Social network analysis of mythology field

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Abstract

Purpose – The main purpose of the study is to detect, monitor the mythology field and make predictions of the development of it using social network analysis metrics. Mythology, which is the subject of many disciplines, is an area with extensive working potential. In addition to basic bibliometric indicators, the relationships of this field, which cannot be seen by other methods, were analyzed using measures such as centrality, between, eigenvector, modularity and silhouette coefficients.

Design/methodology/approach – In this study, social network analysis of the field of mythology, which has an interdisciplinary structure, was made. Within the scope of the study, 28,370 publications were selected from the publications in the field of mythology in the Web of Science (WoS) citation database between 1900 and 2019 using the probability-based stratified sampling method (5%), and detailed analyzes were made on these publications. The aforementioned publications were analyzed in terms of publication and citation numbers, publication types, subject categories, keywords used, co-authorship, researchers with the highest number of publications, institutions and countries with the highest number of document co-citations.

Findings – The findings show that the field of mythology gathers around four main subjects (sociology, folklore, politics and anthropology). When interpreted in terms of centrality metrics in more detail, the symbiotic or complementary relationship between anthropology, folklore, politics, sociology and mythology can be easily observed.

Originality/value – The findings of this study are seen important for scientists, decision-makers and policymakers. In addition, the findings of the study can be used to create the curriculum of the field.

Keywords Mythology, Social network analysis, Betweenness centrality, Silhouette coefficient, Modularity coefficient

Paper type Research paper

Introduction

The main purpose of visualization of the field of science is to detect, monitor and make predictions of the development of the field. Scientific networks, on the other hand, have a variable structure and over time some variables are relatively light, while others are dramatic. Understanding the effects of these variables is important for all players of scientific communication (Chen, 2004, p. 5303). In addition to determining the needs of the field, we can also define visualization and social network analysis as a key element in terms of the evaluation of scientific publications and the development of the scientific policies of countries. The importance of bibliometric research and social network analysis in guiding science and technology policies has also led to the establishment of centers operating for this purpose in various countries. In this context, the *Centre for Science and Technology Studies (CWTS)* in the Netherlands is a center that conducts advanced quantitative analysis of science and technology performance.

Many aspects of a scientific field are revealed using different methods such as scientific collaboration networks, author co-citation maps, citation networks and monitoring of co-citation networks. Although these methods and bibliometric indicators give us general information about the network in question, relationships can be observed more in depth in

social network analysis. In network analysis, relationships between players have a primary priority, while individual features are secondly important (Otte and Rousseau, 2002, p. 442). Some authors who are not noticed in bibliometric analyses performed by traditional methods based on frequency calculation may have an extremely important role within the network. Social network analysis offers an effective method for showing us such unnoticed points (Mangas-Vega *et al.*, 2016, p. 912).

Social network analysis also guides us in terms of understanding the scales and characteristics of the distribution of scientific literature. This method allows people to understand how to share professional knowledge efficiently; helps measure and evaluate the scientific performance of individuals, groups or the entire social network (Abbasi and Altmann, 2010, p. 50). Beyond that, this method of analysis, which is used to examine the detection of potential interdisciplinary collaborations, the structure, patterns of existing collaborations and also new developments, provides quantitative and qualitative measurements to better understand the relationship of its members on a particular social network (Scott, 2000, p. 3).

Metrics on how to interpret the network created in social network analysis are called network structure measures (density, number of components, distance, diversity, etc.). It is one-to-one associated with the structure of the network or the area examined which of these measures should be used during reading of the network. For example, it may be important for the person who is connected to other players on the network in terms of collaboration rather than the person who receives the most citations on a network. Therefore, we can say that the authors who define the center point as degrees respond to the potential for visibility or effectiveness in the communication of these points. This measure, called *betweennes centrality*, is sort of a spy network, which detects most of the classified information transmitted through which spy. In this network, this central person is important for the main network to be located on the network (Freeman, 1979, pp. 219–220). Another important measure is *centrality*, a measure that shows how many moves go from one point to the other, i.e. how many people connect a person to the other person. This information shows us how quickly the person has access to everyone on the network (Abbasi *et al.*, 2011, p. 598).

In the examinations conducted using all these social network analysis measures, the course of scientific fields over time has become possible. It is also important to use network metrics to hold the projection on the field. The purpose of this paper is to detect the development of the mythology field using the social network analysis metrics. There is no scientific analysis on this field and as mythology has a multidisciplinary feature, the findings of this paper will guide future studies for who works in the field. According to the results of the paper, researchers will be able to see more clearly in the light of what have been studied, to detect new topics, and to provide an opportunity to publish more effectively recognizing gaps. Since the results of this paper inform us about the future view of the field of mythology, it will pave the way for researchers and save them from repetition. This paper is also illuminating for decision-makers in higher education and policymakers. Nevertheless, the findings of the paper can be used to create the curriculum of the field.

Literature review

Network analysis is a case based on the 1700s. "Can you connect from a certain place and return to the starting point by crossing only once?" was asked about the seven bridges on the Pregel river in Königsberg, Prussia (Gribkovskaia *et al.*, 2007). Leonhard Euler's mathematical proof of 1735, which proved the impossibility of the trip in question, is described as the origin of the graph theory. Jacob Levy Moreno, founder of sociometrics discipline, said networks could be used not only to show technical issues but also relationships between individuals and groups (Rostampoor-Vajari, 2012).

A new technique-initiated social networking analysis in the 1960s (Scott, 1991) is to understand how the focus of the analysis and network structure features affect behavior (Webster and Morrison, 2004). Over time, studies have developed to understand the current status and course of all players of the scientific community. For example, there are studies that have used the social network analysis method on issues such as inter-journal relations, how information flow develops and the classification of journals (Leydesdorff, 2004, 2007; Biehl *et al.*, 2006; Lin and Liao, 2008; Polites and Watson, 2009). Social network analysis measures were also used to visualize the disciplines of scientific journals (Leydesdorff, 2007). These studies are also important in terms of monitoring the development of disciplines through journals.

There are also studies that examine the issues of cooperation with scientists, such as studies conducted using social network analysis method to increase cooperation between individuals and help solve problems (Pereira and Soares, 2007; Abbasi *et al.*, 2011; Malin and Carley, 2007; Eblen *et al.*, 2012). This method gives more detailed information on how to organize environments that support the transmission of information between the communities and the collaborations of scientists (Larivière *et al.*, 2006) and communities in the context of fields (Malin and Carley, 2007). Not only field, journal, researcher, but also new subjects/areas (such as big data, personal publishing, electronic participation) are also investigated using this method in the literature (Hu and Zhang, 2017; Vahed *et al.*, 2018; Mangas-Vega *et al.*, 2016; Kaliva *et al.*, 2015).

Social network analysis is also used for the evaluation of websites. Yang *et al.* (2010) conducted a link analysis on the website of the top 100 universities in China to see their relationship. Similarly, Palonen and Hakkarainen (2000) used social network measures to analyze peer interaction patterns in a computer-aided classroom of primary school students. The study analyzed the intensity of direct interaction between students, the scope of each member's participation (centrality) and the model of interaction (centralization) in society as a whole. Another study that analyzed the development of social networks in marketing research and network structures was also used in centrality measures (Wang *et al.*, 2015).

