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Research Article

Factors Affecting the Number of Citations: A Mixed Method Study

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ABSTRACT

In this study, factors effective in the number of citations received by papers in Library and Information Science were identified, weighted and analyzed. Using a mixed method research, a content analysis of related literature and Delphi study were designed in the qualitative phase. Items effective in citation counts were included in a reliable-validated questionnaire. Research population in the qualitative phase included 70 academic specialists in Library and Information Science. Of them, 30 and 20 specialists completed the questionnaires in the first and second rounds of the Delphi study. In the quantitative phase, all 1665 Library and Information Science papers published in 2014 in journals indexed in both *Web of Science* and *Library and Information Science Abstracts* (*LISA)* were statistically analyzed. A two-rounded Delphi study was used for confirming the components and sub-components at work. A citation analysis was used in the quantitative phase. Five main components with 70 subcomponents were identified in the qualitative phase as ones effective in citation counts in Library and Information Science: field-related features, journal-related features, paper-related features, author-related features, and keyword-related features. In the component of field-related features, the Delphi panel members weighted publisher prestige, the scope of subfields and subjects, research institute / university prestige as three top items. In the component of journal-related features, they regarded indexing in prestigious databases, impact factor, internationality and quartile score as top-ranked items. In the component of paper related features highly-weighted items were accessibility and visibility, access type, language, and the credibility of references. In the component of author-related features, authors' reputation, their joining scientific social media, their having an online resume and connection of e-mails with publication listings and high h-indices were among highly weighted items. In the component of keyword related features, subject relevance (keyword similarity), topical popularity and the number of keywords were more important. In the quantitative phase, findings showed that the prestige of publisher in the field, journals with high impact factors and quartile scores, and authors with higher h-indices and professional webpages as well as updated publication listings and accurate contact information, long complete papers and including keywords in the title and abstract were significantly correlated with the number of citations. Library and Information Science researchers can integrate the accepted / confirmed items in the qualitative and quantitative phases of this study as a set of criteria for assuming the possible rate of citations a Library and Information Science paper receives.

Keywords: Citation Analysis, Citation Counts, Citation Rate, Library and Information Science, Delphi Study, Iran.

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INTRODUCTION

The importance of a scientific paper is routinely measured by counting how many times it has been cited by other papers[1] and the number of citations is the most frequently used measure for quantifying the significance of a scientific paper.[2] A paper may be cited for different scientific and non-scientific reasons and a variety of features should be analyzed to better understand the relationship between citing and cited papers.[3] However, a citation to a paper is conceived as a main criterion for its impact and value in the scientific community.[4] Therefore, researchers tend to publish highly-cited and more influential papers helpful for their careers and achievements.[5]

Nowadays, a part or the whole of the scientific performance of researchers worldwide are evaluated and scored based on their published papers in and received citations from high prestige journals. It is assumed that the more the scientific influence of a paper or its received citations is, the higher its scientific quality.[6]

Using citation data for quantitatively evaluating research has heavily been considered in recent years.[7] Developing such

an approach provides a context for evaluating individual researchers, research teams, research institutes / universities, collaborating countries/regions and certain fields and individual journals.[8]

Empirical evidence shows that a considerable number of papers indexed in the Web of Science (WoS) have received no or few citations during years after publication. If the citation is conceived as the quality of a paper, can it be concluded that the huge number of papers published in WoS-indexed journals are low quality ones? In fact, papers with no or few citations have been accepted in the scientific community as influential ones. However, nothing can be said about their quality and/or their authors' scientific influence in the scientific community. Non-cited papers authored by Nobel laureates are good evidence for the claim.[9]

This study aimed to identify, weight and analyze the factors affecting the number of citations to papers on Library and Information Science (LIS). In addition, the possible relationship between some variables at work was studied based on factual data extracted from WoS. Main research questions are as follows:

1. According to LIS experts, what are the factors affecting the number of citations received by LIS papers?
2. Is there any significant relationship between field-related features and the number of citations received by LIS papers?
3. Is there any significant relationship between journal-related features and the number of citations received by LIS papers?
4. Is there any significant relationship between paper-related features and the number of citations received by LIS papers?
5. Is there any significant relationship between author-related features and the number of citations received by LIS papers?
6. Is there any significant relationship between keyword-related features and the number of citations received by LIS papers?

LITERATURE REVIEW

The citation is not a new phenomenon, although its theoretical foundations may be formed recently. In his book on social, historical and philosophical aspects of science, *Little Science, Big Science*, Price[10] noted that the citation to previous works has been emerged explicitly since about 1850s in scientific journals. Some factors affect the rate of citations received by a certain paper, ranging from the use of unique author name consistently throughout academic careers and standardized institutional affiliations and addresses to providing full contact information as well as publishing in highly-impact journals.[11]

Peters and van Raan[12] showed that there is a significant positive relationship between authors' rankings, the number of references, paper language, and journal prestige and influence weight (Narin's indicator of a journal) and the number of citations. Haslam *et al.*[13] found that some factors cause increased citation number, including first author eminence, having a more senior later author, journal prestige, paper length, and the number and recency of references. Jamali and Nikzad[14] showed that differences exist between papers with different types of titles in terms of downloads and citations, especially ones with question titles that tend to be downloaded more, but cited less than the others. The number of downloads and citations were positively correlated.

Bornmann *et al.*[15] found that citation counts are correlated with the language of publishing journal, citation performance of references, and the reputation of authors. Jabbour *et al.*[16] reported that four main factors may be at work in the impact of paper citations: the prestige of the author and research network, the prestige of the means of publication and indexing, accessibility and quality characteristics of the paper, and the international nature of communication and scope of the study at hand.

Didegah and Thelwall[17,18] concluded that the journal impact factor, the impact and number of references and their average citation impact, abstract length, and individual and international teamwork significantly associated with higher citation impact; but the number of authors and keywords, title length and paper length were insignificant or of no practical significance in this respect. Papers with a combinational title (use of a hyphen or a colon separating different ideas within a sentence). However, the number of citations was not correlated with the number of words in the title. Rostami *et al.*[19] suggested that some features in the paper such as the type of the title and keywords different from words included in the title can help to predict the number of citation counts. Title length was not associated with citation counts.

