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Designing and Explaining a Model for Creation and Development of Knowledge-Based Cooperative Companies with a Mixed Qualitative-Quantitative Approach

Younos Vakil Alroaia ^{1,*} , Samira Nazari Ghazvini ¹

¹ Entrepreneurship and Commercialization Research Center, Semnan Branch, Islamic Azad University, Semnan, Iran; y.vakil@semnaniau.ac.ir; samiraghazvini51@gmail.com.

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Abstract

The present research aims to design a model for the creation and development of knowledge-based cooperative companies in Semnan province by a mixed qualitative-quantitative approach. The qualitative approach was based on grounded theory and the quantitative approach was based on structural equation analysis. In terms of purpose, this research is an applied study, and in terms of method, it is a descriptive survey study. The population includes the knowledge-based companies of Semnan province. Out of the mentioned data collection was done by library studies and semi-structured interviews in the qualitative phase and questionnaire in the quantitative phase. In the qualitative phase, the factors and the data obtained from the interviews were analyzed by Atlas. ti8 and grounded theory coding proposed by Strass and Corbin. The components and indicators of the creation and development of knowledge-based cooperative companies were identified on this basis. In the quantitative phase, Lisrel software and IBM SPSS statistics. The 26 software were used to apply the interpretive structural equation for developing the final research model. The findings include the indicators of components of creation, and development of knowledge-based cooperative companies in Semnan province and the model proposed for this purpose. The most important of these components: education and research, technology, management strategies and policy-making, new platforms and infrastructures, expansion of knowledge application, knowledge-based innovation and creativity.

Keywords: Knowledge-based, Cooperative companies, Creation and Development, Grounded theory.

1 | Introduction

The main property of today's world is the expanded changes, increased complexity, and growing competition. Therefore, newly established companies with high-tech and novel products and providing better services are the managers' most important concern. Furthermore, with the shift of the mass production-based economy to a knowledge-based economy, capital generation and competitive advantage is observed as the realization of inclusive development. This shift also makes fundamental changes in other economy-related factors such as technology, service, industry, and their functions. As a result, some modifications and processes have been raised in the world under the title of a knowledge-based economy.

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Corresponding Author: y.vakil@semnaniau.ac.ir



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As a result of the highlighted role of a knowledge-based economy, knowledge-based companies have become so important in the economic growth and development of countries. So, knowledge provides the possibility of realization of added value, wealth generation, economic growth, and inclusive development in today's societies. Knowledge-based companies play an important role as small and medium-sized enterprises that enter into the market by using the knowledge of new products. In knowledge-based companies, economic growth and job creation are realized proportional to innovation capacity; i.e. the achievements resulted from research and development are continuously changing into novel products, processes, and systems by investment. The researchers and entrepreneurs' access to investment capacities is a major factor in achieving innovation and operation of technological capacities in the national economy [1].

The term "knowledge-based companies" is rarely observed in the international literature with the mentioned concept. The term "knowledge-based (cooperative) companies" mainly refers to the companies that are learners and knowledge creators and use explicit or implicit knowledge for the development of their products and technologies. This concept refers to the established organizations that use the process of knowledge creation and application for the progress of their business [2]. In other words, in the theoretical literature, "Knowledge-Based Organizations (KBOs)", "knowledge-creating companies", "learning organizations", and "intelligent organizations" have been used as KBO. The study of the scientific papers and theoretical foundations suggests that there are a variety of concepts related to technology-based small and medium-sized enterprises. Rickne and Jacobson [51] have mentioned the concepts related to these companies as the following: intelligent organizations, technology-based small and medium-sized firms, a new enterprise in the high-tech industry, and attractive small company and new venture. Today's societies are approaching generating capital out of knowledge and applying knowledge for achieving competitive advantage and inclusive development. The tendency to generate capital out of knowledge has created different forms of commercialization approach. The research works in different areas suggest the application of knowledge commercialization under different titles such as technology commercialization, research finding commercialization, innovation commercialization, entrepreneurship, knowledge prophetization, etc. Furthermore, over the past 50 years, developing economies have undergone a set of changes, so that knowledge has dominated these transformations [3]. Commercialization of academic studies can be achieved by different strategies and methods. Nowadays, knowledge is urgently recognized as an important strategy for most of the regional and local economic policies [4].

Knowledge-based cooperative companies and the industries that are based on strategic technologies are distinct from traditional companies and industries. For instance, in these companies, there is a high ratio of specialist employees to the total number of employees; universities have higher contribution in management and leadership of these companies; they have more technological changes than traditional industries and more research and development project; industrial development is mainly based on technological development rather than capital and hardware; their competitive advantage relies on technology, and they quickly capture the new markets [5]. The establishment of knowledge-based companies in science and technology parks for the commercialization of ideas is one of the first serious measures toward the realization of conversion of innovation into technology [6]. Although more than 2000 knowledge-based companies are currently working in the country, their share of GDP is between 1% and 2% [7]. Researchers have always wondered about the cause of the failure of innovation. After several years of research and investigation, the following factors have been identified as the causes of failure of innovations: lack of the culture of supporting innovation, lack of the sense of owning the organization in managers, lack of an inclusive process of innovation, failing to allocate adequate resources to this process, lack of relationship between the projects and organizational strategies, lack of enough time and energy to be spent on eliminating organizational ambiguities, lack of variety in processes (contradictory beliefs), failing to develop achievement measurement tools, lack of competent managers and coaches in innovation teams, and lack of an idea-generating management system [8]. The gap in our entrepreneurial sector is the lack of knowledge skills and knowledge-based entrepreneurial activity [9]. Knowledge-based cooperative companies have attracted more attention due to their role in

national development and economic growth. These companies need continuous innovation to fulfill their mission [10]. Regarding the important role of these companies and the government's attention to cooperation between universities and companies, designing an optimal model for the development of knowledge-based cooperative companies can help the recognition of the factors involved in this area. Meanwhile, identifying the factors involved in the development of knowledge-based cooperative companies especially in Semnan province can present a model of such companies not only in this province but also all over the country. This model is also necessary for knowledge-based economies that involve intense competition, reduced resources, and increased constraints. Therefore, this research aims to propose a model for the creation and development of knowledge-based cooperative companies in Semnan province. The model of this research is presented in a way that can be studied, evaluated and developed in all societies. Also, this model includes all knowledge-based cooperatives that operate in any field (whether industrial or commercial, production of goods or services). Previous research has only focused on knowledge-based companies, not knowledge-based cooperatives. Creating a culture of knowledge-based economy and developing it in the country can help create a strong economy. Providing a model in this field can provide a correct strategy to these companies. Due to the epidemic conditions, these companies have received a lot of attention, so we will pay attention to designing a comprehensive and general model, at least in Semnan province. The main question of this study is the model of creating and developing knowledge-based cooperatives in Semnan province?

