

## Organizational Factors Affecting the Growth and Success of Academic Spin-offs

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**Abstract.** The present study aimed to identify the organizational factors affecting the growth and success of academic spin-offs. The research was conducted based on a mixed method design and the study population consisted of experts of incubation centers and spin-offs. The participants were selected using purposive sampling in the qualitative part and random stratified sampling in the quantitative part. Data coding was employed to analyze qualitative data and exploratory and confirmatory factor analysis were used to analyze quantitative data. The qualitative results indicated that 26 organizational factors affected the growth and success of academic

spin-offs. The quantitative results showed that “business planning to convert ideas into products” and “applicability of academic research” predict the highest and the lowest variance of the dependent variable, respectively.

**Keywords:** Academic Spin-Offs; Organizational Factors; Knowledge Commercialization; Entrepreneurship

## 1. Introduction

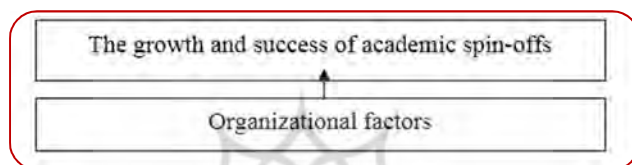
Nowadays, the third-generation universities are supposed to be entrepreneurial and innovative. It has been well and unavoidably proven that the third-generation universities play a decisive role in the socioeconomic development of societies and the creation of demand-based products, services, and processes. It is highly essential to transfer technology and commercialize academic research through knowledge-based businesses emerged in entrepreneurial universities. Matching academic research with market needs as well as financial exploitation of research results for academics help us to achieve these two goals. Academic spin-offs are knowledge- or technology-based entrepreneurial institutes that play a major role in the development of high-tech industries and provide new markets (Ritala and Hurmelinna-Laukkanen 2013). In terms of the significance of this study, it can be stated that the identification of the factors affecting the growth of academic spin-offs can positively and tangibly affect socioeconomic, research, and technological areas. Moreover, it can offer entrepreneurial universities permanent income and provide new job prospects for the community's workforce. Therefore, it seems necessary to identify and pay attention to organizational factors that cause the growth and success of academic spin-offs. The main research question is, what are the organizational factors affecting the growth of academic spin-offs?

## 2. Literature review

Social scientists adopt a different approach to examining the organizational factors affecting business activities. Instead of focusing on

widespread social and economic forces, they emphasize organizational resources and human resources of knowledge and try to find a relationship between activities of spin-offs, research budget, quality of researchers, participants of incubation centers, and transfer of technology. Helm and Mauroner (2007) indicated that the size of the organization and spin-off is one of the organizational factors affecting the growth of such companies (Helm and Mauroner 2007). They also stated that the explicit strategy of the parent organization to support spin-offs, the parent organization commitment, and management and implementation of spin-offs by the parent organization are other effective factors in this regard. Egel, Gottschalk, Rammer, and Spielkamp (2003) emphasized that legal structure is an important factor that affects the growth of academic spin-offs (Egel et al. 2003). Kassiech, Radosevich, and Banbury (1997) reported that project management skills and employees affect the growth of academic spin-offs (Kassiech, Radosevich and Banbury 1997). Kenney and Joe (2004) stated that organizational focus on research is effective in the growth of academic spin-offs (Kenney and Goe 2004). Mansfield (1995) concluded that the commercialization of academic R&D activities is a major organizational factor affecting the growth of spin-offs (Mansfield 1995). Rosenberg (2000) emphasized that the size of working groups and teamwork culture are among the organizational factors affecting the growth of academic spin-offs. Van Geenhuizen and Soetanto (2009, 2011) demonstrated that innovation is a major factor affecting the growth of academic spin-offs (Van Geenhuizen and Soetanto 2009). Anna, Tadeusz, and Magdalena (2015) interviewed professors from three American universities who owned 16 academic spin-offs and reported that the technological knowledge, innovation culture, the presence of industrial engineers and scientists, and protection of intellectual property are the key factors affecting the success of academic spin-offs (Szopa, Marek and Fafrowicz 2015). Zolfaghari and Hejazi (2013) showed the effect of organizational, individual, and environmental factors on the growth of spin-offs (Zolfaghari and Hejazi 2013). Ekhtiarzadeh (2014) stated that idea conceptualization, foundation in incubation centers, research and development, marketing, sales and market stability, development of new markets, and market survival and competitiveness are the 7 key

challenges of the growth of spin-offs (Ekhtiarzadeh 2013). Academic spin-offs have begun their activities in Iranian universities. For instance, academic spin-offs have done considerable work in the Academic Center for Education, Culture and Research and Isfahan Science and Technology Town. However, more extensive measures need to be taken to create the necessary platforms for the provision of knowledge and technology and create economic value for organizations in a way to lead to economic and technological growth. Considering theoretical foundations and the research background, the research conceptual model was developed as shown in Figure 1.



**Figure 1.** The conceptual model

Based on research foundations, the research questions were as follows: What are the organizational factors affecting the growth and success of academic spin-offs? How are these factors prioritized? What kind of model can identify the organizational factors affecting the growth and success of academic spin-offs? How is the goodness of fit of the proposed model?

