International Journal of Information Science and Management
Vol. 20, No. 4, 2022, 153-168
https://dorl.net/dor/20.1001.1.20088302.2022.20.4.10.9

Original Research

Study on Scientific outputs of Scholars in the Field of Digital Libraries Using Altmetrics Indicators

Ali Biranvand
Assistant Prof., Department of Knowledge and Information Science, Payame Noor University, Iran.
biranvand@pnu.ac.ir
ORCID iD: https://orcid.org/0000-0003-2316-0405

Amir Reza Asnafi
Assistant Professor, Department of Knowledge and Information Science, Shahid Beheshti University, Tehran, Iran.
Corresponding Author: a_asnafi@sbu.ac.ir
ORCID iD: https://orcid.org/0000-0001-9908-2031

Zeinab Biranvand
Payame Noor University (PNU), Tehran, Iran.
zeinabbiranvand58@gmail.com
ORCID iD: https://orcid.org/0000-0003-2321-475x)

Received: 30 October 2021
Accepted: 16 January 2022

Abstract

The current study aims to calculate the relationship between Altmetric scores obtained from the observation and dissemination of digital library resources in the Dimensions database and the number of citations received in the Scopus database. Also, in another part of the research, the predictive power of the number of Scopus citations by Altmetric scores is examined. The present research is applied in terms of purpose and survey-descriptive in terms of type, which is done by the scientometric method and with an Altmetric approach. The statistical population of the study includes all articles in the field of digital libraries (24183 records) that are indexed in the Scopus citation database during 1960-2020. Dimensions database has been used to evaluate the Altmetric scores obtained from these articles on social networks. Due to the limited access to the required data in the Scopus database, 2000 highly cited articles in the field of digital libraries in this Scopus database were studied through the Dimensions database. The data collection tools are Scopus Citation Database and Dimensions Database. The required data is collected through the Scopus database. In this study, the studied indicators from the Dimensions database appear as the independent variable of the research. The dependent variables in this study are the number of citations to articles in the Scopus database. Correlation tests and multiple regression between the studied indices are used to examine the relationships between variables and perform statistical tests. The software used is Excel and SPSS version 23. The present study results show that the social networks Patent, Facebook, Wikipedia, and Twitter have the highest correlation with the number of citations in the Dimensions database. The social networks Blog, Google User, and Q&A do not significantly relate to the number of citations received in Dimensions. Patent social networks, Wikipedia, and Twitter have the highest correlation with the number of Scopus citations. In this case, the social networks of Blog, Google User, Pulse Source and Q&A do not significantly correlate with the number of citations received. Among the citation databases studied, Mendeley has the highest correlation between the numbers of citations. Other results indicate that the publication and viewing of documents on social

networks cannot predict the number of citations in the Dimensions and Scopus databases.

Keywords: Altmetrics, Citations, Scopus, Dimensions, Digital Libraries.

Introduction

Scientific social networks provide an ideal opportunity for researchers to connect with other peers and use relevant resources without engaging in the process of false information loss and beyond searching in search engines and databases. Priem, Piwowar & Hemminger (2012) introduce the activity in scientific social networks as the main reason for increasing the visibility of scientific articles and products and believe that the visibility of scientific products is one of the indicators of scientific development in scientific communities (ibid). With the advent of the Web, new communication methods and information dissemination are no longer new and more efficient metrics. Citation analyzes have emerged to perform various and realistic scales. Socio-scientific networks are new knowledge transfer and sharing tools that are being developed daily to interact with the research community. Social networks are a collection of individuals, organizations, and other social entities interconnected by social relationships such as friendship, cooperation, or information exchange. The structure of these networks is composed of individuals, groups and organizations as their nodes (Biranvand & Shanbady, 2022). Social networks are rapidly becoming a common tool for disseminating information in learning institutions. This is due to people's awareness about the importance and place of knowledge sharing and further development of technology. Social networks have been recognized as the best medium for exploring a wide range of knowledge in various fields, using the Internet as one of the most appropriate means of communication. The significant growth of the influence of scientific social networks among scientific societies has led to the identification of knowledge-sharing individuals and universities in each field and the issue of knowledge sharing. Socio-scientific networks are bases for creating a sense of interaction between researchers that enable the achievement of a new form of communication and content sharing (Chawinga, 2017; Tess, 2013). There is now a wide range of socio-scientific networks used by researchers to provide scientific activities and connect with other researchers worldwide (Mason, 2020). One of the ways to evaluate the scientific potential of researchers and, consequently, research centers and universities is to review their scientific products in citation databases.

The indexing of scientific works in valid citation databases indicates the high quality of articles, which is considered an essential and accurate factor in evaluating the person or university in question. In this regard, citation metrics have become increasingly important in measuring research impact. However, these metrics are not without flaws. Hence, many scientists and researchers have tried to show realistic scales from the effects of research works. Altmetric is a new, web-based metric that can evaluate all scientific and research outputs to complement citation metrics.

