation at the organizational level, and large organizations and companies cannot avoid it due to increasing changes and constantly changing environmental conditions that affect competition (Coccia & Watts, 2020). Entrepreneurial universities are central to the economics of regional and national communities (Cunningham et al., 2019). Therefore, Schmitz et al. (2017) in their study identified knowledge as the critical factor of production and development in society. Entrepreneurial universities are perceived as a channel for knowledge spillovers; they serve as central actors of innovation networks and stimulate network activities. Etzkowitz (2014) describe entrepreneurial universities as a driver of the transition towards a knowledge-based society because they constitute a key mechanism in the commercialization of knowledge. Hence, public sector entities may also decisively affect regional innovation performance and enhance regional competitiveness and regional economic growth (Graf & Menter, 2022). Growth and profitability through an innovative network encourage the university to help create the culture needed for an entrepreneurial university and to facilitate the development of entrepreneurial universities (Alexander & Evgeniy, 2012). In addition, less attention has been paid to the role of innovation and entrepreneurship in academic missions, and new teaching techniques and innovative curricula can support entrepreneurship and innovation programs (Schmitz et al., 2017). According to the mentioned arguments and studies, the other related sub-hypotheses are as follows.

H1e. Innovation component has a meaningful effect on entrepreneurial university.

H2e. Innovation component has a meaningful effect on entrepreneurial university, considering education as a mediator variable.

A review of the research background indicates that most researches have examined the results of the entrepreneurship university and internationalization separately, and no study has probed the meditating role of education in the foregoing relationship. Therefore, as the components of internationalization are not explicitly investigated, no study has considered the components of internationalization in entrepreneurial universities. In this study, education was used as a mediating factor. In summary, based on the literature review, the conceptual model can be drawn as follows.

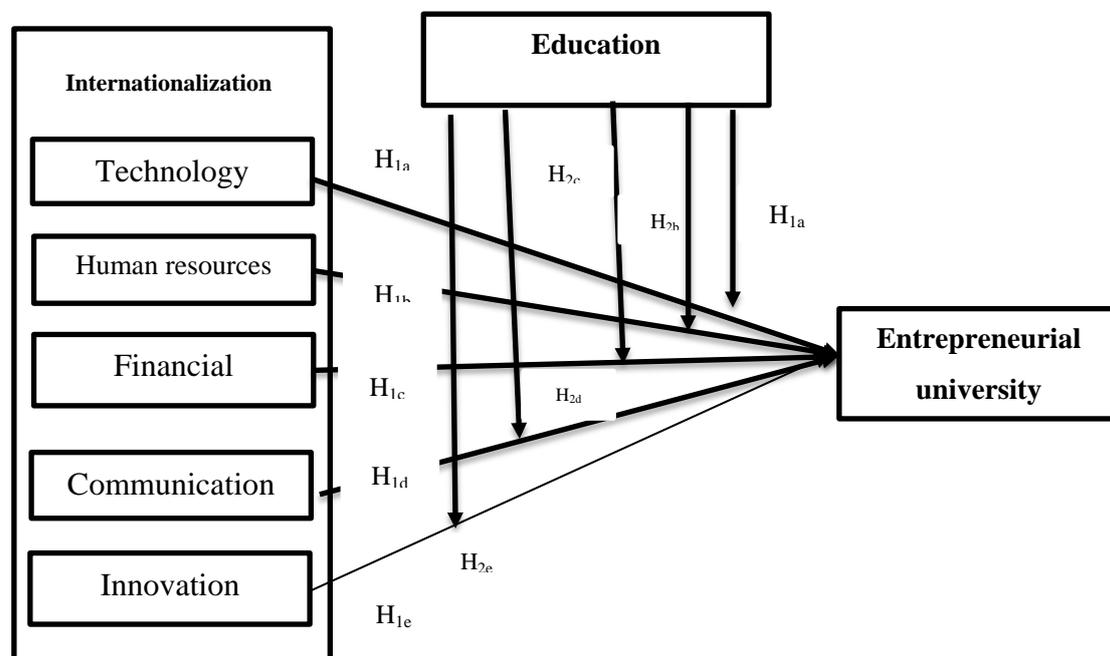


Figure 1. The Conceptual Model (Source: Authors' Elaboration)

