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RESEARCH ARTICLE

Forty Years of Management Information Systems From the Window of MIS Quarterly

MIS Quarterly Penceresinden Yönetim Bilişim Sistemlerinin Kırk Yılı

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ABSTRACT

In the globalizing and digital transformation corporate ecosystem, the management information systems discipline maintains its key place. 104 journals in the area of management information systems will continue to be published in 2021, according to SCImago Journal and Country Rank statistics. MIS Quarterly is one of the most prominent field journals in the field, with a publishing history spanning more than four decades and having the highest ranking in the SCImago. The study aims to present the forty-year portfolio of the related literature with scientometrics and bibliometrics from the perspective of MIS Quarterly. By presenting the findings of the analyzes carried out in many areas such as content, institution, country, researcher, and citation of 1,550 publications between 1980 and 2020, this research offers concrete inferences about how management information systems have evolved from past to present in a period of forty years, and discusses the change that the field has undergone, together with the dynamics of the related periods.

Keywords: Management Information Systems, MIS Quarterly, Bibliometrics, Scientometrics, Science Mapping, Journal Analysis

ÖZ

Yönetim bilişim sistemleri disiplini, küreselleşen ve dijital dönüşümün içinde bulunan işletme ekosisteminde kritik konumunu korumaktadır. Scimago Jorunal and Country Rank sitesine göre yönetim bilişim sistemleri alanında 2021 yılında yayın faaliyetini sürdürmekte olan 104 dergi bulunmaktadır. Bunlardan SCImago Journal Rank Indicator değeri en yüksek olan dergi ise MIS Quarterly'dir. Kırk yılı aşkın yayın hayatını sürdüren MIS Quarterly, yönetim bilişim sistemleri için en önemli alan dergileri arasındadır. Çalışma, MIS Quarterly dergisi gözüyle, ilgili yazının kırk yıllık portföyünü bilimetri ve bibliyometri metodolojileriyle ortaya koymayı amaçlamaktadır. Araştırma, 1980-2020 yılı arasında gerçekleştirilen 1.550 yayının, içerik, kurum, ülke, araştırmacı, atıf gibi pek çok boyutta değerlendirilmesi sonucunda elde edilen bulguları sunarak, ele alınan kırk yıllık bir periyotta yönetim bilişim sistemlerinin geçmişten bugüne nasıl evrildiği konusunda somut çıkarımlar yapmakta ve alanın geçirdiği değişimi ilgili dönemlerin dinamikleriyle birlikte tartışmaktadır.

Anahtar kelimeler: Yönetim Bilişim Sistemleri, MIS Quarterly, Bibliyometri, Bilimetri, Bilimsel Haritalama, Dergi Analizi

1. INTRODUCTION

Management information systems (MIS) focus on using and managing information technology for strategic, managerial, and operational purposes at the social, organizational, and individual levels, evolving according to the current dynamics. As a result, this is an application field in which many disciplines collaborate, including cognitive psychology, computer science, economics, operations management, organizational theory, and engineering (Culnan 1987; Baskerville and Myers, 2002; Katerattanakul et al., 2006).

Argyris (1971) defines MIS as a system that enables standardized methods to manage, process, and transform data from various sources into useful information for all processes and at all managerial and administrative levels. According to Nath and Badgujar (2013), MIS is the process of gathering, processing, storing, retrieving, and transmitting relevant data for efficient management operations and business planning in any organization, and it is thus regarded as the heart of management and decision processes. Al-Mamary et al. (2013) define MIS as a type of information system that transforms and summarizes data into meaningful and usable forms for managerial decision-making. According to these definitions, MIS applications are systems that handle various organizational levels and incorporate data flow, information extraction, and reporting functions for decision support.

According to Akpınar (2011), instruction in this topic is referred to as Wirtschaftsinformatik (Business Informatics) in countries where German is the primary language, but different titles are used in nations where English is the primary language. These titles vary, such as Business Information Technology, Computer Information Technology, Business Computing, Business Informatics, Information Systems, Management of Information Systems, and Management of Business Systems. Gambill et al. (1999), Pierson et al. (2008), and Lunt et al. (2003) support these findings.

As stated by Bensghir Kaya (2002), MIS is conceptually used in various ways, with some definitions focusing on general concepts such as technologies related to information processing processes and procedures related to other business processes; others consider it to be an information system developed to support business functions. According to Reddy et al. (2009), MIS differs from regular information systems in that its primary goal is to analyze other systems that deal with the organization's operational activities. From this point of view, MIS can be thought of as a subset of general planning and control activities in organizations, which covers the deployment of people, technology, and related procedures. Therefore, as stated by Gorry and Scott-Morton (1971), MIS research integrates management, behavioral, and technical techniques and analyzes them as a whole, and studies are conducted in this manner (Damar et al., 2021). Adeoti-Adekeye (1997), in contrast to previous definitions, noted that there is no globally agreed definition of MIS and that existing definitions represent the interests of academics in the field, the management information systems discipline, and the researcher's judgment.