The advent of the Web and related technologies has led libraries to maintain an active presence in this new environment and provide services to their users to maintain their position in the production of new science and in the knowledge cycle in general. Given the digital library's importance, role and position, several definitions have been proposed, each of which includes different concepts, but there has been no theoretical agreement on the existing definitions. Given the interdisciplinary nature of digital libraries and the role of different fields

such as computer science, library and information science, sociology, etc., different perspectives on digital libraries seem natural. Computer scientists consider digital libraries to be databases and information retrieval systems. In their view, a digital library is a system that allows the user to access a wide range of organized information seamlessly. Librarians and information scientists see digital libraries as more than just a database and an information retrieval system in which elements such as information needs, end-user communities, intellectual property, and information availability are more important.

This research has examined the resources related to the field of digital libraries in Scopus and Dimensions databases, considering the effectiveness of scientific social networks in increasing the benefit of researchers and scholars from the scientific products of their counterparts. This study can reveal the effect of using social networks and Altmetrics on the number of citations received in the Scopus database. Given the importance of scientific interaction and participation through scientific social networks, this study intends to investigate the relationship between Altmetric scores resulting from documents related to the digital library field in social networks and the number of citations received in the Scopus database. The primary purpose of this study is to investigate the relationship between Altmetric scores and the number of citations received from highly-cited documents in digital libraries in the Scopus database from 1960 to 2020. However, the sub-objectives of the research are:

1- Studying the status of publishing digital library resources in Dimensions and Scopus databases during 1960-2020.

2- Studying the relationship between the Altmetric scores of highly cited sources in the field of digital libraries and the number of citations received in Dimensions and Scopus databases.

Research questions

1- What is the status of publishing digital library resources in Dimensions and Scopus databases from 1960-2020?

2- Is there a relationship between the dissemination of resources on social networks and the number of citations received in the Dimensions and Scopus database?

3- Is there a relationship between referring to sources through citation databases and the number of citations received in Dimensions and Scopus databases?

4- Do social media metrics have the power to predict the number of citations received from digital library resources in the Scopus database?

5- Do the metrics for viewing documents in citation databases have the power to predict the number of citations received from digital library resources in the Scopus database?

6- Do the metrics received from the Dimensions database (published on social media and citation databases) have the power to predict the most cited year of publication of digital library resources in the Scopus database?

Considering the subject of Altmetrics in the evaluation of research activities, several studies have been conducted worldwide to examine the quality and accuracy of indicators in social networks (Wouters, Zahedi & Costas, 2019). Thelwall and Kousha (2014) have reviewed the activity of researchers in the field of philosophy in the social network. The overall result indicates the impact of the Academia Scientific Network on the scientific communication of researchers in this field. The researchers 'profile analysis showed that students' profiles are slightly more popular than academic members. There is no significant difference in the

frequency of observations regarding gender. Among the sources, the articles were viewed more often. Mohammadi and Thelwall (2014) have examined the significant relationship between the number of readers of articles in Mendeley and the number of citations received in the science citation database. The results of this study indicate that the Mendeley social network can be used to help transfer knowledge between different disciplines and ultimately receive more citations for articles. Lawton (2016) studied social media tools for informal scientific communication among academics and stated that most academics use social media tools for informal scientific communication. Obstacles such as lack of motivation, poor digital literacy, and concerns about Internet security have led to the non-use of social networks. Facebook and Twitter have been the most used among members.

Thelwall and Kousha (2017) examined the number of citations of 2675 articles in the library and information science field in 2017 in the Scopus database and concluded that the amount of citations received in ResearchGate is less than Google Scholar but more than WebScience and Scopus have been. ResearchGate is also more relevant to Google Scholar in terms of citations received. However, sharing versions of articles on ResearchGate is even more important. Ortega (2018) has compared the services of Plum x, Altmetrics and Crossref. This study recommends the use of a specific server to analyze particular metrics. Whereas, if we want to make a general analysis, we must use a combination of several providers.

Biranvand, Ghanaatian and Alhaei (2021) have investigated the relationship between Altmetrics scores related to highly cited articles in the field of particle physics in the Dimensions database with the number of citations received in the Clarity Analytical and Dimensions database. The findings of this study show that the publication of articles on Facebook, Wikipedia, and Q&A social networks has a positive and significant relationship with the number of citations received through the Dimensions Database and Clarity Analytics. While there is no significant relationship between the publication of articles on the news networks Otletsa, Blog, Twitter, Weibo, Patent, Facebook, Google Plus User, Editor, Video Uploader and citations received from Dimensions and Clarity Analytics. There is a positive and significant relationship between the number of articles viewed in the Mendelian citation database and citations received through the Dimensions database and analytical clarity. However, there is no significant relationship between the number of articles viewed in the citation databases of SiteULike and Conota and the number of citations received by the Dimensions database and analytical clarity.

