

# A study on scientific collaboration and co-authorship patterns in library and information science studies in Iran between 2005 and 2009

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## ABSTRACT

**Background:** Scientific collaboration is among the most important subjects in scientometrics, and many studies have investigated this concept to this day. The goal of the current study is investigation of scientific collaboration and co-authorship patterns of researchers in the field of library and information science in Iran between years 2005 and 2009. **Materials and Methods:** The current study uses scientometrics method. The statistical population consists of 942 documents published in Iranian library and information science journals between years 2005 and 2009. Collaboration coefficient, collaboration index (CI), and degree of collaboration (DC) were used for data analysis. **Findings:** The findings showed that among 942 investigated documents, 506 documents (53.70%) was created by one individual researcher and 436 documents (46.30%) were the result of collaboration between two or more researchers. Also, the highest rank of different authorship patterns belonged to National Journal of Librarianship and Information Organization (code H). **Conclusion:** The average collaboration coefficient for the library and information science researchers in the investigated time frame was 0.23. The closer this coefficient is to 1, the higher is the level of collaboration between authors, and a coefficient near zero shows a tendency to prefer individual articles. The highest collaboration index with an average of 1.92 authors per paper was seen in year 1388. The five year collaboration index in library and information science in Iran was 1.58, and the average degree of collaboration between researchers in the investigated papers was 0.46, which shows that library and information science researchers have a tendency for co-authorship. However, the co-authorship had increased in recent years reaching its highest number in year 1388. The researchers' collaboration coefficient also shows relative increase between years 1384 and 1388. National Journal of Librarianship and Information Organization has the highest rank among all the investigated journals based on collaboration coefficient, collaboration index (CI), and degree of collaboration (DC).

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## INTRODUCTION

The inherent complexities of science and technology in recent years have caused most countries, universities, and research institutions to face difficulties in finding the right human resources and enough budgets for their research projects. One of the results of these complexities is that solo, individual researches are being replaced by collective

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research attempts in many disciplines such that scientific collaboration has become one of the most important social mechanisms in recent research projects.<sup>[1]</sup> Newman believes that useful and effective sharing of viewpoints, specialization of scientific disciplines, multi-discipline studies, increasing of research costs, and political factors all played important roles in increasing the level of collaboration between researchers.<sup>[2]</sup> The result of this collaboration is that in order to complete their research, many scientists collaborate with their peers in other organization, disciplines, and even other countries.<sup>[3]</sup> One of the most tangible forms of this collaboration is co-authorship,<sup>[4]</sup> which can be seen in articles published in any technical and scientific journal nowadays.

During recent years, the discipline of library and information science in Iran had grown in both educational and research dimensions. Continuity in publication of research journals and emergence of new ones are among the most important happenings regarding its research dimension. Due to these changes, many researchers tried to investigate the research structure of this discipline in different national and international levels, aiming to identify its strengths and weaknesses in order to improve the studies conducted in this discipline.

In his study, Farajpahlou investigated the collective articles of Iranian authors in Library and information science in four specialized Farsi journals between years 2001 and 2003. His findings showed that among 168 investigated articles, only 23 articles (14%) were the results of collaboration of several authors and the average collaboration was 2.04 authors per paper.<sup>[5]</sup> An investigation of Pakistan Library and Information Science Journal (PLISJ) by Naseer and Mahmood between years 1998 and 2007 showed that 88.6% of the articles published in this journal had one author.<sup>[6]</sup> Another study by Danesh *et al.* on the library and information science articles indexed in Emerald between years 2003 and 2008 showed that the collaboration coefficient of researchers in library and information science discipline is 0.08.<sup>[7]</sup> Yousefy and Malekahmadi also investigated the collaboration between authors of library and information science discipline in ISI, Scopus, and PubMed databases between years 2001 and 2010. Their findings showed that 60.45% of the articles had a one author pattern and 30.46% of them had multi-author pattern. Also, the collaboration coefficient of the researchers during the investigated time period was 0.25.<sup>[8]</sup>

