Designing a Model and Evaluating its Suitability for the Entrepreneurial University

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Abstract. Introduction: around the world, the science system of many countries is being transformed and changed in response to increasing social and economic need for knowledge and technology. The theory of the entrepreneurial university is one of the models proposed for reflecting the new and transformed image of the university characterized by a broader interaction between the universities and the community. The universities in developed

countries have shifted towards entrepreneurship. In knowledge-based economy, along with educational and research responsibilities, universities also have a third mission, which involves more extensive engagement in the process of innovation and development of technology. Accordingly, new university-based networks are being developed and considering their capabilities as the source for producing and distributing knowledge, universities are becoming more entrepreneurial in order to play their critical role in industrial innovation and technology development, leading to new jobs and increased well-being.

Keywords: Entrepreneurial University, National and Regional, Internal Factors, External Factors.

1. Introduction and Background

The trend of global growth and development and the necessity of keeping up with this growth have increased the position of entrepreneurship in many countries more than ever before (Cunterjio, 2014). There is a special focus on entrepreneurship and entrepreneurs. Promoting entrepreneurship and creating the context necessary for its expansion are considered as important tools for the economic progress of various countries, particularly the developing countries since highly effective entrepreneurial activities will result in economic expansion (e.g. creating jobs, innovation in practices, competitiveness, and so on) (Adersich, 2014). On the other hand, the experiences of various countries, including developed and developing countries, indicate that the best option for preparting the graduates of the educational system for the labor market is for universities and higher education organizations to create the necessary context and environment for entrepreneurship and self-employment (Zhang and Li, 2015).

Table 1. Various components and factors influencing the entrepreneurial university

No.	Key empowering factors for the entrepreneurial university	Author(s)
1	Management, structure, culture, and mission of the institution	Hurthi (2014)
2	The human resources of the university, the structure, financial resources, strategy, the internal and external environments	Bronstein and Raylan (2014)
3	Quality of graduates, attraction of financial resources, forming science and technology parks, flexible organizational structure, content of the curriculum	Behzadi et al. (2014)
4	Teaching entrepreneurship, internationalization of the university, knowledge transfer and change, vision, financial leverages	National Center for Teaching Entrepreneurship in UK (2013)
5	Focusing on human resources, efforts to attract financial resources, promotion of the principle of taking initiative, creation of a decentralized structure	Kurdnaich et al. (2012)

2. Method

 The scientific model of this study is based on qualitative interviews and quantitative analysis. For the qualitative part, we interviewed university deans and academic elites, and sampling was based on targeted and snowball sampling methods. Ultimately, we carried out 22 qualitative interviews with subject experts and using the technique of grounded theory, we identified the components of entrepreneurial university in .Payam-e-Noor University. The significance of each one of the components in the extracted model for identifying the components and characteristics of an entrepreneurial university was evaluated. The study was performed using open, axial, and selective coding. The findings show two main codes and the codes are categorized in 9 axes. For the quantitative part, the questionnaire was distributed among 169 faculty members.

3. Findings

The findings of the study are obtained using simultaneous analysis and using the coding process during and after the interviews, and they are presented below. After classifying the extracted factors based on their concepts, eight factors (items) were obtained, which are presented below:

Table 2. Factors influencing the formation of the entrepreneurial university
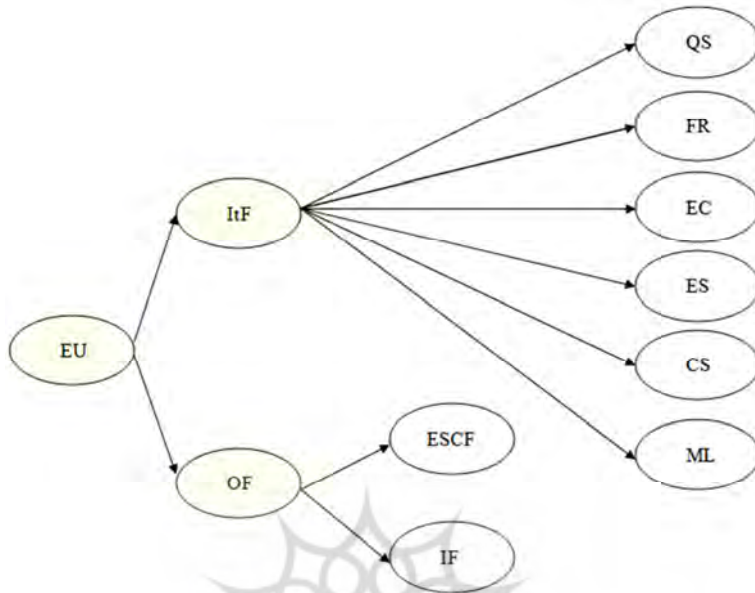
Factor (item)	Number of concepts (questions)
Quality of services	11
Financial resources	13
Entrepreneurial capability	15
Entrepreneurial structure	11
Entrepreneurial culture	7
Management and leadership	16
Economic, social, and cultural factors	10
International factors	10