Studies examining directly the overall structure and development of disciplines are not much. Wu and Duan (2015) performed social networking analysis on the author/institution/ country basis of the psychiatry field. In this study, the network's centrality metrics (betweenness, closeness, brokerage, clousure and eigenvector) were looked at, as well as the most prolific authors, institutions and countries. In another study, Kumar and Zhang (2007) examined their online marketplaces through an example of the eBay platform. In order to understand buyer–seller interaction, user habits and popular product categories, this study concluded that the most visible player, associated with quantity and quality, does not necessarily need to have the best position on the network. There is also the study examining the development of librarianship and information science, the publications of Library HiTech, one of the important journals of this field, covering the 2006–2017 year range were analyzed. In addition to bibliometric measurements, social network measurements were used in analyses such as the frequency of passing keywords together (co-occurrence analysis of the keywords) (Cheng *et al.*, 2018). In another study of similar concept (Matheus, 1996), an analysis of the library and information science field in Brazil was conducted. In the study, which also benefited from bibliometric measurements, the effectiveness status of the authors was examined by the analyses using centrality measurements. In another study that demonstrates the research structure in agriculture in Portugal and how the process of creating and transferring information in this field develops, in addition to co-authorship, how information sharing occurs within the scope of agricultural research and development (R&D) applications and where information capital is fed and network structures have been thoroughly analyzed (Neto *et al.*, 2008).

There are also studies in the literature that mention the use of social network analysis method, and when the study is examined, it is seen that only bibliometric methods are used.

The study analyzed the doctoral thesis in India in the field of renewable energy, the social network analysis is not used; identifying statistics was enough (Kumar and Narula, 2017). Another study measured the increase or decrease in the number of citations taken based on the scientific cooperation strategies implemented by researchers in nuclear science and technology and the relationship between these strategies and each strategy implemented. It is seen that bibliometric methods are used in this publication. Although the title of the study stated that the social network analysis method was used, the findings of the study are not in this direction (Tajedini *et al.*, 2018).

The main purpose of this study is to analyze of the development of the mythology field using the abovementioned social network analysis metrics. Mythology, which is the subject of many disciplines, is an area with extensive working potential. In addition to basic bibliometric indicators, the relationships of this field, which cannot be seen by other methods, were analyzed using measures such as centrality, between, eigenvector, modularity and silhouette coefficients. There is no such detailed analysis of the field of mythology. As stated above, the field of mythology shows a multidisciplinary feature, the data expected to guide future studies have valuable data both for those working in this field and subfield as sociology, folklore, anthropology and politics. Nonetheless, we believe that it is worth not only for mythology and its subfields, but also for many researchers in the fields such as history, archeology and linguistics, both in terms of subject matter, publications and persons that they should keep up with.

Data source and method

The aim of this study is to examine publications in the field of mythology from various angles (publication and citation numbers, publication types, subject categories of publications and keywords used in publications, co-authoring, the most published researchers, institutions and countries with the most common publications). The data used in the scope of the study were provided from the Web of Science (WoS) citation database. For this purpose, between 1900 and 2019, the study of mythology in WoS between 1900 and 2019 included those who passed "folklore" or "legendry" or "mythry" or "mythos" or "tradition" in the search for subjects (at least once in essence or keywords). The dataset was then reshaped with expert help and represented the mythology field with 141,850 sources. In order to perform detailed analysis of these resources, the sample was chosen. Another reason for selecting the sample is that the data provided from the WoS citation database is dirty and often manually corrected. Because the quality of the dataset directly affects the analysis results, it is important to use a dataset that represents the population and has completed corrections. In this context, 28,370 resources were selected by probability-based strata sample selection method, and all analyses were carried out on this dataset. Although all resources have been scanned since 1900 while searching, the oldest source in the dataset belongs to 1975. The data were visualized using ten0-year slices so that the development and change of the field can easily be monitored. There are 28,370 studies in the sample between 1975 and 2019 and 802,925 references to these studies. Because the ability to represent the population is higher, layered sample based on probability has been preferred. Strata sample selection was made in the form of systematic sample selection from the list sorted by the number of citations. There is no prejudice in the selection of samples. The pattern of continuous increase of publications in the dataset over the years is reflected in sampling (Figure 1).

Within the scope of the study, 50 records with the most citations (or joint citations) per 10 annual slices were visualized. On the other hand, there are a lot of anonymous work in the dataset. CiteSpace and VOSviewer software are used to visualize data.

The questions we sought in our research are:
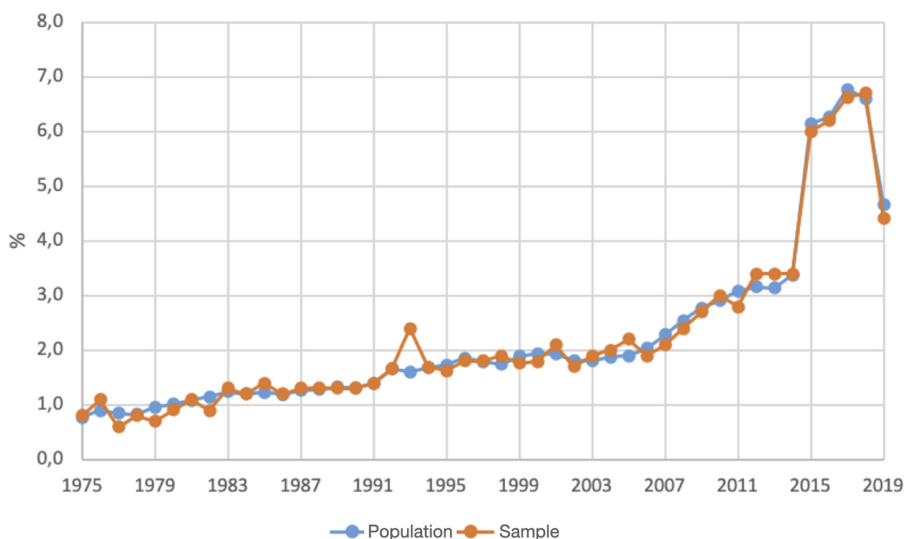
(1) Is there any change in publications or concepts in the field of mythology according to time?

(2) What is the trend in terms of document co-citation in the field of mythology and is there any difference in time?

(3) What are the works that can be considered a turning point among the publications in the field of mythology?

(4) What are the areas with symbiotic relations with the mythology field?

(5) Who are the key authors in the field of mythology?

(6) Which institutions and countries are the most collaborated by the authors who produce publications in the field of mythology?

Findings and discussion

This section offers general information about the studies in the field of mythology, which were first published between 1975 and 2019. The findings for 28,370 sources and references created by layered sample selection method were evaluated by social network analysis method.