Much research has been done on the role of social networks in increasing the number of visits and citations received from databases indexed in databases. Thelwall and Kousha (2017) also examined the number of citations of 2675 articles in the library and information sciences in 2017 in the Scopus database and concluded that the amount of citations received in ResearchGate is less than Google Scholar but more than WebScience, and It was Scopus. ResearchGate is also more relevant to Google Scholar in terms of citations received. However, sharing versions of articles on ResearchGate is even more critical. The results of Bardus et al. (2020) study on the effect of using social networks in attracting citations in health articles show that not using social media directly affects not increasing the number of citations in health research. In Biranvand and Shanbady's (2020) research, the effect of measurements obtained from ResearchGate and Mendel social networks on Scopus scientometric indices has been studied. The findings show a positive and significant relationship between the metrics of ResearchGate and Mendele (according to the follow-up) of social networks with the

scientometric indicators of the Scopus database. The results of a study, Mason (2020), comparing the research network and academia among Japanese researchers show that Japanese researchers are more inclined to use the research network. Because ResearchGate has been introduced much more passively than the Academy. The language factor is one of the barriers to using social networks. Research backgrounds show a significant relationship between metrics from social networks and information indicators of databases, indicating the importance and role of information and sharing of scientific products through social networks. Is. Also, a significant relationship has been reported between the publication of documents on social networks and the absorption of the number of citations in databases.

Material and Methods

The present research is applied in terms of purpose and survey-descriptive in terms of type, which is done by the scientometric and altmetric method. Applied research emphasizes solving special problems in real conditions. The tendency to be practical and its application examines real issues. The statistical population of the study includes all articles in the field of digital libraries that are indexed in the Scopus citation database from 1960 to 2020. Dimensions database has been used to evaluate the altmertic scores obtained from the presence of these articles in social networks. Due to the limited access to the required data in the Scopus database, 2000 highly cited articles in the field of digital libraries in this Scopus database were studied through the Dimensions database. The data collection tools are Scopus Citation Database and Dimensions Database. The required data is collected through the Scopus database. The collected data are studied on a case-by-case basis in the Dimensions database. Through Dimensions, Altmetrics scores are extracted.

To identify indexed articles in the field of digital libraries in the Scopus database, the search process is done through the following search strategy.

Query: (TITLE-ABS-KEY ("Digital library*") AND PUBYEAR > 1959 AND PUBYEAR < 2021)

After extracting the articles of digital libraries, in the second stage, by restricting the sorting field based on highly cited articles, the output of the Scopus database is based on the most cited articles in the field of digital libraries. At this stage, based on the output of highly cited digital library articles from Scopus, the articles are reviewed on a case-by-case basis in the Dimensions database. Data analysis is done in two parts: descriptive statistics and analytic statistics. In the descriptive statistics section, statistics such as frequency, the mean, and standard deviation of variables are used to express the general characteristics of society. In the analytic statistics section, correlation tests and multiple regression between the studied indices are used to examine the relationships between variables and perform statistical tests. The software used is Excel and SPSS version 23.

Results

This section provides information on articles in the field of digital libraries indexed by Scopus for six decades (1960-2020). This information includes the growth trend of resource production, indexed documents, the language of documents, and type of access, product publications, and scientometric indicators (number of documents, citations, index score) of digital library resources. In the second part of the statistical description of the research community, data related to the studied indicators (citations, Altmetrics scores, visits) of digital

library resources in the Dimensions database are presented. Investigations showed that 24,183 sources indexed in the Scopus database over 60 years (1960-2020) were retrieved during the search process. The highest number of articles produced in the 60 years under review was in 2005, 2006, 2007, and 2008. This period has produced the largest number of scientific resources in the field of digital cabins. The oldest document indexed in this area is the conference paper entitled "Session 8: Information Retrieval: 8.1 the relevant response theory of information storage and retrieval", published in 1965 by Kelley. Overall scores related to the studied indicators and altmertics:

To review and compare scientometric indices and altmetric scores of the most cited sources in the field of digital libraries in the Scopus and Dimensions database, information about 100 titles of the mentioned documents is listed in Table 4-6. Mentioned indicators from the Scopus database include the year of publication and number of citations. The Altmetics scores listed on the Dimensions database include posting on social media (social networks: Twitter, Blog, Wikipedia, Google Plus, User Source Policy, Facebook, Q&A Trades, and patent) and viewing in databases (including citation databases: Mendeley, CiteULike and Conotta).