Since quality of services, financial resources, entrepreneurial capability, entrepreneurial structure, entrepreneurial culture, and management and leadership are completely developed and created inside the entrepreneurial university, these factors are considered as internal factors. On the other hand, the two categories of economic, social, and cultural factors and international factors are considered as external factors.

Table 3. General factors influencing the formation of the entrepreneurial university

General categories	Factors
Internal factors	Quality of services; financial resources; entrepreneurial capability; entrepreneurial structure; entrepreneurial culture; management and leadership
External factors	Economic, social, and cultural factors; international factors

By reviewing the available studies on entrepreneurial university as well as the items extracted from the interview with the faculty members of the universities, the following theoretical model was inferred.

Fig. 1. Theoretical model

In this model, QS denotes quality of services, FR denotes financial resources, EC denotes entrepreneurial capability, ES denotes entrepreneurial structure, CS denotes entrepreneurial culture, ML denotes management and leadership, ESCF denotes economic, social, and cultural factors, IF denotes international factors, **ItF** denotes internal factors, OF denotes external factors, and EU denotes the entrepreneurial university.

Table 4. Descriptive results

No.	Item	Mean	Mode	Standard deviation	Skewness	Kurtosis
1	The university has clear mission and objectives for supporting entrepreneurship.	76/2	0/3	879/0	164/0	-136/0
2	The vision and mission of the university for becoming entrepreneurial are clear	03/3	0/3	967/0	-088/0	-257/0
3	The objectives and the strategy of the university for developing jobs based on academic majors are clear.	81/2	0/3	834/0	-104/0	-286/0

No.	Item	Mean	Mode	Standard deviation	Skewness	Kurtosis
4	The organizational structure reflects an entrepreneurial culture.	15/3	0/3	83/0	-098/0	-05/0
5	Individual characteristics have been considered when creating the entrepreneurial university.	75/2	0/3	939/0	095/0	-344/0
6	The leadership thought is one of the main components of the entrepreneurial university.	91/0	0/3	896/0	-011/0	-119/0
7	Technology is one of the important necessities for making a university entrepreneurial.	18/3	0/3	861/0	-089/0	-214/0
8	The university has a clear research strategy in its plans.	87/2	0/3	861/0	-089/0	-214/0
9	Devising research-based regulations, coordination between the vision and mission of the university and the decision making process are among the important indicators of an entrepreneurial university.	8/2	0/3	951/0	-018/0	-491/0
10	The university has matched its graduates with the needs of the market and the community.	28/3	0/3	978/0	-087/0	-514/0
11	Establishing startups is one of the important priorities for the university.	30/3	0/3	852/0	-227/0	-119/0

The descriptive results related to the statistical measures of the items for the component of quality of services shows that the highest score is related to establishing startups in the university with a mean score of 30/0, followed by matching graduates and the needs of the market and society with a mean score of 28/3. Moreover, all the items (as observed variables) have a normal distribution since their skewness is in the range of -3 to 3, and their kurtosis is in the range of -10 to 10. In order to determine the statistical distribution of the latent components of the

variable of internal factors, mean, mode, standard deviation, skewness, and kurtosis are used, and the results are presented below.