2 | A Review of Theoretical Foundations

2.1 | Knowledge-based Companies

Regarding article 1 of the law on supporting knowledge-based companies and commercialization of innovations and inventions enacted in 2010, knowledge-based companies known as a specific legal term are defined as the following: a knowledge-based company is a private or cooperative company or institute that is formed for synergy of science and wealth, development of knowledge-based economy, the realization of scientific and economic goals (including the expansion and application of innovation and invention), and commercialization of the results of research and development (designing and production of products and services) with high-tech and added-value especially in the production of the relevant software [11]. In the international literature, the concept of KBOs, learning organizations, knowledge-creating organizations, and intelligent organizations are not antonyms of KBOs. Based on the definition proposed by the Ministry of Science, Research, and Technology, a knowledge-based company is a company whose stock belongs to a university, research center, or academic people [12].

Leyli has defined knowledge-based companies as the following: a knowledge-based company is a system whose major internal processes are allocated to information exchange, creating and detecting new solutions, and cooperating with other companies and systems. Compared to industrial systems that produce tangible outputs, the production of a knowledge-based company is considered to be involved in intangible elements such as innovation, creativity, exploration, and innovation [13]. Amani Tehrani and Ahmad Amini [14] have classified the Iranian knowledge-based companies into three categories: A. technology-based units covered by science and technology parks, B. companies approved by the Supreme Council of Science, Research, and Technology that are obliged to make policy, plan, and apply the law on supporting knowledge-based companies, and C. the companies belonging to universities or academic knowledge-based companies. They also mentioned the properties of academic knowledge-based universities and their probable challenges. Kumar [15] identified the components of innovation, skill, specialty, communication, marketing, and coordination involved in the allocation and application of knowledge for the promotion of the capacity of knowledge-based businesses. Shane and Venkataraman [16] stated that technical systems, institutions, and major research policies of universities as the factors involved in the implementation of knowledge-based businesses. Shankar et al. [17] claimed that knowledge-based companies play a major role in the explanation and modeling of production, research and development, scientific and technical enrichment, education, human development, knowledge transfer, and expansion of innovation in every country. Zac [18] believes that in addition to product, a knowledge-based

organization is characterized by its processes, goal, and vision. According to him, regardless of its products, every organization can be a knowledge-based one as far as it focuses on knowledge. He also believes that evaluation of the internal knowledge of an organization depends on the four factors of process, place, goal, and vision. Soybi mentioned value creation for customers and management as the key factors involved in the success and survival of knowledge-based companies [19]. Samadi et al. [20] addressed the solutions for the government's support of the success of knowledge-based companies. Talebi and Zare Yekta [21] introduced the model of development of knowledge-based SMEs. Chase [22] investigated the stimuli and approaches of creating KBOs from the viewpoint of the entrepreneurs who are responsible for applying knowledge management as a business strategy. His results include the issue such as organizational culture and employees. It was finally concluded that most organizations face challenges in using knowledge management tools.

2.2 | Background

Bagheri et al. [23] investigated the role of governmental support in the formation of strategies of knowledge-based companies in the face of the consequences of coronavirus pandemic. They classified the companies' strategies into four categories including defensive strategies, opportunity seeking, reactive, and analytical strategies. Arab elah firozja et al. [24] proposed a model for the creation of knowledge-based companies with an approach to SWOT analysis in medical universities of Mazandaran province. The results of studying the fitness of the model showed that the threats with the highest factor loading were the lack of mediating cooperation in the joined activities of small knowledge-based companies and industrial and economic groups. Also, it was found that innovation capacity is effective in the organization's innovative performance. Roumezi et al. [25] designed a model for the creation and development of knowledge-based companies working in the area of humanities by combining the variables with six major strategies. They concluded that economic growth and job creation are realized proportional to the innovation capacity, i.e. the research findings are changed into novel products, processes, and systems by investment. The issue of innovation and commercialization is far more necessary in knowledge-based companies. In recent years, knowledge-based companies have been considered as the agent of economic development in countries. The increased market changes have led to the need for more innovation and innovative programs in knowledge-based companies. Saedi et al. [26] designed and explained an architectural model of human resources in a knowledge-based organization. Their findings include the indicators and components of human resource architecture and an architectural model proposed for human resource knowledge in KBOs. Kiani et al. [27] proposed an interpretive structural model for the challenges of knowledge-based companies established in science and technology parks. They found 28 challenges classified in 8 dimensions. The highly influential challenges included lack of specialty in senior managers of the parks, instability in the management of the park, intense bureaucracy in the administrative sector, lack of monitoring in parks, lack of criticism and suggestion system, high costs of renting, lack of an inclusive support system for the companies established in parks, and lack of infrastructural facilities. The mentioned factors were the most important challenges of knowledge-based companies in Fars province. Dorostkar Ahmadi and Golshahi [28] identified and ranked the elements of a reward pack for future knowledgeable employees (case study: knowledge-based companies of defensive industries). Their findings showed that non-financial rewards such as position, success, and progress are the most satisfactory elements, and financial rewards such as the granted goods, leaves, and even salary are the least satisfactory elements for future knowledgeable employees. Yahiaei and Hasanzadeh [29] proposed a model for the commercialization of technology in knowledge-based ICT companies. In this paper, they identified the effective factors, obstacles, and different models of commercialization in knowledge-based ICT companies all over the world. Finally, they proposed an indigenous model for the commercialization of technology in domestic companies based on PESTLE. Their findings showed that all the six components of PESTLE are effective in technological commercialization while the most effective factors are the economic factors and the least effective factors are legal factors. Mirghfour et al. [30] designed an integrated model for the development of innovation and commercialization in the Iranian knowledge-based companies by grounded theory. Based on data analysis, the market achievement is an axial component of the

