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# Identifying the Innovation Ecosystem Indicators of University Growth and Technology Centers with the Knowledge-Based Economy Approach with the Data Foundation Approach

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**Abstract**

**Purpose:** Considering the quantitative growth of university growth and technology centers in the country and the need for solutions to facilitate the success of these companies in global competition, this study identifies the indicators of innovation ecosystem of university growth and technology centers with the knowledge-based economy approach with data foundation approach.

**Methodology:** This research was based on empirical philosophy and has been done with a deductive-inductive approach. From the perspective of the goal, it was a fundamental research that has been done with a mixed research method. The study population of this study includes entrepreneurship professors and managers who have work experience in knowledge-based companies. Sampling was done by non-probabilistic and purposeful sampling method. Data collection tools are interviews and questionnaires. In the analysis of the interviews, the data theory of the foundation (selective, open and pivotal) was used. Also, the identified indicators have been validated by fuzzy Delphi method. Finally, the final model of the research is presented. Research data analysis was performed in the qualitative phase with MAXQDA software and in the quantitative phase with Matlab software.

**Findings:** To achieve the objectives of the research, by analyzing interviews with experts, a set of practical indicators of the innovation ecosystem were identified. In the open coding stage, 517 codes were identified, which with the observed observations, 9 main categories and 41 sub-categories were obtained.

**Conclusion:** Based on the achievements of this study, issues such as organizational management, growth center rules and regulations, innovation ecosystem infrastructure, knowledge ecosystem, innovation ecosystem, ecosystem capital, economic ecosystem, innovation ecosystem challenges and key players are key elements in the success of these universities in knowledge-based economy was considered. These cases also interact with each other in 41 minor areas.

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## 1. Introduction

Today, the knowledge-based economy is witnessing a transition from the business ecosystem to the innovation ecosystem. The key to understanding the difference between these two paradigms is the discussion of value. The business ecosystem emphasizes the importance of value acquisition and value creation is a central element in the innovation ecosystem (Ritala et al, 2013). The sustainability of organizations depends on the proper use of knowledge. In fact, gaining deep knowledge and understanding provides organizational success at all levels. It should be acknowledged that it is the increase in organizational knowledge that provides the means for change and innovation, and this issue requires rational and appropriate management so that the organization can improve its operational efficiency of change and innovation day by day (Shakoori et al, 2018). Given that knowledge-based universities are the center of the country's innovative performance, so management in these organizations should be based on innovative structures. Therefore, the main challenge is whether the structures of innovators that arise from the organizational knowledge of these organizations always adhere to certain patterns or the dimensions and components of these patterns should be examined at each time point (Sun et al, 2018).

Cluster and value network are two key concepts for understanding the innovation ecosystem. Clusters, as a conceptual framework, make it possible to study regional competition and economic performance. In clusters, being in the same region of businesses increases productivity stimulates innovation and the formation of new businesses (Dedehayir et al, 2018). The regional focus of the cluster distinguishes it from the innovation ecosystem, which is not bounded by a specific geographical location, but is constrained by a "collective capability." The value network depicts an interconnected and complex network of direct and indirect communications between a group of actors, which create value for customers through the products and services they produce (Dedehayir et al, 2018). The value network can be considered as a nested system and a hierarchy of producers and markets. Thus, the value network framework allows the study of communication structures, but is relatively passive about the dynamics of these relationships. But innovation ecosystems are different from value networks by focusing on the collaborative and evolutionary processes that occur in different organizations (de Vasconcelos, 2018).

An ecosystem can be defined as: a complex synergy between a diverse range of collaborative efforts by small and large companies, universities, research institutes and laboratories, and bold investment companies that drive innovation to market (Walrave, 2018). The innovation ecosystem consists of a network of interdependent actors that combine specialized but complementary resources or capabilities to co-create and deliver comprehensive value proposition to end customers and monetize the value created (Walrave, 2018). Also, growth and technology centers are a complex consisting of one or more buildings in which new research units such as academic research centers, private research companies, and research and development centers of industry and executive organizations are temporarily located and benefit from the support services established in this center. Public (academic and industrial) and private sectors are involved in organizing and managing incubators (Kumar et al, 2017).