Given the current rate of technological and information change, it is unavoidable that the MIS discipline will evolve and transform. It is essential to keep an eye on this area and examine it on a regular basis if you want to reach a specific level of maturity and development (Palvia et al., 2004). Understanding how the MIS field's identity is established is feasible by analyzing accumulated information and discovering its philosophical foundations rather than individual studies (Holsapple, 2008). In particular, scientometrics and bibliometric approaches provide valuable information on how to conduct these studies directing a scientific field. Scientometrics is a methodology that uses quantitative techniques to examine literature and make holistic judgments, allowing researchers to dig deeper into the state and evolution of a scientific area (Cocosila et al., 2011). Such studies are essential for understanding the patterns and networks that define a field, popular subjects, research output, and diverse characteristics of publications (Damar et al., 2021).

The employment of techniques in reviewing studies, bibliometrics, and literature dates back to the early 1980s in the discipline of MIS (Damar and Aydın, 2021). Ives et al. (1980) created a classification scheme for possible MIS areas of study, which they utilized to categorize over 300 MIS doctorate theses. Ives and Olson (1984) investigated user participation in the MIS development process and questioned if it affected system success. Culnan and Swanson (1986) examined 271 articles published in six journals between 1980 and 1984 to assess the emergence of MIS as a field of scientific study distinct from reference disciplines such as computer science, management science, and organizational behavior, as well as the impact of the MIS

Quarterly journal and leading field congresses on the publication portfolio. The work of Culnan (1987), on the other hand, is a field study published in the MIS Quarterly that details the analyses conducted on the most commonly used citations in the papers. Farhoomand (1987) investigated the historical development of MIS research from a philosophical and scientific perspective, using 536 papers published between 1977 and 1985, and found that research tactics had swiftly moved from qualitative to empirical methods during the time they were under consideration.

These research attempts would continue in the years ahead, but they would be tailored to other areas that fall under the MIS umbrella. Two more studies that look at trends in the MIS field have been published in the previous decade. For example, Cocosila et al. (2011) revealed the holistic evaluation of the papers presented at events such as the International Conference on Information Systems (ICIS), Pacific Asia Conference on Information Systems (PACIS), and the Administrative Sciences Association of Canada Annual Conference (ASAC), which are the most prestigious scientific events in the field of MIS, within the scope of scientometrics. Mohanty (2014) examined the MIS Quarterly and reported the bibliometric structure of the journal's publications from 1995 to 2009. Similar studies in MIS and other domains show that the issues covered are revisited in multiple techniques and dimensions, as well as at different time intervals, in order to track changes in the literature in a long-term manner. Many studies in the national literature also raise concerns about recent advancements in the field of MIS and make recommendations (Akaranga and Makau, 2016; Damar and Aydın, 2021; Uğur et al., 2016; Yarlıkaş, 2015).

Nowadays, businesses and scientists conducting field research are exposed to far greater information production and change than in earlier periods because of the influence and rush of the digital revolution. These circumstances significantly impact MIS and associated research, and research and publication creation is substantially faster than in past decades. This proposition, which serves as the study's rationale, states that the evolution of the accumulated research portfolio from the past to the present should be examined over a more extended period to comprehend the dynamics in the MIS field. In this context, the study intends to assess influential researchers, topics, the field's evolution, references, countries, and institutions over forty years to holistically evaluate the field and explore the reflections of environmental dynamics in MIS. MIS Quarterly is currently the most important publication channel in terms of its long history and publication quality. The research aims to investigate the evolution of MIS research through the perspective of this journal. This research analyzes the comprehensive publication portfolio in many dimensions using scientometrics and bibliometrics techniques and tools (Hood and Wilson, 2001; Tonta and Al, 2007), i.e., trends in the number of publications over time, prominent authors and collaborative patterns, sources, citation relationships between journals and citation statistics, topics covered, and yearly evaluations of these issues. As a result, the findings shed light on MIS's past and current state, which is impacted by various disciplines but matures into its own area, providing many ideas for future research.