development of innovation and commercialization in knowledge-based. So, they have proposed several solutions for entering and dominating the market and interacting with the market actors. Ali Porterbati et al. [31] studied the commercialization of the results of academic research works in a knowledge-based economy from the viewpoint of board members of Esfarayen Universities. They found that the factors influencing the commercialization of research findings and a knowledge-based economy include focusing on the market, organizational culture, internal and organizational management, intellectual property rights management, networking, entrepreneurship, and business. Khayatian et al. [32] investigated the sustainability of knowledge-based companies in Iran. They found that the nature of sustainability of knowledge-based companies consists of the four components of financial results, market results, innovation results, and entrepreneurship results. Meanwhile, they concluded that the effective components of sustainability of knowledge-based companies include intra-organizational factors (individual properties of founders and corporate properties) and extra-organizational factors (business properties and the components of innovation system). Sarvari [33] claimed that the most important properties of these companies include idea orientation, commercialization, and competitiveness. Akbarzadeh and Shaizadeh [34] identified and prioritized the key activities of the government for the creation of knowledge-based companies. Allahyari Fard and Abbasi [35] investigated the appropriate structural model of knowledge-based companies. Based on the researchers' viewpoints, it seems that an integrated organizational structure of "team-based, network, and virtual vision" can be useful for knowledge-based companies and promote their efficiency. Therefore, it is suggested as an appropriate model for the organizational structure of small knowledge-based companies. Avazpour and Mosleh Shirazi [36] evaluated the properties of knowledge-based companies. They mainly aimed to get a more comprehensive understanding of a knowledge-based company. This understanding helps to define the main dimensions of a knowledge-based company and presents some solutions for evaluation of the extent to which companies are knowledge-based. Leal Filho et al. [37] have also emphasized the importance of proper orientation of research activities in universities. They believe that without this orientation, research activities can only lead to dispersed events with any synergy. In this area, research policy-making is realized in the form of a successful university-industry relationship to facilitate the research flows in different institutions. Yaghoubi et al. [38] identified and ranked the stimuli of the development of knowledge-based companies (case study: science and technology park of Fars province). Their findings showed the five dimensions of economic and legal factors, marketing and foreign relationships, technological, cultural, and human relationships, and finally, structural and information framework. Communicating with global markets and global networking are the factors that can increase global knowledge and provide a tool for knowledge-based development. The most important factors involved in the development and knowledge-based and technology-based companies were the ease of access to technology and technological advice, easy access to suppliers, and allocation of subsidy to knowledge-based companies while paying attention to regional policies. Meanwhile, marketing, foreign relations, technological, economic, and legal dimensions were respectively recognized as the most important dimensions. Westerberg et al. [39] investigated the concept of knowledge-based organization and proposed a model for the perception of KBOs. This model included the resource elements (organizational structure, symbolic tools, and material tools), communication process (learning processes, communication paths), and caring behaviors (practical experience and theoretical knowledge). Wennberg et al. [40] investigated the difference between the performance of the individuals who only focus on knowledge transfer by academic studies found new companies without any practical and industrial experience and the people who are involved in creating a new business with academic education. They believe that the knowledge obtained from the experiences is more useful for entrepreneurial activities than academic teachings obtained by research activities. Cantu et al. [41] investigated intellectual and human capitals, research products, budget, and entrepreneurial sectors resulted from research capacities and research-based education in KBOs. They applied their model to a group of academic researchers. They concluded that this model can be implemented by disseminating the knowledge assets and meeting social and economic needs in different regions, and also creating value for researchers and organizations. Devis [42] identified the factors involved in the success of knowledge-based companies and their ability to provide innovative and technological products and access the customers. Gorman and McCarty [43] claimed that the most important properties of knowledge-based companies include high skill, higher education of employees, high levels of research and development, export tendency, a major deal of

intangible assets, products, and service with a short lifecycle, and high gross profit margin. Neagu [44] identified the properties of KBOs. All the mentioned researchers believe that to determine the extent to which organizations are knowledge-based, they should be studied from different aspects including human and labor force, knowledge-creation processes, organizational culture, organizational structure management, and information and communication technology.

3 | Method

This study is mixed research performed by qualitative-quantitative approach and a comparative inferential paradigm. In terms of purpose, it is an applied study, and in terms of method, it is descriptive survey research. The population includes the knowledge-based companies of Semnan province. There are many knowledge-based companies operating in the Semnan province, some of which are located in the Science and Technology Park of Semnan University, which last year sold more than 90 billion Rials worth of products [50]. The components and dimensions of the model of development of knowledge-based companies were determined by grounded theory. In the qualitative phase, structural equation analysis was used for analyzing the interaction and relationship between the dimensions.

3.1 | Population and Sampling

To approve the model, 22 managers and experts of knowledge-based companies located at the centers and units of Science and Technology Park of Semnan were selected by convenience purposive sampling. To test the fitness of the model of cooperative knowledge-based companies, the employees of knowledge-based companies located at the centers and units of Science and Technology Park of Semnan constitute the sample. Because they are aware of all aspects of the subject of our study and understand it. The samples have been selected by stratified random sampling. Sampling has been done based on Cochran's formula (348 people).

3.2 | Reliability and Validity of Data Collection Tools

Without knowing the validity of a measurement tool, the obtained data cannot be considered accurate. A measurement tool may be valid for the evaluation of a specific property while it is not appropriate for the evaluation of another property in another population. This evaluation aims to determine whether the content of the measurement tool has the capacity of evaluating the determined goal or not [45]. So, the content validity is evaluated based on the experts' opinions. In this research, the validity of the measurement tools for the evaluation of variables has been approved based on the professors' and specialists' opinions. To assess the validity of each item, a questionnaire is filled by the experts, and it includes three choices of "it is necessary", "it is useful, but not necessary", and "it is not necessary". In the next step, the Law she coefficient of each item was calculated by the following formula.

$$CVR = \frac{(ne - \frac{N}{2})}{N/2}$$

In this relation, CVR is the content validity of each item (question), N is the total number of experts or referees (22 people in this research), and ne is the number of positive votes to an item. The obtained coefficients are compared to the Law she content validity table and in this way, the content validity of the tool is evaluated. In this regard, the Law she coefficient was obtained 0.40 based on the 22 experts' viewpoint. The minimum acceptable CVR value based on the number of evaluating experts is presented in *Table 1*.

Table 1. The minimum acceptable CVR value based on the number of evaluating experts [45].

The Number of Experts	CVR	The Number of Experts	CVR	The Number of Experts	CVR
5	0.99	11	0.59	12	0.40
6	0.99	12	0.56	25	0.37
7	0.99	13	0.54	30	0.33
8	0.75	14	0.51	35	0.31
9	0.78	15	0.49	40	0.29
10	0.62	20	0.42		

4 | Data Analysis

The data collected from the interviews and library studies are done in several steps including summarizing, classifying, coding based on grounded theory and finally defining the concepts and categories. Data analysis was done by ATLAS.ti8. Grounded theory was done based on Strauss and Corbin’s approach. In this sector, the process of this theory, theoretical sampling, note-taking, coding (open coding, axial coding, and selective coding), creating and proposing the theory is explained, and finally, the validity of the grounded theory is discussed. After developing the model based on grounded theory, structural equation modeling was used to determine the relationship between the categories and components. To collect the initial data, first, the questionnaire was designed based on the model and distributed among the experts. Then, the data were analyzed by SPSS and LISREL to determine the effectiveness of each component.

4.1 | Qualitative Findings

After studying the research background and the models proposed in domestic and foreign studies, some of the joint variables that were observed in most of the models and corresponding to the dimensions and goals of cooperative knowledge-based companies were identified. Then, semi-structured interviews were done with 22 experienced professors, experts, and specialists of knowledge-based companies of the province to design the research model. *Table 4* presents a summary of the major and minor components of the research used for designing the model of development of knowledge-based companies. These components have been extracted from the experts’ opinions by open, axial, and selective coding.

4.2 | Open Coding

4.2.1 | Causal conditions

In axial coding, causal conditions are the conditions affecting the axial phenomenon and lead to the occurrence or expansion of the phenomenon. According to *Table 2*, ideals, government policies, and self-esteem are considered as the causal conditions affecting the axial phenomenon.

Table 2. Open codes and categories of causal conditions.

Causal Conditions	Categories	Open Codes
	Ideals	Independence, preservation of independence borders, entrepreneurial thinking, entrepreneur university.
	Governmental Policies	Governmental supportive strategies, facilitating rules and regulations, issuing permission.
	Self-Esteem	Application of scientific and intellectual flourishing.