3. Methodology

The research population included all the managers and faculty members of major universities located in Tehran, including University of Tehran, Sharif University of Technology, and Tarbiat Modares University. The reason why these universities were chosen are as follows: (a) They are among the

highest-ranking universities of Iran, (b) they are successful in the field of international cooperation (such as participating in Erasmus project, etc.), and (c) they possess their own entrepreneurship and innovation centers and Science and Technology Parks, including several active startups in their campus. The data were collected from January to April 2019 (N=320). One hundred and seventy-five individuals were selected using Morgan's table and a random sampling technique (n=175). When the size of population is specified, Morgan table is used to calculate the sample size. Finally, 171 valid questionnaires were collected, with 79 being related to the University of Tehran, 45 to Tarbiat Modares University, and 47 to Sharif University of Technology.

We used thirty-five questions, with a 5-point Likert-type scale. The questions were drawn from standard questionnaires. For measuring internationalization, 25 questions were drawn from Prahalad and Hamel (1990), and for measuring the education and entrepreneurial university, equally five questions were drawn from Griffioen (2019) and Todorovic et al. (2011), respectively. The questionnaires were distributed through online platforms of the Universities. Finally, the questionnaires were gathered and analyzed (See Table 1). Finally, with some minor modifications, a 25-item questionnaire was developed using the Press Line website and a link to the questionnaire was sent to the participants.

4. Results

The demographic characteristics of respondents were as follows. In terms of gender, 33% were female, and 67% were male. Concerning the age factor, 7% were in the 20-30 years old age group, 32% in the 30-40 years old age group, 51% were between 40-50 years old, and the remaining 10% were over 50. Therefore, it can be claimed that participants in the present study had enough diversity in terms of demographic characteristics such as gender and age.

4.1 Construct validity

In this research, internationalization and its elements were the independent variables, the entrepreneurial university was the dependent variable, and the education was the mediating variable (Figure 1). Smart PLS3 software was used, and the structural equation modelling method was followed to examine the relationships. Academic experts confirmed the content validity of the questionnaire, and the validity of the structure was confirmed through confirmatory factor analysis. To check the validity of the content of the questionnaire, the opinions of experts and faculty members (5 people) were taken and the questions were corrected. To evaluate the reliability of the questionnaire, Cronbach's alpha coefficient and combined reliability were used (Fornell & Larcker, 1981).

To measure the reliability of the questionnaire, Cronbach's alpha coefficient was calculated. The answer to each question is a different numerical question that has acceptable reliability above 0.7. Finally, the collected data were analyzed by Smart PLS3 software package. As Table 1 shows, the values of Cronbach's alpha coefficients of all variables are more than the minimum acceptable amount, i.e., 0.7, so we can conclude that the instrument used for measuring the variables has had sufficient reliability.

Table 1. Relationship Between Variables (Source: Authors)

No.	Variable	Dimensions	Cronbach's alpha
1	Education	---	0.834
		Technology	0.905
		Human Resources	0.896
2	Internationalization components	Financial	0.756
		Communication	0.919
		innovation	0.780
3	Entrepreneurial University	---	0.919

Partial least square method was adapted for evaluating the reliability, in which the factor loads and combined reliability were used to measure reliability. The closer the factor load to 1, the stronger and more appropriate the question, and 0.4 is the criterion for the correctness of the factor load (Hulland, 1999).

As Table 1 summarizes, the numbers indicate that the value of the shared alpha and reliability coefficient of all structures is greater than the minimum acceptable value, i.e., 0.7, so the structures of

this study are reliable and desirable. Convergent validity is acceptable since minimum acceptable value for AVE is 0.5 and all structures have higher scores than 0.5 in the measured amount of the mean of extracted variance (AVE).