Table 1

Scientometric indices and altmetric scores of the most cited documents in the field of digital libraries (1960 to 2020)

	Scopus		Dimensions			
Title	Year published	No. of citation	No. of citation	Year most cited	No. of refering to references	Publishing reference
Texture features for browsing and retrieval of image data	1996	2984	2588	2013	61	683
Or-library: Distributing test problems by electronic mail	1990	1320	1198	2013	2	128
Generating Feynman diagrams and amplitudes with FeynArts 3	2001	1289	1125		1	74
ArnetMiner: Extraction and mining of academic social networks	2008	1147	994		5	483
The jpeg2000 still image coding system: an overview	2000	1107	927	2004	88	185
The impact of e-learning in medical education	2006	1078	1127	2020		1941
Automatic Image Annotation and Retrieval using Cross-Media Relevance Models	2003	974	793	2004	3	105
Overview of the status and global strategy for neonicotinoids	2011	904	943	2020	20	782
Determining semantic similarity among entity classes from different ontologies	2003	716	607	2008	15	258
A systematic review of software development cost estimation studies	2007	651	502	2012	3	602
Exokernel: An operating system architecture for application-level resource management	1995	626	525	1998	4	536
Gestures without libraries, toolkits or training: A $1 recognizer for user interface prototypes	2007	575	494	2,014	5	477
Cuba - A library for multidimensional numerical integration	2005	570	484	2019	2	73

	Scopus		Dimensions			
Title	Year published	No. of citation	No. of citation	Year most cited	No. of refering to references	Publishing reference
The Bayesian image retrieval system, PicHunter: Theory, implementation, and psychophysical experiments	2000	557	483	2004	20	105
Extracting information from textual documents in the electronic health record: a review of recent research.	2008	528	507	2019	7	645
Co-authorship networks in the digital library research community	2005	522	495	2018	11	524
Automatic recognition of multi-word terms: The C-value/NC-value method	2000	519	374	2018	4	304
A compact SPICE model for carbon-nanotube field-effect transistors including…	2007	513	453	2017	1	113
Agent-based Simulation Platforms: Review and Development Recommendations	2006	489	407	2013	2	927
Matrices, vector spaces, and information retrieval	1999	488	430	2008	31	235
Perl-speaks-NONMEM (PsN) - A Perl module for NONMEM related programming	2004	484	482	2020	11	170
Data matching: Concepts and techniques for record linkage, entity resolution, and duplicate detection	2012	468	348	2018	3	287
Automatic text detection and tracking in digital video	2000	468	404	2005	60	133
A Pseudo-Response Regulator is misexpressed in the photoperiod insensitive Ppd…	2007	453	502	2014	1	270
A real-time matching system for large fingerprint databases	1996	449	414	2005	61	105
Probabilistic author-topic models for information discovery	2004	436	347	2012	2	382
The MPEG-7 visual standard for content description - An overview	2001	405	351	2012	54	160
Mining version histories to guide software changes	2004	388	280	2013	4	322
Does the technology acceptance model predict actual use? A systematic literature review	2010	385	344	2020	2	1321
Digital libraries and autonomous citation indexing	1999	380	326	2005	50	384
Anatomy of high-performance matrix multiplication	2008	379	356	2016	16	336
Periodicity, directionality, and randomness: Wold features for image modeling and retrieval	1996	362	347	2002	3	92
Copy Detection Mechanisms for Digital Documents	1995	353	68	2015	60	118
A formal definition of Big Data based on its essential features	2016	352	374	2020	6	1057
Visualizing the non-visual: spatial analysis and interaction with information from…	1995	343	283	2007	3	250
The Google generation: The information behaviour of the researcher of the future	2008	334	289	2016	10	693
Ontology visualization methods - A survey	2007	333	255	2015	2	467
Security and privacy in electronic health records: A	2013	329	313	2019	28	

Title	Scopus		Dimensions			
	Year published	No. of citation	No. of citation	Year most cited	No. of refering to references	Publishing reference
systematic literature review						
Adaptive name matching in information integration	2003	327	281	2009	22	171
Comparison of reading paper and on-line documents	1997	324	305	2011	6	258
Ensemble selection from libraries of models	2004	302	354	2019	4	453
Socially assistive robots in elderly care: A systematic review into effects and effectiveness	2012	290	317	2020	8	492
Molecular shape diversity of combinatorial libraries: A prerequisite for broad...	2003	286	294	2019	3	318
Information filtering: Overview of issues, research and systems	2001	285	247	2018	1	256
On the recommending of citations for research papers	2002	283	230	2020		
Video visualization for compact presentation and fast browsing of pictorial content	1997	253	229	2010	55	34
Generalized Hirsch h-index for disclosing latent facts in citation networks	2007	246	234	2011	3	220
Identifying relevant studies in software engineering	2011	242	228	2019		
Big Data in the construction industry: A review of present status, opportunities, and future.	2016	240	220	2020	2	986
Early intensive behavioral intervention (EIBI) for young children with autism spectrum...	2012	239	282	2019	56	330
Google scholar: The pros and the cons	2005	237	202	2016	34	402
Prediction of Low-Thermal-Conductivity Compounds with First-Principles…	2015	233	241	2020	12	309
A novel feature selection algorithm for text categorization	2007	233	210	2019	1	192
Context-aware citation recommendation	2010	232	198	2019	1	304
The GrADS project: Software support for high-level grid application development	2001	223	212	2004	14	60
Jungloid mining: Helping to navigate the API jungle	2005	221	269	2013	1	67
Valgrind: A program supervision framework	2003	221	226	2006	13	74
Detection and representation of scenes in videos	2005	218	198	2012	9	76
Discovering web access patterns and trends by applying OLAP and data mining technology on web logs	1998	216	196	2002	4	117
The effect of information communication technology interventions on…	2016	215	242	2020	32	748
Augmented reality learning experiences: Survey of prototype design and evaluation	2014	215	188	2020	8	668
Automatic genre classification of music content	2006	215	166	2014	4	268
Virtual screening of molecular databases using a support vector machine	2005	211	188	2008	2	137
Time as essence for photo browsing through personal digital libraries	2002	211	181	2008	11	66

