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Techno-Markets and Commercialization of Products of Knowledge-Based Companies

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Abstract

Techno-market is one of the tools that was created with the aim of facilitating the implementation and realization of knowledge-based economy policies and product commercialization in this field, and in fact, it is a system for guiding and monitoring technology exchanges. The objective of this research endeavor is to meticulously identify and methodically rank the pivotal determinants influencing the successful commercialization of products within the purview of knowledge-based companies operating within techno-markets. The research method is descriptive in terms of practical purpose and survey in terms of data collection. The statistical population of the research is the experts of Science and Technology Park of Tehran University who have at least 10 years of work experience in the field of knowledge-based companies and preferably have relevant education in the relevant fields; The statistical population of the research is the experts of Science and Technology Park of Tehran University who have at least 10 years of work experience in the field of knowledge-based companies and preferably have relevant education in the pertinent fields; To achieve this objective, a purposive sampling technique was employed to select a cohort of 15 seasoned experts, and information was gathered through the utilization of a semi-open questionnaire, employing the Delphi method and interviews in a combined manner. After identification, factors have been ranked by fuzzy AHP method. The ascertained factors, along with their hierarchical ranking, encompass the following dimensions: technology marketing, consultancy and technology transfer, legal and financial considerations, attention to the demands of the target market, technology management, technology sales, policy making, technical, manufacturing and sales with international standards.

Keywords: commercialization, knowledge-based products, techno-markets, fuzzy hierarchical analysis process

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Introduction

Ideas must be commercialized to become a successful and profitable business, and commercialization as a non-linear and complex process requires the role of various actors and agents with different capabilities. One of the mechanisms that has been created with the

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aim of facilitating the implementation and realization of knowledge-based economy policies and the commercialization of products in this area is techno-market. Techno-market is a system for directing and monitoring technology exchanges.

The process of commercialization is inherently intricate and non-linear, necessitating the collaborative engagement of diverse factors and actors possessing varying proficiencies and capacities. Techno-market is one of the tools that was created with the aim of facilitating the implementation and realization of knowledge-based economy policies and product commercialization in this field, and it is actually a system to guide and monitor technology exchanges. Technology is known as the main factor and engine of economic development in today's world. The imperative significance of technology exchanges should be underscored, not solely as an industrial requisite, but also as a business endeavor endowed with the potential to generate high augmented value (1). In different regions of the world, various methods are used to facilitate technology transfer and exchange at local, national, regional and international levels (2). Knowledge-based companies are knowledge learners and creators, focus on research and development, and use new technical knowledge implicitly or explicitly to develop their products and technologies (3). Technology-oriented companies should know that both technological conditions and market conditions are changing rapidly, and this dynamic environment requires more attention to marketing and technology aspects (4). Statistics show that the average failure rate for products with advanced technology in the market is 60% higher than other products (5).

There are two types of techno-markets, defined by the roles they take on. In this marketplace, technology transfer information is collected and processed to meet user needs. The second type of techno-market is called the technology trading market. Within this market context, trade exhibitions featuring physical product showcases and virtual technology exhibits play a pivotal role, serving as platforms that enabling technology suppliers to negotiate contractual agreements. Having organized research and development programs, as well as structured financial support initiatives, coherent and transparent policies in the techno-market landscape, well-defined technological attributes and organizational capabilities, after-sales services, formal and informal buying and selling channels are among the characteristics that are currently receiving attention in establishing technological markets in various countries (6).

In the 2025 development vision document, it is predicted that 50% of the country's gross domestic product (GDP) and 20% of the country's income should be provided through knowledge-based products. The basis for the realization of such a goal is the establishment and support of knowledge-based companies, which effective measures have been taken in this field in recent years (Pour Abbasi, 2017). But many knowledge-based companies are facing major problems to enter the market or develop the market of their products (7).

In the context of product offering in high-tech markets, two points are important: First, understanding the difference between the customer's perspective and the management's perspective. Second, the specific characteristics of high-tech markets that distinguish them from other product categories (8).

This research has two questions as follows:

1. What are the effective factors in the commercialization of knowledge-based products through techno-market?
2. What are the sub-indices of each of these factors and what is the rank and position of each of these sub-indices?

Table 1: Summary of domestic and foreign research background

Authors	Topic	Results
9	Examining the requirements for successful entry into the market for new knowledge-based companies (case study of Tehran information and communication technology companies)	The requirements for the successful entry of these companies into the market are organizational dimensions, environmental and individual factors. Furthermore, the ranking of components indicates a higher significance of strategic capability components, marketing and sales capabilities, and human resources within the organizational dimension-components related to supportive institutions, social factors, political-economic-technological factors within the environmental dimen-