Table 2. Composite Reliability, Reliability, and AVE (Source: Authors)

Variable	Dimension	Question	Factor loading	T-value	Composite reliability	AVE	rho-R	R ²	R ² - adjusted	Q ²
Education	---	Q1	0.908	35.681	0.885	0.609	0.852	0.823	0.802	0.701
		Q2	0.865	5.660						
		Q3	0.890	29.015						
		Q4	0.860	27.931						
		Q5	0.910	37.720						
Internationalization components	Technology	Q6	0.875	29.267	0.931	0.730	0.916	---	---	---
		Q7	0.914	36.442						
		Q8	0.820	14.798						
		Q9	0.869	16.350						
		Q10	0.896	23.924						
	Human resources	Q11	0.853	17.432	0.924	0.709	0.907	---	---	---
		Q12	0.878	25.042						
		Q13	0.901	31.120						
		Q14	0.858	21.710						
		Q15	0.856	18.777						
	Financial	Q16	0.831	15.059	0.782	0.561	0.782	---	---	---
		Q17	0.890	13.585						
		Q18	0.796	12.189						
		Q19	0.583	2.179						
		Q20	0.623	2.685						
Communication	Q21	0.684	4.964	0.939	0.756	0.920	---	---	---	
	Q22	0.718	9.608							
	Q23	0.890	22.214							
	Q24	0.896	26.882							
	Q25	0.684	6.163							
Innovation	Q26	0.715	7.545	0.855	0.553	0.800	---	---	---	
	Q27	0.838	14.763							
	Q28	0.897	23.770							
	Q29	0.583	2.743							
	Q30	0.817	15.351							
Entrepreneurial University	---	Q31	0.819	14.198	0.940	0.757	0.923	0.650	0.598	0.600
		Q32	0.830	16.901						
		Q33	0.747	11.050						
		Q34	0.920	36.959						
		Q35	0.885	26.569						

To assess convergent validity, the mean-variance index was extracted, and the mean root index of the extracted variance was used to evaluate the divergence (Fornell & Larcker, 1981). Thus, the convergent validity is approved for variables a divergent validity is approved since mean values of the extracted mean-variance are more significant than the correlation of the variable with the other variables and the numbers in the original diameter are greater than their sub-values (Fornell & Larcker, 1981). Therefore, one can conclude that the divergent validity is confirmed (see Table 3).

Table 3. Convergent Validity (Source: Authors)

Variables	CC	E	EU	FC	HRC	IC	TC
CC	0.780						
E	0.379	0.855					
EU	0.717	0.208	0.842				
FC	0.575	0.678	0.403	0.815			
HRC	0.445	0.869	0.264	0.804	0.871		
IC	0.744	0.304	0.738	0.639	0.452	0.756	
TC	0.465	0.847	0.207	0.779	0.870	0.409	0.892

Notes: Entrepreneurial university (EU); Education (E); Innovation Component (IC); Financial Component (FC); Human Resources Component (HRC); Communication Component (CC); Technology Component (TC).

In conformity with the above tables and the outcomes of Smart PLS3 software output in Tables 2, 3 and 4, the measurement models (convergent and divergent) and reliability coefficients (factor load, combined reliability coefficient, and Cronbach’s alpha) are appropriate. To evaluate the fit of the model, three levels of (measurement, structural and general), were examined (Hair Jr et al., 2017). For evaluating the fit of the structural model, several criteria were adapted using the least partial quadratic method.

Since all scales are administered by the self-report method to assure that no common method bias existed in the research, Kock’s (2015) proposal was used: if all VIFs on account of a full collinearity test are similar to or below 3.3, the model could be deemed without common method bias. Accordingly, the VIF values for Education (VIF=2.939), Technology (VIF=2.899), Human Resources (VIF=2.949), Financial (VIF=1.762), Communication (VIF=2.240), Innovation (VIF=2.153), and Entrepreneurial university (VIF=2.978) were less than 3.3, showing that the model is free of common method bias.