2. WHY MIS QUARTERLY?

New publications in MIS are introduced every day, and new journals that contribute to the field begin publishing operations, just as they do in every discipline. Scientific research and publications on the topic are on the rise, and the literature portfolio in this field has evolved, developed, and altered through time as organizations, computer science, technology, and the economy have grown. It is anticipated that the answer to what has been discussed throughout the years in this transition, development, and transformation will be of great use to all MIS researchers. According to Shotton et al. (2009), new research requires examining, integrating, and reusing valuable scientific outputs from prior investigations.

This study assesses the forty-year publication life of MIS Quarterly within this analysis context. MIS Quarterly has been one of the most prominent journals in the field (Gillenson and Stutz, 1991). Since 1980, the Management Information Systems Research Center in the United States has published MIS Quarterly in North America, which has been assigned to various research areas at the highest level, such as Management Information Systems (Q1), Computer Science and Applications (Q1), Information Systems (Q1), and Information Systems and Management (Q1). It has the highest score in the MIS field, with 5,283, according to Scimago journal and nation rankings. The journal's index value is 230, the average number of citations based on publication is 92.52, the total number of citations is 5,921, and the number of publications cited in the last three years is 184 (Scimagojr, 2021).

The development of information technology-based services, the management of information technology resources, and the

development and transmission of information about the managerial, organizational, and societal impacts of information technology, as well as its use, impact, and economy, are all goals of MIS Quarterly publishing activities. The journal is particularly interested in professional challenges affecting the subject of information systems as a whole. The response to the research issue of the article must offer an essential scientific contribution to the discipline of information systems, according to a requirement set forth by the journal for an article to be published. Another criterion is that the work produced has had or has the potential to have a broad societal influence. Because the discipline of management information systems is a heterogeneous topic, research that analyzes several fields together is seen positively in the journal (MIS Quarterly, 2021).

In the light of all of these considerations, MIS Quarterly was chosen as the journal of choice to see the MIS field, as well as the researchers' areas of interest and the texture of the field. In truth, MIS Quarterly has been an intriguing journal for bibliometric analyses in the literature at various points (Mohanty, 2014), but no study has been found in the literature for over forty years. Furthermore, the most important differentiating feature of the research is that it discusses the transformation of the MIS research area in partitioned periods.

3. METHODOLOGY

Scientific databases share data that is regarded as a valuable resource. These databases not only contain a wide range of publications in hundreds of study fields, but they also contain bibliometric data from those articles, such as title, abstract, keywords, references, and other demographic data. In its purest form, bibliometric data includes far more information than plain text views. This type of data may be evaluated more effectively with the advent of research fields such as bibliometrics and scientometrics, which combine statistics, network analysis, and data mining techniques with evolving technology infrastructure (Garfield, 2009; Hood and Wilson, 2001; Özdağoğlu et al., 2020; Damar et al., 2021).

The article utilizes scientometrics, bibliometrics, and related tools and follows a methodology in this direction. The bibliometric data used in the analyses were gathered on 04.02.2022 from the Web of Science Core Collection, covering all of the MIS Quarterly's articles from 1980 to 2020. Preprocessing was applied on a plain text stack before the analyses. There were 1,550 papers published within the considered period and analyzed in this study. In addition to the forty-year timeframe chosen, 79 new papers were released in 2021. In this regard, this paper reveals findings on the following issues in MIS Quarterly:

The distribution of the number of papers by years,

- Impact of the journal through scientometric indicators,
- Countries and institutions that are prominent in the journal,
- Collaboration patterns among institutions and authors,
- Most-cited papers in the journal,
- Most-cited references and co-citation patterns,
- Keyword distributions and most popular topics over keywords,
- Changes in subject popularity in different time periods (1980-1990, 1991-2000, 2001-2010, 2011-2015, 2016-2020).

Figure 1 depicts the methodological approach in general. From the pre-processed dataset, summary statistics and clustering-based network models are utilized to extract information in several dimensions, including the number of publications, significant authors and journals, references used, prominent institutions, and nations. The demographic structure was investigated using Web of Science reports and queries.

The VOSviewer software was used to perform clustering-based and multidimensional network analyses analyzing the relationships between dimensions; in addition to visuals displaying descriptive statistics, VOSViewer employs its own network analysis algorithm, which is a modular-based clustering technique based on an intelligent local motion algorithm, comparable to multidimensional scaling (van Eck and Waltman, 2009; Waltman and Van Eck, 2013; Waltman et al., 2010). The study

also used bibliometrix, an R tool, the VOSViewer package, SQL query language, and Microsoft Excel software. Analyses were enriched by using different bibliometric software tools to provide readers with the most relevant visuals and findings.