Antoniou *et al.*[20] found that subject-related studies, study design, studies reporting study design in the title, long papers, and studies with high number of references were associated with higher citation rates. Onodera and Yoshikane[8] found price index as the strongest predictor of citations, followed by the number of references; but the effects of the number of authors and authors' achievement measures were rather weak. Alimoradi *et al.*[21] revealed that title type, number of words and characters in the title, the authors' country of origin and mentioning the time of study in the title were not associated with the number of citations. A significant relationship was found between types of papers and number of citations. Falahati Qadimi Fumani *et al.*[22] showed that title length and citations to papers were not correlated and the number

of punctuation marks was not a variable to predict a paper's citation rate.

In a relatively comprehensive literature review, Tahamtan *et al*.[23] reported three general categories with 28 components affecting the number of citations, including the factors related to the paper, journal and author(s). Uddin and Khan[24] concluded that keyword growth, keyword diversity, number of keywords and percentage of new keywords had a significant positive relation with citation counts. In studying an association between the abstract ratio of keywords (the sum of repetition of keywords in the abstract divided by abstract length) and the weight ratio of keywords (the frequency of paper's keywords per journal), Sohrabi and Iraj[25] showed that both variables are statistically significant predictors of received citations in scientific papers in educational field.

Tahamtan and Bornmann[1] provided a conceptual model of citation process, based on the context of cited papers, processes from selection to citation, and the context of citing papers. They found that many factors are associated with authors' decision to cite a paper, such as the location of the citation context, the features of citing documents, their authors' and journals' features and so on. They explained many reasons for citing a paper, such as setting a background for new research, use of the cited authors' methodology, and criticism of a previously published work. In the context of cited documents, document features, author features, and journal features, together with citing authors' positive or negative attitudes toward the value of papers affected the citation process.

In studying a correlation between paper length and citation rate, Xie *et al*.[26] designed a meta-analysis and showed a moderate, positive correlation between paper length and citation rate and concluded that the longer a paper is, the more citations it receives. In order to better understand the dynamics of citations, Xie *et al*.[27] identified more factors effective in citation counts. They established reliable schemes to identify and record a total of 66 candidate factors related to articles, authors, references and citations which had not been comprehensively studied before. They found that 46 factors were significantly associated with citations, from which six most significant factors were selected by a regression analysis.

Lee[28] examined 21 factors –related to all authors and to the first author– as potential predictors of citation counts in predicting the future citation counts of conference papers in computer science and information science and found that the predictive power of author-related factors was rather weak. However, the factors related to all-author properties had a greater effect on citation counts than variables related to the first author properties. Yan *et al*.[29] examined two dimensions of a paper's novelty (new combinations and new components) in affecting its impact and citation. The results provided support for the hypothesis that a paper's new combinations and new components significantly affect its impact.

Warren *et al*.[30] found that highly cited studies were associated with abstract and manuscript word counts, manuscript pages, Figures, sample sizes and references. A higher *h*-index for the first author made it more likely to be in the high-citation paper group. They suggested that study design and paper structure might influence papers' audience and effect.

In conclusion, it appears that various factors may affect the number of citations received by a paper, including among others, its quality, language, type, accessibility and visibility, the references used, the prestige and impact factor of a publishing journal, authors' reputation and affiliated country, the number of co-authors, contributing countries and the type of contribution (institutional, national and international), title length, the number and wording of keywords, the topic under study and so on.

In spite of the importance of citation rate in research evaluation, there is no relatively comprehensive study on the factors affecting the number of citations received by papers in LIS field. This study is the first to identify and weight the main factors affecting the rate of received citations in LIS papers and explore the possible relationship among them.

METHODOLOGY

As a mixed method research, this study was conducted in some steps. In the qualitative phase, main possible components and sub-components affecting the number of citations were extracted by a literature review and content analysis. Then, a 5-point Likert-type scale with 84 items (with Liker-type points ranging from disagreement on the influence of the related item on the number of citations received by LIS papers =1 to agreement on the influence of the related item on the number of citations received by LIS papers =5) was designed based on the extracted components and sub-components. The content validity of the scale was confirmed by some specialists in the field and its internal consistency amounted to a=.711.

In continuation, a two-rounded Delphi study was used for confirming the components and sub-components. In the first round, components / sub-components with which the Delphi panel members agreed (with mean rate higher than 3 as the cut point) were recognized as influencing factors in receiving citations to LIS papers and included in the scale for the second round. The minimum level of 30% of agreement among the Delphi panel members for an item was conceived as the consensus weight of the item, showing that they accepted it as the item to be included. The mean rate of scores for an item divided by overall mean score for all items given by the Delphi panel members was conceived as its consensus weight.

Based on the literature review and according to some specialists in the field, factors affecting the rate of received citations were included in 5 main components and 84 subcomponents: field-related features (8 sub-components), journal-related features (13 sub-components), paper-related features (33 sub-components), author-related features (19 sub-components), and keyword-related features (11 subcomponents). For their prioritization and evaluation, these were all sent to the LIS specialists in the first round of the Delphi study in the form of a questionnaire. In the second round, these components and subcomponents were finalized in 70 items as factors affecting the number of citations received by LIS papers. These items can be seen in Tables in finding section below.

The Delphi panel members were selected via the non-probability sampling as a purposeful sample of 70 Iranian faculty members working in LIS departments and published at least two JCR-indexed papers in the field. Of them, 30 and 20 specialists completed the questionnaires in the first and second rounds of the Delphi study, respectively.

In the quantitative phase, a citation analysis was used. Papers published in 2014 in LIS-oriented journals indexed in both *JCR* and *LISA* were included as research population. A 5-year time spam was considered for these papers to be cited. An advanced search strategy was used in the WoS in December 2019 for extracting these papers. Limiting the papers to original articles and reviews and ones published in 2014, 1665 papers published in 37 related journals were identified. These journals were ranked based on the number of their published papers as shown in Table 1.

