

Identification of the Driving Forces Affecting the Future of Research in the Field of Scientometrics in Iran based on the Characteristics of the Knowledge-Based Society

Ebrahim Emami Gharetappeh

Ph.D. Candidate in Knowledge and Information Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.

ebiemami@gmail.com

ORCID iD: <https://orcid.org/0000-0001-7241-0349>

Farideh Osareh

Professor in Knowledge and Information Science, Shahid Chamran University of Ahvaz, Ahvaz, Iran.

osareh.f@gmail.com

ORCID iD: <https://orcid.org/0000-0001-6691-0339>

Saeedeh Ebrahimi

Associate Prof., in Knowledge and Information Science
Shiraz University, Shiraz, Iran.

sebrahimi.shirazu@gmail.com

ORCID iD: <https://orcid.org/0000-0001-6738-1205>

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Abstract

Since scientometrics has changed significantly over time, study of its changes can include a description of the past, an analysis of the current situation, and planning for the Future, leading to optimal policymaking and planning by organizations. The objective of the present study was to identify trends and driving forces affecting future research in the field of scientometrics in Iran based on the characteristics of the knowledge-based society. This study is applied that has conducted by literature review and survey. An expert panel was conducted with 15 experts in the field of Knowledge Science. Then, a researcher-made questionnaire was distributed among the experts. The study results showed that the driving forces affecting the Future of scientometrics can be divided into 14 general indicators (10 internal indicators including communication and interactions, experts, creativity and innovation, information technology, citation, methodology, index, language barriers, facilities, and specific problems of the field and 4 external indicators including sociology, economics, information technology and policymaking and management of the country's higher education system) with 66 items. Given the undesired situation of trends of scientometrics in Iran, policymakers and managers of the country's higher education system in Iran should consider the need to change the trends and the effective drivers of scientometrics because the lack of synchronization with the changes, the effectiveness, and applicability of research will reduce and faded over time.

Keywords: Scientometrics, Internal Driving Forces, External Driving Forces, Trends.

Introduction

In today's changing world, science, technology, and innovation fields have been changed. New and efficient technologies have such a position that the knowledge of creating these useful technologies is considered a strategic tool for governments. There has been a close relationship between science, technology, and innovation in recent years. Therefore some countries intend

to create opportunities and focus on scientific products that can be transformed into technology associated with innovation (Karamali, 2019).

Despite the promising growth trends in science that indicate national and human capacities in Iran, unfortunately, some factors shaping the Future of science in Iran are worrying (Fatemi & Arasti, 2018). Normative weakness in scientific ethics, institutional, structural, and management weakness, over quantitiveness, weakness in the demand side of science, educational system and curricula, weakness in the social effect of science, lack of integrity in the development of our science, weakness in learning, systemic development and intelligence, ambiguity in public understanding of science in Iran (Higher Education Research and Planning Institute, 2014).

Today, scientometrics as a field of study has the most common methods of evaluating science, technology, and innovation (Osareh, Heydari, Zare Farashbandi & Haji Zain-al-Abidini, 2013). The increasing information in the field of scientometrics, on the one hand, and the changes in education and research, on the other hand, have caused a large volume of information (Proskuryakova, 2019).

Scientometrics experts should be flexible and ready to face changes in a society with rapid and continuous changes (Burrows & Gnad, 2020). Future research as a new field has gradually passed its legitimacy period. Today, as an empowering knowledge, it has affected the theoretical and practical fields through studying the status quo and identifying key influential parameters. Perhaps by reviewing the existing documents in the country, it can be said that the current structures in the fields of science, technology, and innovation in the country, in addition to legal support for technology and innovation, are related to issues such as supervision, administration, management, exploitation, and direction to technologies, indicating the special importance of science and technology for the system (Heydari & Nazemi, 2016). Like other fields, the policies in scientometrics are not integrated, and the adopted policies are repetitions of the same topics stated in the previous documents. New issues are less discussed, indicating that previous policies cannot be implemented and should be repeated in new documents. Therefore, we will be involved in implementing the previous policies and explain less about the new policies.