General information

Between 1975 and 2019, there were 141,850 publications in the field of mythology, and a total of 463,147 citations were made (three citations per publication on average). The distribution of these publications and citations by years is given in Figure 2. The number of citations in the field of mythology has increased since the early 1990s. This can be a factor since the 1990s, when citation indexes became important all over the world. Because between 1990 and 2000, the number of journals in the WoS (Clarivate Analytics) citation index increased by 21% (Testa, 2011). The number of publications in the field of mythology has also increased significantly since 2014. The number of studies published in 2019 is small. It can be said that
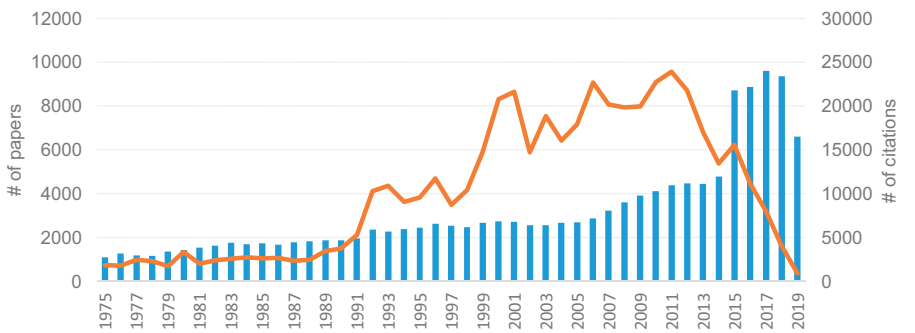
the studies published in 2019 and the citations made to them are not yet listed in the directory. On the other hand, the number of citations based on the number of citations calculated the use of a journal according to the number of citations and the average life of half-life is an important data. Half-life of the journals, where mythology studies are frequently published, has been for an average of ten years. Again, because there are a lot of monograph-type publications in the field of mythology and the frequency of publication of these publications is low, the frequency of citations coming to the studies is also low (because the type of studies cited are monographs more) [1].

Research articles account for 58% of publications in the field of mythology (Table 1). Another type of publication most common is book reviews and accounts for about a third (28%) of publications.

The most published literary compilation journal is *The Times Literary Supplement*. One of the factors in the number of publications is that it contains a lot of publications because it is a weekly journal. It is interesting that *the Library Journal*, which includes publications about librarianship founded in 1876 by Melvil Dewey, the developer of the Dewey Ten Classification System, is at second place. It is thought that the interdisciplinary structure of both librarianship and knowledge science and the field of mythology has an effect resulting with the large number of publications in the table's "Other" section (see Table 2).

The top ten researchers who contribute the most to publications in the field of mythology are listed in Table 3. The dataset has 1,282 anonymous work. One of the most important reasons for this is that referencing is not done according to standards. Edgar Charles Polomé, professor of comparative religions and languages, is the most contributing person. In addition, researchers such as Jacqueline Simpson, Robert Wildhaber and Walter Puchner are also significant. Half of publications have five or more authors.

Researchers in the field of mythology collaborated with 15,955 different institutions. The distributions of publications according to the top ten most collaborative institutions and

Figure 2.
Publications on mythology and their citation counts

Publication type	N	%
Article	82,904	58.44
Book review	40,152	28.31
Proceeding	7,730	5.45
Publishing	3,287	2.32
Review	2,986	2.11
Letter	949	0.67
Note	725	0.51
Other	3,117	2.20
Total	141,850	100.01

Table 1.
Distribution of publications in the field of mythology by document types

countries are shown in Tables 4 and 5. In collaborating institutions (Table 5), University of California, University of London, University of Oxford; In the cooperative countries (Table 6), the US, Britain, Canada, Russia, Germany and the UK are among the first.

Social network analysis
Co-citation network for publications. Common attribution networks allow both the landmark work in the fields and key authors to identify and monitor authors and publication sets by year. Figure 3 shows a network of co-citation with 293 nodes and 732 connections created for the mythology area. Each color shows a time frame of ten years, and time-based inferens are made through colors. The top section of Figure 3 appears in the colors that CiteSpace uses to visualize time zones. Blue color is the first years, the green color is mid-years, orange and red colors have been in recent years. As can be easily viewed from the network, darker colors represent older times, while lighter tints indicate recent times. When interpreted chronologically, there are usually studies on *folklore* in the first 20 years. In the next ten years, studies in *sociology* were commemorated in studies in the field of *mythology.*

Journal name	N	%	Journal name	N	%
TLS the Times Literary Supplement	1228	0.87	Western Folklore	570	0.40
Library Journal	1162	0.82	New York Times Book Review	501	0.35
Journal of American Folklore	829	0.58	Classical Review	492	0.35
Folklore	706	0.50	Catholic Biblical Quarterly	472	0.33
Fabula	699	0.50	Other	134.551	94.85
American Historical Review	640	0.45	Total	141.850	100.00

Table 2. Distribution of publications in journals the field of mythology

Author (s)	Publication count	Author(s)	Publication count
Anonymous	1,282	Nicolaisen WFH	44
Polomé EC	90	Wood J	40
Simpson J	77	Bendix R	36
Wildhaber R	65	Bronner SJ	33
Puchner W	56	Other researchers	149,803
Top S	46	Total	151,572

Note(s): The total number of publications is over 141,850 due to co-author publications with many authors

Table 3. Researchers contributing to publications in the field of mythology (top 10)

Institute	Document co-citation	Institute	Document co-citation
California University	2,428	Harvard University	850
London University	2,071	New York State University	838
Oxford University	1,299	Toronto University	821
Russian Academy of Sciences	1,204	Wisconsin University	734
Cambridge University	1,062	Other	141,679
Pennsylvania Higher Education Institution	853	Total	153,839

Note(s): The total number of publications is over 141,850 because some publications are collaborated with multiple universities

Table 4. Most collaborated institutions in publications in the field of mythology (top 10)

Then, *anthropology* and policy-related publications in recent years' *politics* have been prominent.

Choosing thresholds is very important in social networking research. For example, if the threshold value is taken to five, publications with less than five partners (authors, institutions, countries) do not enter the network, so both broadcast frequency and connection forces (and all other centrality measures) are calculated accordingly. In this case, the number of collaborative authors, institutions, countries does not reflect the actual value, and the network is shaped differently. For this reason, the threshold value was taken as one in this study.

One of the most important points regarding the structure of the network is the intensity. The more connections between the points, the more dense the network is. In this context, the network is not dense because the density is 0.0171. Although low-density, it is important to remind you that at this point the density of a network containing many (293) players will already be low. In addition, the number of isolated network parts (7) that are not connected to each other is not greater. More specifically (at the cluster level), when the relationships are examined for citations, for example, in cluster number 2, the connections are looser. On the other hand, connections in cluster 0, the largest cluster (which hosts the most players), are tighter, the density from center to outward is reduced and the number of independent works is only three (see Figure 3).

Centrality from network scales is related to the position of players on the network, and one of their most important goals is to identify the main players. One of the measurements of centrality is interconnector (betweenness centrality), a measurement of connection level with other units where a unit is not directly linked (Chen, 2016). The distance centrality score is calculated as the smallest number of paths between the two points and the section of the total number of paths. The value of centrality between authors, studies, journals or institutions that provide the relationship between different clusters is determined by value. In Figure 3, the thickness of purple rings represents the degree centrality of the between the nodes. The thicker the ring in question, the higher the centrality value of the splint. Such authors or studies serve as bridges between different clusters.