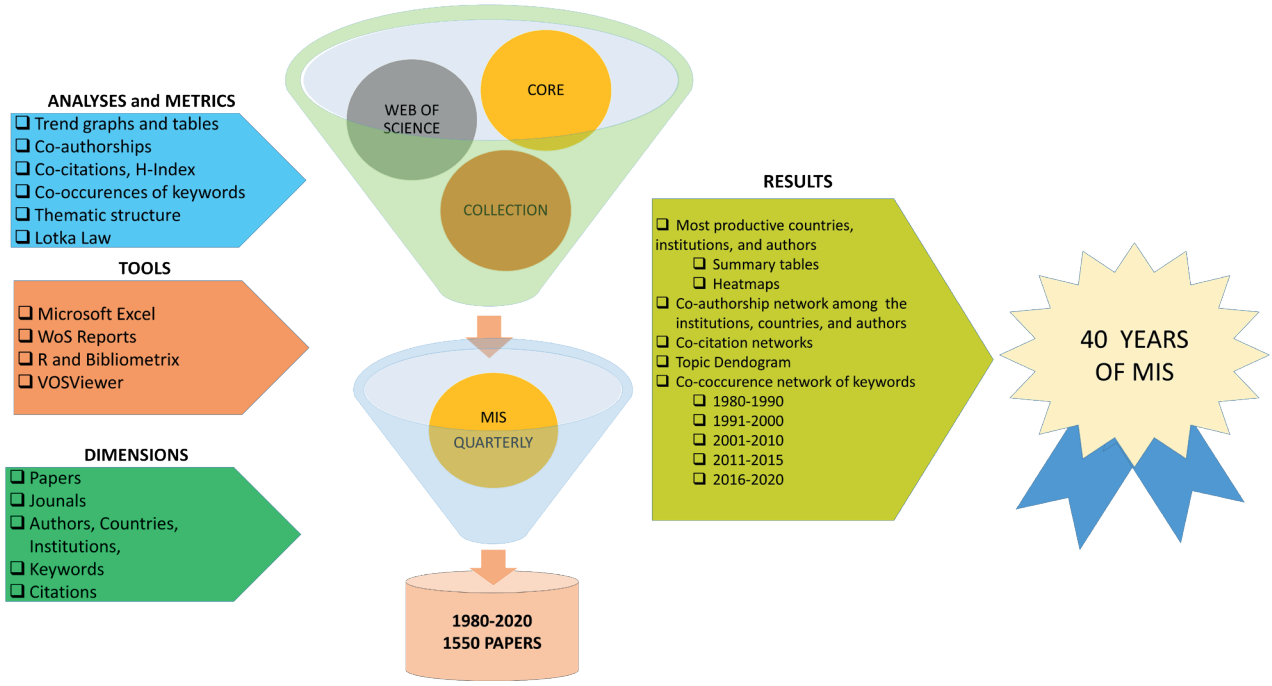

Figure 1. Research Framework

The study has been enhanced to include data from Scopus on the most contributed topics between 2016-2020 by the scholars who have made headlines in the MIS Quarterly journal. By doing so, researchers are informed about the topics that the field's pioneers had focused on in recent years.

4. FINDINGS and DISCUSSION

The study includes an appraisal of countries, institutions, and researchers, analyses based on references over the papers published during forty years to shed light on the growth of the MIS field. The data set is segmented into ten-year and five-year periods in the last years and discussed separately to make subject-based evaluations and discover the discussion topics across time. The goal of these analyses is to observe how information and communication technology, which has advanced quickly in recent years, is reflected in the literature. The findings are categorized under these topics, with relevant statistics and network analyses, as well as discussions of developing trends and patterns.

4.1. Generic Statistics

Between 1980 and 2020, there were 1,550 publications in MIS Quarterly. Distribution of these publications by years are 2020 (*f*:60), 2019 (*f*:59), 2018 (*f*:61), 2017 (*f*:63), 2016 (*f*:51), 2015 (*f*:48), 2014 (*f*:59), 2013 (*f*:67), 2012 (*f*:67), 2011 (*f*:57), 2010 (*f*:41), 2009 (*f*:47), 2008 (*f*:39), 2007 (*f*:35), 2006 (*f*:46), 2005 (*f*:34), 2004 (*f*:30), 2003 (*f*:26), 2002 (*f*:27), 2001 (*f*:21), 2000 (*f*:28), 1999 (*f*:33), 1998 (*f*:26), 1997 (*f*:24), 1996 (*f*:26), 1995 (*f*:30) , 1994 (*f*:26), 1993 (*f*:32), 1992 (*f*:35), 1991 (*f*:33), 1990 (*f*:29), 1989 (*f*:34), 1988 (*f*:38), 1987(*f*:36), 1986 (*f*:29), 1985 (*f*:28), 1984 (*f*:23), 1983 (*f*:24), 1982 (*f*:29), 1981 (*f*:24), 1980 (*f*:25), respectively. The number of publications remained relatively modest in the early years, but as a result of the journal's parallel advances with the field, the annual average of articles grew to 60. When this figure is compared to that of the 1980s, it is clear that the growth is greater than 100 percent.