Perhaps one of the reasons is the lack of a suitable model given all the internal and external affecting factors; a model that can determine the position of scientometrics in research based on the characteristics of society and the needs of users and draw a picture of its Future based on internal and external affecting factors. It seems that researchers in the field of scientometrics, with their current situation in Iran and not having a suitable model to consider all the internal and external factors affecting it are moving towards a vague and worrying future. Conducting studies to identify the driving forces affecting scientometrics in Iran can reduce these concerns to some extent and prepare scientometrics policymakers for appropriate and timely action towards these factors.

Driving forces can affect the outcome of events. In other words, the elements change the main plan of the scenarios and finally define the stories (Cuhls, 2013). Driving forces can be divided into two internal and external groups. Internal driving forces are within the organization, and external driving forces are outside and affect the organization's policies and decisions. Determining the driving forces requires identifying the changing trends affecting the subject. Identifying the global trends of the knowledge-based society helps policymakers and decision-makers understand today's world's realities, obtain sufficient and necessary knowledge

in this field and evaluate global approaches (Holstein & Doroudi, 2021).

It should be noted that we can talk about the details of science completely if we are aware of its basis, generality, and purpose. Therefore, reviewing the trends in the thematic fields and showing the developments can help to analyze the current situation. Since the field of scientometrics has changed significantly over time, the study of the changes can include a description of the past, an analysis of the current situation, and planning for the Future, which will lead to optimal policymaking and planning by organizations.

According to the above, the problem of the present study is to review the status of the trends of the knowledge-based society and the performance of scientometrics in Iran accordingly and identify the driving forces affecting in the next fifteen years.

Research questions

The present study aims to answer the following questions:

1. What is the status of Iran's scientometrics based on the trends of the knowledge-based society?
2. What driving forces affect the Future of scientometrics in Iran?
3. What is the importance of each identified driving force on future research in the field of scientometrics in Iran?

Literature review

The literature background to interpret the findings in the field of Identification of the driving forces affecting the Future of research in the field of scientometrics is explained as follows:

Ahmadi and Osareh (2014), In their study entitled "Evolution of Scientometrics in Iran," investigated the level and approach of research in the field of scientometrics and the evolution of scientometrics concepts in Iran. The study results showed that since 2004, the research activities in this field in Iran had significant development, and its average growth rate was 32%. In these years, 1800 concepts have been proposed in the research of this field. Also, the conceptual structure of scientometrics has changed significantly over time in such a way that some concepts have faded over time, and others have emerged. The study results indicated the scientific development of this field in Iran quantitatively and, to some extent, qualitatively.

In their study, Ravikumar, Agrahari and Singh (2014) investigated the drawing of the intellectual structure of Scientometrics Journal during 2005-2010. The study results showed that the concepts of citation analysis, co-citation clusters, network analysis, web link analysis, co-authorship, text analysis, co-lexical analysis, cluster analysis, and scientific collaboration were the most used concepts of these courses in the Journal. Also, the results showed conceptual change during these two periods, so during the first period, the concepts of cluster analysis, self-citation, bibliometric analysis, and co-citation clustering have the highest frequency, respectively. During the second period, concepts of the H index, scientometrics analysis, co-occurrence analysis of words, and co-authorship analysis have been frequent. In general, their study results indicated major changes in the concepts during these two periods; over time, the concepts faded and appeared.

Ahmadi, Osareh, Heydari and Hosseini Beheshti (2017), in their study entitled "Drawing and Analysis of the Conceptual Network of the Knowledge Structure of Scientometric in Iran" investigated the conceptual network of the knowledge structure of scientometrics in Iran

through the documents provided by Iranian researchers inside and outside the country. The cluster analysis results showed that scientometrics in Iran is divided into 17 thematic clusters. The documents of this field in Iran have grown by 32% and in recent years, 270 emerging conceptual events in the form of 13 conceptual models have been presented in the documents of this field.