Knowledge-based economics is an economy in which innovation is the main factor in creating economic added value and achieving competitiveness regardless of the technology level of activities, just as non-technological innovations that cause economic added value and competitiveness are examples of knowledge-based economics. Knowledge economy is an economic foundation in which the application of knowledge and information is of great importance and production and distribution are based on it and investment in knowledge-based industries has received special attention (Sørensen et al, 2016). By Knowledge-Based Economics Universities This title refers to a university system that is targeted at the fundamentals of knowledge-based economics. In a university based on knowledge-based economics, strategic, long-term goals and academic visions are designed based on knowledge-based principles and are supported by specific short-term goals, trends, procedures and policies.

In all industries, there is a general movement from product production and service delivery to complex networks of value creation by different actors. This network signifies the creation, dissemination and maintenance of value through innovation and is known as the concept of innovation ecosystem. Various researchers have explicitly emphasized the strategic importance of the innovation ecosystem in their studies (Adner, Kapoor, 2016; Walrave, 2018). The importance of this issue can be explained from several aspects. Organizational innovation can be of any kind and start in any of the sub-processes or be led by any of the different actors. For example, on the one hand, many new products may appear by entrepreneurs or ordinary people, or some innovations may be driven by large companies, or even these innovations may come from the heart of the universities and the courses they hold. Today, innovation ecosystems are considered as a very prominent type of environment that can be created or nurtured to get a wider view. The innovation ecosystem refers to elements - individuals, organizations or institutions - outside of the entrepreneur who motivates or hinders the individual's decision to become an entrepreneur or the likelihood of his success if he starts an entrepreneurial business. This ecosystem creates an environment that encourages entrepreneurial endeavors. Therefore, it is very important from a theoretical point of view (Mohammadi et al, 2018).

The innovation ecosystem forms the core of a knowledge-based economy. In the knowledge-based economy, the grounds for creating creativity and turning it into innovation must be provided, and economic dynamism must be provided in the shadow of a knowledge-based competitive environment. From a competitive perspective, it is knowledge that innovative universities provide sustainable economic development (Chae, 2019). Research is related to the process of innovation ecosystem, growth and technology centers, knowledge-based economy, this issue is one of the important issues due to limited research on creating significant value and in Iran according to growth and technology centers Growing but unaware, requires a lot of research and this research is one of these researches. In summary, the innovation ecosystem is critical to the success of knowledge-based universities. Although several studies have been conducted in the field of designing various models of innovation ecosystem in different parts of the world, but so far no study has been conducted to design the model of innovation ecosystem in the growth and technology centers of universities. Therefore, in order to boost the business of university growth and technology centers, in this study, an attempt has been made to identify the innovation ecosystem indicators of university growth and technology centers with the knowledge-based economy approach and the foundation data approach. In this regard, the main issue of this research is to provide a model for the innovation ecosystem in the growth and technology centers of universities based on knowledge-based economics.

## 2. Methodology

The present study was a fundamental and philosophical study in the category of empirical research and was conducted with a deductive-inductive approach. From the perspective of data type, the present study was conducted with a mixed approach (qualitative-quantitative) and from the perspective of data collection time was in the category of cross-sectional research. The main tools for data collection were semi-structured interviews and the fuzzy Delphi questionnaire. The spatial scope of this study was the growth and technology centers of universities in Tehran province. The sample size in qualitative and interview studies is usually between 5 and 25 people. In the present study, the sampling process continued until theoretical saturation was reached. The study population of this study includes university professors and managers in the field of knowledge-based businesses who have a degree in entrepreneurship. Also, experts must have at least ten years of executive experience in the field of knowledge-based economics or have scientific writings in this field in the form of books and articles. In the qualitative part of this study, the sample was selected purposefully using the snowball method. Accordingly, 10 eligible individuals participated in this study. In the second part, based on the identified categories, the Delphi questionnaire

