

# Content Analysis Of National Documents On Scientific Cooperation And Interactions Between Faculty Members In Agricultural Higher Education System

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**Abstract:** Scientific interactions and cooperation are considered as the main components in the production of science; interaction and communication between professors are also considered as the most important areas of communication in higher education. Therefore, the level of interactions, communications, and collaborative activities plays a key role in the professional development of faculty members. The purpose of this research is to answer this fundamental question which should be considered on the basis of the transactional and National and Certain Documents for the formulation of the components of scientific cooperation and interaction between faculty members. This research is a descriptive analysis in terms of nature in which content analysis and documentary analysis are used. The population of the study includes the extra and determined documents out of which five documents are sampled by purposive sampling. Phishing, checklist and researcher forms have been the tools for data collection required for research. Descriptive analysis has been used to interpret and analyze the data. The categories of education, research and outsourcing services are classified based on the findings of the research, and ultimately these components were extracted, which include international participation, collaborative research interactions and multidisciplinary interactions in research category, joint courses and joint international interactions in the field of training and team interaction, international engagement and technological interactions in the field of outsourcing services. Accordingly, professional inputs and collaborations among faculty members will be highly valued if the inference components are taken into consideration.

**Keywords:** Interactions, Scientific Collaboration, National and Certain Documents, Content Analysis, Agricultural Higher Education System.

## Introduction

Science is a social institution that is definitely developed by social interaction with other scientists. Since an essential element in the advancement of science is the combination of ideas that have never been existed, effective communication between scientists is an indisputable component in scientific activity (Tavakol, 1991). Therefore, the process of producing scientific knowledge is an interactive process. In other words, in society, there is not only consumption and efficiency of scientific knowledge, but science itself is also a product of some kind of co-creation and co-thinking of researchers (Seddiq, 2001). In the present era, scientific interactions and cooperation are considered as the key to convergence of science and different expertise. However, in recent decades, cooperation and scientific cooperation between specialists have been accelerated in different fields and have been accepted to some extent and it needs to be encouraged, but the pattern of scientific interactions and cooperation in Iran has not been formed yet Iran drastically differs from most countries in the structure of interactions.

Although Iran is scientifically advanced and has a well-experienced workforce in different fields, scientific cooperation is still in its early stage there (Harirchi, 2003). However, studies have shown that the production of science has grown very well in Iran, especially in recent years. But at the same time, problems such as less interaction of Iranian scholars are dominant over the scientific community in comparison with foreign scholars. Some cultural problems, such as theft of thoughts and the lack of mutual trust, have led the authors and the executives of the research projects to be very cautious and less insistence to work in group work (Osareh, 2005). Interactions and communication are considered the main components in the production of science and the mutual interaction and communication is the essence of scientific growth. Interaction and communication between professors are also among the most important areas of communication in higher education. The scientific communications and interactions mean the group relationships, collaborations and social or scientific interactions of academic teachers both inside and outside the workplace (Ghanei rad, 2006). Interactions, communication and collaborative activities are important in the professional development of faculty members, and they crystallize and visualize it in terms of participation by members in teamwork and team-related community and academic networks such as scientific associations and other scientific communities such as editorial boards, scientific committees research projects, group and joint research projects, etc. can be searched (Nourshahi and Samiei, 2011). The existence of deep interactions and communication between the beneficiaries of education in universities indicates the seriousness of education and, more generally, the development of scientific disciplines. The weakness of academic relations is, conversely, linked to other problems in the field of science. In general, there are several elements such as scientists, universities, academic publications, books,