Betz, Betz, Kim, Rachel, Monks and Phillips (2019) in their study entitled "Surveying the Future of Science, Technology, and Business: A 35-Year Horizon" asked readers of Science, Nature, and the Harvard Business Review about their expectations for the development of science, technology, and business over a 35-year horizon. The results showed that during 2018-2053, significant benefits will be obtained from the convergence of biomedicine and computer science. They will bring challenges and changes in the agriculture and education sectors. The results of the present study led to the Identification of effective and key factors of the advancement of science, technology and business.

Palumbo, Bussmann and Kern (2021) in their article entitled "Value of Professional Science and the Future of Library Science," investigated the opinions of more than 200 American university librarians about the Future of library science and scientific communication. The results showed that scientific and research communication, contact with groups, group work, information literacy, virtual reference, research data management services, services to specific organizations and association communication are important and key factors in the Future of Library Science.

A retrospective survey of multiple research articles conducted in scientometrics demonstrates that such studies have addressed this field as a review or a historical trend. Furthermore, conceptual and structural development is remarkable in such research studies. As with scientometrics, futures studies have been conducted theoretically, and field researchers have undertaken multiple case studies through Scenario writing to portray the prospects of scientometrics.

The literature review found that the challenge of changes in scientometrics has always been one of the researchers' concerns. Attention to the Future of the field of Scientology is evident in the conducted studies.

Methodology

The present study is theoretical-applied because on the one hand, it deals with the expansion of knowledge on the subject of research and its description and explanation, and on the other hand, the study results allow decision-making for appropriate planning for the Future of scientometrics.

The approach of this study is future studies. The systematic review, the experts panel and the Delphi process have been used to collect data. To analyze the data, SPSS and Micmac software been used. Data validation is used to measure the validity and reliability of data.

The research data included all the outputs provided by researchers in scientometrics in the form of books, articles, academic theses, and research projects inside and outside of the country, including printed and electronic documents in Farsi and English during 2000-2019. For data collection, national and international databases were used with specialized search and the online bibliography of scientometrics (Jamali, 2013). Also, for complete access to documents and searching for specialized topics, scientific journals and other related journals and their lists were reviewed thoroughly.

This study used two approaches to achieve the main driving forces. Accordingly, the first stage included a literature review to determine trends and driving forces. At the second stage, the knowledge extracted at the first stage was investigated with the participation and involvement of stakeholders.

The data collection method at the first stage was library studies and interviews with subject experts through questionnaires. This stage was performed to identify critical factors and driving forces in scientometrics. At this stage, the questionnaire was designed as open. The data collection tool at the second stage was a researcher-made questionnaire based on the results obtained from the first stage. This stage was performed to confirm and value the previous stage's key factors and driving forces using the opinions of subject experts in this field.

In future study literature, the period of such research is between ten and thirty years. Therefore, in the present study, a fifteen-year time frame has been considered for the Future of the field of scientometrics.

The beneficiaries of the research include experts in the field of scientometrics and knowledge science. Accordingly, the beneficiaries will consist of several groups. The first group is university faculty members. The second group includes experts in the field of scientometrics in research centers and science and technology parks. Due to their specialized performance, these experts can have effective opinions in the studied field. The third group comprises experts from the centers of scientometrics of the universities of the Ministry of Health, Treatment, and Medical Education. The fourth groups are master and doctorate students whose thesis is in the field of scientometrics.

Results

A literature review to identify the Effective research trends in the knowledge-based society showed 10 trends: "Communications and interactions", "Experts", "Creativity and innovation", "Information technology", "Methodology", "Language barriers", "Facilities", "Sociology", "Economics" and "Politicization and Management of the Higher Education System of the country". The study results of the trends identified in the research in the field of scientometrics are shown in Table 1.