Data on 40 measurable variables (out of the five main components and their related sub-components initially identified in the qualitative phase) were extracted from retrieved records / citation data and statistically analyzed. Some approaches of descriptive and inferential statistics were used for data analysis and answering the research questions by applying SPSS 22.

RESULTS

In research question 1, determining and weighting the factors effective in the number of citations received by LIS papers was considered. Table 2 shows the sub-components on the component "field-related features" according to experts in the first round of the Delphi study. All 8 sub-components of this main component were accepted in the first round.

Table 3 shows the sub-components on the component "journal-related features" according to experts in the first round of the Delphi study. As can be seen, all 13 sub-components of this main component were agreed upon in the first round.

Table 1: Journals and the number of their papers indexed in *JCR* and *LISA* in LIS field in 2014.

No.	Journal Title	Number of papers
1	Scientometrics	338
2	Journal of the Association for Information Science and Technology	158
3	Journal of Informetrics	82
4	Journal of Academic Librarianship	75
5	Government Information Quarterly	74
6	Library Journal	70
7	Journal of Knowledge Management	64
8	Journal of Information Science	63
9	Telematics and Informatics	54
10	Online Information Review	51
11	Social Science Computer Review	50
12	College Research Libraries	41
13	Journal of the Medical Library Association	41
14	Knowledge Organization	39
15	Revista Espanola De Documentacion Cientifica	38
16	European Journal of Information Systems	37
17	Zeitschrift Fur Bibliothekswesen Und Bibliographie	35
18	Reference user Services Quarterly	34
19	Health Information and Libraries Journal	33
20	Interlending Document Supply	33
21	Library Trends	33
22	Law Library Journal	29
23	Learned Publishing	26
24	Information Society	25
25	Library Information Science Research	25
26	Journal of Librarianship and Information Science	24
27	Information Technology People	21
28	Information Culture	20
29	Journal of Information Technology	19
30	Australian Academic Research Libraries	18
31	Journal of Strategic Information Systems	18
32	Information Technology for Development	17
33	Journal of Organizational and End user Computing	16
34	Journal of Scholarly Publishing	16
35	Library Resources Technical Services	16
36	Information Technology and Libraries	15
37	Journal of Global Information Management	14

Table 4 shows the subcomponents on the main component "paper-related features" according to the Delphi panel members in the first round. Out of 33 items, 12 items were

Table 2: The subcomponents on the component "field-related features" according to experts in the first round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Scope of subfields	3.47	-.074	-1.316	33.33	.128	3	.744
2	Number of scientific journals	3.70	-.727	-.067	43.33	.126	2	
3	Specialties within the field	3.20	-.316	-.911	46.66	.118	6	
4	Country self-citations	3.03	-.211	-.421	40.00	.112	8	
5	Overall scientific production	3.27	-.049	-.750	30.00	.120	5	
6	Ratio of faculty members to published papers	3.07	.124	-.108	43.33	.113	7	
7	Research institute / university prestige	3.47	-.440	-.839	43.33	.128	3	
8	Publisher prestige	3.97	-1.041	2.033	43.33	.146	1	

Table 3: The subcomponents on the component "journal-related features" according to experts in the first round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Indexing / Abstracting in prestigious databases (such as Scopus, ISI, LISA)	4.57	-1.320	.556	66.66	.093	1	.792
2	Impact factor (IF)	4.20	-1.442	2.030	50.00	.086	3	
3	Quartile score	3.93	-1.090	.743	43.33	.081	5	
4	Influence weight indicator	3.57	-.214	-.569	43.33	.073	8	
5	Self-citation rate	3.20	.321	-.308	46.66	.065	11	
6	Language	4.27	-.291	-.554	53.33	.087	2	
7	Forms of publication and presentation	3.67	-.751	.134	60.00	.075	7	
8	Publication frequency	3.13	.357	-.590	40.00	.064	13	
9	Professionalism	3.80	-.381	-.948	33.33	.078	6	
10	Internationality	4.20	-1.139	1.275	46.66	.086	3	
11	Regional-focused	3.50	-.324	-1.006	46.66	.071	9	
12	Number of early received citations	3.17	-.819	-.530	50.00	.065	12	
13	Interdisciplinarity	3.43	.071	-.753	36.66	.071	10	

Table 4: The subcomponents on the component "paper-related features" according to experts in the first round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Length	2.97	-.348	-.349	40	.026	22	.911
2	Various sections	3.29	-.700	-.122	50	.029	18	
3	Methodology	3.77	-1.054	.808	46.66	.035	11	
4	Sample size	2.55	.059	-1.092	36.66	.032	28	
5	Study design	3.07	-.106	-.860	30	.028	21	
6	Figures and appendices	2.61	-.480	.079	53.33	.024	27	
7	Characteristics of findings, discussion and conclusion	3.70	-1.030	1.692	53.33	.034	12	
8	More notes and callouts	2.43	.025	-.574	40.33	.022	31	
9	Title length	2.48	.017	-.562	40	.022	29	
10	Title grammatical type (i.e., nominal, declarative, questions and complete sentences)	2.65	.205	-1.020	36.66	.023	26	
11	Title punctuation	2.35	.016	-.213	46.66	.021	32	
12	Mentioning study place in title	2.48	.367	.052	36.66	.022	29	
13	Mentioning study time span in title	2.68	.161	-1.158	36.66	.024	25	
14	Acronyms and abbreviations in title	2.29	-.126	-1.080	43.33	.021	33	
15	Name of certain countries in title	2.74	.364	-.855	46.66	.025	24	
16	Quality (readability, relevance and innovation)	4.22	-1.786	1.753	46.66	.039	3	
17	Novelty and interest of subject(s)	4.38	-1.251	1.907	60	.039	1	
18	Number and diversity of references	3.48	-.447	-.611	43.33	.031	15	
19	Internationally-scoped references	3.61	-.682	-.452	50	.032	14	
20	Credibility of references	3.90	-1.203	1.387	50	.035	8	
21	Recency of references	4.03	-1.113	.858	43.33	.036	6	
22	Highly-cited journals in reference list	3.68	-.444	-.013	36.66	.033	13	
23	Age (Publishing date)	3.90	-.925	.618	46.66	.034	9	
24	Cited half-life	3.50	-.593	-.325	56.66	.031	16	
25	Paper type (review, original article, short communication, etc.)	3.90	-1.085	.832	46.66	.034	9	
26	Language	4.20	-1.056	.672	43.33	.037	5	
27	Accessibility and visibility	4.43	-1.436	2.057	56.66	.039	2	
28	Used as a reference in Wikipedia	3.27	-.300	-1.038	40	.028	19	
29	Access mode (Open access vs. fee based access)	4.27	-1.028	1.635	50	.038	4	
30	Indexed in main indexing/abstracting databases	4.10	-1.692	1.234	43.33	.036	7	
31	Abstract length	2.90	-.637	-.825	36.66	.026	23	
32	Abstract readability	3.47	-1.249	.901	60	.031	17	
33	Abstract type (structured vs. unstructured)	3.20	-1.056	.672	43.33	.028	20	