with a range of seven degrees has been used. In the qualitative part of the present study, using data-based method (grounded theory), categories such as causal conditions, central phenomena, contextual conditions, strategies and actions, intervening conditions and consequences in designing the innovation ecosystem model have been studied. Finally, the identified indicators have been validated using the fuzzy Delphi method. MAXQDA software was used for qualitative analysis and fuzzy Delphi calculations were performed by coding in MATLAB environment. Fuzzy Delphi technique has been used to screen and validate the indicators of the innovation ecosystem of the growth and technology centers of universities with the knowledge-based economy approach. To fuzzy the view of experts, a spectrum of seven degrees is used according to Table 1.

**Table1.** Seven fuzzy degrees for evaluating indicators

| Absolutely important | Very important | Important | medium | Insignificant | Very insignificant | Completely insignificant |
|---|---|---|---|---|---|---|
| (0.9, 1, 1) | (0.75, 0.9, 1) | (0.5, 0.75, 0.9) | (0.3, 0.5, 0.75) | (0.1, 0.3, 0.5) | (0, 0.1, 0.3) | (0, 0, 0.1) |

In the next step, the fuzzy average of people's scores must be calculated. In fact, these aggregation methods are experimental methods that have been proposed by various researchers. For example, a conventional method for aggregating a set of triangular fuzzy numbers is the minimum l, the mean m, and the maximum u. In this study, we have used the fuzzy mean method.

## 3. Findings

In order to identify the indicators of the innovation ecosystem of the growth and technology centers of universities with the knowledge-based economy approach with the data foundation approach, semi-structured specialized interviews have been conducted with experts active in the growth and technology centers of universities. At this stage, 5 open questions are considered before the start of the interview, and during the interview process, it is expected that new questions will be asked. In order for the researcher to get acquainted with the depth and scope of the data content, he / she has repeatedly read the data and actively read the data (searching for meanings and patterns). The results of the interviews were analyzed using the data-based method. For this purpose, the text of the interviews was read and reviewed several times. The data were then broken down into semantic units in the form of sentences and paragraphs related to the main meaning. The semantic units were reviewed several times and then the appropriate codes of each semantic unit were written and the codes were classified based on semantic similarity. The analysis process was repeated in the same way with the addition of each interview. Interviews continued until theoretical saturation. The criterion for achieving theoretical saturation was to achieve repetition in the extracted codes. In the open coding stage, 517 codes were identified, which with the observed observations, 9 main categories and 41 sub-categories were obtained. These indicators are categorized into main and sub-themes. The indicators of the innovation ecosystem model in the growth and technology centers of universities extracted from the interviews are presented in Table 2.

**Table2.** Main and sub-categories of innovation ecosystem

| Main dimensions | Sub-dimensions |
|---|---|
| Organizational management | 1. Creating codified, sustainable and long-term plans |
| | 2. Hire suitable consultants or mentors |
| | 3. Using the Eisenberg model for the ecosystem framework |
| | 4. Define the ecosystem of any organization |
| | 5. Satisfaction of customers |
| Rules and regulations of growth centers | 6. Evaluate and obtain accurate statistics from growth centers, accelerators, innovation and entrepreneurship centers and consulting centers |
| | 7. Monitoring the actions and strategies of growth centers |
| | 8. Training of mentors |
| | 9. Assign specific tasks to each unit in the growth centers |
| Innovation ecosystem | 10. Human Capital |