Table 5. Statistical Measures for the Components of the Variable of Internal Factors

No.	Item	Mean	Mode	Standard deviation	Skewness	Kurtosis
1	Quality of services	84/32	0/34	25/7	-033/0	-128/0
2	Financial resources	94/38	0/9	46/8	-058/0	-475/0
3	Entrepreneurial capability	89/42	0/43	96/9	026/0	-416/0
4	Entrepreneurial structure	55/52	0/33	66/7	-04/0	-593/0
5	Entrepreneurial culture	16/20	0/20	56/4	-033/0	-25/0
6	Management and leadership	63/47	0/48	97/10	-016/0	-416/0

The descriptive results related to the statistical measures for the latent components of the variable of internal factors show that the highest score is related to the importance of management and leadership with a mean score of 63/47, followed by the importance of entrepreneurial capability with a mean score of 89/42. Moreover, all the latent factors have a normal distribution since their skewness is in the range of -3 to 3, and their kurtosis is in the range of -10 to 10. In order to determine the statistical distribution of the latent components of the variable of external factors, mean, mode, standard deviation, skewness, and kurtosis are used, and the results are presented below.

Table 6. Statistical Measures for the Components of the Variable of External Factors

No.		Item	Mean	Mode	Standard deviation	Skewness	Kurtosis
1		Economic, social, and cultural factors	51/2	0/29	76/6	025/0	318/0
2		International factors	04/29	0/29	58/6	062/0	-132/0

The descriptive results related to the statistical measures for the latent components of the variable of external factors show that the highest score is related to the importance of economic, social, and cultural

factors with a mean score of 29.51, followed by the importance of international factors with a mean score of 29.04. Moreover, the two latent factors have a normal distribution since their skewness is in the range of -3 to 3, and their kurtosis is in the range of -10 to 10. In this section, based on the factors (items) and the questions assigned to them, the first and second order confirmatory factor analysis was performed. At the final section, the general model proposed in the previous section is tested using structural equation modeling. Internal factors (**ItF**) include six components (items). In order to confirm that these six components can accurately explain the concept of internal factors, second-order factor analysis was used, and the result is presented below. In order to evaluate the fitness of the model, the ratio of chi-square to degree of freedom ($\mathbf{X^2/df}$), goodness of fit index (GFI), the Root Mean Square Error of Approximation (RMSEA), the comparative fit index (CFI), and normed fit index (NFI) were used. While evaluating the fitness of the model, it is sufficient if at least three indices are in the acceptable range. The results for the fitness of the model are presented below.

Table 7. Model Fit Indices for the Internal Factors

Index	Estimated Value	Acceptable Threshold
Chi-squared ($\mathbf{X^2}$)	93/2773	-
Ratio of chi-squared to degree of freedom ($\mathbf{X^2/df}$)	088/1	Lower than 3
Goodness of fit index (GFI)	825/0	Higher than 8/0
The Root Mean Square Error of Approximation (RMSEA)	016/0	Lower than 8/0
Comparative fit index (CFI)	981/0	Higher than 85/0
Normed fit index (NFI)	982/0	Higher than 85/0

It can be seen that all the indices for the second-order factor analysis of internal factors are in the acceptable range. Therefore, it can be said with confidence that the model fits the data. Next, we estimate the model coefficients in the measuring models using maximum likelihood estimation. This is presented in the form of factor loadings, coefficient of determination, and t-values.

Table 8. Statistical Measures for the Second-Order Factor Analysis of Internal Factors

No.	Component (item)		Factor Loading	Coefficient of Determination	t statistic
1	Quality of services	QS	703/0	494/0	-
2	Financial resources	FR	755/0	57/0	*950/7
3	Entrepreneurial capability	EC	718/0	516/0	*950/7
4	Entrepreneurial structure	ES	694/0	482/0	*071/8
5	Entrepreneurial culture	CS	704/0	496/0	*779/7
6	Management and leadership	ML	685/0	469/0	*667/7

* Significant at the 5 percent error level

The results obtained from the second-order confirmatory factor analysis for the latent variable of internal factors show that all the components (items) are significantly loaded on the internal factors. For instance, financial resources with an effect size of 755/0 can contribute to the explanation of internal factors ($t = \mathbf{7.950}$). External factors (OF) include two components (items). In order to confirm that these two components can accurately justify the concepts of external factors, we used the second-order factor analysis, whose results are presented below. In order to evaluate the fitness of the model, the ratio of chi-square to degree of freedom ($\mathbf{X^2/df}$), goodness of fit index (GFI), the Root Mean Square Error of Approximation (RMSEA), the comparative fit index (CFI), and normed fit index (NFI) were used. While evaluating the fitness of the model, it is sufficient if at least three indices are in the acceptable range. The results for the fitness of the model are presented below.