		sion, and individual components of managerial mindset, personal individual managerial traits, and inter-individual managerial traits within the individual dimension hold prominence.
10	Identifying and leveling the most important factors affecting the success of the brand of industrial knowledge-based business products using the ISM technique, an empirical witness: technology units located in the science and technology park of Semnan province.	After the final refinement, eight factors were selected. In the next step, these factors were leveled by interpretive structural modeling technique. Finally, among the factors affecting the success of the brand of knowledge-based companies, the history of the company and the type of ownership are placed at the first level and as the most influential factors. At the next level, the brand features are situated. The third level encompasses market share, the fourth level pertains to company size and market share allocation, and ultimately, the most impressible factors which are communications and marketing strategies, situated at the fifth level.
11	The effect of essential marketing capabilities on the performance of knowledge-based companies	There is a positive and significant correlation between marketing capabilities and the performance of knowledge-based companies, and the results of the regression showed that "service marketing", "internet marketing" and "new product marketing" have an effect on the performance of knowledge-based companies. Finally, based on the results of Friedman's test, international marketing and export have the most influence, and service and Internet marketing are in the next ranks.
12	Key success factors of knowledge-based companies by relying on university growth centers	The factors of marketing and sales capabilities, the existence of expert forces and infrastructures related to information technology (software, hardware, network) respectively have the greatest impact on the success of knowledge-based companies that rely on academic growth centers.
13	Analysis of the role of techno-markets in the process of commercialization of knowledge-based products	Among the 43 identified indicators effective in the commercialization of knowledge-based products in the techno-market platform, after turning the variables, 9 factors were finally identified, which explained 80.74% of the variance. Technology marketing factors, technology consulting and transfer, and legal factors and financial provision were respectively ranked first in the role of techno-market in the commercialization of knowledge-based products.
14	Examining the model of sustainability of knowledge-based companies in Iran	The nature of sustainability of knowledge-based companies consists of four components: financial results, market results, innovation results, and entrepreneurial results. Factors affecting the sustainability of knowledge-based companies have two main components: internal factors (consisting of two categories of individual factors of founders and corporate factors) and external factors (consisting of two categories of factors, business characteristics and innovation system components).
15	Identification and analysis of the most important strategic components influencing the failure of knowledge-based companies in Iran (case study: Kermanshah Science and Technology Park)	The results showed that the failure of market technology, lack of government involvement in the process of facilitating technology exchange, lack of brand and mistrust of industries, government bodies and the market affect the failure of knowledge-based companies in the field of technology exchange and commercialization.
16	Active marketing orientation of a company in the high technology sector	Innovation in the high-tech sector is difficult due to technological and market (consumer) uncertainty, as well as competitive volatility, and this significantly increases the risk of new products market failure. One way that companies may deal with this risk is adopting a market orientation. Companies that produce new products in the high-tech sector must follow a proactive marketing orientation and thus focus on latent and future consumer needs.
17	Investigating business model configuration and dynamics for technology commercialization in mature markets	Significant changes in strategies during the technology commercialization process are not necessarily seen in fundamental changes in the business model, and companies can deliberately use temporary strategies and business models as tools for identifying more suitable approaches to reach the market.
18	Identifying and ranking factors affecting the failure of knowledge-based companies in Iran and ranking them with AHP technique	The four factors of lack of confidence of the market and industries in the products of domestic knowledge-based companies, lack of brand, lack of government support and lack of proper techno-market are in the first ranks of failure of knowledge-based companies.

19	Technology commercialization through sustainable knowledge sharing from academic and industrial collaborations with a focus on patenting	The willingness to patent and commercialize it largely depends on the type of technology and management strategies of the executives.
20	Understanding the commercialization process of products with a high level of technology as one of the appropriate ways to commercialize the interaction between universities and inventors (Thought owners)	Participation in technology events and markets can be effective in the commercialization of achievements containing high technology, taking into account the conditions of maintaining intellectual property.
21	An empirical study of the success of technology companies in commercializing products	Factors related to market demand for new technologies and products targeted by projects, such as credit approval and branding, play a role in the successful commercialization of projects.

Research Methodology

The method of this research is in the form of a descriptive method considering that we are dealing with the description of indicators and research components at the level of the investigated society. Also, due to the use of questionnaire tools in the form of field methods, the method of this research can be considered survey based. Furthermore, the outcomes of this study hold practical implications for the examined society, thereby the research method is practical. Finally, in terms of typology, this research can be considered one of the types of qualitative-quantitative research. The community of interviewees of this research is all managers and employees of knowledge-based companies and technology units, heads of growth centers and experts of science and technology park of Tehran province. In order to obtain the required information, semi-structured exploratory interviews are conducted with 15 experts (people who have expertise in technology commercialization and participation in techno-markets) by non-random sampling method and in a targeted method.

In this research, library-related research methods using tools such as documents and records, books, articles, websites, journals, etc., have been employed. Additionally, a field method using a standard questionnaire tool has also been utilized. Considering that the research is a qualitative type of research, therefore, the data collection tool has been used in the qualitative part of the semi-structured interview to identify the factors and sub-indices of the commercialization of knowledge-based products in the context of techno-market. In this research, Fuzzy Hierarchy Analysis Process (FAHP) was used for data analysis. The Fuzzy Hierarchy Process is a multi-criteria technique, based on the Analytical Hierarchy Process, but uses a wide range of values to incorporate the uncertainty, ambiguities, or indetermination of the decision maker. Different methods have been developed for its application. Buckley's method is for combining fuzzy comparison ratios in methodology. Other methods used are Chang's extent analysis method and fuzzy hierarchical analysis process based on Chang's entropy.