### 3. Method

Given the research purpose and nature, the research methodology was based on an exploratory mixed method (a combination of qualitative and quantitative techniques). In the qualitative part, the research subject was discussed with 12 experts. The questionnaire was developed based on the components and codes extracted from interviews. The results showed that Cronbach's alpha coefficient of this questionnaire was indicating an acceptable level of reliability. The qualitative data were analyzed using content analysis and coding techniques based on Strauss and Corbin's approach to grounded theory. Exploratory and confirmatory factor analysis was employed to rank the organizational factors affecting the growth and success of academic spin-offs. All statistical analyses were performed in LISREL-8.54.

#### 4. Findings

After conducting interviews with experts, the qualitative data were analyzed using open coding and 110 initial conceptual codes were extracted.

**Table 1.** The results of content analysis of interviews and open coding

Number	Components
1	Prediction of clear and motivating goals in the organizational structure
2	Establishment of informal and supportive relationships in the workplace
3	Non-hierarchical and flexible organizational structure
4	Ability to create knowledge
5	Development of a process for the optimal use of knowledge
6	Development of a mechanism for knowledge storage
7	Knowledge sharing through organizational and managerial measures
8	Company location
9	Gaining managerial and organizational knowledge tailored to the needs of academic spin-offs
10	Taking technical skills courses
11	Conduction of applied studies at the university
12	Diversity in faculty members of academic spin-offs
13	Comprehensive educational and research policies to support the establishment of spin-offs
14	Good communication with incubation centers and science and technology parks
15	Using previous experiences of professors and members of spin-offs
16	Strategic planning for creating jobs for postgraduate students with new ideas
17	Communication between the mother university and industries
18	Getting feedback on the mother university performance to provide managers of spin-offs with scientific supports
19	Development of a communication system for interaction with academic alumni
20	Development of a network of communication for members and founders of spin-offs
21	Encouragement of new ideas
22	Promotion of self-confidence culture

Number	Components
23	Promotion of the culture of co-operation and interaction between employees
24	Planning for close and continuous cooperation with the mother university
25	Business planning to convert ideas into products
26	Development of a strategic plan for selling commercialized products

To answer the first and the second research questions, exploratory factor analysis was employed to identify the factors affecting the establishment of academic spin-offs (Table 2).

**Table 2.** Exploratory factor analysis

Sampling adequacy	Approximation	Degree of freedom (df)	Level of significance (Sig.)
0.640	730.782	325	0.000

In order to determine the distribution of variables among factors and to name the factors, the relevant matrix was calculated (Table 3). For more appropriate distribution of variables, factor analysis using varimax rotation was performed.

**Table 3.** The matrix of variance values explained

Factor	Components extracted before rotation			Components extracted after rotation		
	Total	Variance percentage	Cumulative percentage	Total	Variance percentage	Cumulative percentage
1	3.4	13	13	1.8	7	7
2	1.8	7	20	1.7	6	13
3	1.5	6	26	1.7	7	20
4	1.5	5.7	32	1.6	6.5	26.5
5	1.4	5.4	37	1.5	5.9	32
6	1.3	5	42	1.4	5.6	38
7	1.2	4.9	47	1.4	5.6	44
8	1.1	4.4	52	1.4	5.5	49.5
9	1.1	4.2	56	1.4	5.4	55
10	1.03	3.9	60.2	1.3	5.2	60.2

Based on Table 3, the 10 organizational factors affecting the growth and

success of academic spin-offs altogether account for 60.238% of the variance of variables. These 10 factors include business planning to convert ideas into products, development of a strategic plan for selling commercialized products, development of a network of communication for members and founders of spin-offs, good communication with incubation centers and science and technology parks, promotion of self-confidence culture, the use of previous experiences of professors and members of spin-offs, prediction of clear and motivating goals in the organizational structure, company location, managerial and organizational knowledge tailored to the needs of academic spin-offs, and applicability of academic research. Figure 2 shows the standard coefficients of the organizational factors affecting the growth and success of academic spin-offs. This figure indicates that “business planning to convert ideas into products”, with a standard coefficient of 0.49, “prediction of clear and motivating goals in the organizational structure”, with a standard coefficient of 0.47, and “managerial and organizational knowledge”, with a standard coefficient of 0.44, have the greatest effect on the growth and success of academic spin-offs.