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academic research centers, university publishers, academic associations, rules, and norms that govern the behavior of actors within the scientific community, the processes of proper science production, interactions between actors and collective action situations such as gathering and scientific seminars in communication activities in organizational communication such as instrumental action, communication, discursive, and strategic are the major constituent entities of the scientific community (Sharipoor and Fazeli, 2006). The scientific social interaction is based on the transfer of information and the results of scientific activities through the network of specialists and the revision system by scientific colleagues, which are evaluated according to research activities of scientists, including direct and indirect exchange and transfer of direct and indirect information and the results of scientific activities between scientists and scientific institutions through communication channels (Bagheri Heidari, 2014). Scientific interactions and collaborations have two dimensions: scientific and social, and each one can influence one another. Each group can be divided into inter group and outer group interaction. Inter group interaction is possible in both direct and indirect interaction. Indirect interaction is usually done through books, articles, magazines, and virtual space, but direct interaction is as face-to-face (Bagheri Benjar, 2015). Scientific interaction and collaboration are considered as an effective way of acquiring advanced science and technology for developing and recently developed countries, the point of view of scientific interaction and cooperation is not an index for quality, but is a means to achieve it. It can be said that the quality of scientists' work and, consequently, the level of scientific development is higher as the degree of cooperation between them is higher (Kim, 2003). The evaluation of the origin and source of scientific cooperation should be started with a study of past history. Scientific cooperation is an important feature of the structure of contemporary scientific research, and the group working has not been originated from the twentieth century, and in fact, scientific interaction and cooperation is not a new concept, but also is a reaction against the phenomenon of professionalization of science. Professionalization is a process that includes rules, rights, and access to a group, either by bringing members of a group to one another or by bringing them from other people in a larger society (Rahimi and Fattahi, 2007). The roots of scientific cooperation should be sought in the seventeenth-century scientific revolution and in the communicational organizations of the scientific revolution, means the scientific journals and their contents, which are the same scientific articles. France, after the seventeenth century, formed the most prominent scientific institutions in the world, and thus the conditions in this country provided the basis for the development of formal science education, new research laboratories and specialization, and ultimately professionalization. In this way, France became a model for imitation of other countries, such as Germany and England. In the twentieth century, the subject of scientific interaction and collaboration became increasingly important with the development of universities and the creation of additional sections that emphasized the research (Beaver & Rosen, 1978). The major and discussable issues in the field of scientific interaction and collaboration are patterns used in collaboration. In fact, the patterns of scientific cooperation

are related to the choice of peer-partners, so that the peer-partner can be either an individual in an institution or someone from other disciplines in other institutions. Different scholars have tried to define a variety of scientific interactions and cooperation in the form of patterns, the types of scientific collaboration among the authors of the articles in the form of single-authored articles, articles that have been jointly written by authors in the same institute, the articles that have been jointly written by authors in different institutions in the same province or geographic region, the articles that have been jointly written by authors in different countries. Accordingly, the patterns of scientific cooperation have been categorized into four groups. 1- Inter-institution collaboration 2- Inter-regional cooperation 3- between regional cooperation 4- International cooperation, and according to research, inter-institutional cooperation is more than other types (Wang, 2005). Since the governing academic culture is individualistic, some faculty members are completely excluded from collaborative, grouping, and related scientific activities, and prefer individual work to teamwork. Therefore, scientific interactions and cooperation between people and scientific disciplines are dimmed, and this group collaboration is also rarely done in the international arena. Researchers believe that many reasons can have an effect on the creation of individualist culture, which we cannot mention all of them, but one of the main reasons is related to the subject matter. Educational system policies (educational planning, curriculum, and course syllabus) do not encourage group work and activities; therefore, most syllabus and activities have been set in a completely personal way, the belief of professors to person-centered, existing laws and regulations, and competitive system are just among the reasons that affects collaborative communication, interactions, and teamwork. For example, rule relating to individual rating in group articles, according to which the first author's rating is greater than the rest of the colleagues, reduces the level of collaboration and participation of individuals in research, so individuals are required to do their research individually to achieve more rating. In general, in the social structure of the scientific environment of Iran, relations and interactions between professors are in a form in which relations and interactions have a fragile, temporary and unsustainable form, and the social structure is not institutionalized in the universities, and there are weakness of communication and academic exchanges among professors in most cases of academic disciplines in Iran (Ghazi Tabatabai and Marjaee, 2001). According to Ghanei Rad and Khosro Khavar (2011), the results of numerous studies in Iran suggest a weakness in the structure of scientific interactions and cooperation among faculty members and researchers. In addition, the results of another study by Ghanei Rad (2006) showed that the scientific cooperation of the faculty members of the universities of the country is low, and these interactions are mostly limited within the organizational structures and their outer group cooperation is low. The two phenomena of being below of scientific collaboration between faculty members and being high of inter group scientific collaboration are consistent with outer group cooperation and illustrate the existence of another phenomenon, that is the same weakness of the scientific community. In this way, the faculty members, due to the lack of a solid scientific community, have a weak academic