Title	Scopus		Dimensions			
	Year published	No. of citation	No. of citation	Year most cited	No. of refering to references	Publishing reference
Enabling technologies for fog computing in healthcare IoT systems	2019	209	217	2020	3	450
Learning author-topic models from text corpora	2010	208	190	2017	4	352
Automatic document metadata extraction using support vector machines	2003	206	127	2007		199
Clinical information extraction applications: A literature review	2018	205	253	2019	19	621
Supporting exploratory search	2006	205	151	2008	1	85
The readability of pediatric patient education materials on the world wide web	2001	203	196	2011	2	107
Smartphone and tablet self management apps for asthma	2013	199	208	2020	55	717
GIOSS: Text-source discovery over the Internet	1999	198	176	2007	4	36
The DBLP computer science bibliography: Evolution, research issues, perspectives	2002	197	168	2020	4	45
A parallel FDTD algorithm using the MPI library	2001	197	162	2007	1	65
Collaborative tagging as a knowledge organisation and resource discovery tool	2006	194	156	2009	1	226
A systematic review of immersive virtual reality applications for higher education:	2020	192	208	2020	40	1110

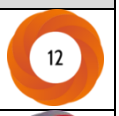
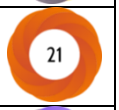
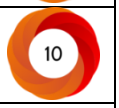
Based on the information in the table above, the following results can be seen:

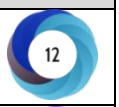
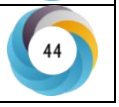
- The most cited document indexed in the Scopus database is "Texture features for browsing and retrieval of image data". This article was published in 1996 by Manjunath. This article has been cited 2984 times during the present study (2020). The highest number of citations received in this article in 2013 was 169 citations
- The most cited document indexed in the Dimensions database is "Texture features for browsing and retrieval of image data". This article has been cited 2588 times. It has also been studied 61 times on social networks and read 683 times through citation databases
- The highest number of observations through the studied citation databases is related to the article entitled "The impact of e-learning in medical education, " referred to 1941 times
- The highest number of citations of the studied social networks is related to the article "The jpeg2000 still image coding system: an overview". This article has been mentioned 88 times on social networks
- Scores related to the reading rate of highly cited sources in the studied citation databases

In this section, the scores related to the number of citations of each of the most cited documents in the field of digital libraries in the social networks of Patent, Twitter, News, Blog, Wiki, Google User, Source Policy, Q&A, and Facebook are mentioned separately. The received altmetric score is also displayed.

Table 2

Scores related to the number of citations of highly cited documents in the field of digital libraries on social networks (1965-2020)

Title	Patent	twitter	News	Blog	Wiki	Google user	Policy source	Q&A	Facebook	Altmeric score
Texture features for browsing and retrieval of image data	61									
ArnetMiner: Extraction and mining of academic social networks			1	1	3					
The jpeg2000 still image coding system: an overview	88									
Overview of the status and global strategy for neonicotinoids			8	1	1					
Determining semantic similarity among entity classes from different ontologies	15									
A systematic review of software development cost estimation studies	2		1							
Gestures without libraries, toolkits or training: A $1 recognizer for user interface prototypes	3	1				1				
Matrices, vector spaces, and information retrieval	31									
Perl-speaks-NONMEM (PsN) - A Perl module for NONMEM related programming	11									
Data matching: Concepts and techniques for record linkage, entity resolution, and duplicate detection		8		1				2		
Automatic text detection and tracking in digital video	60									
A real-time matching system for large fingerprint databases	60							1		
The MPEG-7 visual standard for content description - An overview	54									
Digital libraries and autonomous citation indexing	49	1								
Anatomy of high-performance matrix multiplication	1	9		1	5					
Copy Detection Mechanisms for Digital Documents	60									

Title	Patent	twitter	News	Blog	Wiki	Google user	Policy source	Q&A	Facebook	Altmeric score
A formal definition of Big Data based on its essential features		2			2				2	
The Google generation: The information behaviour of the researcher of the future		4		1	4		1			
Security and privacy in electronic health records: A systematic literature review	1	21			1		3		2	
Adaptive name matching in information integration	20						2			
Socially assistive robots in elderly care: A systematic review into effects and effectiveness		1	4	1			2			
Video visualization for compact presentation and fast browsing of pictorial content	55									
Early intensive behavioral intervention (EIBI) for young children with autism spectrum...		40	1	4		1	2	1	7	
Google Scholar: The pros and the cons		32							2	
Prediction of Low-Thermal-Conductivity Compounds with First-Principles…		12								
The GrADS project: Software support for high-level grid application development	14									
The effect of information communication technology interventions on…		27					3		2	
Augmented reality learning experiences: Survey of prototype design and evaluation	1	6					1			
Clinical information extraction applications: A literature review	1	15			2				1	
Smartphone and tablet self-management apps for asthma		51		2			1		1	
A systematic review of immersive virtual reality applications for higher education:		37		2	1					