4.2 Structural Model

PLS regression is an extension of the multiple linear regression model. In order to assess the proposed model, R square, t values, predictive relevance (Q^2), and standard beta were examined. The first measure was to study the t values. The t values must have been higher than 1.96, at the 95% confidence level (Thomas, 2003). The findings revealed that all the t values were higher than 1.96 at the mentioned confidence level (Figure 2). Thus, all the relationships, except the sixth hypothesis (t-value= 1.926), were supported. It means that education did not significantly mediate the relationship between the financial component and entrepreneurial university (H2c).

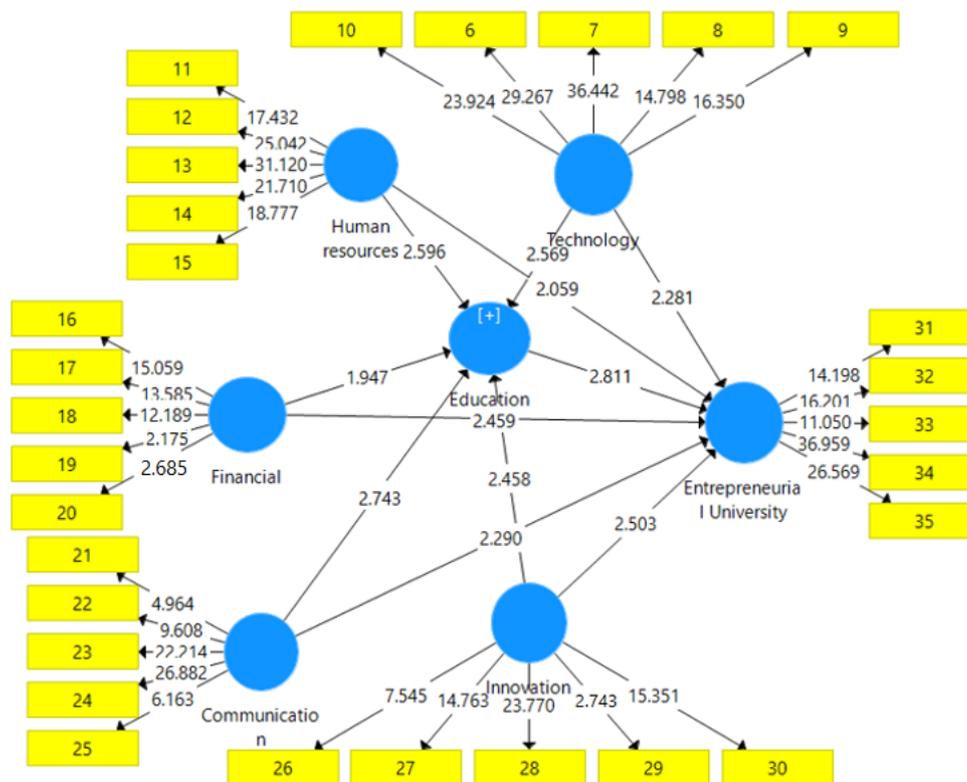


Figure 2. T-Values

The second criteria used in this research was R square. The three values of 0.19, 0.33, and 0.67 were respectively interpreted as weak, mediating, and strong relationships. This criterion is only used for dependent variables, and not independent variables, which were 0.823 and 0.650 for education and entrepreneurial university, respectively (Figure 3).