In the journal, there are several categories of publications, which are distributed as articles (*f*:1,266), editorial materials (*f*:162), review (*f*:98), proceedings papers (*f*:18), corrections (*f*:7), notes (*f*:7), letters (*f*:4), bibliographies (*f*:3), reprints (*f*:3), and biographical-items (*f*:1), respectively.

The research papers of scholars from 45 various nations were published in MIS Quarterly (Table 1). Table 1 does not include

Liechtenstein, which has three publications, and Egypt, Saudi Arabia, Thailand, and Wales, having two papers each. Brazil, Costa Rica, Cyprus, Hong Kong, Jamaica, Kenya, Malaysia, Northern Ireland, Oman, Philippines, Poland, Qatar, Scotland, and Turkey have one publication.

Table 1

Distribution of the Papers Counts by Countries

Rank	Country	N	C	ACPI	%	Rank	Country	N	C	ACPI	%
1	USA	1,209	215,870	178.55	78.00	14	Finland	19	3,169	166.79	1.22
2	Canada	166	36,207	218.11	10.71	15	Spain	14	1,875	133.93	0.90
3	China	100	14,428	144.28	6.45	16	Sweden	13	1,506	115.85	0.83
4	England	70	8,760	125.14	4.51	17	Norway	12	1,540	128.33	0.77
5	Singapore	48	8,867	184.73	3.09	18	Switzerland	12	1,019	84.92	0.77
6	Australia	46	6,803	147.89	2.96	19	Taiwan	10	733	73.30	0.64
7	S. Korea	39	10,534	270.10	2.51	20	India	9	352	39.11	0.58
8	Israel	29	2,010	69.31	1.87	21	Austria	6	896	149.33	0.38
9	Netherlands	27	6,151	227.81	1.74	22	Ireland	6	835	139.17	0.38
10	Germany	24	2,510	104.58	1.54	23	Italy	6	401	66.83	0.38
11	France	23	5,170	224.78	1.48	24	Portugal	6	712	118.67	0.38
12	New Zealand	23	4,771	207.43	1.48	25	Belgium	4	226	56.50	0.25
13	Denmark	21	1,902	90.57	1.35	26	S. Africa	4	401	100.25	0.25

* N: Document Count, C: Citation Count, ACPI: Average Citations Per Item

Table 1 shows that South Korea is seventh in terms of publications with 39 and first in terms of citation averages with 270.1. The Netherlands, which ranks ninth with 27 publications, is second with an average of 227.81 citations, followed by France, which is third with 23 publications and 224.78 citations. The United States ranks top in terms of articles with a significant difference, but it falls behind the average number of citations. The United States of America, Canada, England, and Australia have the most publications. Aside from this, it is worth noting that China, Singapore, Israel, and South Korea all trail these countries. Although it is emphasized that countries with a strong software sector, such as Israel, India, and Ireland, published in this journal, the fact that only Israel is among the top ten countries is another factor to consider. However, these countries' interest in the software industry paralleled that of the United States, and they took steps to contribute to the sector's development, particularly in the 1980s and 1990s, and made these efforts part of institutional and state policy. Given the significance these countries place on the IT sector (Kannabiran and Sankaran, 2011; Issac et al., 2006; Damar et al., 2018), it is intriguing that this priority is not reflected in the MIS literature as much as the top-ranking countries.

The distribution of the number of publications by the countries published in the MIS Quarterly over the last five years is as follows: USA (*f*:229), China (*f*:54), Canada (*f*:33), England (*f*:18), Singapore (*f*:16), Australia (*f*:11), France (*f*:11), Israel (*f*:11), Germany (*f*:10), South Korea (*f*:10). China, which ranks third in the overall table, has produced 54 percent of all publications in the last five years. South Korea and Singapore, in addition to China, are two more countries that are distinguished in the industry. These countries stand out in computer science, information systems, information science and library science, and management, where MIS journals are classified.