4.2.2 | Contextual conditions

Contextual conditions are the conditions affecting the strategies. The context consists of a set of properties that imply the phenomenon; i.e. the place of the incidents related to the phenomenon. The context or platform refers to a set of special conditions in which action and reaction strategies are applied (*Table 3*). The interviewees mentioned the topics that we coded in the table below. In general, Inclusive supports

and micro and macro environments can provide the context of the creation and development of knowledge-based companies. This is the result of the respondents being coded.

Table 3. Open codes and categories of contextual conditions.

Contextual Conditions	Categories	Open Codes
	Support	Inclusive governmental support of establishment of knowledge-based companies, legal support, and media (national) supports, supporting the creation of internet platform.
	Micro and Macro Environment	In micro environments, customers are the most important components of trade. Also, trade partners and suppliers are fundamental components of every organization. Market mediators help companies, and macro environments such as technological, social, cultural, economic, political, legal, physical, and demographic environments are also important components.

4.2.3 | Intervening conditions

Intervening conditions are structural conditions belonging to a phenomenon and affecting the strategies. These conditions facilitate the application of strategies in a special area or constrain them. In this research, intervening conditions were classified into four categories [46]. The codes extracted from the interview are shown in *Table 4*. The interview text was coded and classified into categories about them.

Table 4. Open codes and categories of intervening conditions.

Intervening Conditions	Categories	Open Codes
	Innovation and Technology Constraints	Closed innovation, technological instability, market instability, uncertainty, inability to predict the technological incidents.
	Internal Transformations	Structural, management.
	External Transformations	Social, political, cultural, and economic transformations.
	Mental Paradigms	Intellectual-cultural framework.

4.2.4 | Strategies

The special actions or interactions resulted from the axial phenomenon i.e. the strategies are based on some measures taken to control, manage, and face the phenomenon. Strategies are purposive and also, there are always some intervening conditions that facilitate or constrain the strategies [46]. The most important strategies were coded according to experts in *Table 5*.

Table 5. Open codes and categories of strategies.

Strategies	Categories	Open Codes
	Education and Research	Standardization of educational activities, educational knowledge research, application of new educational methods, inclusive business development plan, knowledge development, scientific and technical enrichment.
	Technology	Technological and entrepreneurial inventions, creation of new processes in production of goods and services, creation of new distribution systems, e-commerce, commercialization of new technologies, e-government.
	Management strategies and Policy-Making	Designing motivating reward packs, creative skill management, corporate management, intellectual property right management, talent attraction management, specialist human force attraction, value creation for customers, strategic planning for budgeting.
	New Platforms and Infrastructures	Explaining and modeling production processes, virtual networks, facilitation measures, investment and funding.
	Expansion of Knowledge Application	Promotion of entrepreneurship, human force development, cultural development, economic development.
	Knowledge-Based Innovation and Creativity	Idea-orientation, providing the opportunity of entrepreneurship, opportunity seeking.

4.2.5 | Outcomes

This sector is focused on the expected results and outcomes of establishing knowledge-based companies. To extract these outcomes, the interviews were classified into 12 categories in open coding (*Table 6*).

Table 6. Open coding and categories of outcomes.

Outcomes	Categories	Open Coding
	Resistive economy	Economic independence.
	Benefiting the society	Pioneering society, security, responsibility.
	Competitive advantage	Technology-based competition, international competition.
	Value creation	Sustainability, effectiveness, economic, and profitability.
	Entrepreneurship	Technological entrepreneurship, technological entrepreneurship environment.
	Commercialization	Innovative commercialization, credited brand
	Knowledge-based economic development	Knowledge-based economic development, economic flourish.
	High levels of research and development	Indigenous, academic, intra-organizational, and extra-organizational research and development.
	Education of specialist human force	Creativity, innovation, entrepreneurship.
	Standard and above-standard quality of products and services	Innovative production process, creation of new processes of product and service provision.
	Job creation	Elimination of unemployment in the province.
	Invention and innovation	Technological progress, acceleration of production processes, localization of technology.

Interviewees noted, when a society can create entrepreneurial businesses, it gets economic power and achieves job creation. This situation will benefit society and guarantee people’s job security. Knowledge-based economic development results from research and development, invention, and innovation of the society members. Production of high-quality products can increase the companies’ competitive advantage and improves export. Meanwhile, the education of creative and innovative human forces promotes entrepreneurship motivation.

4.3 | Axial Coding

Axial coding aims to create a relationship between the categories generated in open coding. This process is done based on a paradigm and helps the theoretician in theory processing. In axial coding, the development of this relationship is based on the expansion of one of the categories. *Fig. 1* shows an overview of this coding.

The main category (the axial idea or incident) is defined as the phenomenon and other categories become related to this major category. Causal conditions are the incidents and factors that lead to the development of the phenomenon.

The context refers to a special set of conditions, and intervening conditions refer to a wider set of conditions in which the phenomenon occurs. Action or interaction strategies refer to the measures and responses that occur as a result of the phenomenon, and finally, the wanted or wanted consequences of these actions to form the outcomes.