Table 1
Effective research trends in the field of scientometrics

Trend	Status
Communication and interaction	Poor interaction and cooperation of experts in the field in the research
	Poor foreign relations and international cooperation
	Poor interdisciplinary communication with other professionals
	Poor communication and interaction between scientometrics and industry, technology and innovation
Experts	Low use of expert faculty members in the field of scientometrics in universities
	Low hiring of scientometrics experts in scientometrics centers
	Poor interaction and cooperation of field experts
Creativity and innovation	Lack of creativity in selecting the subject and conducting research
	Poor performance in research innovation

Trend	Status
	Low compatibility of research topics with the research priorities of the field
Information technology	Poor performance in increasing the Internet penetration rate and expanding the bandwidth in the country
	Undesired situation of information and communication infrastructure
	Disregarding new forms of content
	Not using artificial intelligence and natural language processing
Methodology	Lack of diversity in the use of methods
	Lack of integrated methodological principles for research in this field
	Introduction of different methodologies from different fields to analyze the problems of this field
	Poor fit between the research methodology and the nature of the research problem
	Predominance of quantitative methods over qualitative methods in research
Language barriers	Overemphasis of citation index in English
	Poor English language of field researchers
	Few publications in the field in the national language
Facilities	Lack of material and spiritual support and services for researchers in the field
	Lack of support for comprehensive access to national and international references and bases
	Poor planning to hold training courses and workshops for experts in the field
Sociology	Disregarding the role of science in social relations
	Spread of the spirit of documentation
	Undesired position of the field in public opinion
	Undesired academic structure of the field and inappropriate approach of higher education managers and universities
	Few social functions of scientometrics
Economics	Disregarding science, technology and innovation as components affecting the economics
	Disregarding the increasing importance of the knowledge-based economy
	Weakness in increasing the supply and demand of knowledge goods
Policymaking and management of the country's higher education system	Undesired situation of tendency to revise the plans and teaching references of the field
	Officials' disregard for the position and importance of the field
	Poor planning to upgrade the field of study from master's degree to doctorate level
	Improper formulation of the comprehensive scientific map document of the country and scientometrics approaches in it
	Disregarding the importance of the development of science and technology in the 6 th Development Plan and other upstream documents
	Disregarding the promotion of universities in international systems

Trend	Status
	Disregarding upstream documents such as the development document of biotechnology science and other priority areas to the components of scientometrics
	Adverse effect of scientometrics indicators on promotion regulations
	Effect of low attention of universities to scientometrics indicators for promotion regulations
	Lack of policy to promote scientometrics
	Lack of policy of the definition of the position of scientometrics expert in related organizations
	Disregarding the globalization of higher education and accepting international students in the field

Literature review showed that the research in the field of scientometrics is not associated with the trends affecting the research in the field based on the characteristics of the knowledge-based society.

After examining the status of trends affecting scientometrics in Iran, the driving forces affecting the Future of scientometrics in Iran were identified. For this purpose, the strategies of reviewing texts and surveying experts' opinions in the field were adopted. The study results showed that the driving forces affecting the Future of scientometrics can be divided into 14 general indicators (10 internal indicators including communication and interactions, experts, creativity and innovation, information technology, citation, methodology, index, language barriers, facilities, and specific problems of the field and 4 external indicators including sociology, economics, information technology and policymaking and management of the country's higher education system) with 66 items.

According to the experts, the study results showed that the index "language barriers" ranked first with an importance factor of 91.11. The items "index" with an importance factor of 90 and "citation" with an importance factor of 83.23 ranked second and third, respectively.