collaboration and their research is influenced by individualism. Also, Fathi Vajargah et al (2011) considered the scientific and linguistic weaknesses of faculty members of the universities of the country as limitation in their international interactions and cooperation. In the following, we will give an overview of some research in the area of scientific interactions and cooperation. Velasco et al. (2014) have emphasized one of the most important qualifications in the field of higher education, in the international research on the development of qualifications. Scholes and Hoagel (2008), in a research entitled "Knowledge creation and data production quality", have concluded that socialization has a positive relationship with the production of high quality ideas. They believed that in today's world no new ideas are created by one person, but there must be a lot of specialists in order to innovate them in high quality, because better understanding of the subject will be realized in interaction with each other and in the questioning and answering design. Nieto and Sentameri (2007) have come to the conclusion that the importance of collaborative networks in the quality of innovation through longitudinal studies carried out by Spanish industrial companies. Competition in organizations in the world today revolves around the quality of the ideas produced. Various factors lie behind the quality of innovation, one of which is cooperation networks. Their research results showed that collaborative networks have a positive effect on the quality of innovations. Royle et al. (2007) evaluated the extent of collaborative products of Chinese scholars in international publications, and concluded that about half of the products of these scholars is obtained from international participation. Other results from this research showed that the geographical proximity of scholars from different countries has an effect on their scientific cooperation. Emara and Landry (2005), in a research on information as determining the quality of innovation in Canadian industrial companies, show that an innovation phenomenon is associated with the collaboration of researches of industrial companies with researchers at university centers. Because university centers have information and research resources that can add to the quality of the ideas produced in this regard. Liang and Zhu (2002), in a study, have only measured the patterns of inter-regional cooperation in China. Their results can be divided into three groups. 1- The power of regional scientific production affects the priority of participation and ranking of authors' names. 2- Geographic proximity is an important factor in determining the patterns of inter-regional cooperation. 3- The power of inter-regional interaction increases by increasing regional production power and reducing the gap between regions. The results of this study indicate that geographical gap is an important factor in determining the degree of scientific cooperation. Katz and Martin (1996), in an article entitled "What is scientific collaboration?" evaluates the factors that have the greatest effect on the tendency to collaboration (interpersonal, inter-organizational, and international). They have come to the conclusion that scientific productivity is extremely dependent on the number of collaborations between authors. The authors validated more and as a result of more compilations are often more collaborated. Reducing communication costs, the need for mutual cooperation with other scientists, increasing the need for specialized education, the importance of interdisciplinary students, fair