The information in the table above is arranged in the order of the highly cited sources extracted from the Scopus database. According to the information in this table, the highest number of publications of a resource on social networks is related to the article "The jpeg2000 still image coding system: an overview," which is mentioned 88 times in the studied networks.

Based on the information in Table 3-6, the patent has the most significant number of publications in digital libraries. Twitter has been the most used since then**.** Study the relationship between altmetric scores and the number of citations received**.** The Spearman correlation coefficient test was used to examine the relationship between the research variables, according to the type of variables and their abnormal distribution.

Table 3

The correlation coefficient between the Altmetrics scores of the most cited documents in the field of digital libraries and the number of citations in the Scopus and Dimensions database

		Social network								Citation databases		
		Patent	Twitters	Blog	Facebook	Wikipedia	Google user	Policy source	Q&A	Mendeley	Cite U like	Connota
Scopous	correlation	**0.964	*0.457	-0.049	0.048	**0.870	0.029	0.029	0.068	**0.810	0.056	0.010
	significance	0.002	0,000	0.782	0.003	0.000	0.568	0.067	0.010	0.004	0.917	0.057
Dimensions	correlation	**0.818	*0.621	-0.032	**0.790	**0.747	-0.059	0.032	0.008	**0.893	-0.002	-0.002
	significance	0.001	0.000	0.688	0.000	0.000	0.784	0.092	0.041	0.000	0.997	0.039

**Significant at 0.01 * Significant at 0.05

The significance level related to the correlation coefficient between the altmetric scores obtained from the social networks Patent, Twitter, Wikipedia, and Facebook and the number of citations in Scopus and Dimensions is less than 0.05. Therefore, according to the observed correlation coefficient, this field has a positive and significant relationship. The significance level between the heterogeneity scores of blog social networks and the number of citations in Scopus and Dimensions databases is higher than 0.05, and the existing correlation coefficient indicates no significant relationship in this field.

The significance level between the altmetric scores obtained from the Mendelian citation database and the number of citations received in Scopus and Dimensions is less than 0.05. The obtained correlation coefficient also shows a strong relationship between altmetric scores and the number of citations received in these two databases. The level of significance between the site's orthogonal and conotto altmetric scores and the number of citations received in Scopus and Dimensions indicates the absence of an inverse relationship. The negative correlation coefficient obtained from the relationship between the altmetric scores of "cite U like" and Conota with the number of citations received by Dimensions indicates a negative relationship. A multiple regression test was used to evaluate the predictive power of the number of citations in the Scopus database by measuring viewing documents in citation databases. Document observation metrics are considered predictor variables, and the citation number index is considered a dependent variable.

The significance level (0.000) obtained in this study shows that the document observation metric can predict the number of citations received in the Scopus database. Viewing documents has an 18% ability to predict the number of citations received in the Scopus database (Table 4).

Table 4
Multiple regression coefficients between viewing documents in citation databases and the number of citations received in Scopus

variables	number of citatins				
Predictor	R	R^2	β	Sig.	t
Observing documents in citation databases	0.428	0.183	0.428	0.000	3.963

Document metering on social media can predict the number of citations received in the Scopus database. Publishing documents on social networks to a minimal extent (less than one percent) can predict the number of citations received in the Scopus database (Table 5).

Table 5
Multiple regression coefficients between the publication of documents on social networks and the number of citations received in Scopus

variables	number of citatins				
Predictor	R	R^2	β	Sig.	t
Publishing documents on social network	0.238	0.056	0.238	0.000	3.963

According to the T score (-2/849), the publication of documents on social networks cannot predict the number of citations received in the Scopus database (Table 6).

Table 6
Multiple regression coefficients between the year of publishing and the number of citations received in Scopus

variables	number of citatins				
predictor	R	R^2	β	Sig.	t
Year of publishing	0.067	0.077	-0.277	0.005	- 2.849

Discussion

Calculating the correlation coefficient between the altmetric scores related to the publication of documents on social networks and the number of citations made in Dimensions shows that the highest correlation values are between the patent network (0.818) and Facebook (0.790), Wikipedia (0.747), and Twitter (0.621), respectively. Other social networks such as Blog, Google User, and Q&A do not have a significant relationship with the number of citations received in Dimensions Almost the same results have been repeated in the correlation between the publication of documents on social networks and the number of citations received in Scopus. The correlation between the publication of documents on social networks and the number of citations received in Scopus related to the social network Patent (correlation coefficient 0.964) and Wikipedia (correlation coefficient 0.870), and Twitter (correlation coefficient 0.457), respectively. In this case, the social networks of Blog, Google User, Pulse Source and Keywanda do not significantly correlate with the number of citations received. All of the above results are based on the research findings of Biranvand, Sami and Rahmanian (2021), Tang, Tsang and Van (2020).