Table 2

Driving forces affecting the Future of scientometrics in Iran

driving force	index	descriptive statistics		
		M	SD	importance factor
Internal	Communication and interaction	3.22	0.52	64.12
	Experts	3.73	0.52	72.22
	Creativity and innovation	4.05	0.55	81.54
	Information technology	3.16	0.44	63.20
	Citation	4.21	0.53	83.23
	Methodology	3.83	0.89	76.54
	Index	4.41	0.44	90
	Language barriers	4.39	0.54	91.11
	Facilities	3.51	0.48	69.23
	Field problems	3.84	0.38	78.54
External	Sociology	2.92	0.53	57.65
	Economics	3.27	0.50	62.44
	Information technology	3.14	0.51	61.48

driving force	index	descriptive statistics		
		M	SD	importance factor
	Policymaking and management of the country's higher education system	4.14	0.60	82.88

For the internal driving forces, the study results showed that items of "lack of attention to multiple indicators (a collection of scientific, technological and economic indicators)", "lack of publications in the field in the national language," and "high attention to the index of articles and citations and low attention to other indicators" ranked the first to third, respectively. All three items with the highest average and importance factor belong to the "index" (Table 3).

Table 3

Internal driving forces affecting the Future of scientometrics in Iran

driving force	index	item	descriptive statistics		
			M	SD	importance factor
internal	Communication and interaction	Interaction and cooperation of experts in the field in the subject of research	3	0.68	60
		Expanding foreign relations and facilitating international cooperation	3.23	0.78	64.62
		Interdisciplinary communication with other professionals	3.30	0.74	65.96
		Communication and interaction between scientometrics and industry, technology and innovation	3.34	0.72	66.73
internal	Experts	Hiring expert faculty members in the field of scientometrics in universities	3.99	0.72	79.81
		Hiring scientometric experts in scientometric centers	3.91	0.81	78.27
		Interaction and cooperation of field experts	3.29	0.63	65.77
internal	Creativity and innovation	Creativity in choosing the subject and conducting research	3.64	0.87	72.88
		Innovation in research	4.12	0.79	82.31
		Fit of research subjects with the research priorities of the field	4.40	0.70	88.08
internal	Information technology	Increasing the rate of Internet penetration and expanding the bandwidth in the country	3.22	0.67	64.42
		Situation of information and communication infrastructure	3.21	0.52	64.23
		New forms of content	3.29	0.71	65.77
		Using artificial intelligence and natural language processing	2.93	0.84	58.62
internal	Citation	Lack of complete and comprehensive citation databases for data analysis	4.02	0.95	80.38
		Using ISI and Scopus citation index by researchers	4.36	0.72	87.12
		Limitations of science measurement tools, including ISI, for measuring the science	4.06	0.88	81.15
		Lack of local and national citation index for researchers to use	4.39	0.90	87.88

driving force	index	item	descriptive statistics		
			M	SD	importance factor
internal	Methodology	Lack of diversity in the use of methods	3.83	0.89	76.54
		Lack of integrated methodological principles for research in this field	4	0.88	80
		Introduction of different methodologies from different fields to analyze the problems of this field	3.91	0.87	78.27
		Fit between the research methodology and the nature of the research problem	3.86	0.76	77.12
		Predominance of quantitative methods over qualitative methods in research	4.37	0.95	87.31
internal	Index	Disregarding multiple indicators (a set of scientific, technological and economic indicators)	4.79	0.53	95.77
		Much attention to the index of articles and citations and little attention to others	4.59	0.62	91.73
		Critically generalizing journal ranking index to researchers' evaluations in universities and research institutes	3.92	0.73	78.46
		Much attention to quantitative index	4.35	0.79	86.92
internal	Facilities	Overemphasis of citation index in English	4.11	0.85	82.12
		Poor English language of field researchers	4.45	0.77	89.04
		Few publications in the field in the national language	4.61	0.70	92.12
internal		Providing material and spiritual support and services to researchers in the field	3.83	0.77	76.54
		Support for comprehensive access to national and international references and bases	3.59	0.72	71.73
		Holding training courses and workshops for experts in the field	3.12	0.69	62.31
internal	Field problems	Lack of theoretical references in the field of scientometrics	4.35	0.74	86.92
		Too much attention to quantity and too little attention to quality	4.32	0.67	86.35
		Non-native field of scientometrics	3.40	0.98	68.08
		Inappropriate position of the field of scientometrics	4.31	0.83	86.15
		Criticisms to this field due to the effect of its indicators on the promotion regulations	3.55	0.80	70.96
		Participation of other researchers in scientific articles and research	3.47	0.78	69.42
		A stereotyped view due to the lack of study field of scientometrics in the universities of the world	3.51	0.70	70.19