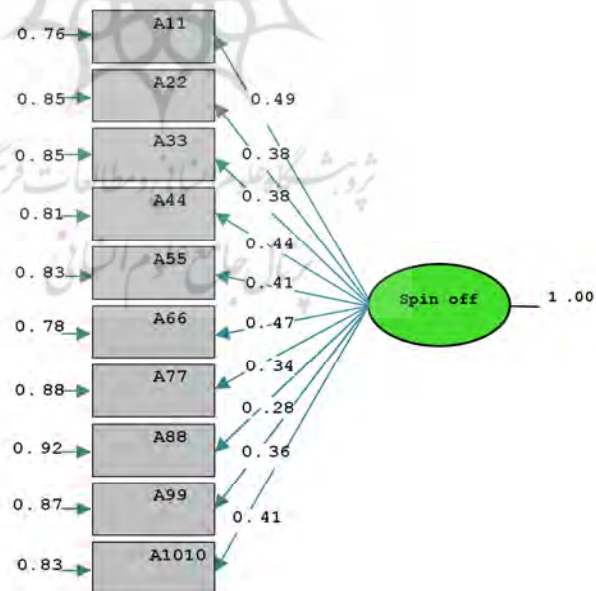
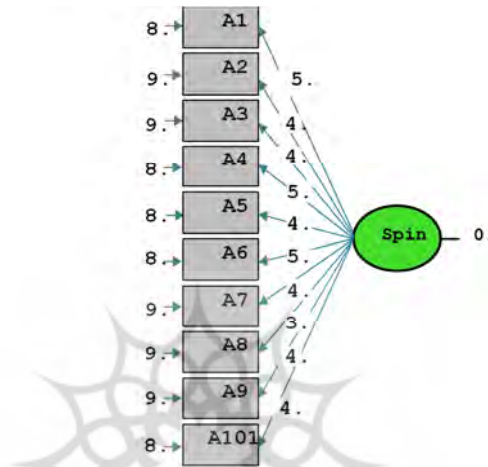


Figure 2. Direct standard coefficient

To answer the third research question and develop the model, confirmatory factor analysis was employed to assess the construct validity of the factors and components based on the qualitative results and exploratory factor analysis. Figure 3 presents the measurement model in the case of significant coefficients (T-value).



**Figure 3.** T-value coefficients

Figure 3 indicates the significance of coefficients and the main organizational factors affecting the growth and success of academic spin-offs. It can be then concluded that these 10 organizational factors affect the growth and success of academic spin-offs. Figure 4 shows the relationship between the study variables as the final model. To answer the fourth research question, the research model was evaluated in terms of the goodness of fit. Table 4 shows the goodness-of-fit indices of the final model. Since the goodness-of-fit indices of the final model present acceptable values, it can be stated that the relationships between variables are consistent with theoretical foundations and qualitative and quantitative results.



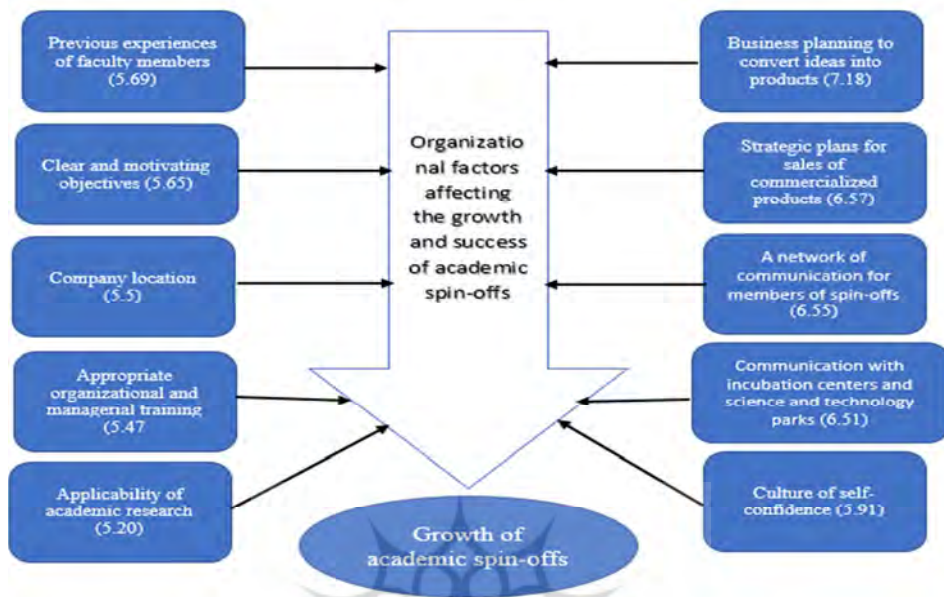


Figure 4. The final model

Table 4. The goodness-of-fit indices of the final model

Indices	Acceptable value	Obtained value	Result
Chi-square	-	43.08	Confirmed
P-value	-	0.0000	Confirmed
df	df>0	35	Confirmed
df (C2)	df (C2) <3	1.28	Confirmed
RMSEA	RMSEA<0.1	0.08	Confirmed
NNFI	NNFI>0.9	0.94	Confirmed
AGFI	AGFI>0.9	0.93	Confirmed
GFI	GFI>0.9	0.96	Confirmed
CFI	CFI>0.9	0.96	Confirmed
IFI	IFI>0.9	0.96	Confirmed
RMR	Close to 0	0.079	Confirmed

### 5. Conclusions

The present study aimed to investigate the organizational factors affecting the growth and success of academic spin-offs. The results of coding and content analysis showed that 10 organizational factors affect the growth and success of academic spin-offs. The study findings demonstrated that one of the most important factors affecting the

growth of academic spin-offs is their close and continuous cooperation with the university.

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