4.2. Institutions and Researchers

The MIS Quarterly clearly shows that university output in the United States, and thus the productivity of researchers, is very high (Table 2). Other notable institutions on the list include the University of British Columbia, McGill University in Canada, and the City University of Hong Kong in Hong Kong. Another intriguing conclusion of the study is that institutions that are not listed in Table 2 but have had high levels of scientific productivity in the recent five years are also prominent, e.g., The Hong Kong University of Science Technology, National University of Singapore, University of Warwick, Copenhagen Business School, and Nanjing University. Figure 2 depicts the situation much more clearly. In many studies, the countries and institutions that the authors are a part of conduct research together to strengthen their cooperation and research capacities by bringing together limited research resources and applying them in accordance with the established goals. Co-authorship networks can be utilized to investigate these patterns of collaboration, and thus co-authorship analysis can be used to assess research program efficiency, evaluate the relationship between scientific and technological development, map priority thematic

areas, assess regional contributions to knowledge production, assess inter-organizational networks, and assess international cooperation (e Fonseca et al., 2016).

Table 2

Productivity and Impact of Institutions

Rank	Institutions	Country	N	%	X	STC	ACPI
1	University System of Georgia	USA	147	9.48	67	28,995	197.24
2	University of Texas System	USA	89	5.74	40	7,392	83.06
3	Pennsylvania Commonwealth System of Higher Education	USA	87	5.61	48	12,214	140.39
4	University of Minnesota System	USA	86	5.54	48	22,392	260.37
5	University of Minnesota Twin Cities	USA	86	5.54	48	22,392	260.37
6	State University System of Florida	USA	85	5.48	45	22,611	266.01
7	Georgia State University	USA	80	5.16	44	17,212	215.15
8	University System of Maryland	USA	65	4.19	47	25,420	391.08
9	University of Maryland College Park	USA	56	3.61	41	24,630	439.82
10	University of Georgia	USA	55	3.54	39	13,732	249.67
11	University of British Columbia	Canada	51	3.29	36	10,474	205.37
12	University of Arizona	USA	48	3.09	27	10,554	219.88
13	Indiana University System	USA	44	2.83	30	6,958	158.14
14	Temple University	USA	44	2.83	29	5,212	118.45
15	University of Arkansas Fayetteville	USA	43	2.77	27	18,378	427.4
16	University of Arkansas System	USA	43	2.77	27	18,378	427.4
17	University of Texas Austin	USA	42	2.71	27	4,283	101.98
18	Indiana University Bloomington	USA	41	2.64	27	6,575	160.37
19	City University of Hong Kong	Hong Kong	39	2.51	25	6,531	167.46
20	McGill University	Canada	38	2.45	28	4,861	127.92
21	University of California System	USA	38	2.45	26	6,180	162.63
22	State University of New York Suny System	USA	35	2.25	23	4,000	114.29
23	University of Pittsburgh	USA	33	2.12	20	3,859	116.94
24	Southern Methodist University	USA	32	2.06	16	1,859	58.09
25	Carnegie Mellon University	USA	31	2.00	17	1,840	59.35

* *N*: Document Count, *C*: Citation Count, *X*: *H*-Index, *STC*: Sum of Times Cited, *ACPI*: Average Citations Per Item

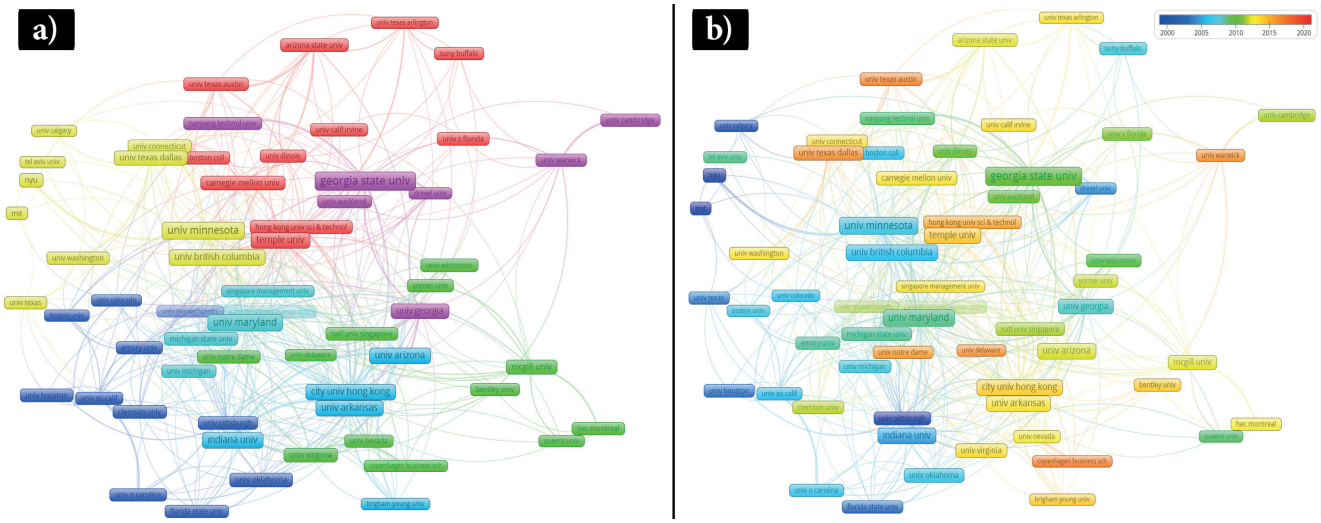

Figure 2. Co-authorship Network by Institutions (Min.10)