| | |
|---|---|
| infrastructure | 11. Understanding the capitals of knowledge and technology knowledge |
| | 12. Measuring the infrastructure of the organization |
| | 13. Strengthening physical infrastructure (airport - telephone - water - electricity, etc.) |
| Knowledge ecosystem | 14. Provide proper after-sales service |
| | 15. Acquisition of written and tacit knowledge |
| | 16. Combining organizational and technical knowledge |
| | 17. Acquire environmental knowledge |
| Innovation ecosystem | 18. Giving speaking power to innovative people |
| | 19. Giving decision-making power to innovative people |
| | 20. Creating a culture and entrepreneurship culture |
| | 21. Provide the necessary conditions for the growth of people |
| Ecosystem assets | 22. Cash and non-cash assets |
| | 23. Social capital |
| | 24. human capitals |
| | 25. Cultural and spiritual assets |
| | 26. Communication capital |
| | 27. Experimental capitals |
| Economic ecosystem | 28. Economic support of innovative people by the organization |
| | 29. Venture capitalists |
| | 30. Creating growth and diversity of economic activities |
| | 31. Intellectual Property Investment |
| Challenges of the innovation ecosystem | 32. Inconsistency of academic books on knowledge transfer |
| | 33. Poor communication between people involved in the ecosystem, the investor and the startup |
| | 34. Existence of risk indicators |
| | 35. Lack of related education of professors |
| | 36. Lack of proper understanding of growth center managers of knowledge management |
| Key actors | 37. University professors or academics |
| | 38. Students and legal, knowledge and educational specialists |
| | 39. Accelerators |

The identified categories are classified into 9 categories: organizational management, growth center rules and regulations, innovation ecosystem infrastructure, knowledge ecosystem, innovation ecosystem, ecosystem assets, economic ecosystem, innovation ecosystem challenges and key actors. The paradigm model of the innovation ecosystem in the growth and technology centers of universities based on knowledge-based economics is presented in Figure 1.