In general, the centrality ratings of players were found to be relatively low (up 0.24). Therefore, we can describe the common network of citations for publications in the field of

Country	N	%	Country	N	%
United States of America	41,571	35.77	Australia	3,364	2.89
England	11,100	9.55	France	3,237	2.79
Canada	5,326	4.58	Italy	2,657	2.29
Russia	4,965	4.27	China	2,013	1.73
Germany	4,212	3.62	Other	33,988	29.24
Spain	3,624	3.12	Total	116,057	100.00

Note(s): Different from the total 100% due to a rounding error

Table 5.
The countries most collaborated in publications in the field of mythology (top 10)

Cluster ID	Publication count	Silhouette coefficient	Average year
0	48	0.822	1987
1	46	0.892	1994
2	38	0.972	1977
3	28	0.944	2006
4	10	0.998	2012
5	7	0.990	1986

Table 6.
Information for clusters
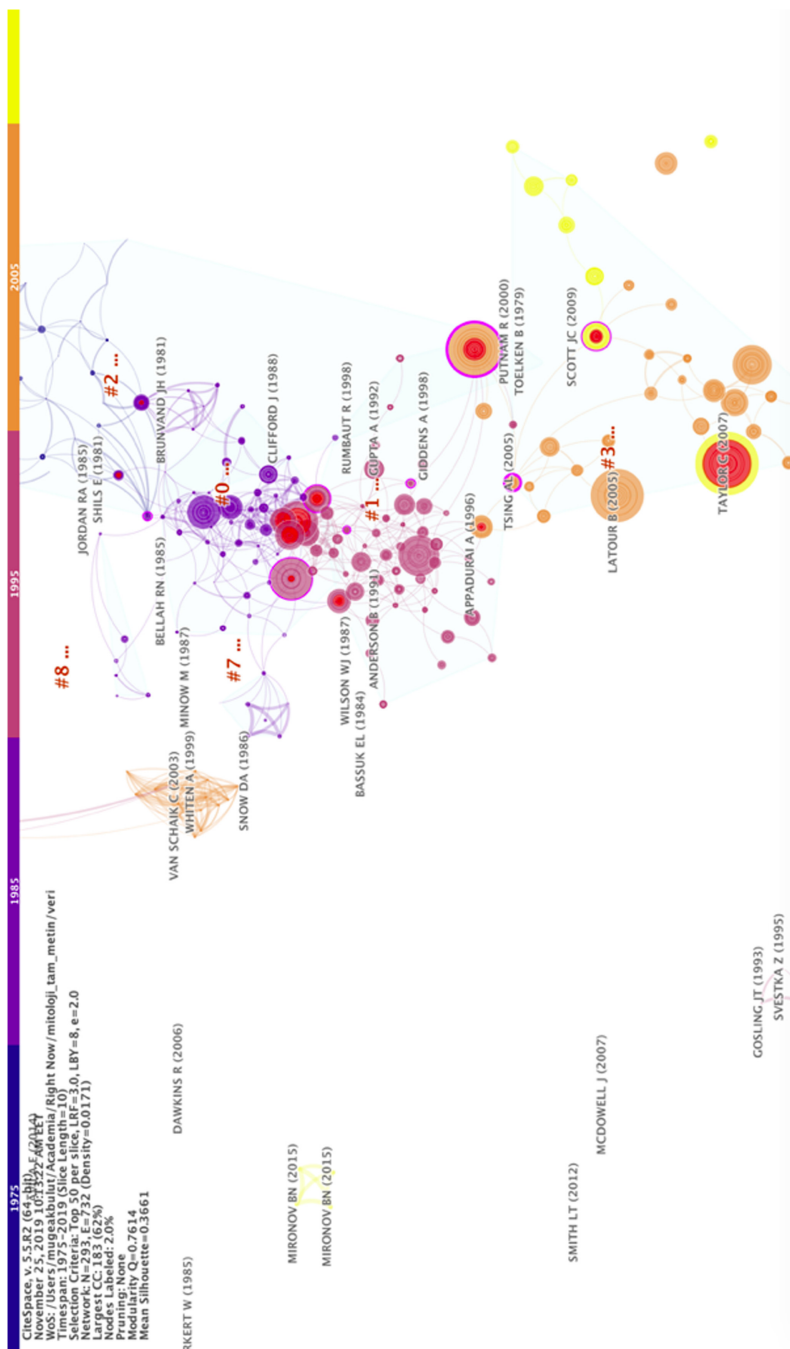
Figure 3.
Between 1975 and
2019, the common
attribution network in
the field of mythology
(for publications)

mythology as a loose network. This can be interpreted as an indication that many disciplines refer to areas influenced by mythology, even if they are not directly related to mythology.

When we look at the subject distribution of broadcasts on the network, the clustering made by us, regardless of the clustering of Citespace, is as in Figure 4. Co-citations are gathered around a total of four main topics (sociology, folklore, politics and anthropology) and are shaped as multihubs as network structure. Each group represents a different style of behavior. So we can say that there are four subareas for the large cluster of mythology. In more detail, when the common web of mythology is examined, the [2] symbiotic relationship between *anthropology, folklore, politics* and *sociology* and the field of mythology can be easily observed.

When the policy set (see Figure 4) is examined in detail, studies that are directly or indirectly related to policy stand out. Orange and Petersson (2017), with their work on Islam and nationalism in Kazakhstan, Sadeghi (2013) stands out with her book on women and prayers in the context of Islamic Law. Schindler's (2015) book on political poetry and mythology on classical philology, and Gerber's (2015) book on mythology and political developments are located in the policy set. The work in the cluster was written after 2013. In this context, we can say that the work on *politics* in the field of mythology has begun to be studied recently.

The small network, positioned as a different orange component on the left side of the network, represents the work in the journals *Nature* and *Science*. These studies are positioned as small word, which does not contain links to other clusters.

When the co-citation network created for the mythology field is examined holistically, it can be said that similar behaviors are exhibited in terms of co-authoring among the works on *folklor* and *sociology*. Both groups are heavily co-authored within themselves. In many studies (citation explosions are citation bursts), observed in the field of *sociology* in particular. Bauman's work "Verbal Art as Performance" in *the American Anthropologist* journal, for example, in the year it was published received citation explosion. Herman Melville's world-famous novel, White Whale, received citations explosions after 12 years its release and along seven years. Therefore, the situation addressed as *sleeping beauty* was encountered in the literature. Kirk and Bauman's work is described in the literature as smart girls as it has experienced an explosion of citations immediately after its release (see Figure 5).