Figure 2 reflects the authors' institutions who have co-authored at least ten papers. While the colors of "a" represent institutional clusters, the colors in "b", which range from blue to red, indicate the year the studies were conducted or the study's actuality. This makes current trends about authors, institutions, or countries, as well as primary studies. In Figure 3, seven different clusters stand out, thus, institutions are gathered in seven other clusters. In the 2000s, while the Massachusetts Institute of Technology (MIT), New York University (NYU), University of Calgary, Texas State University, the University of Pittsburgh

were at the forefront, the University of Warwick, Hong Kong University of Science and Technology, Copenhagen Business School, and the University of Delaware have recently emerged.

Furthermore, institutions in the United States collaborate with countries such as New Zealand, Canada, Israel, and Denmark. Tel Aviv University in Israel and Auckland University in New Zealand, HEC Montréal Business School, and the University of British Columbia in Canada are essential institutions. This inter-institutional network structure is crucial for identifying and analyzing possible trends, especially in enhancing developing countries' scientific productivity.

It is possible to display numerical and visual characteristics of author, institution, or country clusters, distances within and between clusters, and the degree of relationship in these networks, where clustering and network analysis are employed holistically. Furthermore, information regarding the actuality of these linkages may be gained by adding the time dimension to the network image. Figure 3 illustrates the co-authorship network and cross-country collaboration of the authors published in MIS Quarterly in this context.