Table 9. Model Fit Indices for the External Factors

Index	Estimated Value	Acceptable Threshold
Chi-squared ($\mathbf{X^2}$)	475/193	-
Ratio of chi-squared to degree of freedom ($\mathbf{X^2/df}$)	145/1	Lower than 3
Goodness of fit index (GFI)	946/0	Higher than 8/0
The Root Mean Square Error of Approximation(RMSEA)	021/0	Lower than 8/0
Comparative fit index (CFI)	992/0	Higher than 85/0
Normed fit index (NFI)	943/0	Higher than 85/0

It can be seen that all the indices for the second-order factor analysis of external factors are in the acceptable range. Therefore, it can be said

with confidence that the model fits the data. Next, we estimate the model coefficients in the measuring models using maximum likelihood estimation. This is presented in the form of factor loadings, coefficient of determination, and t-values.

Table 10. Statistical Measures for the Second-Order Factor Analysis of External Factors

No.	Component (item)		Factor Loading	Coefficient of Determination	t statistic
1	Economic, social, and cultural factors	ESCF	75/0	563/0	*461/5
2	International factors	IF	77/0	585/0	-
* Significant at the 5 percent error level					

The results obtained from the second-order confirmatory factor analysis for the latent variable of external factors show that all the components (items) are significantly loaded on the internal factors. For instance, economic, social, and cultural factors with an effect size of 0.75 can contribute to the explanation of external factors ($t = 5.461$).

After performing confirmatory factor analysis for each of the factors in the proposed model (proposed in the qualitative section), in order to evaluate the general model, the structural equation modeling method was used so that the general model can also be evaluated. As mentioned earlier, the general model includes the latent variables of quality of services, financial resources, entrepreneurial capability, entrepreneurial structure, entrepreneurial culture, and management and leadership as endogenous variables and the latent variable of internal factors as the exogenous variable. The results obtained from second-order confirmatory factor analysis for the latent variable of 'external factors' show that all the components (items) are loaded significantly on the external factors. For instance, economic, social, and cultural factors with a size of 75/0 can contribute to the explanation of the variable of external factors ($t = 5.461$).
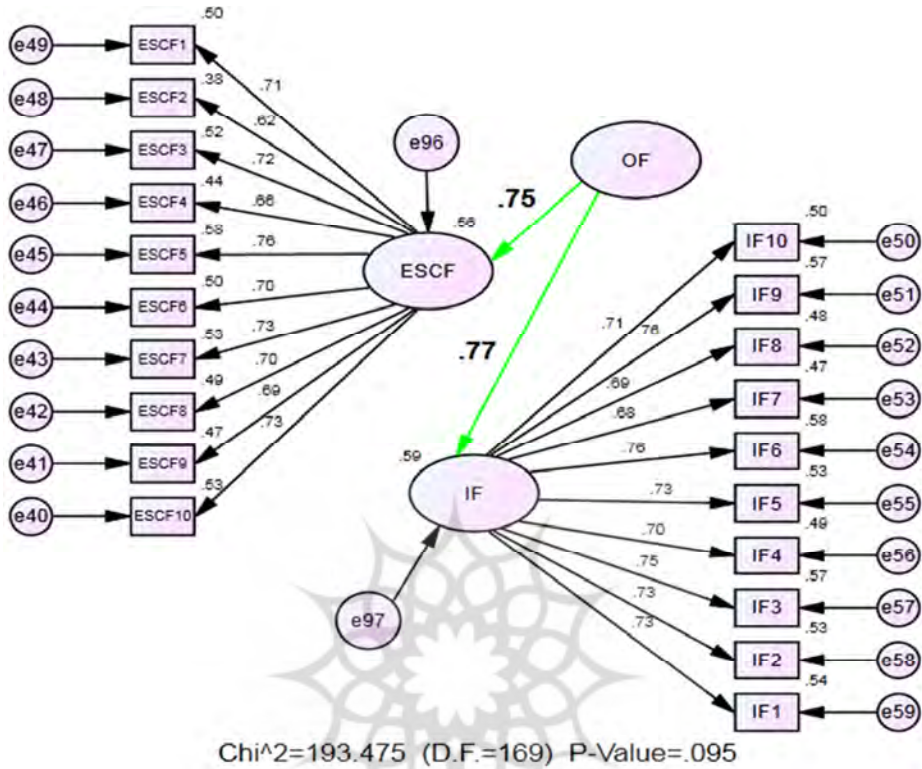
Fig. 2. Estimation of Factor Loadings in the Confirmatory Factor Analysis of External Factors