Previous research (Biranvand et al., 2021; Biranvand & Shanbady, 2022; Susarla & Friedrich, 2018) showed that there was a positive correlation between altmetric scores in social networks.

And the scientometric indicators of databases express the importance of working in social networks, using citation databases, and sharing scientific products in this way. Although a significant relationship between the presence of documents in social networks and the absorption of citations in databases has been reported in most studies. One of the factors indicating the importance of scientific interaction and participation through socio-scientific networks is the study of the status of highly cited articles in scientific fields. Examining the relationship between the numbers of citations received from articles in scientific databases, and the number of observations of articles in socio-scientific networks provides a clear understanding of the importance of authors' activities in social networks.

Examining the correlation between viewing documents in citation databases and the number of citations received in Daimenson shows that only between the Mendel citation database and the number of citations received in Dimensions is there a powerful relationship (correlation coefficient 0.893), and in the case of databases. There is no significant relationship between site U like and connota. The study of the correlation between the observation of documents in citation databases and the number of citations received in Scopus also shows a strong relationship (correlation coefficient of 0.810) in this case. Other citation databases like CiteUlike and Conotta do not significantly correlate with citations in Scopus. The results of this part of the research are in line with Poladian and Bergo (2017), Riahinia, Rahimi, Jahangiri, Biranvand and Shanbadi (2020), and Susarla and Friedrich (2018). But it contradicts the results of Parabhoi and Verma (2019).

The results obtained regarding the relationship between the year of publication of sources and the year of receipt of the highest number of citations received in Scopus and Dimensions show a positive and significant relationship in this field. The significance level of < 0.000 and the correlation coefficient of 0.654 show a relatively strong relationship between the year of publication and the year of receiving the highest number of citations, between the time of publication of documents, and the time of receiving the highest number of citations. Examining the average year required for a degree to receive the highest number of citations is one of the most important issues for many researchers and authors of scientific works.

The results of the study on the predictive power of the number of citations received in the Scopus database by publishing documents on social networks show that the publication of documents on these social networks is not able to predict the number of citations in Scopus. The results of the study on the predictive power of the number of citations received in the Scopus database by viewing the documents in the Mendelian, SiteUlike, and Conotta citation databases show that the observation of the documents in these citation databases is very small (Less than one percent) can predict the number of citations in Scopus.

The results show that the Altmetrics scores obtained from the Dimensions database do not have the power to predict the citations made in the Scopus database. There is a positive and significant relationship between the metrics obtained from social media activity and the scientometric indicators of the Scopus database, indicating that the authors of the field of digital libraries from ResearchGate distribute and share the results and use their research.

One of the topics studied in this study is to identify the relationship between altmetric scores resulting from the publication and viewing of documents on social networks with the number of citations received in the Scopus database in the field of digital library resources. The results of Tang et al., (2020), Votars et al. (2019), Poladian and Bergo (2017), Shrivastava and Mohajan (2016), Parabhoi and Verma (2019), Tehlwal (2017) ,and Susarla and Friedrich (2018) confirm the positive impact of the use of social networks and databases in the process of forming more citations.

Conclusion

What can be concluded from the results of the present study is that it is not possible to predict the number of citations in the Scopus database by Altmetrics scores obtained from social networks. The results of this study confirm the positive effect of using social networks and databases in forming more citations. Accordingly, it is suggested that the factors influencing the tendency to use social networks in digital libraries be identified. Also, identify the thematic relevance of posts posted in connection with a particular article on social media. Finally, the distribution and sharing platforms of information by domestic and foreign authors in digital libraries are identified and compared. Finally, based on the research findings, the following is suggested:

- Identify the factors influencing the tendency to use social networks in digital libraries.
- Identify the thematic relevance of the posts published in connection with a specific article on social networks.
- Identify and compare the distribution and sharing platforms of information by domestic and foreign authors in the field of digital libraries.