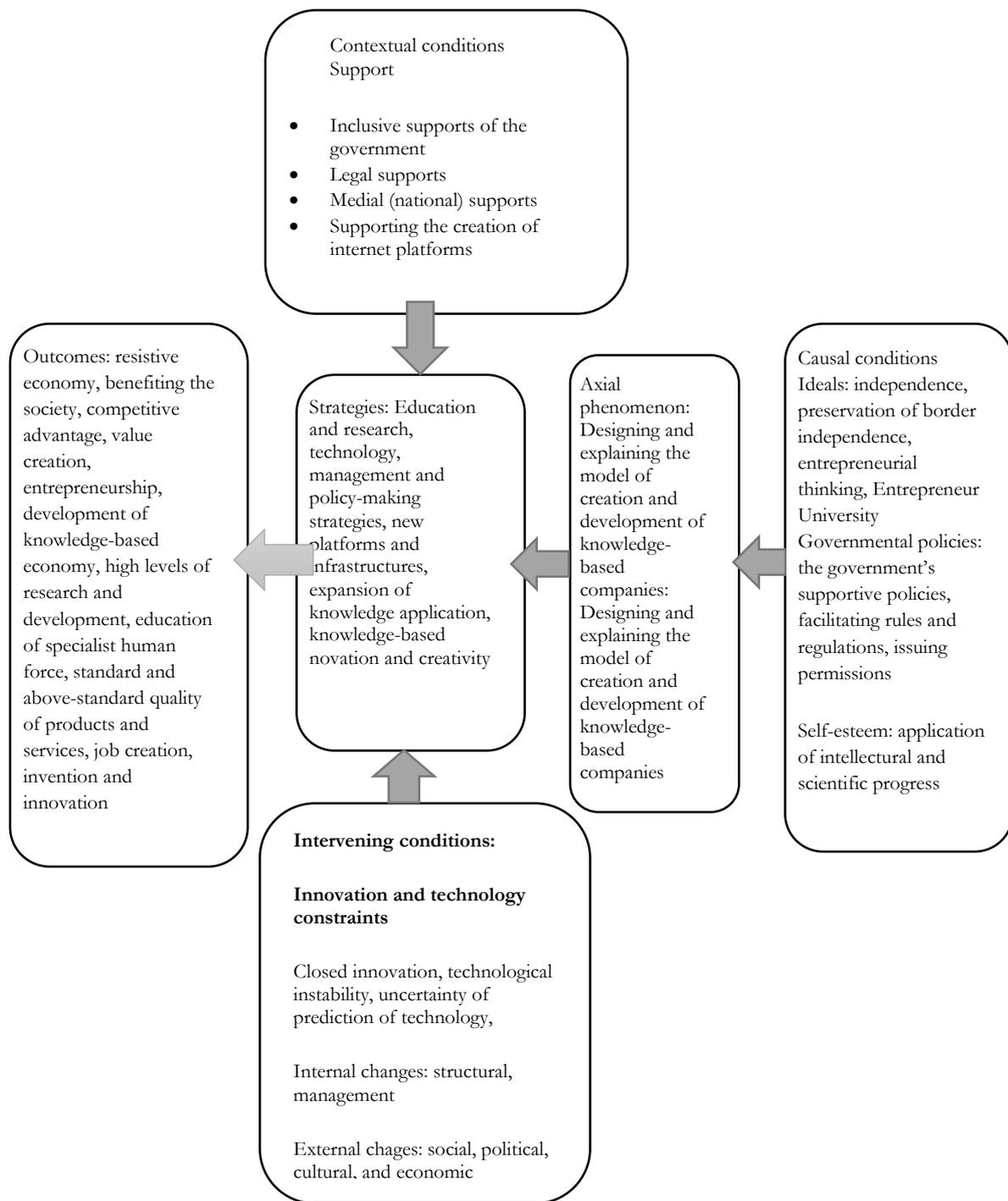


Fig. 1. The axial coding paradigm.

4.4 | Selective Coding

Selective coding refers to the process of choosing the major category, creating a systematic relationship between the major category and other categories, approving the validity of these relations, and completing the classes that need further modification and development. Selective coding is done based on the results of open coding and axial coding. The main step is theory processing so that the axial category is systematically related to other categories. These relationships are presented in the framework of narration and the categories that need further improvement and development are modified.

After the interviews and fundamental analyses, the effective strategic categories were investigated in six areas including education and research, technology, management strategies and policy-making, new platforms and infrastructures, expansion of knowledge, and innovation and creativity. One of the main goals of innovative systems in every country is binding the technology to the market and making wealth

out of that. On one hand, social pressures are focused on the promotion of welfare and making wealth out of investments in science and technology, and on the other hand, the economic dilemmas caused by the inadequacy of public resources have raised the issue of commercialization of the research findings as one of the most important priorities of universities and research institutes.

Establishing knowledge-based companies is a solution for supporting the graduates' and experts' ideas and also one of the most important measures taken for commercialization of ideas. Regarding the large number of unemployed graduates, the establishment of knowledge-based companies can be an effective step toward creating sustainable jobs for creative graduates. However, an important issue in this area is supplying the necessary financial resources and governmental supports, and facilities for product marketing.

Knowledge-based companies provoke a knowledge-based economy and they play a key role in knowledge-based economic development. The term "knowledge-based organization" refers to the companies that are learners and knowledge creators and use implicit or explicit knowledge for developing their products and technologies. This concept mainly refers to the established organizations that use knowledge creation and application processes for the progress of their business [2].

Creating an idea can lead to the creation of a knowledge-based company. The realization of this idea requires inclusive research and development in all aspects. The next step is to apply the results of the research and development for realizing the idea and finally, implementing the findings can provide better outcomes. The major changes in business environments caused by technological globalization have made it difficult to manage today's organizations. Due to the important role of learning in the formation of new organizations and the inefficiency of traditional solutions, managers must follow the new thoughts that can transform the management and education methods in organizations [47]. Researchers believe that the only solution for correspondence of future organizations with the changes and transformation is changing into a leaner system [48]. Knowledge-based cooperative companies are innately learners. So, they change with their surrounding changes. Therefore, research and education have been recognized as effective elements involved in designing and explaining the model of creation and development of knowledge-based cooperative companies. When an organization continuously applies educational activities, this process will eventually become standard. Also, the studies performed for learning and standardization will lead to educational research works. In this regard, the application of new methods for providing better education will result in knowledge development. Technical and practical implementation of knowledge in cooperative projects will lead to development.

Improvement of production processes and using new methods of service provision and production are the main factors that make cooperative companies focused on new technologies. Innovative inventions result from the improvement of processes and the use of new distribution systems for providing higher levels of technology.

Small and medium-sized enterprises and particularly, knowledge-based companies have attracted the attention of researchers and policy-makers. These companies play a key role in economic growth and development by the commercialization of research findings. In the literature, these companies have been referred to by different concepts and terms [49]. Most of the knowledge-based companies have paid attention to the commercialization of the new technologies to provide the conditions required for capturing global markets. Some of these companies that have worked in the area of e-commerce have created the opportunity of moving towards an electronic government.

Expansion of knowledge can be realized by development in economic, cultural, and human resource areas and promotion of entrepreneurship in the province. Also, it provides the opportunity for idea processing and entrepreneurship. So, innovation and creativity can be considered effective elements in this area.

One of the best strategies adopted by managers is providing reward packs for employees. Also, corporate management and intellectual property right are efficient tools. The most important activities in this area include the attraction of specialist human force and employing talented people. The other outcome of the managers' strategic policies is budgeting proportional to the economic conditions. All these activities can create value for customers, and they are observed in management and policy-making strategies.

Explaining and modeling the production processes, virtual networks, facilitation activities, investment, and funding are all effective in the creation and development of knowledge-based cooperative companies. Modeling the production processes is one of the latest low-risk methods of providing products and services. Since the internet is a key component of the platform of every company and used for all activities such as commercialization, marketing, etc., it has provided a platform for providing the products and services at the minimum cost. The experts have discussed different dimensions of investment in these companies as major infrastructures.

This research aimed to design and explain a model for the creation and development of knowledge-based cooperative companies based on the findings (Fig. 2). This model includes the stages of creating knowledge-based companies. Meanwhile, it is an inclusive model that can be used in most areas.

4.5 | Quantitative Findings

To approve the model, a questionnaire was designed based on the extracted variables and distributed among the experts and employees of knowledge-based cooperative companies. This process was done by confirmatory factor analysis in LISREL.

Confirmatory factor analysis is a method of testing the hypothesis and it is used when the researcher has raised a set of hypotheses about the relationship between the indicators (factors) and the items (questions) to measure the data based on a pre-determined structure. In this way, the items related to every factor or indicator only measure that dimension. Confirmatory factor analysis measures whether the items can represent their relevant dimension or not. Also, it determines the extent to which the selected items can represent their latent variable. Factor loadings are calculated based on the relevance of the items of a construct with that. If this value is obtained equal to or more than 0.4, the variance of the construct and its indicators is higher than the variance of the measurement error and the reliability of the model is acceptable.