Up to this stage, which was in fact the confirmatory factor analysis, each of the observable variables can be considered the same for their latent factors. Therefore, the correlation among the factors can be analyzed. The correlation among extracted factors shows that all the factors have a significant relationship with their subscales (their components) in a way that the latent variable of entrepreneurial university has a positive and significant correlation with all of its components (i.e. quality of services, financial resources, entrepreneurial capability, entrepreneurial structure, entrepreneurial culture, management and leadership, economic, social, and cultural factors, international factors, internal factors, and external factors). After correcting the model, the final model was obtained by making the acceptable connections between the errors of the observable variables for each factor. In order to evaluate the

fitness of the model, the ratio of chi-square to degree of freedom $(\mathbf{X^2}/\boldsymbol{df})$, goodness of fit index (GFI), the Root Mean Square Error of Approximation (RMSEA), the comparative fit index (CFI), and normed fit index (NFI) were used. While evaluating the fitness of the model, it is sufficient if at least three indices are in the acceptable range. The results for the fitness of the model are presented below.

Table 11. Model Fit Indices for the Final Model of the Study

Index	Estimated Value	Acceptable Threshold
Chi-squared ($\mathbf{X^2}$)	33/4565	-
Ratio of chi-squared to degree of freedom ($\mathbf{X^2}/\boldsymbol{df}$)	098/1	Lower than 3
Goodness of fit index (GFI)	788/0	Higher than 8/0
The Root Mean Square Error of Approximation(RMSEA)	017/0	Lower than 8/0
Comparative fit index (CFI)	974/0	Higher than 85/0
Normed fit index (NFI)	77/0	Higher than 85/0

It can be seen that after correcting the model, two indices of Goodness of Fit Index (GFI) and Normed Fit Index (NFI) of the model improved; however, they were still lower than the desirable level. Moreover, in the corrected model, three measures of the ratio of chi-squared to degree of freedom $(\mathbf{X^2}/\boldsymbol{df})$, the Root Mean Square Error of Approximation (RMSEA), and Comparative Fit Index (CFI) have also been improved. The results from the structural equation modeling show that all the components (items) have a significant impact on their own endogenous variables. For instance, the latent variable of 'external factors' with a size of 843/0an affect the variable of 'international factors'. It is worth mentioning that the latent variable of 'external factors' is in turn a linear combination of the latent variables of 'economic, social, and cultural factors' and 'international factors'. Since the lower the value of the Akaike Information Criterion (AIC) for each model, the better than model compared to other models, comparing the initial model and the adjusted model shows that the final model is more suitable than the initial model since the AIC for the initial model was equal to 670/5066 while the value of AIC for the final model was equal to 33/4993.

4. Discussion and Conclusions

The current study was carried out in order to design and devise a model for the entrepreneurial university in Payam-e-Nour University in 2018. After reviewing various studies and the interviews with 28 professors and experts in the field of entrepreneurship and entrepreneurial university, 93 factors were extracted and their frequencies were reported. In order to analyze the factors extracted in the qualitative study, the confirmatory factor analysis was used for each factor. In this section of the study, 327 individuals participated, among whom 165 individuals (5/50%) were female, while 162 individuals (5/49%) were male. The majority of the participants were in the age range of 31 to 40 years, with a frequency percentage of 9/33 percent. Moreover, the majority of the participants were assistant professors, with a frequency percentage of 23/49 percent. The universities where the participants were working included five universities,Azad University,Public University,Payam-e-Nour Universitiy, Technical and Vocational University, and non-profit universities. Moreover, the reliability of each component was evaluated using Cronbach's Alpha coefficient, indicating that all the components had a coefficient higher than 7/0, confirming their reliability. Moreover, the reliability of the questions in the questionnaire was obtained as 959/0 Based on the results obtained from analyzing the items for the component of quality of services, it was found that "establishing startups in the university" with a mean value $30/3\pm852/0$ followed by "matching graduates with the needs of the market and the society" with a mean value of$28/3\pm978/0$,were the most important items from the point of view of the participants. Establishing startups in the university can promote entrepreneurship in the university and improve its services. Moreover,establishing startups can play an important role for improving the image of an entrepreneurial university and creating a large number of job opportunities. In other word , startups not only play an important role in the development of an entrepreneurial university, they can also be considered as a job creation strategy. Furthermore, matching the graduates of the university with the needs and requirements of the job market and the society as a whole by the university is one of the changes that the majority of graduates expect in order to be able to make use of their education after graduating. This important issue must in fact be