The work of philosopher Charles Taylor, political scientist Robert Putnam and anthropology professor Anna Lowenhaupt Tsing are keys to the mythology field. All three of the aforementioned studies are in the book genre and have received a lot of references in relation to the interdisciplinaryness of the field of mythology. As the authors can tell from their professions, they connect different clusters. Putnam, for example, has conducted a study on the fact that American civil society has lost considerable power in recent years. This study can be easily watched on the network, where it is in a bridge position between both *sociology, politics* and *folkscience* clusters. Since the study describes concepts and changes from a cultural perspective, it also takes many citations from different disciplines such as politics, *history* and *sociology*. Therefore, a researcher who cites these individuals will have the visibility of his work in all three subareas.

From the point of view of the groups, the key players are determined by centrality measurements. In particular, each player may have a different significance. One study is important for proximity, and another study may be in an important position for the transition to other studies. For example, it is understood that the most common cited (57) book is "Secular Age" written by philosopher Charles Taylor in 2007. However, the degree of centrality is 0.00. This means that it is not in the intercluster edict position. Tsing's (2011) book titled "Friction: Etnography of the Global Vineyard" is one of two studies with the highest (0.24) centrality, despite receiving 17 co-citations. *Sociology* is the bridge between *anthropology* and *policy* studies. This is expected when you look at the subject of the book.
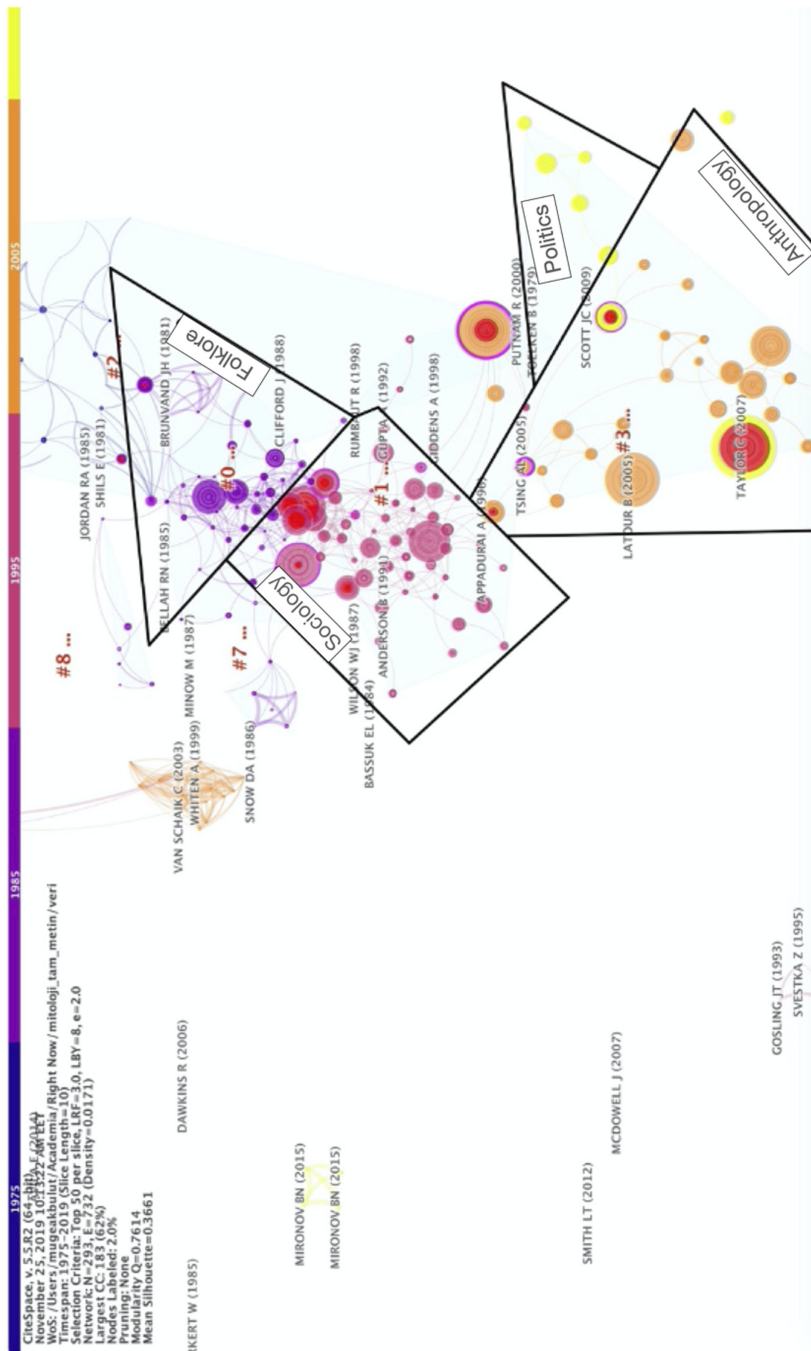
At this point, it is worth remembering the difference between different discipline's citation behaviors. Monograph-type publications are often used in social sciences such as mythology. As a matter of fact, the types of studies that come out with the highest level of centrality are books.