division of labor, cost sharing and high quality of research are the most important factors in stimulating scientific collaboration. Nazarzadeh Zare'i et al. (2016), in a research entitled "Presentation of faculty members' competency pattern in international interactions", found that the faculty members competency was divided in international interactions in six scientific competencies (interdisciplinary and meta-disciplinary knowledge, etc.), the professional (having international language skills, etc.), communicational (negotiation techniques, etc.), intercultural (cultural respect, etc.), metacognition (self-management, etc.), and intellectual (critical thinking...). Noorshahi (2014), in a study entitled "Factors Affecting the professional growth of faculty members" and providing solutions to improve it, the results of comparing the two successful and unsuccessful groups according to the amount of their scientific interactions and relations showed that the successful group have significantly more scientific interactions and relations than unsuccessful groups, and this difference has been especially seen in cases such as membership in the scientific network of related specialized group and participation in scientific-international conferences, membership in related scientific associations and ... .In Adhami et al. (2011), the results of the study of the effect of social factors on the degree of scientific cooperation of faculty members showed that the faculty members most have preferred the pattern of interdisciplinary scientific collaboration and has been the most scientific cooperation in editing the book. Also, the level of scientific interaction and collaboration is higher whatever the degree of scientific rank of the professors to be higher. The native and non-native variable of faculty members also has a significant relationship with their scientific cooperation. Hassanzadeh et al. (2007) evaluated the co-authorship of articles published Iranians in the publications (ISI) and its effect on the amount of citations to these articles. They found that 88.2% of the articles were the result of the joint Iranian authors and in 77.8% of the articles were the co-author of Iran. After Iran, a small percentage of articles have been compiled in cooperation with authors from Britain, Canada and the United States, respectively. Rahimi (2007) has done a research as "evaluating the status of scientific cooperation and factors affecting it among the faculty members of Ferdowsi University of Mashhad in a ten-year period". The basic issue of this research is the lack of sufficient information on the status of how Iranian scientists interact and collaborate in universities. The results indicate that there is a significant difference in terms of scientific cooperation among the four faculties (basic science, engineering, agriculture, and humanities). The factor of mutual trust of colleagues to provide knowledge has been known as the most influential factor of encouragement of the individual by the faculty member. Also, based on part of the research results by Rahimi and Fattahi (2009), entitled evaluating the effect of factors affecting the scientific collaboration from the viewpoint of the faculty members of Ferdowsi University of Mashhad, the mutual trust between the individuals affects scientific cooperation between the faculty members. In spite of numerous studies that has been conducted on faculty interactions and collaboration. Research in which the categories and components of interactions were not traced to the inside and outside of the country, an overview of theoretical and empirical

approaches shows that in the academic community, without a mutual scientific cooperation, constructive interactions, mutual trust, and so on, applied knowledge cannot have a high quality because in a world where specialization has been smaller using the interaction, can be achieved new information and knowledge by saving time and cost. According to what was said, it is necessary to pay a special attention to the scientific interactions and cooperation of faculty members in the universities. Therefore, it is necessary to evaluate these interactions, taking into account the features, conditions and context of the higher education system of the country, and in order to identify the components of the scientific interactions and cooperation and, subsequently, providing solutions to increase and enhance these interactions in universities it seems necessary. Therefore, the general aim of this article is to identify the components of faculty members' scientific interactions and cooperation from the certain and National and Certain Documents.

## Methodology

It is possible to evaluate texts, documents, evidences, and indeed any recorded document, and analyze more systematically, accurately and, most importantly, with higher degrees of reliability. The present study has been carried out using quantitative content analysis method, which is one of a variety of qualitative methods. Content analysis is one of the major ways by which it is possible to evaluate texts, documents, evidences, and indeed any recorded document, and analyze more systematically, accurately and, most importantly, with higher degrees of reliability. In quantitative analysis, a large amount of data is usually analyzed briefly. In this way, a collection of documents or texts can be extracted, counted and classified (Ghaedi and Golshani, 2016). The population under study consisted of extra and certain documents. Five relevant and important documents were selected using a purposive sampling for study. In Table 1, the status of the

documents under study has been surveyed. According to this table, about 36 propositions related to scientific interactions and cooperation have been extracted from the National and Certain Documents. Also, Table 1 shows that 27 propositions are contained in the Ministries of Science, Research and Technology, respectively, six items in the five-year plans of development and in the 20-year vision document of the country's development, a comprehensive scientific map of the country and a statement of Higher education for the 21st Century has each referred to one proposition related to scientific interactions and cooperation (Table 1). And checklists and researcher-made forms are the tools for collecting information and research data. Descriptive analysis method has been used for data interpretation and analysis. In this research, the content analysis of documents by Gal and et al. (Nasr, 2007) was carried out in five stages. In the first step, by identifying the documents related to the research objectives and using the purposive sampling, we selected a sample of documents, then the documents were carefully studied and all the concepts related to the research objectives were extracted. In the second stage, the appropriate categorization method was chosen and each category was sought to be consistent with the research objectives. In the third stage, each of the concepts collected was marked for each category; in other words, each of the concepts extracted from the National and Certain Documents was evaluated to determine: Does the phenomenon described in it falls into one of the categories or not? In the fourth stage, the categorization was performed using open coding and axial coding. In the open coding of all data without any prioritization of the data, and in several categories, and in the central coding, there are several main categories that can be extracted from other categories from within it. Selection and the components were formulated in the form of categories. Ultimately, at the final stage the data were processed, and the results were interpreted.