Table 5: The subcomponents on the component "author-related features" according to experts in the first round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Number of authors	3.2	-.206	-.608	33.66	.050	14	.920
2	Authors from various fields	3.23	-.263	-.381	36.66	.051	13	
3	Authors' reputation	4.30	-1.352	.841	56.66	.067	1	
4	Authors' h-indices	3.67	-.076	-1.129	33.33	.057	3	
5	Authors' m-indices	3.33	.007	-.477	40.00	.052	10	
6	Authors' academic rankings	3.37	-.383	-.265	40.00	.053	8	
7	At least one coauthor more productive than the first author	3.33	-.332	.389	46.66	.052	10	
8	Authors' affiliated country	3.4	-.574	-.408	43.33	.053	6	
9	Scientific ranking of the affiliated country in WoS	3.27	-.209	-1.230	36.66	.051	12	
10	Collaboration type (Organizational, national and international)	3.2	-.429	-.226	36.66	.050	14	
11	Authorship patterns	2.9	.212	-1.019	40.00	.045	18	
12	Authors' self-citation rate	2.87	-.332	-.617	40.00	.045	19	
13	Number of authors with at least one ISI highly-cited paper.	3.5	-.491	-.623	43.33	.055	5	
14	Providing authors' accurate contact information in detail	2.97	.292	-.537	33.33	.046	17	
15	Having professional webpages and updated publication listings	3.37	-.473	-.212	36.66	.053	8	
16	Joining scientific social networks	3.83	-.922	-.312	43.33	.060	2	
17	Connection between authors' e-mail address and their publications	3.17	.062	-.485	36.66	.049	16	
18	Having an online resume (e.g. ORCID or ResearchID)	3.53	-.767	-.067	46.66	.055	4	
19	Citation cartels or mafias disproportionally citing each other	3.40	-.369	-.441	46.66	.053	6	

scored less than the minimum expected level (=3) and excluded in this round.

Table 5 shows the sub-components on the main component "author-related features". Out of 19 related items, only 3 items were scored less than expected and excluded from studying in the second round.

Table 6: The subcomponents on the component "keyword-related features" according to experts in the first round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Keyword growth during a certain time span	3.5	.001	-.890	33.33	.095	4	.877
2	Keyword diversity	3.57	.200	-.841	43.33	.097	3	
3	Number of keywords	3.33	.382	.200	50.00	.091	6	
4	Percentage of new keywords	3.33	.384	-.781	43.33	.091	6	
5	Conformance with controlled vocabulary	3.37	-.449	.060	36.66	.092	5	
6	Different words in keywords	3.07	.338	-.170	50.00	.083	9	
7	Keyword repetition in title	3.07	.543	-.140	46.66	.083	9	
8	Topical popularity (number of interrelated words in abstract)	3.67	.512	.654	36.66	.099	1	
9	Keyword repetition in abstract	3.03	.113	-.308	40.00	.083	11	
10	Number and diversity of keywords in title / abstract	3.2	.135	.473	53.33	.087	8	
11	Subject relevance (keyword similarity)	3.6	-.550	-.225	40.00	.098	2	

Table 6 shows the sub-components on the component "keyword related features". All items were scored more than the cut-point and approved by experts in the first round.

The analysis of completed questionnaires in the first round revealed that all data on items had normal distributions as the kurtosis and skewness values were between -2 and 2. The internal consistency of the questionnaire for all 5 main components were greater than a= .07 that showed the acceptable reliability of the scale. Items scored less than the cut-off point (=3) were excluded from the second round. In addition, an item was added by experts to the component "field-related features" (i.e., interdisciplinarity).

In the second round of the Delphi study, a revised 70-itemed questionnaire based on the included items of the first round was made and the Delphi panel members were asked to complete it and score items. Table 7 shows the finalized items on the component "field-related features" approved by the Delphi panel members in the second round.

Table 7: The subcomponents on the component "field-related features" according to experts in the second round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Scope of subfields	4.05	-.722	.534	50	.122	1	.668
2	Number of scientific journals	3.85	-1.231	1.895	50	.116	4	
3	Specialties within the field	3.70	.119	-.726	40	.111	6	
4	Country self-citation rate	3.50	-.604	.319	40	.106	7	
5	Overall scientific production	3.75	-.957	.582	45	.113	5	
6	Ratio of faculty members to published papers	3.20	-.052	-.594	40	.096	8	
7	Research institute / university prestige	3.95	-.498	-1.001	40	.119	3	
8	Publisher prestige	4.05	-.607	-.248	40	.122	1	
9	Interdisciplinarity	3.10	.602	-.638	50	.094	9	