Findings

To analyze the collected data, analytical statistics are presented in two forms, descriptive and inferential statistics. Initially, using descriptive statistics, cognitive understanding of the conditions and characteristics of the respondents' demographic is obtained, and then, in inferential statistics, after identifying the effective factors in the commercialization of knowledge-based products by helping the process of hierarchical fuzzy analysis, we begin to rank and position these factors and their sub-indices.

Table 2: Frequency distribution and percentage of respondents

Index		Frequency	Percentage
Sex	Male	11	73%
	Female	4	27%

	Total	15	100%
Education	Diploma	0	0%
	Associate's degree	0	0%
	Bachelor	5	33%
	Master	7	47%
	Ph.D.	3	20%
	Total	15	100%
Age	Under 30 years	1	7%
	Between 31 and 40 years	3	20%
	Between 41 and 50 years	9	60%
	More than 50 years	2	13%
	Total	15	100%
Work experience	Under 10 years	2	13%
	Between 10 and 20 years	6	40%
	Between 20 and 30 years	5	33%
	30 years and older	2	13%
	Total	15	100%
Field of activity	Education	3	20%
	Consultant	2	13%
	Business Development	3	20%
	Market and projects development	3	20%
	Growth centers	4	27%
	Total	15	100%

The first research question: What are the effective factors in the commercialization of knowledge-based products through techno-market?

Factors of commercialization of knowledge-based products extracted from the previous steps through techno-market and their groupings were examined by experts. After adjusting and confirming the factors by them, finally, according to their opinion, 21 factors were selected in 9 division groups as effective factors in the commercialization of knowledge-based products through techno-market.

Table 3: Factors in the commercialization of knowledge-based products through techno-market

Factors	Description	Codes
Technology marketing	Transparency in the supply and demand of technology according to market conditions	A1
	Training of skilled and expert people in various fields of techno-market (such as technology evaluation, marketing)	A2
	Determining the possibility of technology development in the future	A3
	Clarification of criteria for choosing technology by the government for commercialization	A4
	Effective in technical and technology and market evaluation	A5
Consulting and technology transfer	More cooperation with companies, groups and technological teams based in research centers	B1
	Introducing the project to the selected owners of technology, consulting and exchanging information between the parties	B2
	Understanding how to produce a product with the lowest possible production cost	B3
	More cooperation with research centers (growth centers, science and technology parks)	B4
Legal and financing	Protecting intellectual property rights of ideas before commercialization	C1
	Commercialization financing through opening documentary credits, foreign currency guarantees, and domestic guarantees (Rials)	C2
	Negotiation to reach the most suitable conditions (legal and financial) for commercialization and sale of the idea	C3
Attention to the requirements of the target market	The possibility of communicating and obtaining advice from investors in identifying the requirements and needs of the target market	D1
	Choosing the suitable brand name for technological products generated in order to have the most attractiveness in the effective market	D2

	Proper orientation in the market and paying attention to the market-oriented nature of the product or its customer-oriented nature	D3
Technology management	Technology management in the company (use of the Internet, intranet, e-commerce, use of databases)	E1
Selling technology	Facilitating technology export or speed of action and accurate evaluation	F1
	The possibility of selling more through localization of new technologies	F2
Policy making	Increasing the trust and beliefs of governmental and non-governmental institutions in the research ability of inventors and researchers	G1
Technical	Exchange of information among skilled individuals in physical and virtual market management	H1
Production and sales under international standards	Focusing on providing a product at the global level, having an international orientation in the design, development and marketing processes	I1

Second question: What are the sub-indices of each of these factors and what is the rank and position of each of these sub-indices?

Factors of commercialization of knowledge-based products are compared through triangular fuzzy numbers for pairwise comparisons. At this stage, first, for all questionnaires of the pairwise comparison matrix, in order to ensure that the points given to the criteria (factors) are compatible, their compatibility rate has been calculated, and after ensuring their compatibility, we have ranked the factors. It shows the importance of the weight of the subgroups compared to each other, from the average opinions of 15 experts collected by the questionnaire. Then, using the EA method with the formation of a final pairwise comparison matrix with fuzzy triangular numbers, the SK value for each of the rows of the pairwise comparison matrix is initially calculated.