**Table 1: Status of the documents under study statistically**

Row	Certain and National and Certain Documents	The frequency of concepts of scientific interaction and cooperation in the certain and National and Certain Documents
1	Regulations of the Ministry of Science, Research and Technology	27
2	Five-year development plans	6
3	20 Years Development Perspective Document	1
4	Country Comprehensive Map	1
5	Higher Education Statement for the 21st Century	1

## Results

As mentioned above, five cases of extra and certain documents were investigated in order to infer the components of the scientific interactions and cooperation. Their findings are as follows:

### **The status of the classification of the components of scientific interactions and collaboration in the extra and certain documents statistically**

As mentioned above, the components of faculty members' scientific interactions and collaborations were extracted

based on the analysis of the content of certain and National and Certain Documents. The status of this category has been shown in Tables 2, 3, and 4. In these tables, the components of scientific interactions and collaboration have been categorized according to the frequency of repetition in the three categories of education, research, and outsourcing services. The first part of the interactions in the education category is at least in 14 sub categories; the second part of the interactions in the research topic is at least in 12 sub categories and the third part of the

interactions in the category of outsourcing services has been referred to at least in 17 sub categories.

### Extracting and categorizing scientific interactions and collaborations from certain and National and Certain Documents

Five cases of the extra and certain documents have been deliberately analyzed and scientific interactions and collaborations have been extracted from the extra and certain documents in three categories: education, research, and services. After extracting professional interactions among faculty members, extra and certain documents were categorized based on the categories of education, research, and services on the basis of the sub categories. These components in the field of education include multidisciplinary interactions, joint courses, joint classes, joint international courses, formation of educational networks, joint interactions, joint international interactions, and international participation; the research categories of these sub categories include multidisciplinary interactions, joint research interactions, international partnerships,

formation of research networks, formation of a multi-disciplinary research network, and multidisciplinary interactions; and the service category includes meta partial interactions, technological interactions, multi-disciplinary interactions, international partnership, and team interactions. Table 2 shows the frequency of the categories of scientific interactions and cooperation in the category of education among the extra and certain documents. Among them components, such as: Participation in internal and external communities (conferences / workshops / congresses / conferences / assemblages) the exchange of professors and the creation of new interdisciplinary courses, the highest emphasis and holding the joint training courses, scientific communication of faculty members (partnerships) with institutions, institutes, and International valid Educational Institutes and the invitation of domestic and foreign scholars and professors have been placed at next priorities, offering joint courses, Launching a joint university and policy-making and joint planning have had least emphasis.

**Table 2:** Frequency of Components of Scientific Interactions and Collaboration in the Education Category of extra and certain documents

Row	Education	Frequency
1	Participation in internal and external communities (council/ workshop / congress / conference / convention)	9
2	Exchange of professors	8
3	Create interdisciplinary trends	6
4	Holding joint training courses	4
5	Scientific Relationship of Faculty Members (Partnership) with internationally recognized institutions, institutes and training centers	3
6	Inviting domestic and foreign experts and professors	2
7	Creating interdisciplinary science centers	1
8	joint study and educational opportunities	1
9	International Collaborative Courses	1
10	Presenting joint lessons	1
11	Launching joint University	1
12	Networking individuals and elite groups	1
13	The number of faculty members and leading scientists in the management of international communities	1
14	Establishing internationally recognized scientific and strategic committees	1

Table 3 shows the frequency of components of scientific interactions and cooperation in the research category. The results showed that designing research projects with more than one implementer, implementing joint research projects (with more than one implementer), studying opportunity and creating collaborative research units have been the most frequent and components such as joint patent (with more than one author), interdisciplinary scientific research,

establishing transnational internal international institutes, establishing interdisciplinary research institutes, holding joint international scientific meetings, part-time work of faculty members in research institutes, cooperation with regional and international research centers, consideration of the job point of the peer group for faculty members and publication of international journals, have had the least emphasis.