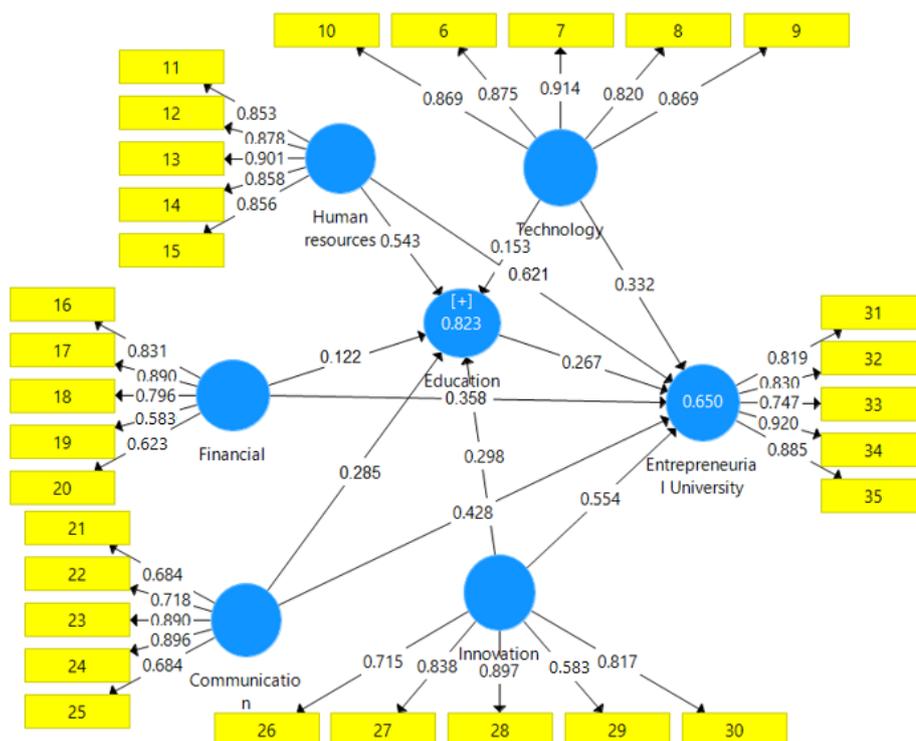


Figure 3. The Model of Entrepreneurial University (Standardized Beta Coefficients are Presented)

4.3 Predictive Relevance (Q²)

This criterion (Q²) must be higher than zero to show good predictive relevance (Kline, 2015). The Q² values for education (Q²= 0.701) and entrepreneurial university (Q²= 0.600) suggested that the model had sufficient predictive relevance.

4.4 Goodness of Fit (GOF)

In addition to investigating the measurement and structural models, the goodness of fit could let us ensure the quality of our model. This criterion is calculated as follows.

$$GOF = \sqrt{\text{average (Commonality)} \times \text{average (R}^2)}$$

Based on our findings, the GOF value was 0.804, which showed the fitness of the model.

Another approximate model fit criterion implemented was the standardized Root Mean Square Residual (SRMR). This value had to be lower than 0.1. According to our findings, SRMR was equal to 0.013. In addition, Bentler-Bonett index or normed fit index (NFI) was used as another useful approximate model fit criterion. This value is normally between 0 and 1, but it had to be greater than 0.9 (Kline, 2015). Based on the findings, this value was equal to 0.948, which is acceptable (See Table 4).

Table 4. SRMR and NFI (Source: Authors)

	SRMR	NFI
Acceptable value	0.10 ≥	0.90 ≤
Calculated value	0.013	0.957

The Variance Accounted For (VAF) was 0.140, so the mediating role of education is evaluated strong in the relationship between internationalization and entrepreneurial university

Finally, Table 5 shows the results of testing the hypotheses. All the relationships, except for the sixth hypothesis (t -value= 1.926), were supported. This means that education did not significantly mediate the relationship between the financial component and entrepreneurial university (H2c).

4.5 Testing Hypotheses

The hypotheses were tested by a t-test. Nine of ten hypotheses were confirmed (see Table 5) and the standardized factor coefficients were used to determine the effect of predictive variables on dependent variables. These coefficients suggest that changes in the dependent variables are explained by the independent variables just up to a few percent.