Spot calculation is visualized networks created by fading connections that do not connect the important points. When Figure 6 is examined, a large number of connections appear to fade. This is important for non-fading networks to point to more important points. A scientist who works in *sociology* and *folklore* should focus on Clifford and Anderson's studies rather than Bellah's studies.
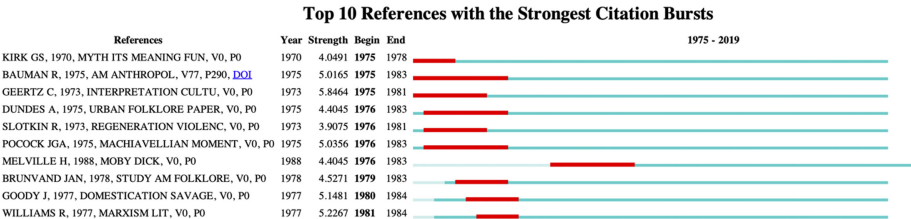
Turning points of the mythology network are crucial to identifying people, institutions, journals or studies that are key to the network. Roughly high points of intercentrality (>1.00) tend to be a critical points in network transitions from one time zone to another (Chen, 2005). Although there is no study of the degree of centrality between the co-citation network of mythology, the book of Robert Putnam, a political scientist with the highest degree of intercentrality (0.24), *sociology, politics* and anthropology; anthropology professor Anna Lowenhaupt Tsing's book is key to linking *sociology* and *anthropology* clusters.
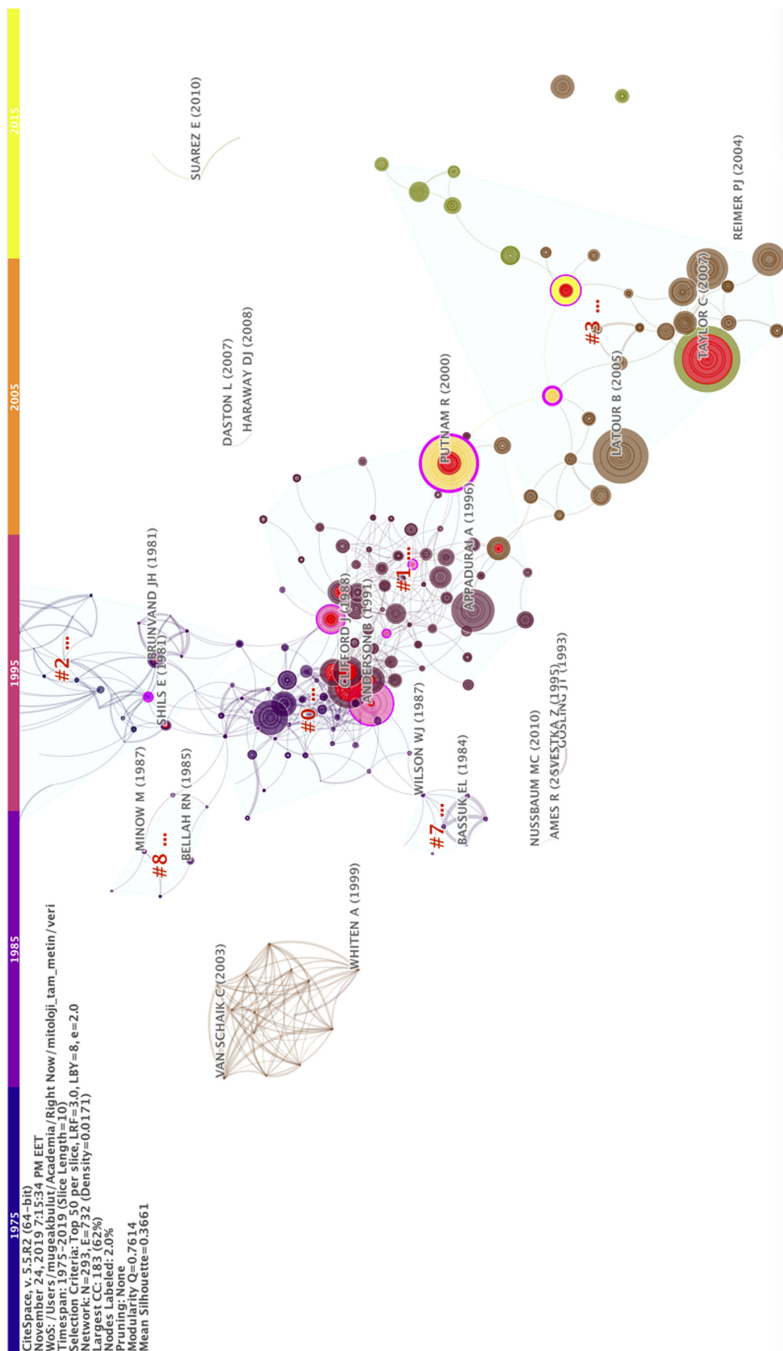
Figure 7 is a timeline representation of the co-citation network. Five clusters stand out in the chart in question. The concept change is due to the fact that there are five clusters here while four clusters are observed in the network representation. Until the first half of the 1980s, "folklore" studies are referred with different terms in the literature. The concept was introduced as "folklore" in the following years. The change of concept usage according to time can be easily monitored.

Unlike the network representation, the publication of Toelken (1979), which has a high degree of eigenvector, stands out in the cluster representation here. Folklorist Barre Toelken's book "Dynamics of Folklore" is in a unifying and key position among the sets of *sociology* and *folklore*.

To measure how homogeneous clusters are within themselves, this study benefited from modularity and silhouette coefficient. As mentioned before, the clusters in Figure 4 are ranked in descending order according to the number of players they contain. So the maximum number of the publications are in the cluster numbered 0 (48 broadcasts). If there are many publications in a cluster, it is important that the homogeneity, i.e. silhouette coefficient, within that cluster is high. The silhouette coefficient between −1 and 1 is used to estimate the uncertainty in defining the nature of the cluster (Rousseeuw, 1987). The fact that the silhouette coefficient is one means that a cluster is perfectly different from other clusters. It is generally accepted that clusters are clearly separated for clusters with a silhouette coefficient between 0.7 and 0.9 and higher (Shibata *et al.*, 2008). For the mythology network, the silhouette coefficient is above 0.8 in all clusters (see Table 6). By looking at this high silhouette coefficient, we can say that the mythology network creates a similar subliterature within itself. However, the smaller the clusters, the higher the silhouette coefficient can be found. This is because several authors are publishing consistently there; therefore, the structure may be distributed

Top 10 References with the Strongest Citation Bursts

References	Year	Strength	Begin	End	1975 - 2019
KIRK GS, 1970, MYTH ITS MEANING FUN, V0, P0	1970	4.0491	**1975**	1978	
BAUMAN R, 1975, AM ANTHROPOL, V77, P290, DOI	1975	5.0165	**1975**	1983	
GEERTZ C, 1973, INTERPRETATION CULTU, V0, P0	1973	5.8464	**1975**	1981	
DUNDES A, 1975, URBAN FOLKLORE PAPER, V0, P0	1975	4.4045	**1976**	1983	
SLOTKIN R, 1973, REGENERATION VIOLENC, V0, P0	1973	3.9075	**1976**	1981	
POCOCK JGA, 1975, MACHIAVELLIAN MOMENT, V0, P0	1975	5.0356	**1976**	1983	
MELVILLE H, 1988, MOBY DICK, V0, P0	1988	4.4045	**1976**	1983	
BRUNVAND JAN, 1978, STUDY AM FOLKLORE, V0, P0	1978	4.5271	**1979**	1983	
GOODY J, 1977, DOMESTICATION SAVAGE, V0, P0	1977	5.1481	**1980**	1984	
WILLIAMS R, 1977, MARXISM LIT, V0, P0	1977	5.2267	**1981**	1984	

Figure 5.
Citation explosion display by year (top ten sources)

Figure 6.
Spotlight
representation for a
co-citation network in
the field of mythology

homogeneously. The important thing is that this coefficient is high in large clusters. Because the silhouette coefficient shows us how tightly or loosely the subareas (i.e. clusters) are separated when we consider an interdisciplinary subject such as mythology.

On the other hand, the modularity Q-coefficient relates to the degree of network separation to independent clusters (Shibata *et al.*, 2008). The high modularity coefficient means that each of the clusters creates a subspace within themselves. The closer this value is to zero in a range from zero to one, the more clear the network has limits.

As mentioned earlier, concepts discussed in the subject of interdisciplinary mythology are not often monolithic. In other words, there are many concepts that fall into the field of mythology. Modularity and silhouette coefficients measure the slack of those separations. Comments about the structure of the field are made through the authors and authors who stand out in each set.
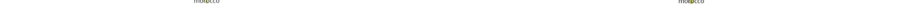
In addition to examining the entire network, triples (triads) can also be focused. Structural space theory is closely related to this issue. In this way, information is obtained such as whether there are closed groups on the network or whether brokering is dominated. Closed structures (closed structures) predict that the subgroup is heavily involved, while open structures (open structures) have structural gaps, meaning potential collaborations. Again, according to the theory of structural space, the points with high centrality serve as a bridge between clusters, so it has structural advantages according to the point at the center of a tight group. In this context, Putnam's work (a study on the loss of considerable power in American civil society in recent years) can be defined as works that integrate *sociology, politics* and *folklore* as potentially revolutionary. Because this kind of study, which is highly likely, can be cited from a wide range of studies from different disciplines such as politics, history, sociology. In other words, a trio of *sociology, politics* and *folklore* have structural gaps. Therefore, this is an opportunity for those who will do research on mythology.