References

Bardus, Marco., El Rassi, Rola., Chahrour, Mohamad., Akl, Elie. W., Raslan, Abdul. Sattar., Meho, Lokman. I. & Akl, Elie. A. (2020). The use of social media to increase the impact of health research: systematic review. *Journal of medical Internet research*, 22(7), e15607. https://doi.org/10.2196/15607

Biranvand, A., Ghanaatian, M. & Alhaei, H. (2021). Investigating the relationship between Altmetric Scores of highly cited articles in the field of particle physics and citations received in databases. Journal of Studies in Library and Information Science. https://doi.org/10.22055/slis.2021.36442.1819 [in Persian]

Biranvand, A., Samie, M. E. & Rahmaniyan, S. (2021). Investigating the relationships between activity of iranian producers in the field of business management in social networks with the scientometric indices of databases. Knowledge Retrieval and Semantic Systems, 8(26), 29-49. https://doi.org/10.22054/jks.2021.58283.1409 [in Persian]

Biranvand, A. & Shanbedi, Z. (2022). Investigating the effect of altmetrics index of ResearchGate social network on research activities of Iranian authors and researchers in the field of nursing in databases. *Knowledge Retrieval and Semantic Systems*, 9(30), 21-40. https://doi.org/10.22054/jks.2020.54330.1352 [in Persian]

Biranvand, A. & Shanbedi, Z. (2020). Investigation of Altmetrics indices obtained from the activities of Iranian writers and researchers in the field of nursing in scientific social networks. Journal of Studies in Library and Information Science. https://doi.org/10.22055/slis.2020.34507.1778 [in Persian]

Chawinga, Winner Dominic. (2017). Taking social media to a university classroom: teaching and learning using Twitter and blogs. International Journal of Educational Technology in Higher Education, 14, 3. https://doi.org/10.1186/s41239-017-0041-6

Lawton, A. (2016). Social networking tools for informal scholarly communication prove popular for academics at two universities. *Evidence Based Library and Information Practice*, 11(2), 195-197. https://doi.org/10.18438/B84P65

Mason, S. (2020). Adoption and usage of academic social networks: A Japan case study. *Scientometrics*, 122(3), 1751-1767. https://doi.org/10.1007/s11192-020-03345-4

Mohammadi, E. & Thelwall, M. (2014). Mendeley readership altmetrics for the social sciences and humanities: Research evaluation and knowledge flows. *Journal of the Association for Information Science & Technology*, 65(8), 1627-1638. https://doi.org/10.1002/asi.23071

Ortega, J. L. (2018). Reliability and accuracy of altmetric providers: A comparison among altmetric.com, plumx and crossref event data. *Scientometrics*, 116(3), 2123-2138. https://doi.org/10.1007/s11192-018-2838-z

Parabhoi, L. & Verma, M. K. (2019, December). Mendeley Readership Counts: An investigation of DESIDOC Journal of Library & Information Technology. In *First International Conference on Science & Technology Metrics*, (pp. 02-04). Bangkok, Thailand.

Pooladian, A. & Borrego, Á. (2017). Twenty years of readership of library and information science literature under Mendeley's microscope. Performance measurement and metrics, 18(1), 67-77. https://doi.org/10.1108/PMM-02-2016-0006

Priem, J. Piwowar, H. A. & Hemminger, B. M. (2012). Altmetrics in the wild: Using social media to explore scholarly impact. arXiv preprint arXiv:1203.4745.

Shrivastava, R. & Mahajan, P. (2016). Relationship between citation counts and Mendeley readership metrics: A case of top 100 cited papers in Physics. *New Library World*, 117(3/4), 229-238. https://doi.org/10.1108/NLW-09-2015-0064

Susarla, S. M. & Friedrich, J. B. (2018). Discussion: Alternative metrics of scholarly output: The relationship among Altmetric Score, Mendeley Reader Score, citations, and downloads in Plastic and Reconstructive Surgery. *Plastic and reconstructive surgery*, 141(3), 810-811. https://doi.org/10.1097/prs.0000000000004133

Tang, Y., Tseng, H. & Vann, C. (2020). Unwrap citation count, Altmetric Attention Score and Mendeley readership status of highly cited articles in the top-tier LIS journals. *Global Knowledge, Memory and Communication*, 69(8/9), 653-664. https://doi.org/10.1108/GKMC-01-2020-0005

Tess, P. A. (2013). The role of social media in higher education classes (real and virtual)- A literature review. *Computers in Human Behavior*, 29(5), A60-A68. https://doi.org/10.1016/j.chb.2012.12.032

Thelwall, M. (2017). Do Mendeley reader counts indicate the value of arts and humanities research? *Journal of Librarianship and Information Science*, 51(3), 781-788. https://doi.org/ 10.1177/0961000617732381

Thelwall, M. & Kousha, K. (2014). Academia.edu: Social network or Academic Network? *Journal of the Association for Information Science & Technology*, 65(4), 721-731. Retrieved from https://ideas.repec.org/a/bla/jinfst/v65y2014i4p721-731.html

Thelwall, M. & Kousha, K. (2017). ResearchGate versus Google Scholar: Which finds more early citations? *Scientometrics*, 112(2), 1125-1131. https://doi.org/10.1007/s11192-017-2400-4

Wouters, P., Zahedi, Z. & Costas, R. (2019). Social media metrics for new research evaluation. In W. Glänzel, H. F. Moed, U. Schmoch, & M. Thelwall (eds.), (W. Glänzel, H. F. Moed, U. Schmoch, & M. Thelwall, eds.), *Springer Handbook of Science and Technology Indicators* (pp. 687-713). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-02511-3_26