Table 5. Path Relationships (Source: Authors)

Path	Coefficients	T-value	Test result
Technology component —entrepreneurial university.	0.332	2.281	Approved
Technology component —entrepreneurial university with the mediating role of education.	0.153	2.569	Approved
Human resources component —entrepreneurial university.	0.621	2.059	Approved
Human resources component —entrepreneurial university with the mediating role of education.	0.543	2.596	Approved
Financial component —entrepreneurial university.	0.358	2.459	Approved
Financial component —entrepreneurial university with the mediating role of education.	0.122	1.947	Not Approved
Communication component —entrepreneurial university.	0.428	2.290	Approved
Communication component —entrepreneurial university with the mediating role of education.	0.285	2.743	Approved
Innovation component —entrepreneurial university.	0.554	2.503	Approved
Innovation component —entrepreneurial university with the mediating role of education.	0.298	2.458	Approved

The results of the study obtained from PLS3 software showed that the critical value obtained for paths are greater than the critical value 1.96 at the 95% confidence level, and the hypotheses are confirmed. The point is that the paths are meaningful, so the appropriateness of the structural model is confirmed. According to the results, the highest impact is related to the direct path of the human resources component to the entrepreneurial university.

5. Discussion

The results of testing the hypotheses showed that all components of internationalization have positive effects on the entrepreneurial university via the mediating role of education. To the degree that PLS3 software results imply, it can be concluded that the first hypothesis which was related to the effect of technology component on the entrepreneurial university and its sub-hypothesis, i.e., the mediating role of education, was confirmed. According to Mohiuddin et al. (2022), the universities that used guidelines and policies to link academia and industry were considered to be effective as they exchange knowledge and technology. Here, what plays a key role in making an entrepreneurial university is the transfer of technology and knowledge. Therefore, the directors of public universities are developing mechanisms and strategies to become an entrepreneurial and international university. Accordingly, public and private universities are working to facilitate the entrepreneurship process aiming to create commercial centers and science and technology parks.

Mazgan (2011) believes that besides following the common international strategic purpose, some countries have adopted their standards to patronize technology and knowledge transition. The review of the researchers (Bekkers & Freitas, 2008; Landry et al., 2010; Philpott et al., 2011) indicates that education plays a role in university different activities of technology. Abreu and Grinevich (2013) argued that the role of technology in different fields has different effects on the entrepreneurial university. For example, technical disciplines have a higher ability to use new technology and knowledge in the field of entrepreneurship (Abreu & Grinevich, 2013). Moreover, intellectual property rights and technology transfer are different in entrepreneurial universities due to the policies and regulations. In addition, most prior studies associated an entrepreneurial university with external supporting factors from the university's environment, such as innovation transfer offices, incubators, and different standards. The second hypothesis of the effect of human resources component on the entrepreneurial university was confirmed by considering the mediating role of education and its sub-hypothesis. One of the effective factors in the development of entrepreneurial universities is human resources. Human resources not only affect the ability of individuals to discover, evaluate, and exploit

entrepreneurial opportunities but also affect the entrepreneurial behavior of individuals. In support of the current hypothesis, Hindle et al. (2009) stated that university development is a process that is shaped by human resources. Jameson and O'Donnell (2015) suggest that the development of an entrepreneurial university involves a total commitment to a coherent mission and strategy through which an engaged and motivated human resource is allowed to act innovatively, supported by appropriate systems and structures. Passaro et al. (2018) deemed human capital as a component of intellectual capital that strongly influences the entrepreneurial university. Thus, the barriers and typical situations such as the lack of financial resources, human resource risks, and lack of enough motivation that internationalization may encounter during the entrepreneurship university should be noted. Therefore, human capital is also the critical factor in the process of entrepreneurial transformation in universities (Guerrero et al., 2015; Nikraftar et al., 2021). Human capital is the most important element for the development of educational quality and innovation production (Bronstein & Reihlen, 2014). In fact, the more knowledge and awareness of experts about the organization, the greater the possibility of knowledge and entrepreneurial activities and access to new information. In addition, the use of qualified and specialized experts in the units aimed to be related to the international can create a competitive advantage. These characteristics allow organizations to be responsive and adapt quickly to changes in the environment.