In Figure 8, which is based on common references in the field of mythology, Myth & Symbol journal is a mythology journal, but is not as active as Plos One. This is because Plos One is a much more interdisciplinary journal, although it includes mythology-related publications. Another thing that stands out in Figure 8 is that the national folklore journal is very big in the network. The reason that national folklore journal is seen as the most cited journal in the network when projection is kept is because the journal has a high rate of self-citation. In other words, studies in the journal National Folklore are cited by other studies in the same journal.

Looking at the intercountry cooperation network, the US is by far the most cooperative country (Figure 9). However, it should be noted that all of the authors with the highest degrees of centrality are from the US.

Concluding remarks
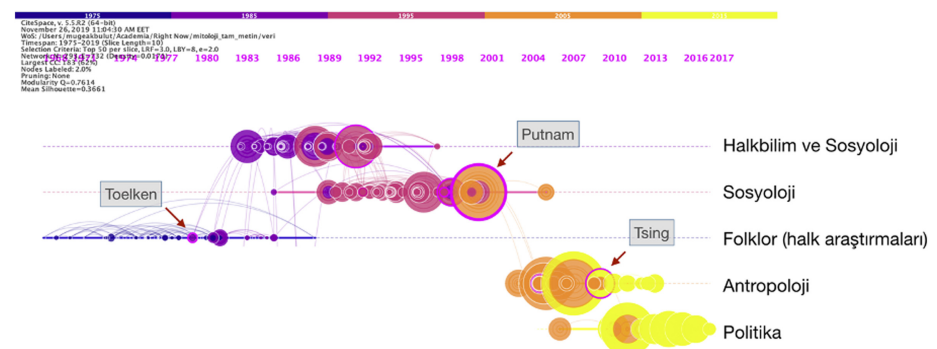
In this study, detailed analysis of the mythology field was carried out by social network analysis method beyond bibliometric data. Mythology is a large field of science covering many areas because it has the subject of interdisciplinary study. As a result of the analysis, the four main areas were determined, and these are sociology, anthropology, folklore and politics. In recent years, the subject of mythology has been studied in the field of politics. The policy field is reflected in the findings of our study as the bottom of it. The homogeneity of these subareas was also observed by calculating silhouette and modularity coefficients. So there is a symbiotic (complementary) relationship between these four areas and mythology. Apart from these four areas, the density of the mythology network, which is cited from many areas, is low. At this point, it is common for such a network to be low in density, which includes a large number of (293) players.

The variable structures of scientific networks and the relationships that cannot be observed in other methods can be monitored by social network analysis. The works, which serve as a bridge between areas in the field of mythology, are areas of sociology, folklore and politics that are strongly cited in many possible areas. Structural gaps have been observed in these areas. If they will research mythology, this is an opportunity and the projection holds. The study, which has seen the most cited explosion in the network, is Bauman's study

Figure 8.
Representation of the most cited journals in the field of mythology

Figure 9.
The countries that publish the most in the field of mythology (left: all countries, right: collaborators with the United States)

"Verbal Art as Performance" in the journal *American Anthropologist* in *sociology*. While this study experienced a citation explosion in the year it was published (smart girls), on the other hand, Sleeping Beauty was also existent in the network. For example, Herman Melville's world famous novel, White Whale, had a citation explosion after 12 years its release and along seven years. Similar behaviors were seen in terms of co-authoring in *folklore* and *sociology* studies. Both groups are heavily co-authored within themselves. The authors, who were not in the position of a citation explosion but were considered keys in the network, were also identified, and it was observed that these authors connect different subareas. When you look at the frequency data in the field of mythology, there is a difference between the most published types and the highest level of centrality. This finding proves that social network analysis reveals relationships beyond what appears.

In the study, the focus was on the studies that served as bridges between fields rather than the most cited studies and studies that have a burst of citations. Although the work in the field is relatively old, mythology continuously improves its interdisciplinary dimension and evolves with different areas. We see this on the network in policy studies that began to emerge after 2013. It is useful for scientists who will study mythology to see which direction the field evolves. This study is also illuminating for decision-makers in higher education and policymakers in that area. In addition, the findings of the study can be used to create the curriculum of the field.

Notes

1. Half-life in the Library Journal in citation report for 10 years, American Historcial Journal half-life was specified as 10.3 years.

2. Six clusters have been created with CiteSpace autocluster analysis. Within the scope of the study, the relevant resources were thoroughly examined and clustering was recreated and four main clusters were determined.

References

Abbasi, A. and Altmann, J. (2010), "A social network system for analyzing publication activities of researchers", in *On Collective Intelligence*, içinde, Springer, Berlin and Heidelberg, pp. 49-61.

Abbasi, A., Altmann, J. and Hossain, L. (2011), "Identifying the effects of co-authorship networks on the performance of scholars: a correlation and regression analysis of performance measures and social network analysis measures", *Journal of Informetrics*, Vol. 5 No. 4, pp. 594-607.

Biehl, M., Kim, H. and Wade, M. (2006), "Relationships among the academic business disciplines: a multi-method citation analysis", *Omega*, Vol. 34 No. 4, pp. 359-371.

Chen, C. (2004), "Searching for intellectual turning points: progressive knowledge domain visualization", *Proceedings of the National Academy of Sciences*, Vol. 101 No. 1, pp. 5303-5310.

Chen, C. (2005), "The centrality of pivotal points in the evolution of scientific networks", *Proceedings of the 10th International Conference on Intelligent User Interfaces*, ACM Press, San Diego, CA, pp. 98-105.

Chen, C. (2016), *CiteSpace: A Practical Guide for Mapping Scientific Literature*, Nova Science Publishers, Hauppauge, NY.

Cheng, F.F., Huang, Y.W., Yu, H.C. and Wu, C.S. (2018), "Mapping knowledge structure by keyword co-occurrence and social network analysis: evidence from Library Hi Tech between 2006 and 2017", *Library Hi Tech*, Vol. 36 No. 4, pp. 636-650.

Eblen, M., Fabsitz, R.R., Olson, J.L., Pearson, K., Pool, L.R., Puggal, M. and Wagner, R.M. (2012), "Social network analysis comparing researcher collaborations in two cardiovascular cohort studies", *Research Evaluation*, Vol. 21 No. 5, pp. 392-405.

Freeman, L.C. (1979), "Centrality in social networks conceptual clarification", *Social Networks*, Vol. 1 No. 3, pp. 215-239.

Gerber, A.J. (2015), "Overlapping mythologies: the political afterlives of frame narratives in gower–s *confessio amantis* and Lydgate's *Fall of princes*", in *Medieval Ovid: Frame Narrative and Political Allegory. The New Middle Ages*, Palgrave Macmillan, New York.

Gribkovskaia, I., Halskau, Ø. and Laporte, G. (2007), "The bridges of Königsberg—a historical perspective", *Networks*, Vol. 49, pp. 199-203, doi: 10.1002/net.20159.