It should be noted that if the factor loadings of the construct and its items are obtained less than 0.4, the items should be modified or removed from the questionnaire. To approve the model, first, the collected data are entered into SPSS and recalled in LISREL. Then, each item is included in the software as a component and connected to the variables related to each question. Also, the relationship between each variable and the main subject was drawn.

The results suggest the significance of the relationships between the latent and obvious variables. In other words, since the sig-value of all the components is more than 1.96, their relationships are approved. After specifying the model, there are various methods for evaluating the fitness of the model with the observed data. In general, several indicators are used for evaluating the model. However, three to five indicators are usually enough for approving the model. In this research, the fitness of the model was evaluated by different indicators, and the Table 7 presents the value of each indicator.

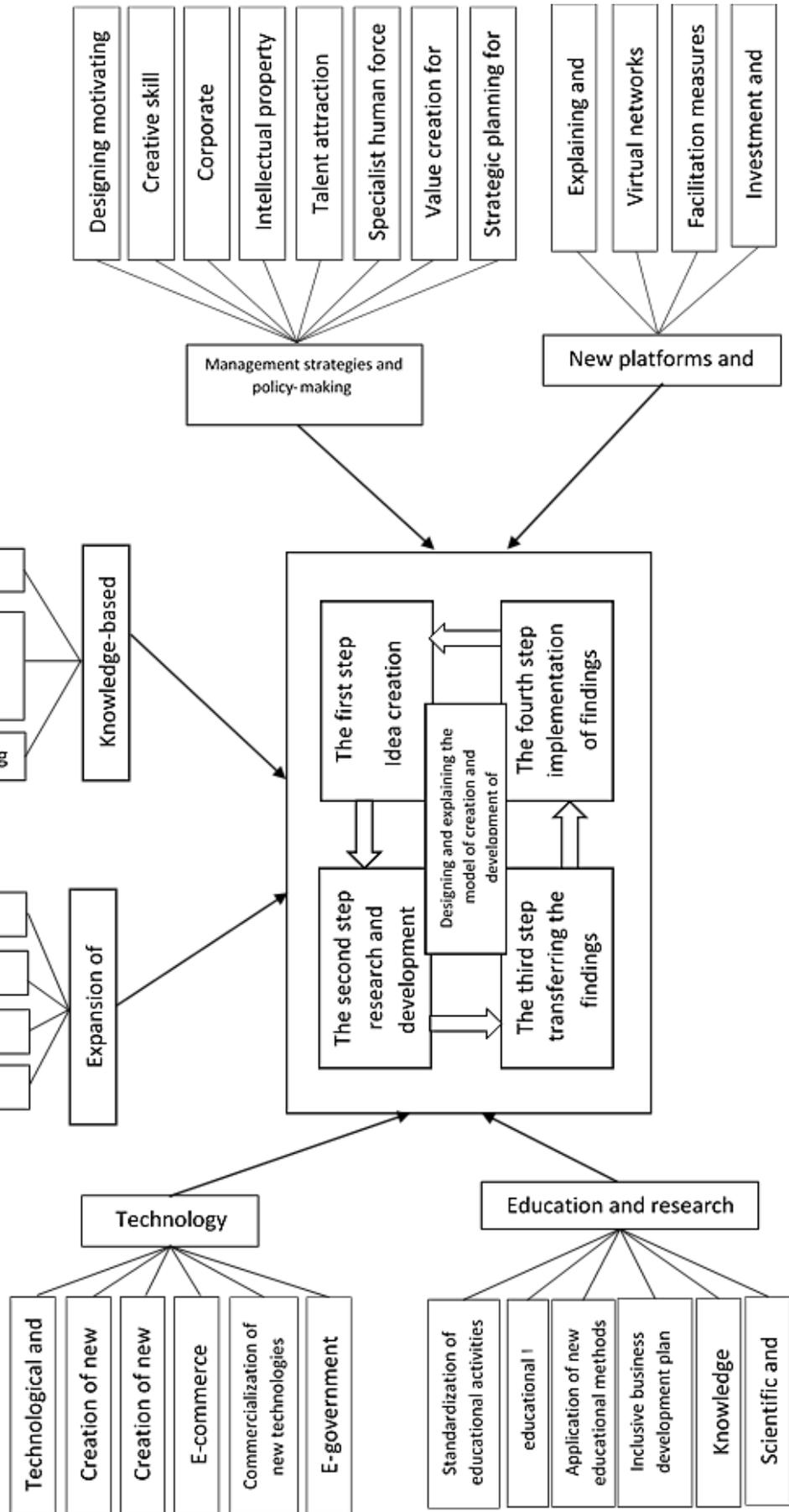


Fig. 2. The final model of creation and development of knowledge-based companies.