Table 8: The subcomponents on the component "journal related features" according to experts in the second round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Indexing / Abstracting in prestigious databases (such as Scopus, ISI, LISA)	4.5	.001	-1.135	50	.087	1	.609
2	Impact factor (IF)	4.45	-1.695	1.960	60	.086	2	
3	Quartile score	4.30	.512	1.256	45	.083	4	
4	Influence weight indicator	3.65	-.834	-.240	35	.071	10	
5	Self-citation rate	3.40	.256	-.387	40	.066	12	
6	Language	4.25	-1.883	1.460	50	.082	5	
7	Forms of publication and presentation	4.15	-1.056	.321	45	.081	6	
8	Publication frequency	3.15	.034	-.797	35	.061	13	
9	Professionalism	4.10	-.877	-.267	45	.080	7	
10	Internationality	4.45	-1.017	-.371	60	.086	2	
11	Regional-focused	3.75	-.706	.305	30	.073	8	
12	Number of early received citations	3.65	-.055	-.734	35	.071	10	
13	Interdisciplinarity	3.75	.418	-.826	45	.073	8	

Table 9: The subcomponents on the component "paper-related features" according to experts in the second round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Various sections	3.40	-.260	-.792	30	.041	20	.858
2	Methodology	3.60	-.294	-.989	40	.043	15	
3	Study design	3.35	.051	-1.274	30	.040	21	
4	Characteristics of findings, discussion and conclusion	3.50	.001	-.719	35	.042	18	
5	Quality (readability, relevance and innovation)	4.40	-1.789	1.750	60	.053	6	
6	Novelty and interest of subject(s)	4.45	-1.818	1.587	55	.053	3	
7	Number and diversity of references	3.90	-.772	-.267	45	.047	12	
8	Internationally-scoped references	4.00	-.761	-.159	40	.048	11	
9	Credibility of references	4.45	-.583	-.459	50	.053	3	
10	Recency of references	4.20	-1.018	1.080	45	.050	8	
11	Highly-cited journals in reference list	3.85	-.208	-.633	40	.046	13	
12	Age (Publishing date)	4.20	-.788	-.830	55	.050	8	
13	Cited half-life	3.50	.175	-.921	40	.042	18	
14	Paper type (review, original article, short communication, etc.)	3.60	-.444	-.735	30	.043	15	
15	Language	4.45	-1.695	1.960	60	.053	3	
16	Accessibility and visibility	4.60	-.442	-2.018	60	.055	1	
17	Used as a reference in Wikipedia	3.70	-.326	-1.489	35	.044	14	
18	Access mode (Open access vs. fee based access)	4.55	-.218	-1.183	55	.054	2	
19	Indexed in main indexing/ abstracting databases	4.35	-.549	-.548	45	.052	7	
20	Abstract readability	4.05	-1.273	1.286	45	.048	10	
21	Abstract type (structured vs. unstructured)	3.55	-.591	-.761	45	.042	17	

Table 8 shows the finalized items on the component "journal-related features" accepted by the experts in the second round of the Delphi study.

Table 9 shows the finalized items on the component "paper-related features" agreed upon by the experts in the second round.

Table 10 shows the finalized items on the component "author-related features" agreed upon by the Delphi study panel members in the second round.

Table 10: The subcomponents on the component "author-related features" according to experts in the second round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Number of authors	3.20	-.143	-.337	35	.056	14	
2	Authors from various fields	3.40	-.625	.023	47	.062	9	.821
3	Authors' reputation	4.60	-.442	-2.018	60	.080	1	
4	Authors' h-indices	3.85	-.828	-.164	40	.067	4	
5	Authors' m-indices	3.05	-.098	-.992	35	.053	15	
6	Authors' academic ranking	3.00	.293	-1.148	35	.052	16	
7	At least one coauthor more productive than the first author	3.25	-.065	-1.046	30	.057	13	
8	Authors' affiliated country	3.30	-.257	-1.394	30	.057	12	
9	Scientific ranking of the affiliated country in WoS	3.70	-.49	-.967	40	.064	6	
10	Collaboration type (Organizational, national and international)	3.55	-.581	-.578	30	.062	10	
11	Number of authors with at least one ISI highly-cited paper	3.75	-.728	-.493	35	.065	5	
12	Having professional webpages and updated publication listings	3.65	-.834	-.240	35	.064	7	
13	Joining scientific social networks	4.05	-1.624	3.063	50	.070	2	
14	Connection between authors' e-mail address and their publications	3.35	-.132	-.786	30	.058	11	
15	Having an online resume (e.g. ORCID or ResearchID)	3.95	-1.059	.783	40	.069	3	
16	Citation cartels or mafias disproportionally citing each other	3.65	-.564	.290	35	.064	7	

Table 11 shows the finalized items on the component "keyword-related features" accepted by the Delphi study panel members in the second round.

The analysis of completed questionnaires in the second round showed that all data on items had normal distributions as the

Table 11: The subcomponents on the component "keyword-related features" according to experts in the second round.

No.	Variable	Mean	Skewness	Kurtosis	Consensus (%)	Consensus weight	Rank	Cronbach's a
1	Keyword growth in a certain time span	3.55	-.314	-.837	30	.089	4	.902
2	Keyword diversity	3.45	-.619	-.277	35	.086	7	
3	Number of keywords	3.70	-.808	-.122	35	.092	3	
4	Percentage of new keywords	3.35	-.432	-.640	35	.084	9	
5	Conformance with controlled vocabulary	3.25	-.229	-.894	35	.081	11	
6	Different words in keywords	3.35	-.179	.191	45	.084	9	
7	Keyword repetition in title	3.50	-.460	-.684	30	.087	6	
8	Topical popularity (number of interrelated words in abstract)	4.40	-.712	-.446	50	.110	2	
9	Keyword repetition in abstract	3.55	-.537	.043	35	.089	4	
10	Number and diversity of keywords in title / abstract	3.45	-.256	-.135	40	.086	7	
11	Subject relevance (keyword similarity)	4.50	-.785	-.213	55	.112	1	

Table 12: Result of Kendall rank correlation test between publisher prestige and the number of citations received by LIS papers.

Component	Sub-component	Number of received citations	
Field-related features	Publisher prestige	Kendall rank r	.288
		P value	.000**
		N	1665

** $p^{<.01}$

kurtosis and skewness values for all items were between -2 and 2. The internal consistency of the questionnaire for all 5 main components were greater than a=.06 in overall that confirmed the acceptable reliability of the scale. As the mean rate of experts' scores on all of the items was higher than 3, all of them in this round were conceived as main items affecting the rate of citations received by LIS papers. No additional item was proposed in this round reflecting the relative completeness of the items involved. At last, but not at least,

Table 13: Ranks and citation counts belonged to each journal publisher / publisher group.