A review of the previous studies shows a low collaboration rate between researchers in library and information science discipline where many articles follow a single author pattern. This is in contrast with the scientific collaboration between researchers in Physics, Biology, and Astronomy.<sup>[9-12]</sup>

The aim of current study is an assessment of scientific collaboration and co-authorship patterns in library and information science researches conducted in Iran. For this end, the published articles related to this discipline in Iranian journals between years 2005 and 2009 were investigated. This research aims to reach the following goals:

- Investigating the frequency of individual and collective scientific productions in library and information science in Iran.
- Investigating the growth of individual and collective scientific studies in library and information science during the investigated time period.
- Investigation of co-authorship patterns of Iranian library and information science researchers and
- Investigation of collaboration coefficient, collaboration index (CI), and degree of collaboration (DC) in Iranian library and information science researchers.

## MATERIALS AND METHODS

The current study uses scientometrics method. The statistical population consisted of 942 documents published in Iranian journals regarding library and information science between years 2005 and 2009 [Table 1]. In order to gather the research data, first, the articles were downloaded onto a personal computer from the main website of each journal. Then, the necessary information such as journal title, number of articles, and number of authors were extracted using a checklist and then analyzed. MS-Excel software was used for data analysis. Also, collaboration coefficient, collaboration index (CI), and degree of collaboration (DC) were calculated using the following equation<sup>[13]</sup>:

$$CI = \frac{\sum_j^k j \times f_j}{N}, DC = 1 - \frac{f_1}{N}, CC = 1 - \left\{ \frac{\sum_{j=1}^n (1/j) f_j}{N} \right\}$$

Where  $f_i$  the total number of articles with  $j$  authors published during a certain period of time,  $N$  is the total number of articles published during the same time period,  $K$  is the number of authors per article in each discipline, and  $f_1$  is the

**Table 1: Number of published librarianship and information science articles based on publication year and journal**

Journal code	Journal name	Publication year					
		2005	2006	2007	2008	2009	Total
A	Informology	19	19	18	27	30	113
B	Library and Information Science Research	0	7	10	0	12	29
C	Research on Information Science and Public Libraries	0	6	30	29	32	97
D	Journal of Academic Librarianship and Information research	18	12	8	18	14	70
E	Information sciences and technology	16	18	21	27	31	113
F	Library and information science	28	35	46	44	4	197
G	Studies on Library and Information science	3	0	0	0	29	32
H	National Journal of Librarianship and Information Organization	45	61	60	65	60	291
Total		129	158	193	210	252	942

number of articles with a single author published during a certain period of time.

The findings show that in the five year period investigated, a total number of 942 articles were published by researchers in the librarianship and information science field in related journals Iran. Among those, 506 documents (53.70%) were written individually and 436 (46.30%) documents were the result of collaboration between two or more authors. This shows that the researchers in librarianship and information science prefer to work individually [Table 2].

As can be seen in Figure 1, the collective articles have increased over time, and the most number of collective articles were published in year 2009. On the other hand, despite some fluctuations, individual articles show a decreasing trend with the least number of individual articles being published in year 2009 [Figure 1].

### Co-authorship patterns of researchers in librarianship and information science

Investigating the co-authorship patterns of researchers in librarianship and information science in Iran shows the individual authorship pattern to be the most common pattern with 506 (53.70%) of the documents being published individually and without help from other authors. The second place belongs to two authorship pattern with 341 (36.20%) of the documents [Table 3].

Figure 2 shows scientific productions with individual co-authorship pattern have been declining overtime reaching its lowest point in year 2009 (with 81 documents). On the other hand, all of the other co-authorship patterns (those

with two, three, four, and more than four authors) show an increasing trend. These findings show that collaboration between authors has become more popular in recent years.

Analysis of co-authorship patterns of librarianship and information science in different journals shows that highest rank in all co-authorship patterns belongs to National Journal of Librarianship and Information Organization (code H), except three authors co-authorship pattern, which belongs to Library and information science (code F) [Table 4].