considered as a mission for the entrepreneurial university in order to facilitate its development. If an entrepreneurial university cannot implement this strategy, it will face a lot of barriers to its development due to the negative feedback it will inevitably receive from its graduates.. (2017), Lahiji (2012), Razavi and Husseini (2014), Aghajani and Miar Kolaei (2014), Clark (2008), Poutter (2008), and Gabe (2012). With regards to the component of financial resources, the results from the descriptive analysis show that the "covering the government's budget for the university" with a mean value of $28/3\pm87/0$ followed by "establishing a strategy for attracting financial resources for creating an entrepreneurial university by the university" with a mean value of $14/3\pm867/0$ were the most important issue from the point of view of participants. One of the prerequisites for establishing and developing an organization, institute, or emerging enterprise is access to valuable financial resources, which can be considered as a catalyst. Having access to such resources may at first seem trivial since it only requires short-term objectives to reach a certain level of progress. Therefore, paying attention to the presence of such valuable assets and resources is essential for an entrepreneurial university.

References

Aranha, E. A. and Garcia, N. P.(2014). Dimensions of a metamodel of an entrepreneurial university. African Journal of Business Management, 8(10), 336-349.

Audretsch, D. B. (2014). From the entrepreneurial university to the university for the entrepreneurial society. Journal of Technology Transfer, 39(3), 313.

Bhayani, A. .(2015). Building entrepreneurial universities in a specific culture-barriers and opportunities. International Journal of Nonprofit and Voluntary Sector Marketing, Int. J. Nonprofit Volant. Sect. Mark. 20: pp 312–330 , DOI: 10.1002/nvsm.1533

Bourdieu, P.(2014). "The Specificity of the Scientific Field and the Social Conditions of the Progress of Reason", in Mario Biagioliced, The Science Studies, Reader Routledge

Cantaragiu, R., Paunescu, C., & Hadad, S.(2014). The social impact of university entrepreneurship in Romania: Is the institutional discourse replicated or adapted? Management & Marketing, 9(4), 403.

Castro-Martinez, E., Jimenez-Saez, F., Arroyo-Vazquez, M.(2013). What might an entrepreneurial university constitute?. 2013 EU-SPRI Forum Conference, Madrid 10-12 April 2013, ISBN 978-84-695-7408-9

Etzkowitz, H.(2001). The second academic revolution and the rise of entrepreneurial science. Technology and Society Magazine, 20(2), 19-29.

Etzkowitz, H.; Ranga, M. and Dzisah, J.(2012). Whither the university? The novum trivium and the transition from industrial to knowledge society. Social Science Information, 51(2),143-164

Guerrero, M., Cunningham, J. A., & Urbano, D. .(2015). Economic impact of entrepreneurial universities' activities: An exploratory study of the United Kingdom. Research Policy, 44(3), 748-764.

Markuerkiaga, L. N., Errasti, E., Ignacio Igartua, J.(2014).Success factors for managing an entrepreneurial university: Developing an integrative framework industry & higher education, Vol 28, No 4, pp 233–244, doi: 10.5367/ihe.2014.0214.

Nelles ,Jen , Vorley,Tim.(2010). Constructing an Entrepreneurial Architecture: An Emergent Framework for Studying the Contemporary University Beyond the Entrepreneurial Turn. Innov High Educ. 35:161–176.

Philpott, K.; Dooley, L.; O'Reilly, C. and Lupton, G.(2011). The entrepreneurial university: Examining the underlying academic tensions. Journal of Technovation, 31, 161–170.

Sabori, A..(2010).. Science production in Iran in 2008, Journal of Rahyaft, No(43)

Saedpanah, Bijan; Fatehrad, Mahdi (2006) Expanding Entrepreneurship in Selected Top Universities: Key Concepts, Evaluating Case Studies, and Suggested Strategies; Sharif University of Technology, Volume Three.

Samadi Miar Kolaei, Hussein; Aghajani, Hasan Ali; Samadi Miar Kolaei, Hamzeh, (2014), Evaluating the Indicators of the Entrepreneurial University in Mazandaran University Based on the Fuzzy Method, Paper 11, Volume 7, Issue 2, Sequence Number 24, Summer of 2014, P. 369-388.