Publisher	Number of papers	Number of citations
Elsevier and Springer	592	6586
Wiley, Johns Hopkins, Taylor and Francis	283	2540
Palgrave, Emerald and SAGE	308	2590
Rutgers	35	189
Others	447	1228
Total	1665	13133

overall consensus was achieved for all items as a condition for finalizing the Delphi study.

Considering research question 2 for possible correlation between the field-related features and the number of citations that papers in LIS field receive, only one variable (i.e., publisher prestige) was included in the quantitative phase. The result of Kendall rank correlation test (Table 12) showed that there was a significant positive correlation in this regard (r=.288, p<.01).

Table 13 shows the ranks and citation counts belonged to each journal publisher / publisher group. As can be seen, the first and last ranks belonged to Elsevier and Springer (with 6586 citations) and Rutgers (with 189 citations), respectively.

Considering research question 3 for studying the possible correlation between journal-related features and the number of citations received by papers published in LIS journals, some correlational tests were used. As Table 14 shows, there was a significant positive correlation between indexing / abstracting in prestigious databases, impact factor, quartile score, self-citation rate, internationality, number of early received citations, and interdisciplinarity on the one hand and the number of citations received by papers in LIS journals, on the other hand (p<.05). Journal professionalism negatively correlated the number of citations (r=-.340, p<.01).

Regarding research question 4 for studying the possible correlation between paper-related features and the number of received citations in LIS papers, some correlational tests were used. As Table 15 shows, there was a significant positive relationship between paper length, title length, number and diversity of references, paper type, abstract length and abstract type on the one hand and the number of citations to papers on the other hand (p<.05).

Considering research question 5 about the possible relationship between author-related features and the number of received citations of papers in LIS, Table 16 shows the result of some correlational tests in this regard. There was a significant positive relationship between the number of authors, authors' h-indices, existing one coauthor more productive than the

Table 14: Results of correlational tests between journal-related features and the number of citations received by papers in LIS journals

Component	Sub-component	Number of citations	
Journal related features	Indexing / Abstracting in prestigious databases (such as Scopus, ISI, LISA)	X^2	31.52
		Spearman's r	.197
		P value	.012*
	IF	Pearson's r	.359
		P value	.000**
	Quartile score	Kendall rank r	.426
		P value	.000**
	Self-citation rate	Pearson's r	.162
		P value	.000**
	Language	X^2	170.58
		Spearman's r	-.236
		P value	.896
	Publication frequency	Pearson's r	.039
		P value	.110
	Professionalism	X^2	261.18
		Spearman's r	-.340
		P value	.000**
	Internationality	Pearson's r	.061
		P value	.013*
	Regional-focused	X^2	385.10
		Spearman's r	.131
		P value	.561
	Number of early received citations	Pearson's r	.135
		P value	.000**
	Interdisciplinarity	X^2	276.289
		Spearman's r	.351
		P value	.000**

*$P^{<.05}$ **$p^{<.01}$

first author, scientific ranking of the affiliated country in WoS, collaboration types, the number of authors with at least one ISI highly-cited paper, providing authors' accurate contact information, having professional webpages and updated publication listings, making connection between authors' e-mail addresses and their publications, having an online resume on the one hand, and the number of citations received by papers in LIS on the other hand (p<.05).

Regarding research question 6 for investigating the possible relationship between keyword-related features and the number of citations received by papers in LIS, results of Pearson's correlational test (Table 17) showed that there was a significant positive relationship between the number of keywords, keyword repetition in paper title and that in paper abstract on the one hand and the number of citations received by papers in LIS on the other hand (p<.05).

Table 15: Results of correlational tests between paper-related features and the number of citations to LIS papers.

Component	Sub-component	Number of citations	
Paper-related features	Paper length	Pearson's r	.131
		P value	.000*
	Title length	Pearson's r	.067
		P value	.011*
	Title punctuation	X^2	83.88
		Spearman's r	-.095
		P value	.058
	Mentioning study place in title	X^2	42.95
		Spearman's r	.126
		P value	.98
	Mentioning study time span in title	X^2	69.349
		Spearman's r	.092
		P value	.333
	Having acronyms and abbreviations in title	X^2	72.81
		Spearman's r	-.014
		P value	.237
	Including the name of some certain countries in title	X^2	95.32
		Spearman's r	-.092
		P value	.990
	Number and diversity of references	Pearson's r	.258
		P value	.000**
	Paper type	X^2	292.35
		Spearman's r	.115
		P value	.000**
	Paper language	X^2	135.02
		Spearman's r	-.192
		P value	.364
	Access mode (Open access vs. fee based access)	X^2	53.21
		Spearman's r	.059
		P value	.852
	Abstract length	Spearman's r	.232
		P value	.000**
	Abstract type	X^2	493.15
		Spearman's r	.235
		P value	.000**

*$P^{<.05}$, **$P^{<.01}$

Table 16: Results of correlational tests between author-related features and the number of citations received by LIS papers.

Component	Sub-component	Number of citations	
Author-related features	Number of authors	Pearson's r	.137
		P value	.000**
	Authors' h-indices	Pearson's r	.254
		P value	.011**
	At Least one coauthor more productive than the first author	Kendall rank r	.142
		P value	.000**
	Authors' affiliated country	X^2	3780.43
		Spearman's r	.198
		P value	.999
	Scientific ranking of the affiliated country in WoS	Kendall rank r	.144
		P value	.000**
	Collaboration type	X^2	364.55
		Spearman's r	.120
		P value	.000**
	Number of authors with at least one ISI highly-cited paper	X^2	329.93
		Spearman's r	.163
		P value	.000**
	Providing authors' accurate contact information in detail	X2	258.020
		Spearman's r	.276
		P value	.000**
	Having professional webpages and updated publication listings	K2	181.24
		Spearman's r	.270
		P value	.000**
	Joining social networks	X^2	77.75
		Spearman's r	.084
		P value	.133
	Connection between authors' e-mail addresses and their publications	X^2	170.72
		Spearman's r	.264
		P value	.000**
	Having an online resume	X^2	151.57
		Spearman's r	.234
		P value	.000**

*$P^{<.05}$, **$P^{<.01}$

DISCUSSION

In this mixed method research, the factors affecting the number of citations received by papers in LIS were identified, weighted and analyzed. In the qualitative phase, out of 70 items identified by conducting a literature review and content analysis, 9, 13, 21, 16 and 11 subcomponents were agreed upon by the Delphi panel members as factors relating to the components field-related features, journal-related features, paper-related features, author related features and keyword related features, respectively.