Hu, J. and Zhang, Y. (2017), "Discovering the interdisciplinary nature of Big Data research through social network analysis and visualization", *Scientometrics*, Vol. 112 No. 1, pp. 91-109.

Kaliva, E., Katsioulas, D., Tambouris, E. and Tarabanis, K. (2015), "Understanding researchers collaboration in eParticipation using social network analysis", *International Journal of Electronic Government Research*, Vol. 11 No. 4, pp. 38-68.

Kumar, V. and Narula, S.A. (2017), "Social networking analysis of renewable energy research in India", *Journal of Scientometric Research*, Vol. 6 No. 2, pp. 102-108.

Kumar, P. and Zhang, K. (2007), "Social network analysis of online marketplaces", *IEEE International Conference on e-Business Engineering (ICEBE'07)*, IEEE, Hong Kong, China, pp. 363-367.

Larivière, V., Gingras, Y. and Archambault, É. (2006), "Canadian collaboration networks: a comparative analysis of the natural sciences, social sciences and the humanities", *Scientometrics*, Vol. 68 No. 3, pp. 519-533.

Leydesdorff, L. (2004), "Clusters and maps of science journals based on bi-connected graphs in journal citation reports", *Journal of Documentation*, Vol. 60 No. 4, pp. 371-427, doi: 10.1108/00220410410548144.

Leydesdorff, L. (2007), "Betweenness centrality as an indicator of the interdisciplinarity of scientific journals", *Journal of the American Society for Information Science and Technology*, Vol. 58 No. 9, pp. 1303-1309, doi: 10.1002/asi.20614.

Lin, T.M. and Liao, C.W. (2008), "Knowledge dissemination of word-of-mouth research: citation analysis and social network analysis", *Libri*, Vol. 58 No. 4, pp. 212-223.

Malin, B. and Carley, K. (2007), "A longitudinal social network analysis of the editorial boards of medical informatics and bioinformatics journals", *Journal of the American Medical Informatics Association*, Vol. 14 No. 3, pp. 340-348.

Mangas-Vega, A., Gómez-Díaz, R. and Cordón-García, J.A. (2016), "Approach to self-publishing with a combination of bibliometric study and social network analysis techniques", *The Electronic Library*, Vol. 34 No. 6, pp. 902-914.

Matheus, R.F. (1996), "Information Science Network–ISN: social network analysis of scientific production of LIS field in Brazil", *PCI J*, Vol. 2005 No. 156, p. 195.

Neto, M.D.C., Correia, A.M.R., Pinto, P. and Aguiar, J. (2008), "Social network analysis applied to knowledge creation and transfer in the Portuguese agricultural R&D field: an exploratory study", *Proceedings of the 9th European Conference on Knowledge Management*, Southampton, pp. 585-592.

Orange, M. and Petersson, B. (2017), "'There can be no other sun in the sky': political myth, spirituality and legitimacy in contemporary Kazakhstan", in Raudvere, C. (Ed.), *Contested Memories and the Demands of the Past: History Cultures in the Modern Muslim World Islam and Nationalism (Islam and Nationalism)*, Palgrave Macmillan, pp. 25-47, doi: 10.1007/978-3-319-39001-7.

Otte, E. and Rousseau, R. (2002), "Social network analysis: a powerful strategy, also for the information sciences", *Journal of Information Science*, Vol. 28 No. 6, pp. 441-453.

Palonen, T. and Hakkarainen, K. (2000), "Patterns of interaction in computer-supported learning: a social network analysis", in Fishman, B. and O'Connor-Divelbiss, S. (Eds), *Fourth International Conference of the Learning Sciences*, Erlbaum, Mahwah, NJ, pp. 334-339.

Pereira, C.S. and Soares, A.L. (2007), "Improving the quality of collaboration requirements for information management through social networks analysis", *International Journal of Information Management*, Vol. 27 No. 2, pp. 86-103.

Polites, G.L. and Watson, R.T. (2009), "Using social network analysis to analyze relationships among IS journals", *Journal of the Association for Information Systems*, Vol. 10 No. 8, p. 2.

Rostampoor-Vajari, M. (2012), "What is sociometry and how we can apply it in our life", *Advances in Asian Social Science*, Vol. 2 No. 4, pp. 570-573.

Rousseeuw, P.J. (1987), "Silhouettes: a graphical aid to the interpretation and validation of cluster analysis", *Journal of Computational and Applied Mathematics*, Vol. 20, pp. 53-65.

Sadeghi, B. (2013), *The Logic of Law Making in Islam: Women and Prayer in the Legal Tradition*, Cambridge University Press, Cambridge.

Schindler, C. (2015), *Pagan Myths - Christian Rulers. Myth and Mythology in the Political Poetry of Claudian*, De Gruyter, Berlin.

Scott, J. (1991), "Networks of corporate power: a comparative assessment", *Annual Review of Sociology*, Vol. 17 No. 1, pp. 181-203.

Scott, J. (2000), *Social Network Analysis: A Handbook*, Sage, London.

Shibata, N., Kajikawa, Y., Taked, Y. and Matsushima, K. (2008), "Detecting emerging research fronts based on topological measures in citation networks of scientific publications", *Technovation*, Vol. 28 No. 11, pp. 758-775.

Tajedini, O., Ghazizade, A. and Sadatmoosavi, A. (2018), "Identifying the effects of co-authorship strategies on the citation-based performance of scholars: a social networks analysis", *Journal of Scientometric Research*, Vol. 7 No. 1, p. 1.

Taylor, C. (2007), *A Secular Age*, Harvard University Press.

Testa, J. (2011), "The globalization of web of science", available at: http://thomsonreuters.com/products_services/science/free/essays/regional_content_expansion_wos/ adresinden erişildi.

Toelken, B. (1979), "Folklore and cultural worldview", in *The Dynamics of Folklore*, University of Oregon, Houghton Mifflin Company, Boston.

Tsing, A.L. (2011), *Friction: An Ethnography of Global Connection*, Princeton University Press, Princeton, Oxford.

Vahed, N., Gavgani, V.Z., Jafarzadeh, R., Tusi, Z. and Erfanmanesh, M. (2018), "Visualization of the scholarly output on evidence based librarianship: a social network analysis", *Evidence Based Library and Information Practice*, Vol. 13 No. 4, pp. 50-69.

Wang, Z., Zhao, H. and Wang, Y. (2015), "Social networks in marketing research 2001–2014: a co-word analysis", *Scientometrics*, Vol. 105 No. 1, pp. 65-82.

Webster, C.M. and Morrison, P.D. (2004), "Network analysis in marketing", *Australasian Marketing Journal*, Vol. 12 No. 2, pp. 8-18.

Wu, Y. and Duan, Z. (2015), "Social network analysis of international scientific collaboration on psychiatry research", *International Journal of Mental Health Systems*, Vol. 9 No. 1, p. 2.

Yang, B., Liu, Z. and Meloche, J.A. (2010), "Visualization of the Chinese academic web based on social network analysis", *Journal of Information Science*, Vol. 36 No. 2, pp. 131-143.

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