For the external driving forces, the study results showed that the items "officials' understanding of the position and importance of the field", "attention of the 6th Development Plan and other upstream documents to the importance of the development of science and technology" and "globalization of Higher Education and admission of international students in the field" ranked the first to third, respectively. All three items with the highest average and importance factor also belong to the index of "policymaking and management of the country's

Higher Education System" (Table 4).

Table 4

External driving forces affecting the Future of research in the field of scientometrics in Iran

driving force	index	item	descriptive statistics		
			M	SD	importance factor
external	Sociology	Valuing the role of science in social relations	2.24	0.76	44.81
		Spread of the spirit of documentation	2.66	1.07	53.27
		Position of the field in public opinion	2.63	0.94	52.50
		Academic structure of the field and the attitude of higher education managers and universities	3.97	0.84	79.42
		Social functions of the field of scientometrics	3.11	0.85	62.12
external	Economics	Science, technology and innovation as components affecting the economics	3.54	0.86	70.77
		Increasing the importance of the knowledge-based economics	3.10	0.57	61.92
		Increasing the supply and demand of knowledge goods	3.18	0.65	63.65
external	Information technology	Increasing the rate of Internet penetration and expanding the bandwidth in the country	3.03	0.70	60.58
		New forms of content	3.26	0.82	65.19
		Using artificial intelligence and natural language processing	3.14	0.95	62.88
		Providing information and communication infrastructure to access information	3.13	0.78	62.50
external	Policymaking and management of the country's higher education system	Tendency to review plans and curriculum references	4.14	0.60	82.88
		Officials' understanding of the position and importance of the field	4.17	0.45	95.38
		Planning to upgrade the educational level of the field from master's degree to doctorate level	3.67	0.82	73.46
		Formulation of a comprehensive scientific map document of the country and scientometrics approaches	4	0.80	80
		Attention to the importance of science and technology development by the 6 th development plan and other upstream documents	4.28	0.70	85.58
		Attention to improving the ranking of universities in international systems	3.59	0.80	71.73
		Attention of upstream documents such as the document on the development of biotechnology science and other priority areas to the components of scientometrics	4.19	0.76	83.85
		Effect of scientometrics indicators on promotion regulations	3.40	0.76	68.08
		Effect of universities' attention to scientometrics indicators on promotion regulations	3.73	0.79	74.62

driving force	index	item	descriptive statistics		
			M	SD	importance factor
		Polycymaking to promote scientometrics	3.30	0.64	65.96
		Polycymaking of defining the position of a scientometrics expert in related organizations	3.50	0.71	70
		Globalization of higher education and admission of international students in the field	4.21	0.69	84.23

Discussion

Human has not considered the Future in most fields of science, and the field of scientometrics is no exception. Future studies as a new field has gradually passed its legitimacy period and today as an empowering knowledge; it has affected the theoretical and practical fields. Perhaps by reviewing the existing documents in the country, it can be said that the current structures in the field of science, technology and innovation in the country, in addition to legal support for technology and innovations, are related to issues such as supervision, administration, management, exploitation, and direction to technologies, indicating the special importance of science and technology for the system (Haidari and Nazemi, 2017).

The field of scientometrics, like other fields of humanities, is affected by important and key factors that move it towards a good future. Education and research in the field of scientometrics should always continue its survival and growth in the coming years, and the survival, growth and excellence of this field require simultaneous attention to its internal and external affecting factors. The lack of accurate and complete understanding of the field of scientometrics and its interdisciplinary fields, as well as the lack of knowledge of external and internal factors affecting this field, is the main problem of the present study. As mentioned earlier, the lack of single policies and an up-to-date program by future needs is the problem of the present study.