Considering the effective factors in the component "field-related features", highly-ranked sub-components were publisher prestige, the scope of subfields and subjects, research institute / university prestige, the number of scientific journals in the field and the amount of overall scientific production. Other subcomponents were specialties within the field, country self-citation rate, the ratio of faculty members to published papers, and interdisciplinarity. These results accord

Table 17: Results of Pearson's correlational test between keyword-related features and the number of citations received by papers in LIS.

Component	Sub-component	Number of citations	
Keyword-related features	Number of keywords	Pearson's r	.105
		P value	.000**
	Keyword repetition in title	Pearson's r	.112
		P value	.012*
	Keyword repetition in abstract	Pearson's r	.117
		P value	.000**

*$p^{<.05}$, **$p^{<.01}$

closely with those of Bornmann *et al*.[15] Ayres and Vars,[31] Bjarnason and Sigfusdottir,[32] Costas *et al*.[33] and Franceschini *et al*.[34] Researchers tend to cite papers published by highly prestigious publishers and research institutes. In addition, the broad scope of a field and the rate of its publications and scientific output are considered in the citation process. The different numbers of citations in different fields and subfields and the diversity of subfields and subjects are at work in this regard.[35] Citation to papers of a certain country by its researchers and highly-productive authors in the field and its scientific production as well as field interdisciplinarity are effective in citation to LIS papers, too.

Among the factors relating to the component "journal-related features", the Delphi panel members ranked indexing and abstracting in prestigious databases (such as Scopus, ISI, LISA), impact factor (IF), internationality, quartile score, language, forms of publication and presentation, professionalism, regional-focused, interdisciplinarity, influence weight, the number of early received citations, self-citation rate, and publication frequency as factors affecting the number of citations received by LIS papers. Such findings accord ones found in several studies.[16,36,37,38] It can be deduced that papers published in such journals may be more visited and read and consequently more cited. Other above-mentioned factors are considered as effective items by LIS authors in giving citations to journal papers.

Out of factors in the component "paper-related features", some factors considered as main ones by the Delphi panel members, including accessibility and visibility, access mode (open access vs. fee based access), novelty and interest of subject(s), credibility of references, paper language, paper quality (readability, relevance and innovation), being indexed in main indexing/abstracting databases, recency of references, paper age (publishing date), abstract readability, having internationally-scoped references, number and diversity of references, including highly-cited journals in the reference list, being used as a reference in Wikipedia, paper type, research methodology, abstract type (structured vs. unstructured), cited half-life, the characteristics of findings and discussion and conclusion sections, having various sections, and mentioning study design. These factors were in work in other studies.[10,13,20,21,30,31,39-42] It should be noted that the paper publication date and recency of its references are of factors heavily affecting its citation rates.[27,41] The paper with novelty is more likely to be among top 1% highly cited papers in the long run.[43] Yan *et al*.[29] reported that a paper's new combinations and new components significantly affect its impact. Besides, citation to a paper increases in the first years of its publication and decreases then, and there is a significant relation between the publication date and citation rate.[44]

In the component "author-related features", some factors were ranked by the experts, including among others, authors' reputation, their joining scientific social networks, having an online resume (e.g. ORCID or ResearchID), authors' h-indices, number of authors with at least one ISI highly-cited paper, scientific rankings of authors' affiliated country in WoS, having professional webpages and updated publication listings, citation cartels, authors from various fields, collaboration type, making connection between authors' e-mail address and their publications, authors' affiliated country, having at least one coauthor more productive than the first author, the number of authors, authors' h-indices and their academic rankings. Some studies reported similar findings.[1,8,11,15,26,39,41,45,46] However, Lee[28] showed that the predictive power of author-related factors was rather weak. It can be said that known authors, ones with high *h*-indices and highly-cited papers, authors more active in social networks and ones owing an online resume are more likely to be cited by others. LIS researchers tend to consider the scientific ranking of the affiliated country, the collaboration type, and coauthors from different disciplines in citing to LIS papers; however, providing standardized and accurate contact information and author self-citation rate were not considered by LIS experts as factors at work in receiving more citations. In line with our study, AL-Ebrahim *et al*.[11] found that author contact information is not effective in the received citation rate. Bornmann *et al*.[15] and Didegah and Thelwall[18] showed that the number of authors and author self-citation rate are not effective in the number of received citations.

Among factors within the component "keyword related features", the Delphi panel members conceived some ones as affecting factors in receiving more citations by LIS papers, including subject relevance (keyword similarity), topical popularity, keyword growth, keyword repetition in abstract, keyword repetition in title, keyword diversity, the number and diversity of keywords in title / abstract, having different words in keywords, percentage of new keywords, and keyword conformance with the controlled vocabulary. Some studies reported similar results.[5,19,24,25,41] It appears that keyword

similarity reflects topical similarity between cited and citing papers and consequent more citedness of the cited paper. The number and diversity of keywords and keyword repetition in the title and abstract can facilitate the searchability of papers and their consequent citability, too.

In total, it is suggested that authors in LIS consider the publisher prestige, indexing database, research institute / university prestige, journal IF, quartile score, internationality, professionalism and interdisciplinarity, and language when citing a paper in their manuscripts. For increasing the chance of their papers to be cited, they can author papers with topical popularity and updated references and collaborate with international authors and co-authored with influential and known authors in LIS field. They can also potentially increase the number of citations of their papers by active presence in scientific social networks as well as making their papers more accessible and visible via dedicated professional websites and updated online resumes. Selecting thesaurus-based keywords and including them in paper title and abstract can be helpful, too.