**Table 3:** The Frequency of Components of Scientific Collaboration and Interaction in the Subject of Research in extra and certain documents

Row	Research	Frequency
1	Compilation of research projects with more than one presenter	10
2	Implementing joint research projects	9
3	Research Opportunity	6
4	Creation of collaborative research units	5
5	Creation of scientific pole	4
	Holding joint research courses	4

6	Scientific exchanges between academic - research centers with regional and international scientific and research centers	3
4	Compilation of interdisciplinary research projects	3
	A group research fee in joint research projects (creation of joint working groups)	3
	Invitation of Outstanding Foreign Professors in Research	3
	Publication of International Publications	3
7	Creation of international research networks	2
8	Compilation of valid international articles	2
9	Compilation of valid scientific articles by more than one author	2
11	Compilation of joint articles with other countries	2
12	Compilation of international collaborative research	2
	Compilation of full citation articles	1
14	Creation of internal research networks	1
15	Creation of international transnational research networks	1
16	Creation of interdisciplinary research institutes	1

Table 4 shows the frequency of components of scientific interactions and cooperation in the research category. The results showed that components such as international conferences and workshops, collaborative activities with domestic and foreign technology institutes (expansion of technological interactions), implementation of research projects with the cooperation of domestic and foreign research centers to meet the needs of industrial centers and support of interdisciplinary technologies, have had the

highest emphasis. And the components of international associations and institutions, the international festival, international competition, regional and international seminars, the development of interdisciplinary technologies, the establishment of transnational networks, international technology, networking in the specialized fields for doing joint work, research-international technology projects with joint investing and international technologies with joint investing, have had the least emphasis.

**Table 4:** The Frequency of components of scientific Interactions and collaboration in the services category in certain and National and Certain Documents

Row	Services	Frequency
1	Participation in knowledge based companies	11
2	Theorizing seats and free discussion	7
3	Science and Technology Parks	6
4	Scientific Forums	6
5	Commercialization of research achievements	5
6	Advisory Councils	4
7	Joint activity of domestic and foreign technology units	3
8	Research and development settlements	2
9	Holding joint meetings and co-thinking among other disciplines	2
10	Development of interdisciplinary science and technology	2
11	Holding a Joint Scientific Meeting	2
12	Development of interdisciplinary science and technology	2
13	Holding international festivals	2
14	Participation in patent at internationally valid databases	1
15	Collaborative Patents	1
16	National free discussion Home	1
17	Joint Research and technology projects with other countries	1
18	Strengthening the Institute's relationship with industry and society	1
19	Strengthening the Institute's relationship with industry and society	1
20	Specialized committees	1
21	Creation and development of specialized small and medium technology companies through growth centers	1
22	Cooperation of foreign technology units in science and technology park	1
23	Discussion sessions and study and free thinking circles	1
24	Strengthening the relationship between universities and research centers with the economic, social and cultural sectors of the country	1
25	Interaction with other countries in the field of science and technology	1
26	Growth Centers	1

### Categorization of Inference Components of Scientific Interaction and Cooperation

After extracting components from extra and certain documents, they were classified according to the category of education, research and services; Table 5 presents the categorization of extractive components. Based on the division conducted, components with a frequency of more than 20 repetitions are referred to as components of the first category or first priority. Accordingly, international partnership and team interactions have been placed in the top priority. Also, components with more than ten repetitions are placed among the second category or second priority components; therefore, joint research collaborations, joint courses, international participation in the category of servicing and technological interactions are

placed at second priority. Finally, components with fewer than ten repetitions are classified as third category or third priority components. Therefore, multidisciplinary interactions, research networks, multidisciplinary research networks, educational networking and joint courses are among the third category or third priority components. Although the categorization of extractive components has been based on the number of repetitions in the extra and certain documents, it must be admitted that this category does not mean that the second and third categories of components are not important, but all extraction components of the extra and certain documents in the first, second and third categories should be considered by the authorities.