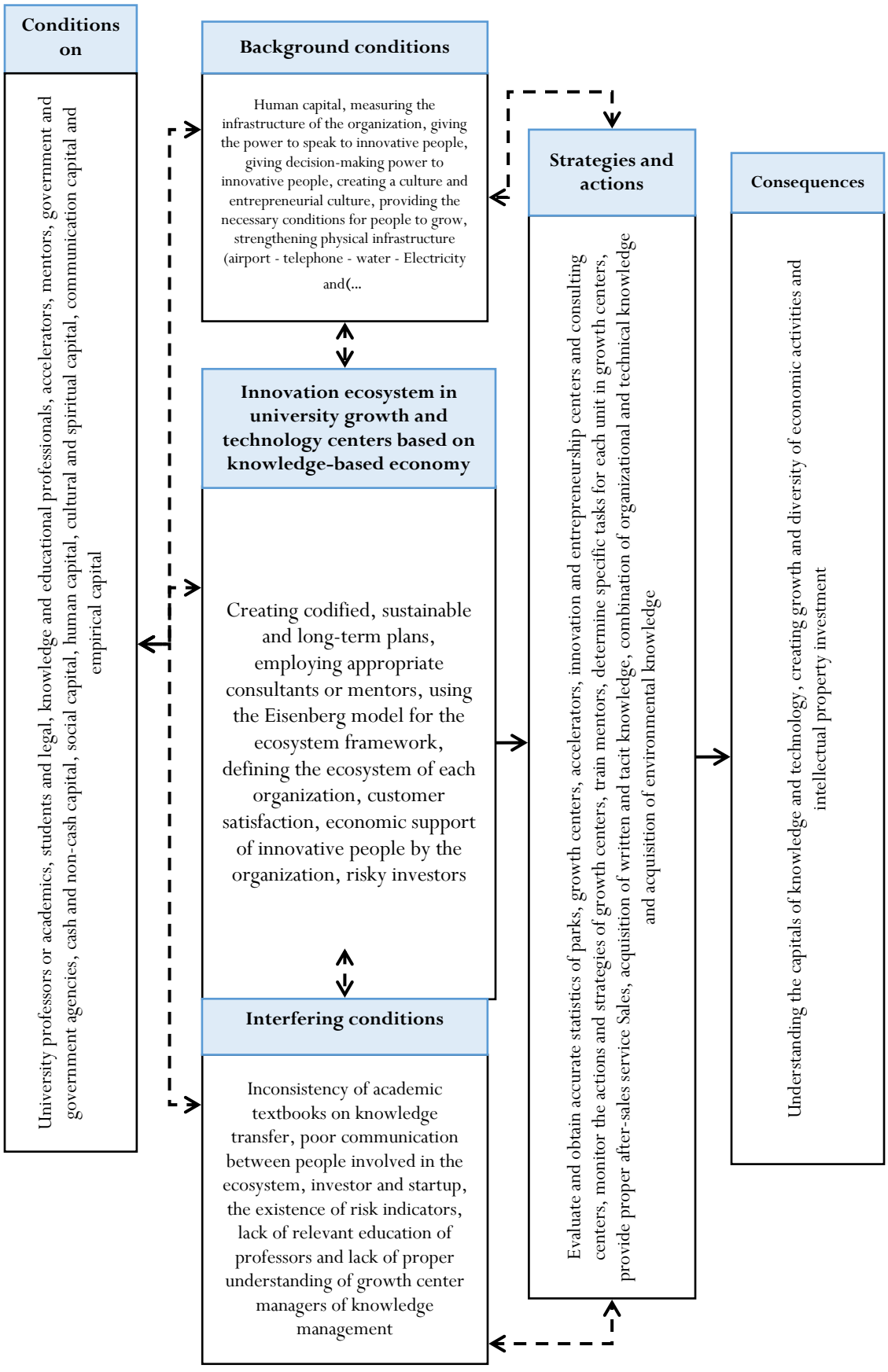
Conditions on
University professors or academics, students and legal, knowledge and educational professionals, accelerators, mentors, government and government agencies, cash and non-cash capital, social capital, human capital, cultural and spiritual capital, communication capital and empirical capital
Background conditions
Human capital, measuring the infrastructure of the organization, giving the power to speak to innovative people, giving decision-making power to innovative people, creating a culture and entrepreneurial culture, providing the necessary conditions for people to grow, strengthening physical infrastructure (airport - telephone - water - Electricity and(...
Innovation ecosystem in university growth and technology centers based on knowledge-based economy
Creating codified, sustainable and long-term plans, employing appropriate consultants or mentors, using the Eisenberg model for the ecosystem framework, defining the ecosystem of each organization, customer satisfaction, economic support of innovative people by the organization, risky investors
Interfering conditions
Inconsistency of academic textbooks on knowledge transfer, poor communication between people involved in the ecosystem, investor and startup, the existence of risk indicators, lack of relevant education of professors and lack of proper understanding of growth center managers of knowledge management
Strategies and actions
Evaluate and obtain accurate statistics of parks, growth centers, accelerators, innovation and entrepreneurship centers and consulting centers, monitor the actions and strategies of growth centers, train mentors, determine specific tasks for each unit in growth centers, provide proper after-sales service Sales, acquisition of written and tacit knowledge, combination of organizational and technical knowledge and acquisition of environmental knowledge
Consequences
Understanding the capitals of knowledge and technology, creating growth and diversity of economic activities and intellectual property investment

**Figure1.** Paradigm model of innovation ecosystem in the growth and technology centers of universities based on knowledge-based economy

The identified indicators were based on the researcher's perception and inference from the interviews conducted using the data-based method. The fuzzy Delphi approach has been used to ensure the accuracy of the identified indicators and the selection of the final indicators. To fuzzy the experts 'point of view, a spectrum of seven degrees is used according to Table 1. The views of 10 experts about each index were collected and the fuzzy mean of the experts' point of view was calculated using Equation 1.