The third hypothesis, the effect of financial component on the entrepreneurial university was confirmed. However, the sub-hypothesis on the mediating role of education was not confirmed. Adopting financial resources and how to direct it to the most efficient internationalization activities for the entrepreneurial universities provides a two-way communication between the applicant and the recipient, and considering that one of the main aspects of economy is to increase domestic production, it is possible to invest and thus adopt more financial resources. Therefore, data and information processed in the field of financial resources, on the one hand is the basis of management decisions to plan, implement, and evaluate the performance of all areas in the university and, on the other hand, is the basis for monitoring and measuring the performance of university management by stakeholders. In this regard, obtaining capital and non-governmental and benevolent financing has been important for the entrepreneurial university. While universities take advantage of funding, private revenues must also be considered. The academic mission to develop knowledge for the problem that arises in the industry shows that universities can increase their funding base through research, consulting, and another activities. According to Yong (2022) due to the bureaucratic process, access to financial information at the university is not accurate. However, the entrepreneurial university can identify and exploit good financial opportunities with the policies it imposes. In addition, in the face of this situation and primarily due to the poor salaries of academics, some academics tend to seek financial resources and foreign aid for the sake of financial interests that may be created from different foreign revenue sources. As a result, the university faculties, schools, and academic departments establish a culture of dependence on external stakeholders for financial and other forms of aid to achieve its economic development goals as an entrepreneurial university.

The fourth hypothesis, the effect of communication component on the entrepreneurial university and its sub-hypothesis (the mediating role of education) were confirmed. Internationalization refers to a set of activities related to the development of international scientific and academic cooperation and communication, which aim to provide an educational and research-based environment in universities (Altbach et al., 2019). Yonezawa (2017) states that communication has an important role in internationalization and impacts the entrepreneurial university. Berggren (2017) argues that communication between researchers, students, and graduates in the international arena should be strengthened. Eliminating the focus on power and responsibility will increase the likelihood of effective employee communication across the university. These include establishing an adequate organization structure for the research center, fund-raising, the identification and forging of relationships with partner companies, maintaining good relations with university executives, and creating collaboration with other research communities and settings. According to Pancenko et al. (2012), business persons communicating with external developers need good communicational skills, in terms of being able to express themselves well both verbally and in writing.

One of the stimuli which could pave the way for the development of the country and universities should be communication. Hence, the use of social networks also has a significant impact on the

internationalization process of the university. In this regard, researchers suggest that digitization as well as intercultural and international communication should be developed in positioning. Another influential component of the internationalization process is virtual programming and how to internationalize, which can make the academic competition stronger and improve the quality of education standards.

The results of the fifth hypothesis, the effect of innovation component on the entrepreneurial university and its sub-hypothesis (the mediating role of education) were also confirmed. Innovation is an essential part of entrepreneurship to the extent that some researchers use the two concepts interchangeably. The more the university is equipped with tools to support innovation, and the better the platform for commercializing ideas and transferring technologies is produced, the more successful they will be in fulfilling their mission. One of the innovation factors of the government is the growth and transfer of technology to the entrepreneurial university. Therefore, in dynamic environments, innovation is essential because it leads to survival (Parry & Battista, 2019). Tajpour et al. (2022) asserted that innovation is the only engine of long-term competitiveness and is an essential element in increasing production efficiency. Thus, cooperation between the three sectors of industry, government, and academia is essential to promoting a national innovation system. In addition, Chebbi et al. (2017) and Ziyae et al. (2019) believe that innovation is assumed to be an essential part of the internationalization process. Innovation has been proposed as an improving factor in the knowledge-based economy in order to change the traditional thinking of the innovation process since it has been proposed as a network system consisting of various proportions and features (Philpott et al., 2011). In addition, according to Arnaut (2010), if entrepreneurial universities do not innovate, national, regional, and international competition will be disrupted. Global experience shows that entrepreneurial universities respond strongly to the needs of innovation in society and economics, education and research in economics and business, and the issues and needs of industries.