After obtaining the SKs, we compare their magnitude using the following relationship.

$$V(M_2 \geq M_1) = \mu_{M2}(d) \begin{cases} 1 = \text{if}(M_2 \geq M_1) \\ 0 = \text{if}(L_1 \geq U_2) \\ \dfrac{U_2 - L_1}{(U_2 - L_1) - (M_1 - M_2)} = \text{otherwise} \end{cases}$$

Table 4: Merged fuzzy comparison matrix

Factors	Technology marketing			Consulting and technology transfer			Legal and financing			Attention to the requirements of the target market			Technology management			Selling technology			Policy making			technical			Produce and sales under international standards		
Technology marketing	1.0	1.0	1.0	1.2	1.7	2.2	1.2	1.7	2.2	1.3	1.6	2.1	1.3	1.7	2.3	1.5	2.0	2.6	1.1	1.6	2.1	1.6	2.1	2.7	1.1	1.5	2.0
Consulting and technology transfer	0.4	0.6	0.8	1.0	1.0	1.0	1.2	1.7	2.2	1.3	1.7	2.1	1.3	1.7	2.3	1.4	1.8	2.4	1.4	1.9	2.5	1.2	1.6	2.2	1.2	1.6	2.2
Legal and financing	0.4	0.6	0.8	0.4	0.6	0.8	1.0	1.0	1.0	1.4	1.9	2.5	1.3	1.7	2.2	1.2	1.6	2.1	1.3	1.7	2.2	1.0	1.4	1.9	1.2	1.6	2.2
Attention to the requirements of the target market	0.5	0.6	0.8	0.5	0.6	0.8	0.4	0.5	0.7	1.0	1.0	1.0	1.0	1.4	1.9	1.2	1.6	2.2	1.2	1.6	2.1	1.2	1.6	2.2	1.2	1.6	2.1
Technology management	0.4	0.6	0.8	0.4	0.6	0.8	0.5	0.6	0.8	0.5	0.7	1.0	1.0	1.0	1.0	1.2	1.6	2.2	1.2	1.6	2.1	0.7	1.0	1.4	1.1	1.5	2.1
Selling technology	0.4	0.5	0.7	0.4	0.5	0.7	0.5	0.6	0.8	0.5	0.6	0.8	0.5	0.6	0.8	1.0	1.0	1.0	1.2	1.6	2.2	1.2	1.6	2.1	1.2	1.6	2.2
Policy making	0.5	0.6	0.9	0.4	0.5	0.7	0.4	0.6	0.8	0.5	0.6	0.8	0.5	0.6	0.8	0.5	0.6	0.8	1.0	1.0	1.0	1.3	1.7	2.2	1.2	1.6	2.1
technical	0.4	0.5	0.6	0.5	0.6	0.8	0.5	0.7	1.0	0.5	0.6	0.8	0.7	1.0	1.5	0.5	0.6	0.8	0.5	0.6	0.8	1.0	1.0	1.0	1.2	1.6	2.2
Produce and sales under international standards	0.5	0.7	0.9	0.5	0.6	0.8	0.5	0.6	0.8	0.5	0.6	0.8	0.5	0.7	0.9	0.5	0.6	0.8	0.5	0.6	0.8	0.5	0.6	0.8	1.0	1.0	1.0

Table 5: Calculation of SK for each row of the pairwise comparison matrix

Fuzzy sum of each row			SK
19.2296	14.9342	11.3705	S1
17.6360	13.6528	10.4616	S2
15.6072	12.0639	9.3345	S3
13.6252	10.5258	8.1621	S4
11.9823	9.0754	7.0116	S5
11.2606	8.7099	6.8076	S6
10.0862	7.9148	6.2433	S7
9.5190	7.2989	5.6868	S8
7.8019	6.0832	4.8085	S9
116.7479	90.2588	69.8865	Total
0.0086	0.0111	0.0143	

Table 6: Fuzzy composite expansion for each row

Fuzzy composite expansion			SK
0.2752	0.1655	0.0974	S1
0.2524	0.1513	0.0896	S2
0.2233	0.1337	0.0800	S3
0.1950	0.1166	0.0699	S4
0.1715	0.1005	0.0601	S5
0.1611	0.0965	0.0583	S6
0.1443	0.0877	0.0535	S7
0.1362	0.0809	0.0487	S8
0.1116	0.0674	0.0412	S9

Table 7: Magnitude degree comparison

SK	The degree of preference of Si over Sk							
S1	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰
S2	0.916	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰
S3	0.798	0.884	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰
S4	0.666	0.753	0.871	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰
S5	0.533	0.617	0.734	0.863	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰
S6	0.480	0.566	0.686	0.819	0.961	۱/۰۰۰	۱/۰۰۰	۱/۰۰۰
S7	0.376	0.463	0.583	0.720	0.868	0.907	۱/۰۰۰	۱/۰۰۰
S8	0.315	0.393	0.516	0.650	0.795	0.833	0.578	۱/۰۰۰
S9	0.127	0.208	0.323	0.459	0.609	0.647	0.441	0.824

After calculating the degree of magnitude, we must obtain the non-normal weight of the criteria (factors) according to the following formulas, for this we chose the smallest value in each of the degrees of magnitudes.

$$W'(X_i) = Min\ [V(S_i \geq S_k)] \quad and\ K = 1,2,\dots,n \dots k \neq i$$

$$W' = [W'(C_1), W'(C_2), \dots, W'(C_n)]^t$$

.