Relationship 1

$$\tilde{F}_{AVE} = (L, M, U) = \frac{\sum l_i^k}{n}, \frac{\sum m_i^k}{n}, \frac{\sum u_k^i}{n}$$

Which in this relation is a triangular fuzzy number $\tilde{f}_i = \left(l_i^k, m_i^k, u_i^k\right)$ the fuzzy equivalent is the k's expert view of the i criterion. Eventually de-fuzzy will be done. For de-fuzzy, the surface center method is used as follows.

Relationship 2

$$DF_{ij} = \frac{\left[\left(u_{ij} - l_{ij}\right) + \left(m_{ij} - l_{ij}\right)\right]}{3} + l_{ij}$$

In this study, the tolerance threshold is considered 0.7, Therefore, the de-fuzzy value greater than 0.7 is acceptable, and any index with a score above 0.7 is approved. After de-fuzzing the mean values by the center method, the indices that scored less than 0.7 were removed. Accordingly, in the first round, five indicators were removed and the remaining 36 indicators were provided to experts. Fuzzy Delphi analysis continued for the indicators remaining in the second round. At this stage, 36 indicators were evaluated based on the views of 10 experts. In the second round, no indicators were eliminated, which is a sign that the Delphi rounds are over. In general, one approach to the end of Delphi is to compare the average scores of the first round and second round questions. If the difference between the two stages is much less than the threshold (0.2), then the polling process will stop. A summary of the results of the fuzzy Delphi technique is presented in Table 3

**Table3.** Summary of fuzzy Delphi technique results

| Identified categories | Fuzzy round average 1 | Fuzzy round average 2 | Dispute | Result |
|---|---|---|---|---|
| Hire suitable consultants or mentors | (0.709,0.868,0.95) | (0.659,0.814,0.923) | 0.044 | Agreement |
| Using the Eisenberg model for the ecosystem framework | (0.614,0.786,0.905) | (0.668,0.805,0.882) | 0.017 | Agreement |
| Define the ecosystem of any organization | (0.523,0.718,0.873) | (0.573,0.764,0.895) | 0.039 | Agreement |
| Satisfaction of customers | (0.605,0.773,0.891) | (0.695,0.859,0.95) | 0.079 | Agreement |
| Evaluate and obtain accurate statistics from growth and entrepreneurship centers | (0.609,0.786,0.905) | (0.795,0.932,0.991) | 0.139 | Agreement |
| Monitoring the actions and strategies of growth centers | (0.659,0.836,0.941) | (0.709,0.868,0.95) | 0.03 | Agreement |
| Training of mentors | (0.823,0.95,0.991) | (0.845,0.964,1) | 0.015 | Agreement |
| Human Capital | (0.759,0.909,0.982) | (0.823,0.95,0.991) | 0.038 | Agreement |
| Understanding the capitals of knowledge and technology knowledge | (0.623,0.814,0.932) | (0.795,0.932,0.991) | 0.117 | Agreement |
| Measuring the infrastructure of the organization | (0.745,0.9,0.982) | (0.559,0.727,0.836) | 0.168 | Agreement |
| Strengthening physical infrastructure (telephone, water, electricity, etc.) | (0.577,0.727,0.832) | (0.714,0.882,0.964) | 0.141 | Agreement |
| Acquisition of written and tacit knowledge | (0.55,0.727,0.868) | (0.605,0.795,0.909) | 0.055 | Agreement |
| Combining organizational and technical knowledge | (0.709,0.868,0.95) | (0.659,0.814,0.923) | 0.044 | Agreement |
| Acquire environmental knowledge | (0.664,0.809,0.895) | (0.836,0.959,0.991) | 0.139 | Agreement |
| Giving speaking power to innovative people | (0.859,0.973,1) | (0.714,0.868,0.968) | 0.094 | Agreement |
| Giving decision-making power to innovative people | (0.623,0.814,0.932) | (0.795,0.932,0.991) | 0.117 | Agreement |
| Creating a culture and entrepreneurship culture | (0.809,0.941,0.991) | (0.668,0.814,0.891) | 0.123 | Agreement |