6. Theoretical Implications

Considering that the purpose of this article was to investigate the effect of university internationalization variables on the development of entrepreneurial university through the mediation of education, the present study was conducted using quantitative methods. Findings showed that in relation to the internationalization of universities by focusing on the internal activities of public universities, day-to-day activities require a lot of resources. Also, executive agents are better positioned to test the distribution of resources in universities and important specify that they should be used, developed or supported. Therefore, it can be said that the internationalization of a university, in addition to international recognition and prestige, will lead to national attention and will lead to greater participation of administrators, faculty members, and experts in international scientific activities. The more entrepreneurship-related students there are in universities, the more entrepreneurial activity there will be in universities. Finally, it can be said that at the level of the country's universities, various institutions play a role in commercializing the results of academic research and entrepreneurship, including industry relations offices, entrepreneurship centers, growth centers and science parks. Since the development of knowledge is one of the fundamental roles of institutions established through the commercialization of academic research, international networks are important to them.

In this regard, the significant mediating role of education shows that the use of related educational processes for all human resources of the university is one of the basic elements in the implementation of internationalization of the university. Education is also an effort to improve the level of knowledge, awareness, technical and professional skills. This allows knowledge to be shared in ways that enhance innovation, risk-taking, and the leadership willingness. Therefore, the more the university is equipped with the tools to support innovation and entrepreneurship, and the better the platform for the commercialization of ideas and the transfer of technologies produced, the more successful it will be in fulfilling its mission. One of the important factors in creating non-technical innovations is the development of human capabilities. Organizational memory-based learning abilities are important factors in organizational innovation.

7. Conclusion

Nowadays, societies have undergone many changes compared to the past, so in order to develop universities, they must pay much attention to the factors that affect the development of this role. The present study aimed to investigate whether internationalization affects the entrepreneurial university considering the mediating role of education in top universities in Iran. The results of this study make managers and faculty members aware of the main components that have to be addressed to implement internationalization in their universities. That is, the path to reaching an internationalization university will show the university managers where to start. In addition, based on the experiences and the attitude they have gained over the years, managers and faculty members can attract more resources and help the entrepreneurial university grow and strengthen through internationalization. Therefore, managers and faculty members should pay special attention to the organization's efforts to achieve an entrepreneurial university through internationalization. The results of this study also show that managers and faculty members who ignore the role of the organizational environment of countries cannot develop the most appropriate competences of the university. Given the differences between countries, the management of universities should pay attention to what capabilities can be more useful in each of the competing countries. Therefore, without a proper understanding of the country's macro environment, reforms made within the organization or in relationship with other stakeholders outside the organization may lead to negative results. Therefore, managers need to consider these factors and they cannot develop the proper competences of the university if they ignore the role of the organizational environment. Thus, it can be claimed that education, as a mediating factor, is effective in entrepreneurial universities. It is suggested that the appointment of flexible and active employees in different departments of top universities can turn the inflexible and rigid culture of the organizations into a more entrepreneurial one. Internationalization requires an academic environment that leads to a transparent structure among individuals, which leads to their active participation. In this study, respondents stated that entrepreneurial universities should not receive financial help from the government. This factor indicates the independence of a university and helps the university attract top ideas to become an entrepreneur. It is suggested that by reviewing the international strategies and goals of universities in the development of entrepreneurship, the government should provide a legal framework for bilateral cooperation between industry-government activists and the university and, as a consequence, promote entrepreneurial universities. The results also showed the growing social relations of universities have faced two coherent but distinct phenomena including globalization and internationalization, meaning partnership and cooperation. In order to achieve effective communication, universities can come up with new ideas internationally. In addition, by expanding international scientific cooperation and establishing scientific relations with other universities, the ground for scientific progress of universities will be provided. For further study, it is also suggested that there are other influential components for the development of entrepreneurial universities in the country that have not been studied in this research and can provide points for other researchers.

8. Limitations

This article has several limitations. First, a cross-sectional study design was used to take the data. Since cross-sectional studies are done once and show a picture of a point in time, they do not reveal important long-term relationships. A longitudinal study can track changes over time and provide a clearer picture of the reasons for success or failure. Second, the study focused on Iran's top universities, but the study of a single region may limit the generalizability of the results to the conditions of different regions.

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