Table 8: Non-normal weight of the main factors of commercialization of knowledge-based products through techno-market

Factors	Degree of preference
Technology marketing	1.000
Consulting and technology transfer	0.916
Legal and financing	0.798
Attention to the requirements of the target market	0.666
Technology management	0.533
Selling technology	0.480
Policy making	0.376
Technical	0.315
Produce and sales under international standards	0.127

Finally, using the following relationship, we obtained the normal and final weight of the factors according to the table below.

$$W_i = \frac{\acute{W}^i}{\sum \acute{W}^i}$$

Table 9: The normal weight of the main factors of commercialization of knowledge-based products through techno-market

Factors	Degree of preference
Technology marketing	0.1919
Consulting and technology transfer	0.1758
Legal and financing	0.1532
Attention to the requirements of the target market	0.1279
Technology management	0.1023
Selling technology	0.0922
Policy making	0.0722
Technical	0.0603
Produce and sales under international standards	0.0243

graph 1: Ranking factors based on normal weight

Applying the weight of criteria (group of factors) in sub-criteria (subgroup of factors)

At this stage, in order to obtain the final weight of each factor, the weight of the group of factors is applied to the weight of the sub-group of factors, in which, the output is listed in the table below.

Table 10: Applying the weight of criteria (group of factors) in sub-criteria (subgroup of factors)

Group of factors	Group weight	Subgroup of factors	Subgroup weight	Applying Group weight in Subgroup
Technology marketing	0.1919	Transparency in the supply and demand of technology according to market conditions	0.2981	0.0572
		Training of skilled and expert people in various fields of technomarket such as technology evaluation, marketing	0.2072	0.0398
		Determining the possibility of technology development in the future	0.1893	0.0363
		Clarification of criteria for choosing technology by the government for commercialization	0.1359	0.0261
		Effective in technical and technology and market evaluation	0.1695	0.0325
Consulting and technology transfer	0.1758	More cooperation with companies, groups and technological teams based in research centers	0.3668	0.0645
		Introducing the project to the selected owners of technology, consulting and exchanging information between the parties	0.1422	0.0250
		Understanding how to produce a product with the lowest possible production cost	0.1236	0.0217
		More cooperation with research centers (growth centers, science and technology parks)	0.3674	0.0646
Legal and financing	0.1532	Protecting intellectual property rights of ideas before commercialization	0.6348	0.0972
		Commercialization financing through opening documentary credits, foreign currency guarantees, and domestic guarantees (Rials)	0.2038	0.0312
		Negotiation to reach the most suitable conditions (legal and financial) for commercialization and sale of the idea	0.1614	0.0247
Attention to the requirements of the target market	0.1279	The possibility of communicating and obtaining advice from investors in identifying the requirements and needs of the target market	0.4164	0.0532
		Choosing the suitable name (brand) for the manufactured technological products	0.3368	0.0431
		Proper orientation in the market and paying attention to the market-oriented nature of the product or its customer-oriented nature	0.2468	0.0316
Technology management	0.1023	Technology management in the company (use of the Internet, intranet, e-commerce, use of databases)	0.1023	0.1023
Selling technology	0.0922	Facilitating technology export or speed of action and accurate evaluation	0.5389	0.0497
		The possibility of selling more through localization of new technologies	0.4611	0.0425
Policy making	0.0722	Increasing the trust and beliefs of governmental and non-governmental institutions in the research ability of inventors and researchers	0.0722	0.0722
Technical	0.0603	Exchange of information among skilled individuals in physical and virtual market management	0.0603	0.0603
Produce and sales under international standards	0.0243	Focusing on providing a product at the global level, having an international orientation in the design, development and marketing processes	0.0243	0.0243
Total	1			1

In order to rank the factors, after consulting with the experts in this field, the normal weight of each group is calculated and ranked. Among the main groups of factors that play a role in the commercialization of