### Collaboration coefficient, collaboration index, and degree of collaboration of the researchers in librarianship and information science

Collaboration index is the average number of authors per article. Data in Table 5 shows that the collaboration index of librarianship and information science has relatively grown during the investigated time period, and the highest collaboration index (1.92) was seen in year 2009. Also, the five year collaboration index of librarianship and information science was 1.58. Degree of collaboration of authors in the investigated articles was 0.46, which means that there is a moderate trend for co-authorship. However, the desire for co-authorship had grown during the investigated period, reaching its apex in year 2009. The collaboration coefficient of the researchers also shows significant growth between years 2005 and 2009. The closer this coefficient is to one, there is more desire for collaboration, and a coefficient near zero means a trend toward individual works. However, total collaboration coefficient of 0.23 shows low collaboration between librarianship and information science researchers.

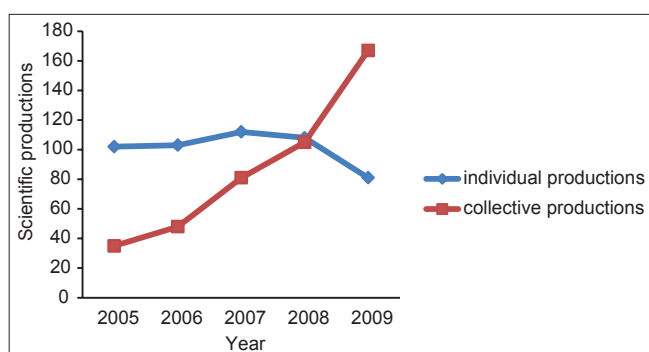


Figure 1: The growth rate of individual and collective articles in librarianship and information science

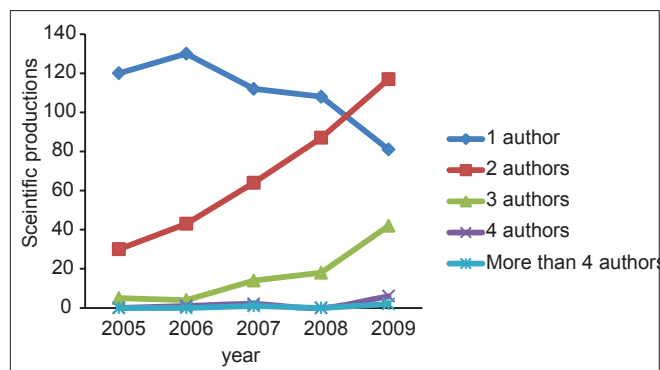


Figure 2: Growth rate of different co-authorship patterns in librarianship and information science articles in Iran

Table 2: Individual and collective scientific productions in librarianship and information science in Iran						
Year	Individual articles		Collective articles		Total number of articles	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
2005	102	10.83	35	3.72	137	14.55
2006	103	10.93	48	5.10	151	16.03
2007	112	11.88	81	8.60	193	20.48
2008	108	11.46	105	11.15	213	22.61
2009	81	8.60	167	17.73	248	26.33
Total	506	53.70	436	46.30	942	100

Analysis of collaboration coefficient (CC), collaboration index (CI), and degree of collaboration (DC) of different journals showed that Library and Information Science Research (B) had the highest Collaboration coefficient (0.45), collaboration index (2.14), and degree of collaboration (0.79) [Table 6].

## CONCLUSION

The study of scientific collaboration, which is one of the subcategories of scientometrics, has gained increased popularity in recent years, and many researchers attempted to discover the scientific collaboration patterns of different disciplines. The current study aimed to investigate the scientific collaboration patterns of librarianship and information science in Iran between years 2005 and 2009. The findings showed that in the investigated time period, a total of 942 documents were published in this discipline, 506 (53.70%) of which were created individually and 436 (46.30%) of them had two or more authors. This indicates that researchers in librarianship and information science tend to work individually. This is in agreement with the findings of Farajpahlou<sup>[5]</sup>, Naseer and Mahmood<sup>[6]</sup> and Yousefy and Malekhamdi.<sup>[8]</sup> Study of evolution of scientific products in librarianship and information science shows that the number of individual articles has decreased while the number of collaborative articles has increased, reaching its apex in year 2009. This can be due to the increase in the number of graduate students in librarianship and information science in recent years. Most of articles published by these graduate students are results of dissertations or class works