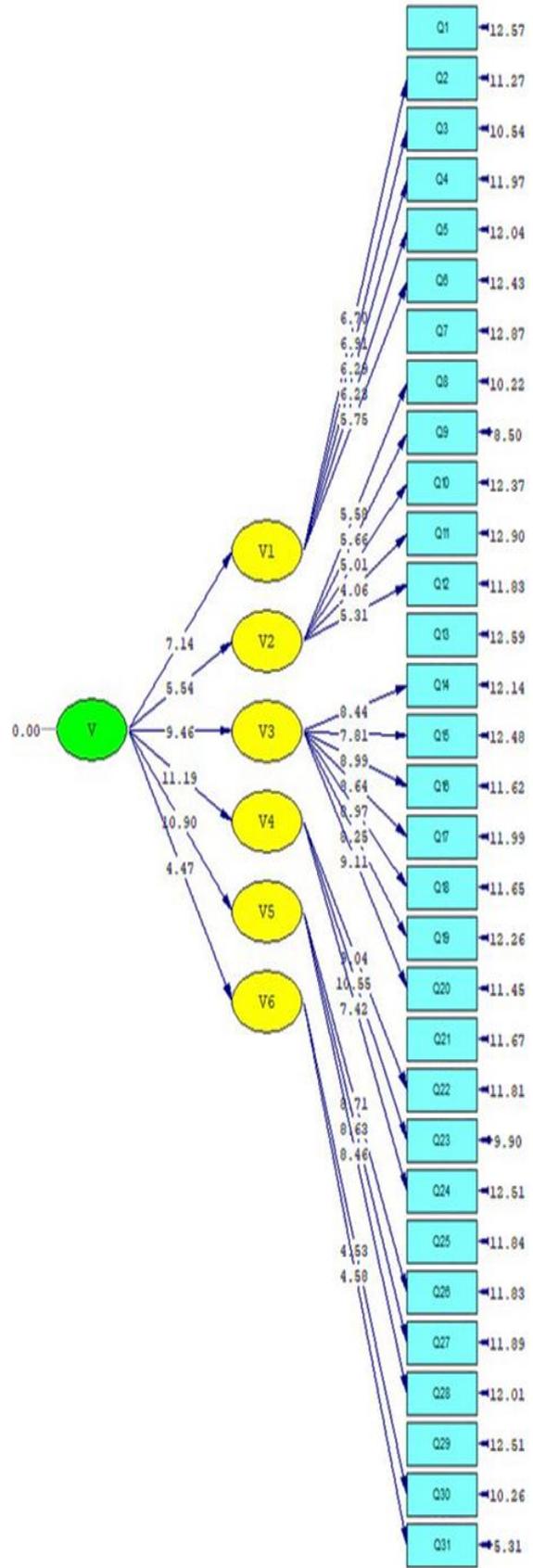
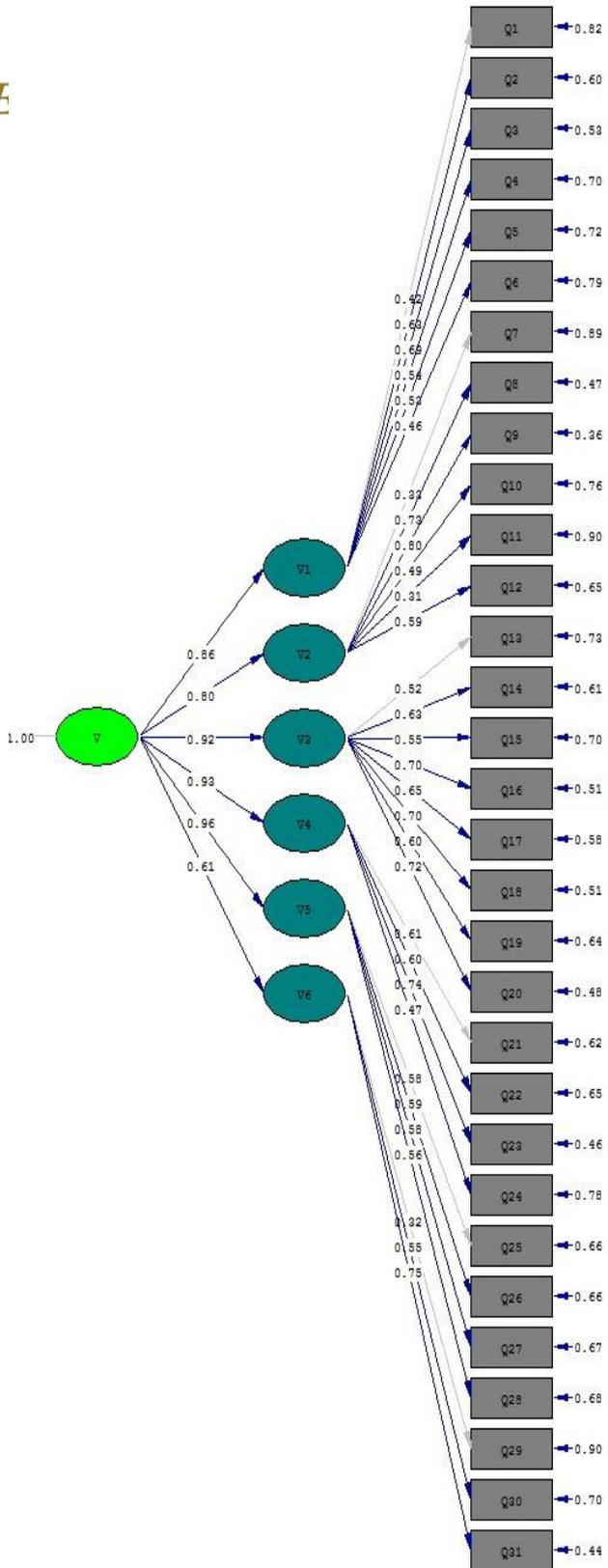
Table 7. Fitness index.

Index	CFI	NNFI	NFI	GFI	AGFI	X ² /df
Acceptance Threshold Value	0.9<	0.9<	0.9<	0.9<	0.9<	3>
	0.92	0.91	0.85	0.93	0.89	1.801

LISREL calculates a t-value for each parameter estimated in the model. This test shows the parameters that can be removed from the model. In other words, the relationships with a t-value of above 1.96 are approved at the confidence level of 95%. Fig. 3 presents the overall structural model and the coefficients of the main variables. Table 8 presents the results of structural equation modeling and approval or rejection of the hypothesis about the relationships between the variables.

Table 8. The relationships between the variables.

Constructs	Indexes	t-value	Confirmatory Factor Loading	Approved/Rejected
Technology	Technological and entrepreneurial inventions	-	0.33	Rejected
	Creation of new processes in production of goods	5.59	0.73	Approved
	Creation of new distribution systems	5.66	0.80	Approved
	E-commerce	5.01	0.49	Approved
	Commercialization of new technologies	4.06	0.31	Approved
	E-government	5.31	0.59	Approved
Education and Research	Standardization of educational activities	-	0.42	Rejected
	Educational knowledge research	6.70	0.63	Approved
	Application of new educational methods	6.91	0.69	Approved
	Inclusive business development plan	6.29	0.54	Approved
	Knowledge development	6.23	0.53	Approved
	Scientific and technical enrichment	5.75	0.46	Approved
Knowledge-Based Innovation and Creativity	Idea-orientation	-	0.32	Rejected
	Providing the opportunity of entrepreneurship	4.53	0.55	Approved
	Opportunity seeking	4.88	0.75	Approved
Expansion of Knowledge Application	Economic development	-	0.58	Approved
	Cultural development	8.71	0.59	Approved
	Human force development	8.63	0.58	Approved
	Promotion of entrepreneurship	8.46	0.56	Approved
New Platforms and Infrastructures	Explaining and modeling production processes	-	0.61	Rejected
	Virtual networks	9.04	0.60	Approved
	Facilitation measures	10.55	0.74	Approved
	Investment and funding	7.42	0.47	Approved
Management Strategies and Policy-Making	Designing motivating reward packs	-	0.52	Rejected
	Creative skill management	8.44	0.63	Approved
	Corporate management	7.81	0.55	Approved
	Intellectual property right management	8.99	0.70	Approved
	Talent attraction management	8.64	0.65	Approved
	Specialist human force attraction	8.97	0.70	Approved
	Value creation for customers	8.25	0.60	Approved
	Strategic planning for budgeting	9.11	0.72	Approved



Chi-Square=0.00, df=0, P-

Fig. 3. Standardized model of confirmatory factor analysis by LISREL.

Fig. 4. t-values of the path diagram.

According to the results of *Table 8*, the main models were approved, but it should be noted that the effect of each of these 6 main variables on the creation and development of knowledge-based cooperatives are different. The twenty-ninth variable, Idea-orientation (0.32) and commercialization of new technologies (0.31) are known as a lesser element and less effective than other variables. Also, the variables of creation of new distribution systems (0.8), opportunity seeking (0.75) and facilitation measures (0.74) have the highest values.

5 | Result and Discussions

Idea-orientation alone is not enough for creating and modeling knowledge-based companies. The managers of knowledge-based companies should standardize their educational activities and educational centers by communicating with universities and try to promote efficient educational methods to make learning more effective in their processes. Technological inventions for the promotion of entrepreneurship and be conceptualized by the application of research findings; i.e. technological inventions can provide the opportunity of entrepreneurship. Nowadays, motivating rewards should be paid attention to prevent the loss of the young human forces not only the elites. Knowledge-based companies should not only focus on innovation. Rather, they should also pay attention to processes to prevent the waste of national capitals. Improvement and planning of new processes should be also as important as invention and innovation. The establishment of knowledge-based companies is not only considered to promote entrepreneurship in the province. Rather, other components are also paid attention to by the experts in this platform.