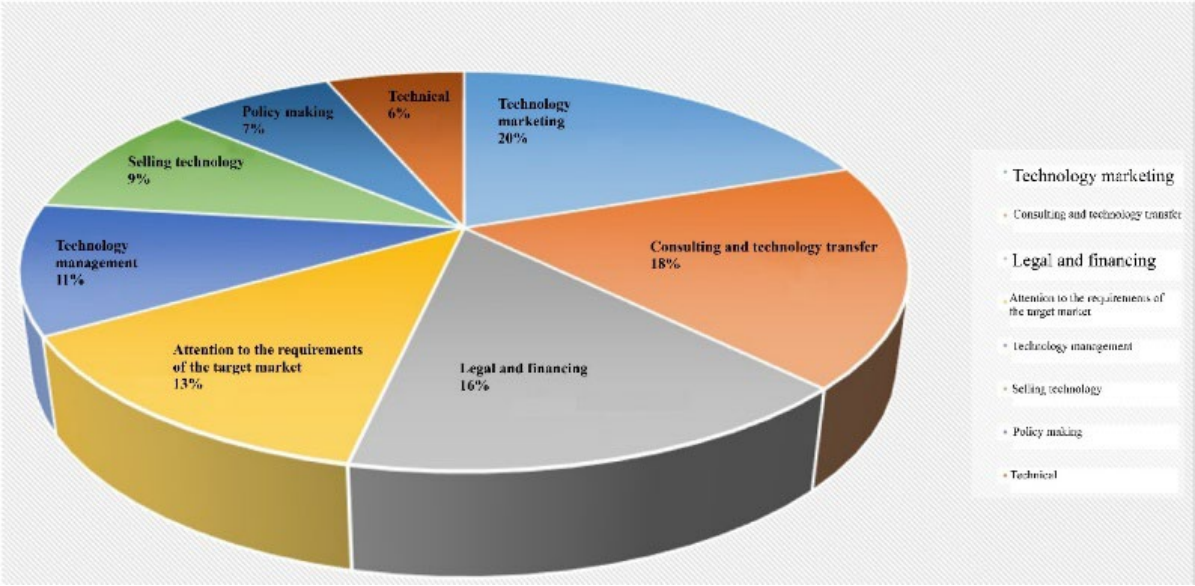
knowledge-based products through techno-market, the technology marketing group with a score of 0.1919, technology consulting and transfer with 0.1758, legal and financial with 0.1532, attention to target market requirements with 0.1279, technology management with 0.1023, Selling technology with 0.0922, policy making with 0.0722, technical with 0.0603, and produce and sales under international standards with 0.0243, score the highest points and importance, respectively.

Furthermore, in order to rank the subgroups, the weights of the subgroups should be calculated and then ranked.

sales under international standards with 0.0243, score the highest points and importance, respectively.

Table 11: Ranking criteria (group of factors)

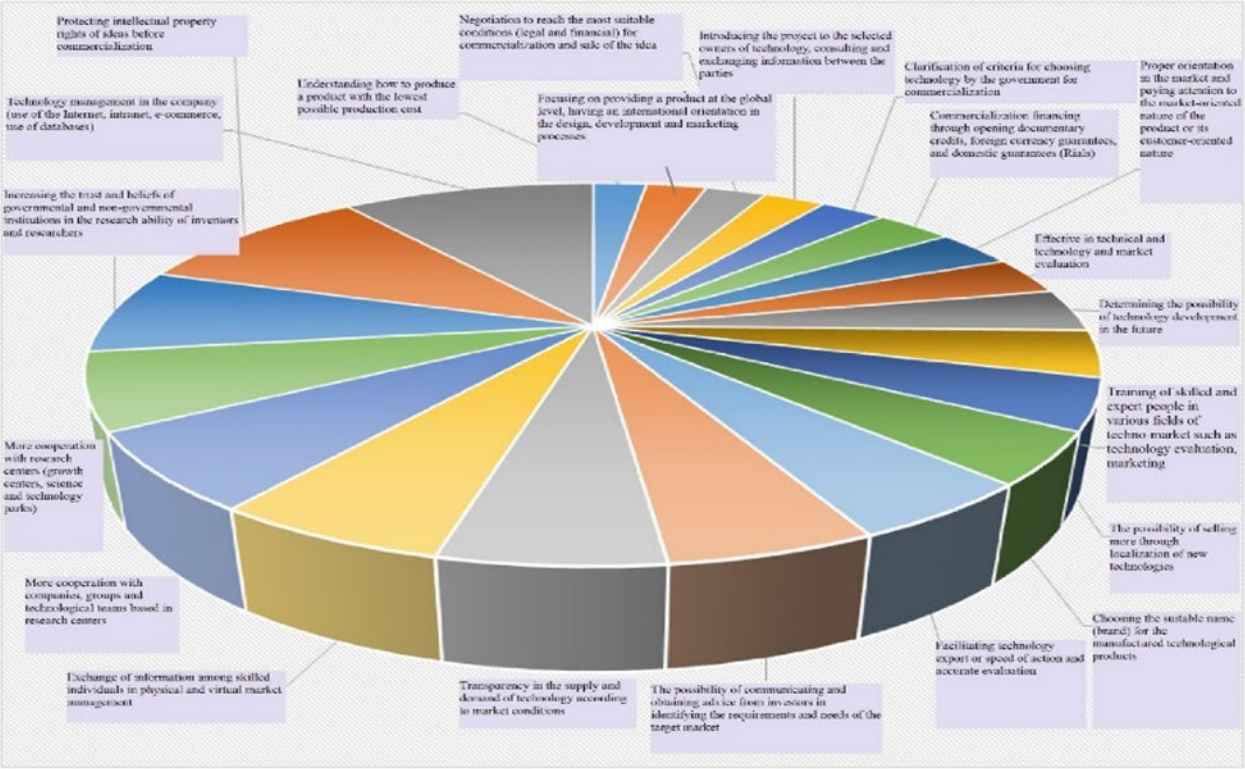
Subgroup of factors	Group weight	Group rank
Technology marketing	0.1919	1
Consulting and technology transfer	0.1758	2
Legal and financing	0.1532	3
Attention to the requirements of the target market	0.1279	4
Technology management	0.1023	5
Selling technology	0.0922	6
Policy making	0.0722	7
Technical	0.0603	8
Produce and sales under international standards	0.0243	9