| | | | | |
|---|---|---|---|---|
| Provide the necessary conditions for the growth of people | (0.823,0.95,0.991) | (0.795,0.923,0.968) | 0.026 | Agreement |
| Cash and non-cash assets | (0.732,0.882,0.959) | (0.732,0.882,0.959) | 0 | Agreement |
| Social capital | (0.845,0.964,1) | (0.859,0.973,1) | 0.008 | Agreement |
| human capitals | (0.523,0.718,0.873) | (0.573,0.764,0.895) | 0.039 | Agreement |
| Cultural and spiritual assets | (0.845,0.964,1) | (0.714,0.882,0.964) | 0.083 | Agreement |
| Communication capital | (0.527,0.732,0.886) | (0.764,0.9,0.977) | 0.165 | Agreement |
| Economic support of innovative people by the organization | (0.75,0.891,0.977) | (0.695,0.859,0.95) | 0.038 | Agreement |
| Venture capitalists | (0.691,0.855,0.959) | (0.564,0.727,0.85) | 0.121 | Agreement |
| Creating growth and diversity of economic activities | (0.605,0.773,0.891) | (0.695,0.859,0.95) | 0.079 | Agreement |
| Intellectual Property Investment | (0.809,0.941,0.991) | (0.636,0.805,0.905) | 0.132 | Agreement |
| Inconsistency of academic books on knowledge transfer | (0.673,0.827,0.914) | (0.732,0.891,0.982) | 0.064 | Agreement |
| Poor communication between people involved in the ecosystem, | (0.627,0.786,0.886) | (0.873,0.982,1) | 0.185 | Agreement |
| Lack of related education of professors | (0.577,0.727,0.832) | (0.718,0.873,0.959) | 0.138 | Agreement |
| Lack of proper understanding of growth center managers of knowledge management | (0.759,0.909,0.982) | (0.6,0.782,0.895) | 0.124 | Agreement |
| University professors or academics | (0.709,0.868,0.95) | (0.695,0.859,0.95) | 0.008 | Agreement |
| Students and legal, knowledge and educational specialists | (0.632,0.791,0.891) | (0.564,0.727,0.85) | 0.058 | Agreement |
| Accelerators | (0.632,0.818,0.941) | (0.636,0.805,0.905) | 0.015 | Agreement |
| Mentors | (0.564,0.736,0.868) | (0.732,0.891,0.982) | 0.145 | Agreement |
| Government and government institutions | (0.636,0.805,0.905) | (0.873,0.982,1) | 0.17 | Agreement |

Based on the results in Table 3, it was found that in all cases the difference is less than 0.2, so the Delphi rounds can be completed. In this way, 36 indicators have been selected.

## 4. Discussion

In this study, the identification of innovation ecosystem indicators of the growth and technology centers of universities with the knowledge-based economy approach with the data-based approach was presented. To achieve the objectives of the research, by analyzing interviews with experts, a set of practical indicators of the innovation ecosystem were identified. In the open coding stage, 517 codes were identified, which with the observed observations, 9 main categories and 41 sub-categories were obtained. Based on the achievements of this study, issues such as organizational management, growth center rules and regulations, innovation ecosystem infrastructure, knowledge ecosystem, innovation ecosystem, ecosystem assets, economic ecosystem, innovation ecosystem challenges and key players are key elements in the success of these universities in knowledge-based economy. . Consistent with the findings of Sørensen et al (2016), it can be acknowledged that universities based on knowledge-based economics of this title, a university system that is targeted based on the principles of knowledge-based economics. In a university based on knowledge-based economics, strategic, long-term goals and academic visions are designed based on knowledge-based principles and are supported by specific short-term goals, trends, procedures and policies.