The main basis of knowledge-based companies is educational and research activity. These companies develop their professional studies and apply educational programs for transferring the results of their studies. Due to their continuous communication with universities and research centers, knowledge-based companies have prioritized this issue. However, their technological outputs are not practically implemented on time and their capacities are sometimes unused. These components can improve the cooperation between knowledge-based companies and universities and it results in decreased environmental threats. These findings are consistent with the results of studies performed by Arab Firouzjah et al. [24], Saedi et al. [26], Roumezi et al. [25], Talebi and Zare Yekta [21], Avazpour and Mosleh Shirazi [36], Leal Filho et al. [37], Wennberg et al. [40], Cantu et al. [41], Neagu [44], Gorman and McCarty [43], and Shankar et al. [17].

Technology is an inseparable part of knowledge-based companies because the products of these companies are the result of new ideas and creativity. Their products are the updated technologies. These companies have applied the updated technologies and technological inventions to develop businesses and different sectors of society such as the economy. This finding is consistent with the results of studies performed by Roumezi et al. [25], Saedi et al. [26], Yahiaei and Hasanzadeh [29], Allahyari Fard and Abbasi [35], Avazpour and Mosleh Shirazi [36], Yaghoubi et al. [38], Leal Filho et al. [37], Davis [42], Gorman and McCarty [43], and Shane [16].

Due to the technological nature of knowledge-based companies, providing new platforms and infrastructures can affect their activity. Experts' attention to the new context and infrastructure indicates the achievement of a resilient economy. Production of technology and technologies, value-added goods, as well as accelerating processes in the context of using virtual networks and the Internet as a result of these activities in knowledge-based cooperatives. The view of these experts on the designed platforms resulting from the results of research and development, was coded in this subcategory. This category was found to include four subcategories that are consistent with the findings reported by Roumezi et al. [25], Kiani et al. [27], Allahyari Fard and Abbasi [35], Shankar et al. [17], Shane [16], Sveiby [19], and Zack [18].

Management and policy-making strategies of knowledge-based companies should be based on the latest methods and economic conditions for capital attraction and prevention of currency outflow. Retention

of efficient human forces is closely related to these policies and management styles in organizations. In recent years, there has been a lot of discussion in the field of payroll system and its impact on the recruitment and retention process. A common understanding from previous studies suggests that traditionally, the abundance of financial elements in reward packages offered by organizations has been a factor influencing job attractiveness for individuals. The use of appropriate management strategies in the leadership of organizations plays an important and key role in the strategy of cooperatives. This type of strategy overshadows the direction of companies, their vision and their main mission. The helmsman of knowledge bases must have a visual view of all aspects from labor creativity, employee satisfaction to technology and technologies in order to be able to integrate the appropriate field of staff activities as well as technological products with correct and efficient policies. In this regard, this component is consistent with the findings reported by Bagheri et al. [23], Roumezi et al. [25], Kiani et al. [27], Dorostkar Ahmadi and Golshahi [28], Akbarzadeh and Shafizadeh [34], Leal Filho et al. [37], and Neagu et al. [44].

The most important subcategories of knowledge expansion have been recognized as the promotion of entrepreneurship, human force development, cultural development, and economic development. When cooperative activities of knowledge-based companies bind to universities, entrepreneurship will be promoted in society. The promotion of entrepreneurship encourages human forces and individual development is the result of this situation. When the ideas proposed by creative individuals are respected, the culture of entrepreneurship will be promoted, and it will lead to cultural and economic synergy. Roumezi et al. [25], Saedi et al. [26], Yahiaei and Hasanzadeh [29], Mirghfour et al. [30], Khayatian et al. [32], Avazpour and Mosleh Shirazi [36], Yaghoubi et al. [38], and Neagu [44] have also mentioned the issue of knowledge expansion.

In knowledge-based innovation and creativity, idea-orientation provides the opportunity for entrepreneurship. Finding the opportunity to realize such ideas is a major challenge for society members and specially students. Knowledge-based cooperative companies can provide the opportunity of entrepreneurship and also develop that by playing a supportive and advisor role. This category was consistent with the findings reported by Arab elah firozja et al. [24], Roumezi et al. [25], Nobakht [9], Mirghfour et al. [30], Samadi et al. [20], Shankar et al. [17], Kumar [15].

5.1 | Future Research Suggestions

- *Identifying further dimensions of knowledge-based companies regarding the resistive economy.*
- *Designing and explaining a model for the creation and development of knowledge-based companies in the neighboring provinces of Semnan and comparing the two models*
- *Comparing the knowledge-based models of each province in the country.*
- *Proposing appropriate solutions for facilitation of the creation and development of knowledge-based companies in Semnan province.*
- *Investigation of the six components of standardization of educational activities, technological and entrepreneurial inventions, designing motivating reward packs, explaining and modeling production processes, promotion of entrepreneurship and idea-orientation in knowledge-based cooperative companies of Semnan province.*
- *Investigation of the function of the identified components and development of knowledge-based companies.*
- *Designing a model for different knowledge-based companies and causal comparison.*
- *Investigation of idea-orientation and its function in knowledge-based companies.*
- *Investigation of standardization of educational activities by knowledge-based companies.*
- *The concept and importance of entrepreneurial and technological inventions in knowledge-based companies.*
- *The basis of designing motivating reward packs in knowledge-based companies.*
- *The dimensions of explaining and modeling production processes in knowledge-based companies of Semnan province.*
- *Investigation of promotion of entrepreneurship in Semnan province by knowledge-based companies and their role in this area.*

5.3 | The Research Limitations

Every research work will be involved in some problems. To achieve the research goals, researchers should identify these problems and try to resolve them. Some of the constraints of the present research include:

Time restrictions. Spending a lot of time getting information from the experts of knowledge-based companies. Negligence of some of the respondents to spend enough time on filling the questionnaires.

Restrictions on access to individuals and resources. Impossibility of interviewing some of the elites due to the coronavirus epidemic. Limitation in accessing some of the experts. Problems of collecting the questionnaires.

Restrictions on effectiveness. The probability of the respondents' being influenced by bias.

Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this manuscript. In addition, the ethical issues, including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, and redundancy have been completely observed by the authors.

Author Contributions

Younos Vakili Alroaia performed conceptualization, methodology, software, and literature review and manuscript preparation. Vakili Alroaia Y. and Nazari Ghazvini S. performed data correction, writing original draft preparation, writing reviewing and editing references.

Author Agreement

I am submitting a manuscript for consideration of publication in JARIE. The manuscript is entitled "Designing and Explaining a Model for Creation and Development of Knowledge-Based Cooperative Companies with a Mixed Qualitative-Quantitative Approach". It has not been published elsewhere and that it has not been submitted simultaneously for publication elsewhere.

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