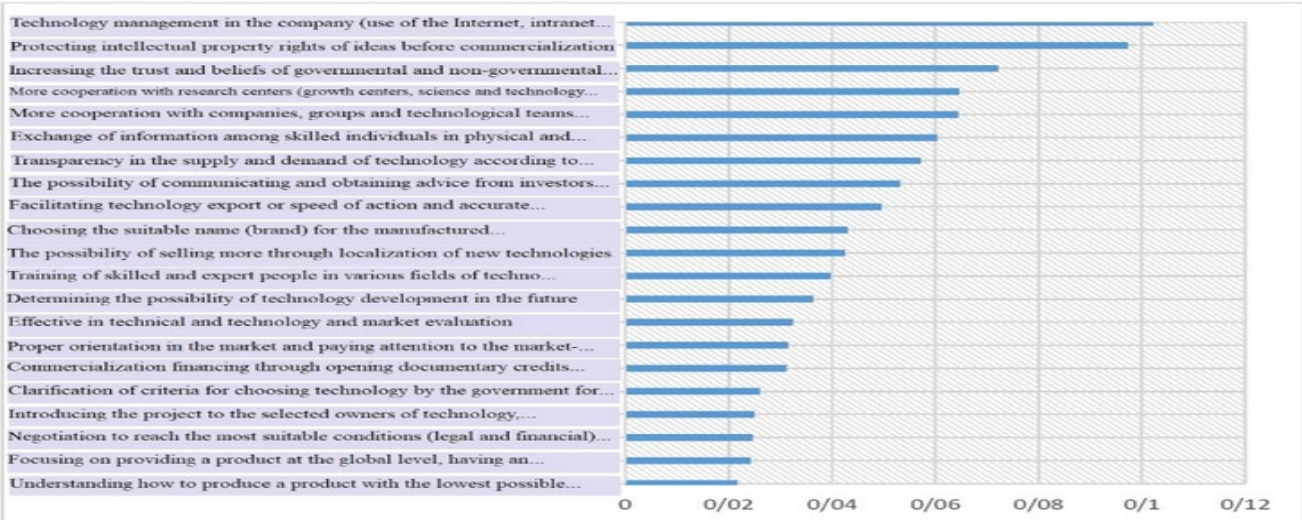
graph 2: The contribution of the main group's factors in the commercialization of knowledge-based products through techno-market

Table 12: Ranking of factors based on group weights

Group of factors	Group weight	Subgroup of factors	Apply group weights to sub-groups	Rank
Technology marketing	0.1919	Transparency in the supply and demand of technology according to market conditions	0.0572	7
		Training of skilled and expert people in various fields of techno-market such as technology evaluation, marketing	0.0398	12
		Determining the possibility of technology development in the future	0.0363	13
		Clarification of criteria for choosing technology by the government for commercialization	0.0261	17
		Effective in technical and technology and market evaluation	0.0325	14
Consulting and technology transfer	0.1758	More cooperation with companies, groups and technological teams based in research centers	0.0645	5
		Introducing the project to the selected owners of technology, consulting and exchanging information between the parties	0.0250	18
		Understanding how to produce a product with the lowest possible production cost	0.0217	21
		More cooperation with research centers (growth centers, science and technology parks)	0.0646	4
Legal and financing	0.1532	Protecting intellectual property rights of ideas before commercialization	0.0972	2
		Commercialization financing through opening documentary credits, foreign currency guarantees, and domestic guarantees (Rials)	0.0312	16
		Negotiation to reach the most suitable conditions (legal and financial) for commercialization and sale of the idea	0.0247	19
Attention to the requirements of the target market	0.1279	The possibility of communicating and obtaining advice from investors in identifying the requirements and needs of the target market	0.0532	8
		Choosing the suitable name (brand) for the manufactured technological products	0.0431	10
		Proper orientation in the market and paying attention to the market-oriented nature of the product or its customer-oriented nature	0.0316	15
Technology management	0.1023	Technology management in the company (use of the Internet, intranet, e-commerce, use of databases)	0.1023	1
Selling technology	0.0922	Facilitating technology export or speed of action and accurate evaluation	0.0497	9
		The possibility of selling more through localization of new technologies	0.0425	11
Policy making	0.0722	Increasing the trust and beliefs of governmental and non-governmental institutions in the research ability of inventors and researchers	0.0722	3
Technical	0.0603	Exchange of information among skilled individuals in physical and virtual market management	0.0603	6
Produce and sales under international standards	0.0243	Focusing on providing a product at the global level, having an international orientation in the design, development and marketing processes	0.0243	20