Identifying the indicators of the innovation ecosystem of the centers of growth and technology of universities with the approach of knowledge-based economy with the data approach of the foundation is a model of strategic, cultural, economic and technological events. Basically, the innovation ecosystem of the growth and technology centers of universities is developed with the approach of knowledge-based economics in terms of results and expected outcomes, in order to adapt to the environmental challenges. when the innovation ecosystem of growth centers and technology of universities with the approach of knowledge-based economy can be transformed from an abstract to an application that allows the development of organizational capabilities to face the current and future environment of innovation

ecosystem growth centers. The model of innovation ecosystem of growth and technology centers of universities with the approach of knowledge-based economy, the value of strategies and necessary measures. The elements of the innovation ecosystem of the growth and technology centers of universities are not fixed and predetermined by the knowledge-based economy approach, rather, the elements in each country are determined by environmental, value, and organizational requirements and these elements will then in turn develop unique capabilities to respond to the environment. Therefore, if environmental requirements change, the components of the innovation ecosystem of the growth and technology centers of universities will change with the expected knowledge-based economy approach. According to Sorensen et al. (2016), criteria such as application of knowledge and information, proper after-sales service, acquisition of written and tacit knowledge, and combination of organizational and technical knowledge are among the influential components in the innovation ecosystem of growth centers and Technology is considered And if these are established, the complexity and ambiguity of the environment will be reduced, and instead of incomplete information, relatively complete information will be found for decision-making, so we can expect that the elements and components of the innovation ecosystem of growth centers and more technology. Find analytical and planning aspects.

Also, based on the results of this study, practical suggestions can be provided for the growth and technology centers of universities. In this regard, it is suggested to the managers of growth and technology centers of universities and higher education institutions of Tehran province to take an important step towards establishing the innovation ecosystem of growth and technology centers of universities by creating codified, sustainable and long-term programs and employing appropriate consultants or mentors in this field. . It is also recommended to use the Eisenberg model for the ecosystem framework. It is suggested to the managers of growth and technology centers of universities and higher education institutions of Tehran province that in order to satisfy customers towards human capital, knowledge and technology capitals should reach a proper understanding and measure the organization's infrastructure and strengthen physical infrastructure to solve hidden challenges, outcome in this area. In addition to the above, it is suggested that by increasing the adaptation of academic books to the transfer of knowledge in universities and higher education institutions in Tehran and strengthening the relationship between people involved in the ecosystem, investors and startups, provide the necessary preparations to achieve the goals of innovation ecosystem in these centers. By recruiting and hiring professors with related education, it has increased the understanding of growth center managers about knowledge management, and this is important for the implementation of the innovation ecosystem of growth centers and technology of universities.

This study also had some limitations. Lack of sufficient scientific support and localized knowledge about the innovation ecosystem in the country, the novelty and youth of the subject has created limitations in terms of conceptualizing the category of innovation ecosystem. The lack of operational experience of the country and accurate statistics in the field of innovation ecosystem in the growth and technology centers of the country's universities is another major constraint. Finally, there are two deterrents to operating in this area. Due to the existing limitations, future researchers are recommended to conduct studies to conceptualize the discussion of innovation ecosystem with a theoretical perspective and from a technical point of view to implement methods of innovation ecosystem model. Suggestions can also be made in the field of benefiting from the results at the level of universities and growth and technology centers and at the macro level. In order to enjoy the benefits of macro-level innovation ecosystem, emphasis should be placed on increasing the capacity for innovation and the influence of the university's growth and technology centers. Also, increasing the value and credibility of universities can be achieved by attracting and retaining specialized human resources and on the other hand, access to new technical knowledge and advanced technologies. At the macro level, it is also suggested that more tax incentives and exemptions be considered for universities and knowledge-based growth and technology centers. Attracting foreign investment and developing a value-based value chain, attracting technical knowledge and advanced

technology will improve the quality of the country's products and services offered in foreign markets. Finally, by increasing the share of knowledge-based industries in added value, they will be able to improve the output and effects of the knowledge-based organization and lead to the promotion of technological and commercial balance in this organization.

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