**Table 5:** Categorization of Inference Components of Scientific Interactions and Collaboration in extra and certain documents

Row	Categories	Inference components	Frequency
1	Research	International partnership	28
		Joint research interactions	12
		Multidisciplinary interactions	7
		Research Networks	2
		Multi-disciplinary research network	1
2	Education	joint courses	16
		International Joint Interactions	6
		Multidisciplinary interactions	4
		joint interactions	3
		International partnership	2
		Educational Networks	1
		joint lessons	1
3	Servicing Categories Research	Teamwork interactions	24
		International partnership	17
		Technological interactions	13
		Multidisciplinary interactions	2

### Discussion and conclusion

By reviewing the research evaluated in this article, it can be seen that, despite the increasing attention of experts to the issue of scientific interaction and cooperation and its significant tendency to study in this field, we are witnessing little attention of researchers to the study and research in this area and their lesser interactions. Internal researches have provided more of pathology of Iran's scientific structure. It seems that the most important factors that have influenced the leaving behind the level of scientific interaction and cooperation have been the lack of institutionalization of scientific interactions and cooperation, distrust, individualism and cultural problems. Also, in external researches, most of the variables within the field of science, such as the number of colleagues, the number of publications, the number of articles, the rank of individuals, the discipline of individuals and their job experience have been considered about the level of scientific interaction and cooperation. In fact, the method of most studies has been the evaluation of the number of joint articles, the number of authors in each joint work in different subject areas and measuring other variables in relation to the degree of scientific cooperation. What is evident in this research, compared with other researches, is operationalization of the concept of scientific interaction and cooperation in the three categories of education, research and servicing and the

presentation of its components in these three categories. In this research, the components of international participation, Joint research interactions, multidisciplinary interactions, research networks in the category of education, components of joint courses, international joint interactions, multi-disciplinary interactions, joint interactions, international partnerships, educational networking and joint lessons, as well as in the servicing category of components of team interactions, international partnership, multidisciplinary interactions have been identified. According to the results obtained, team interactions and international participation were among the first category and first priority of interactions. In a study by Velasco et al. (2014), teamwork has also been highlighted as one of the most important qualifications in higher education, which is in line with the results of this study, that has identified team interactions as the first and most important component of the servicing category. Also, international participation in all three categories of education, research and services has had high emphasis, which is consistent with the research results of Nazarzadeh Zare et al., (2016). Knight (2003) has described international partnership as a process of integrating international and intercultural dimensions in line of educational, research and servicing categories. And he emphasized that faculty members are one of the factors influencing the internationalization process of universities,

and their interactions and international partnerships are not only optional but also necessary. In addition of these considerations of the components derived from the extra and certain documents such as the regulations of the ministry of science, research and technology, five-year development plans, the 20-year vision document of the

country's development, the country's comprehensive scientific plan, and the statement of higher education for the 21st century, is possible to formulate solutions to improve scientific interactions and cooperation, and can lead to the realization of the vision of 1404. These components have been referred to in Table 6.

**Table 6:** *The inductive components of Scientific Interactions and collaboration*

Row	Categories	Inference components	Frequency of inductive components in certain and National and Certain Documents
1	Research	International partnership	28
		Joint research interactions	12
		Multidisciplinary interactions	7
2	Education	joint courses	16
		International Joint Interactions	6
3	Services Categories Research	Teamwork interactions	24
		International partnership	17
		Science and Technology	13

## Suggestions

According to the results of the research, team interactions and international participation are among the most important components of scientific interactions and cooperation, so it is suggested that universities help to expand their international cooperation in the form of joint international research projects, launching a joint university, mobility and international replacement of faculty members, establishing and contacting universities and external scientific centers to get cooperation in various educational and research fields, holding joint international courses, holding conferences and international meetings to increase international interactions of faculty members. It is also suggested that using incentives such as more financial support, increased grant and adding more points to the points of articles and joint research projects, it tries to encourage more faculty members to increase team interactions. The necessity for excellence, the growth and advancement of each scientific center is the expansion of scientific exchanges both inside and outside the country. Therefore, communication and interaction between universities inside and outside of the country is necessary and continuous in terms of updating information and scientific and technological development. Therefore, it is suggested that, in the context of international technological partnership, to form special groups of work with different countries in different fields of technology. It is also recommended to consider the necessary arrangements to facilitate the presence of faculty members at international conferences in order to get necessary arrangements with domestic and foreign researchers.

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