graph 3: Contribution of factors of subgroups



graph 4: Ranking factors of subgroups based on weighting

Discussion

In the field of commercialization of knowledge-based products in the context of techno-markets, 9 factors were identified. Without exaggeration, one of the most complex stages of innovation is the stage of transferring research findings to the market and production,

which is discussed in the transfer of technology from research to production. The reality is that there is no definitive and unquestionable pattern in this field. Awareness and understanding emerge when a potential user learns about a new technology and grasps some of its capabilities and benefits. In this step of technology marketing, the customer wants to know what is the resulting innovation? What are its capabilities and how it works? Heartfelt belief also emerges in the customer when a desirable or undesirable inclination takes shape within the customer. The customer tries to understand what are the advantages and disadvantages of this technology compared to other technologies. In the decision-making stage, the customer aligns the benefits and advantages of the technology with their needs and compares the costs of acquiring it with them. Furthermore, the implementation stage occurs when the customer acquires the new technology and incorporates it into their (production) process, and in the final step, confirmation and validation come when the customer seeks to endorse the implementation of the new technology and continue using it.

Receiving consulting services plays a key role in selling and transferring technology and finally commercializing products. In this area, in most of the techno-markets, the companies have a technology transfer consultant. Technology exchange consultants are companies active in the field of technology services that facilitate technological cooperation between technology owners and technology buyers is an important part of their services and to provide these services while having sufficient knowledge of technology transfer, commercialization and acquisition issues, they are able to use experts in technology fields, legal experts and technology management experts in their network according to the topic, respond with speed and agility to the needs of their employer in order to increase their capability and readiness to enter into an effective technological cooperation, and understanding of the collaborative pathway allows them to improve the speed and quality of these collaborations.

Support indicators for intellectual property rights of ideas before commercialization, commercialization financing through opening documentary credits, foreign and local currency guarantees, financing, secure financial transfer, and negotiation capabilities to achieve the most favorable (legal and financial) conditions for commercialization and sale of ideas were extracted. In this field, it must be said that businesses within the framework of economic and social institutions should be able to innovate, prepare the results for presentation to society, and receive rewards through a specific legal and economic mechanism. In this process, the financial system framework holds significant importance. Generally, the establishment of any economic activity requires providing suitable financial resources to ensure its initiation and sustainability. In this path, innovation, as one of the most important economic activities which is essential for economic development, also requires financial support. On the one hand, innovation is considered the driving force of economic development and the most crucial component in economic competitiveness. On the other hand, due to the issues present in financing these initiatives, conventional financial systems like banks and stock exchanges cannot easily provide adequate funding for these projects. In other way, other sources of the private sector, especially in the first stage, do not have the possibility of financial provision, for this reason, the special role of the government in providing suitable and easily accessible financial support is significantly important in Iran.

In analyzing and examining international markets for export purposes, it is better to consider things such as market size (volume and value), emerging markets versus older markets, availability of substitute products, price and service quality of potential buyers, demographic characteristics of the market, proximity to the market (travel costs and time difference), transportation costs and transfer of products to the target market, legal agreements (free trade, duties and taxes), legal systems and contractual requirements, moral support laws in the market, required documents, political stability of the market and region, legal and industrial infrastructures, cultural and linguistic characteristics of the target market and unique characteristics of the buyers' demand. Considering these criteria for exports, especially exporting a knowledge-based product or service, is very important and crucial. This is because the techno-market platform, while familiarizing knowledge-based companies with

these requirements, provides the necessary groundwork for better commercialization of these product categories in alignment with the needs and demands of the target market.

The management of key pillars that are essential for commercialization has been placed under government control and is still being managed in a governmental manner, which will undoubtedly lead to various challenges in the process of commercialization. Therefore, the most damages are from this area and the most focus is on optimization in the government management sector. Lack of access to all knowledge-based companies or lack of time by them to complete the questionnaire was another limitation that this research has faced. Additionally, the insufficient understanding of respondents regarding the questionnaire statements and criteria, as well as how to respond to it, was a limitation that can be significantly alleviated through the researcher's direct presence, distribution of questionnaires, and providing adequate explanations about it. Policy makers and government officials should show a more serious commitment to the development and continuous implementation of this event. Also, due to the fact that techno-market can prevent the accumulation of technology without using it in knowledge-based companies, research institutions, universities, and organizations, it can be held continuously in academic and research communities in a real and even virtual, seasonally.

Conclusion

The country's science and technology parks and growth centers can strengthen local enterprises by injecting new technologies through available consultancy services in techno-markets, enhancing technological capabilities, and boosting the competitiveness of knowledge-based companies and technological units. Furthermore, in the direction of technology transfer, the techno-market can assist in repeated technology sales, thereby offsetting the development costs for developers and compensating the purchasing costs for technology owners. Before the mass production of the product, knowledge-based companies and technology units should offer their products in the techno-markets. To ensure successful financial support, special attention should be given to business angels and accelerators located in growth centers and science and technology parks as risk-taking providers of capital.

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