**Table 3: Frequency of scientific productions following different co-authorship patterns during the investigated period**

Authorship pattern	Year (frequency)					Total Frequency (%)
	2005	2006	2007	2008	2009	
1 author	102	103	112	108	81	506 (53.72)
2 authors	30	43	64	87	117	341 (36.20)
3 authors	5	4	14	18	42	83 (8.81)
4 authors	0	1	2	0	6	9 (0.96)
More than 4 authors	0	0	1	0	2	3 (0.31)
Total	137	151	193	213	248	942 (100)

**Table 4: The frequency of scientific productions of different journals following different co-authorship patterns during the investigated time period**

Co-authorship patterns	Journal code (frequency)								Total Frequency (%)
	A	B	C	D	E	F	G	H	
1 authors	71	6	65	36	51	95	8	174	506 (53.72)
2 authors	25	15	30	27	46	83	19	96	341 (36.20)
3 authors	17	6	1	7	12	18	5	17	83 (8.81)
4 authors	0	2	1	0	2	1	0	3	9 (0.96)
More than 4 authors	0	0	0	0	2	0	0	1	3 (0.31)
Total	113	29	97	70	113	197	32	291	942 (100)

and, therefore, it's necessary to add the name of the supervisor and advisor as collaborative authors leading to the amount of scientific collaboration. On the other hand, another reason for this increase in scientific collaboration can be due to the needs of the researchers because the multi-discipline nature of librarianship and information science and new research trends in masters, doctorate, and post-doctorate levels increases the necessity of collaboration between researchers of multiply disciplines.

Investigating the co-authorship patterns of librarianship and information science in Iran shows that single author pattern is the most common pattern among the researchers in this area. More than half of the researchers (53.72%) used individual pattern for their works and had no collaboration with other researchers, and 36.20% of the researchers collaborated with only one other individual (two author pattern). Therefore, research individualism and a preference for creating groups of two are the dominant co-authorship patterns. Also, investigating the co-authorship pattern of different journals shows that the first rank of all co-authorship patterns except three author pattern belongs to National Journal of Librarianship and Information Organization (code H).

Relative increase of collaboration coefficient (CC), collaboration index (CI), and degree of collaboration (DC) shows an increase in the desire of researchers in librarianship and information science for working in groups of two and three. Investigating the collaboration index shows that in average, each article was the result of collaboration between

**Table 5: Collaboration coefficient, collaboration index and degree of collaboration of the researchers in librarianship and information science**

Year	Collaboration index	Degree of collaboration	Collaboration coefficient
2005	1.29	0.26	0.14
2006	1.36	0.32	0.17
2007	1.53	0.42	0.22
2008	1.58	0.49	0.25
2009	1.92	0.67	0.36
Total	1.58	0.46	0.23

**Table 6: Collaboration coefficient, collaboration index and degree of collaboration of different Iranian journals in librarianship and information science**

Journal	Collaboration index	Degree of collaboration	Collaboration coefficient
A	1.52	0.37	0.21
B	2.14	0.79	0.45
C	1.36	0.23	0.17
D	1.59	0.49	0.26
E	1.74	0.55	0.30
F	1.62	0.52	0.28
G	1.91	0.75	0.40
H	1.49	0.40	0.21
Total	1.58	0.46	0.29

1.58 researches. This collaboration index was lower than the collaboration index reported by Osareh for astronomy in 2006.<sup>[12]</sup> On the other hand, a degree of collaboration of 0.46 showed a relative tendency towards collaborative works. The collaboration coefficient also had an increasing trend with the total of 0.23, which is in agreement with findings of Yousefy and Malekhamadi<sup>[8]</sup> who reported a collaboration coefficient of 0.25 for researchers of librarianship and medical information science. Also, investigating the journals for these three indicators showed that journal of Library and Information Science Research (B) had the first place in all three indicators.

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