The studies have shown that despite the differences between the characteristics of the countries and the educational and research settings, there are many common points about the driving forces affecting the Future of research in the field of scientometrics among them (Utkin, Bagramyants & Safyanov, 2021). In general, these forces can be divided into 14 general indicators (10 internal indicators including communication and interactions, experts, creativity and innovation, information technology, citation, methodology, index, language barriers, facilities and specific problems of the field and 4 external indicators including sociology, economics, information technology and policymaking and management of the country's higher education system) with 66 items. For the internal driving forces, the items "disregarding multiple indicators (a collection of scientific, technological and economic indicators)", "few publications in the field in the national language" and "high attention to the index of articles and citations and low attention to other indicators" ranked the first to third, respectively. For the external driving forces, the items "officials' understanding of the position and importance of the field", "attention of the 6th development plan and other upstream documents to the importance of the development of science and technology" and "globalization of higher education and admission of international students in the field" ranked the first to third, respectively.

Disregarding and not using multiple indicators simultaneously, as well as paying too much attention to the articles and citations, are always the weaknesses of research in the field of

scientometrics. On the other hand, due to the new nature of the field of scientology in Iran, there are few publications in this field, and the students and researchers of the field are forced to use the publications and translations of foreign authors. Therefore, policy makers and planners in the field of scientometrics should pay attention to this.

Conclusion

National and regional policy makers have always considered development as an ultimate goal in the policies of every country. On the other hand, today the concept of development is tied to the concept of innovation and technology, and these concepts have also been changed in meaning in the last few years. One of these changes is the concept of globalization in the field of innovation and technology development, which has changed innovation from development limited to a specific region to development without borders. Therefore, policy makers and officials' development, expansion and support should also provide all the platforms to achieve the above goals.

It may be said that the most important factor affecting any country's advance of science and technology is the importance of that country's officials to science and technology. The importance of science and technology is not rational or cultural; for example, science and technology are inherently valuable, or from the aspect of apparent cultural competitions that all countries have universities and other scientific institutions, and we should have too. The importance of science and technology in developed countries is that science and technology are seen as a means of solving problems.

When we consider any societal problem, we realize that such a problem and its solution are essentially "intellectual in nature". Whatever you want to do for a country and solve whatever problem - in any religious, medical, military, technical, and educational fields, the solution is finally through thinking and knowledge. Therefore, social problems, like mathematics, need the power of thinking and solving methods. For this reason, this part of the thinking system has been considered since the beginning of societies and then become a cultural element and value throughout human history to the extent that in society, they value science by nature. Therefore, the main function of science and technology is to help solve problems.

The system of thinking and science of society should be efficient and active in solving problems.

Now, if society's officials realize that science, technology and innovation are important to solve problems and should be used, they will try to use it better. This is an interdisciplinary and emerging field to solve problems, fill the gap between researchers and policymakers, and a tool for open policymaking.

As an open system, scientometrics's education and research system interact closely with its surrounding environment and components. Hence, focusing only on the internal driving forces is not enough for the policymaking and management of the country's higher education system, and a complete picture of the internal and external driving forces should be presented. In the next steps, based on the driving forces identified and using scenario-based planning, we can draw the desired and possible future scenarios for research in the field of scientometrics and plan for the Future of the field accordingly.

Therefore, for the future field study, the first step is to investigate the status of the changing trends and determine the driving forces affecting the Future of the studied field (Hosseini Moghadam, 2021). Hence, in this study, an effort was made to take the first step in the planning

process for future study in the field of scientometrics. Determining the key affecting driving forces, analyzing the mutual effects, and finally writing possible and desired scenarios are the next steps in the future study of scientometrics in Iran. It is hoped that this will be achieved in future research.

Endnote

1. This article is part of the doctoral thesis entitled "Strategic Futures Study in the field of Scientometrics by Scenario Planning Approach".

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