In the quantitative phase, factual citation data from WoS were examined for investigating some possible relationships among variables. A significant positive relationship was found between publisher prestige and the number of citations. The highest number of citations belonged to Elsevier and Springer. Franceschini *et al*.[33] emphasized the possibility of some publishers' being more cited and showed that papers published by Springer had more citations than those by Taylore and Francise. Totally, researchers take the publisher prestige in publishing in a journal into account.[47]

In journal-related features, regarding the significant positive relationship of journal quartile score and impact factor with the number of citations of its papers, researchers likely cite journals with high IF. Gaston *et al*.[48] noted that researchers rank journal reputation and impact factor (IF) amongst the key selection criteria when choosing where to submit their manuscripts. This may increase the chance for a weak paper published in a prestigious journal to be cited more comparing a serious paper published in other journals. Callaham *et al*.[49] and Didegah and Thelwall[18] found such relationships. Journal self-citation is another affecting factor as noted by Willis *et al*.[50] Journal's activity in a certain professional field (professionalism) had a significant negative relationship with the number of citations received by its papers as non-professional and multi-field journals have more readers.[51] Being interdisciplinary journal with subjects from several scientific fields positively affects its received citations as interdisciplinary journals are more likely to be read and cited.[52] Journal internationality is another factor affecting the number of citations and journals with authors from different nations receive more citations.[38] However, Didegah and Thelwall[18] found a significant negative relationship between a journal's internationality and its citations. We found a positive relationship between journals' indexing in a prestigious database and the number of citations to them. Jabbour *et al*.[16] found the type of indexing database effective in the number of citations. In addition, we found no relationship between journal publication frequency and citation counts.

Out of factors relating to the paper itself, we found paper length as an effective item in receiving more citations. One reason may be that long papers have more information. Haslam and Koval,[53] Antoniou *et al*.[20] Xie *et al*.[26] and Warren *et al*.[30] found such a relationship. However, Didegah and Thelwall[17] found no significant relationship in this regard. In line with studies by Falagas *et al*.[5] and Annalingam *et al*.[38] we found a significant positive relationship between the length of paper title and citation counts in favor of ones with long titles. However, Jacques and Sebire[54] reported that long-titled papers receive fewer citations. This tendency may be due to field-related aspects and needs further research. As we found, the paper type positively affects the number of citations in favor of review papers. Haslam *et al*.[13] and Alimoradi *et al*.[21] reported the same result. Regarding the abstract type, a significant positive relationship was found in favor of unstructured abstracts. In line with this result, Lokker *et al*.[55] found a negative relationship between structured abstracts and citation counts. Although we found the effective role of including the names of some certain countries in the paper title in receiving more citations, Jacques and Sebire[54] found a negative relationship in this regard. In line with Ruano-Ravina and Alvarez-Dardet,[56] our results showed no relationship between paper language and its citation counts. However, some studies showed a significant relationship in favor of English language.[16] In line with McCabe and Snyder,[57] we found no relationship between paper access mode and its citation counts. Some studies, however, reported that open-accessed papers receive more citations than fee-based ones.[55,58]

Out of author-related factors, one factor effective in increasing the number of citations of LIS papers was the number of authors. The more the number of authors of a paper is, the higher the number of citations it receives. Larivière *et al*.[59] observed that an increase in the number of authors leads to an increase in the scientific impact. However, Didegah and Thelwall[18] found no relationship between these two variables. In line with Hurley *et al*.[45] and Warren *et al*.[30] we found a significant positive relationship between authors' *h*-indices and the number of citations received by their papers. Our results showed that a paper's having at least one coauthor who is more productive than the first author may increase its citation rate. The reason may be that highly-productive authors have greater authorship networks with more

possibility of their coauthors as the members of the network to be cited. Onodera and Yoshikane[8] and Hurley *et al.*[45] found a significant positive relationship between authors' productivity and their citation counts. However, Jabbour *et al.*[16] found no relationship between these two variables. In our study, the scientific ranking of authors' affiliated country in WoS showed a significant positive relationship with the number of citations. One reason may be that the increased self-citation of a country is in parallel with its increased publication counts in WoS. Pasterkamp *et al.*[60] conceived the same nationality of cited and citing authors effective in citation counts. Other effecting factor was the collaboration type where international collaboration achieves more citations comparing institutional, intra-institutional and national ones. Didegah and Thelwall,[18] Antoniou *et al.*[20] and Amara *et al.*[61] found such results. In line with the study by Ale Ebrahim,[11] we found that providing authors' standardized contact information in the paper (such as accurate and same affiliation) is at work in increasing citation counts. In addition, designing professional webpages and updating publication listings as tools for introducing and publicizing authors are effective in receiving more citations. Ale Ebrahim *et al.*[11] found a similar result, too. This is the case in making connection between authors' e-mail addresses and their publications as well as having an online resume (such as ORCID).

Amongst key-word related features, we observed that the number of keywords, keyword repetition in paper title and in abstract positively correlate the number of citations of LIS papers. This accords the findings of some studies.[18,24,25,26] Didegah and Thelwall,[17] however, found no correlation between keywords and citation counts.

CONCLUSION

The findings of this study can be beneficial to researchers in increasing the citability of their research papers and consequent scientific influence in the scientific community. LIS researchers can integrate the accepted / confirmed items in the qualitative and quantitative phases of this study as a set of potential criteria for assuming the possible rate of citations a LIS paper receives. Authors in LIS can plan to publish in journals with high IF and quartile score, published internationally in multidisciplinary fields by known and prestigious publishers. It is suggested that they prevent sliced publishing in fewer pages and try to prepare comprehensive manuscripts. It is better that they use accurate titles and more related references. They should select more co-authors, especially ones with high production, high *h*-indices and more influence from different countries and regions. Creating professional webpages in Google Scholar, ResrarchGate and so on and compiling online resumes with updated publication listings can increase the chance for their papers to be cited more than ever. Selecting keywords from the controlled vocabulary tools and including them in the titles and abstracts of the papers may be at work in receiving more citations.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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