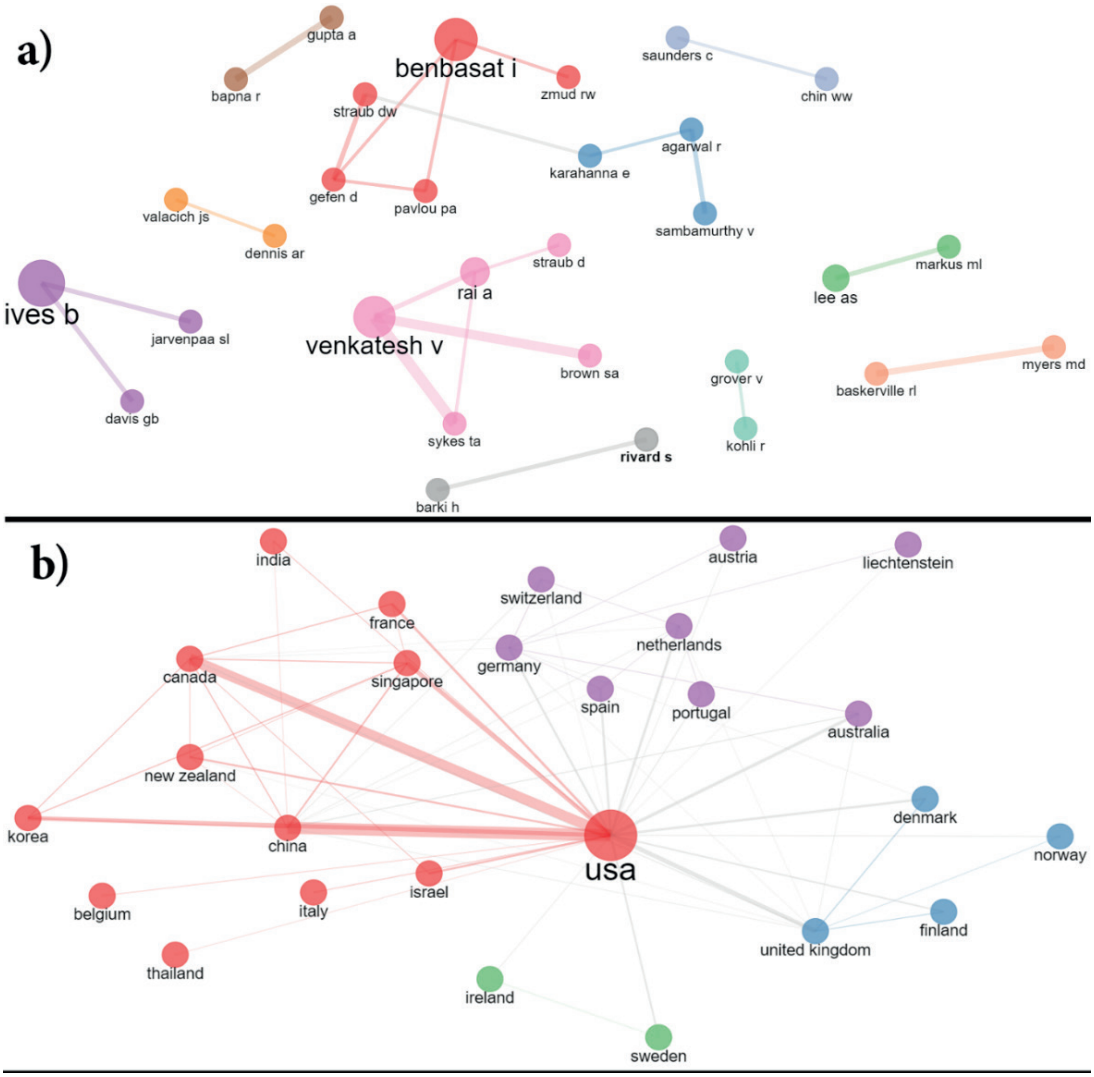

Figure 3. Collaborations among the Institutions, Researchers, and Countries

Between 1980 and 2020, Table 3 shows information such as the number of publications (*N*) and citations (*C*), the number of citations per publication (*ACPI*), and the *H*-Index of academics who published ten or more research and review articles in the MIS Quarterly. According to the number of papers, the most prominent authors in these ranks are Benbasat I (*N*:31; *C*:8997; *ACPI*:290, *X*:23), Venkatesh V (*N*:28; *C*:19650; *ACPI*:701, *X*: 79), Ives B (*N*:22; *C*:1876; *ACPI*: 85, *X*:27), Zmud RW

(*N*:18; *C*:5607; *ACPI*:311, *X*:5), Rai A (*N*:17; *C*:3804; *ACPI*: 223, *X*: 76). When the co-authorship network is reduced to the size of an author based on at least three publication criteria (Figure 4), the close collaboration between Benbasat I and well-known authors such as Zmud RW, Ives B, and Wethere JC, Venkatesh V, and Rai A is a remarkable finding.

Table 3

Most Productive Authors

Rank	Authors	N	C	ACPI	X	Rank	Authors	N	C	ACPI	X
1	Benbasat I.	31	8,997	290.23	27	13	Lyytinen K.	12	922	76.83	10
2	Venkatesh V.	28	19,650	701.79	22	14	Jarvenpaa S.L.	11	1,300	118.18	10
3	Ives B.	22	1,876	85.27	13	15	Mithas S.	11	1,021	92.82	10
4	Zmud R.W.	18	5,607	311.50	18	16	Straub D.W.	11	7,994	726.73	10
5	Rai A.	17	3,804	223.76	13	17	Whinston A.B.	11	1,105	100.45	8
6	Pavlou P.A.	15	4,823	321.53	13	18	Goodhue D.L.	10	2,791	279.10	9
7	Pinsonneault A.	15	1,683	112.20	12	19	Lee A.S.	10	1,327	132.70	9
8	Dennis A.R.	14	1,855	132.50	13	20	Rao H.R.	10	692	69.20	8
9	Grover V.	14	3,093	220.93	13	21	Rivard S.	10	1,053	105.30	8
10	Gupta A.	14	642	45.86	11	22	Sambamurthy V.	10	3,244	324.40	10
11	Karahanna E.	14	7,582	541.57	13	23	Valacich J.S.	10	1,489	148.90	9
12	Agarwal R.	13	4,144	318.77	13	24	Watson H.J.	10	1,133	113.30	10

N: Document Count, *C*: Citation Count, *X*: *H*-index, *STC*: Sum of Times Cited, *ACPI*: Average Citations Per Item

The topics that the most productive researchers handled have been evaluated based on the most contributed topics. The following information has been extracted through a parametric query executed on Scopus bibliometric data in between 2016-2020 (Scopus, 2022):

- *Benbasat, Izak (The University of British Columbia, Vancouver, Canada):* social media, online reviews, brand community, privacy concerns, online shopping, electronic commerce, social networking sites, Instagram.
- *Venkatesh, Viswanath (Virginia Polytechnic Institute and State University, Blacksburg, United States):* technology acceptance model, mobile payment, e-learning, communication; transactive memory systems, shared mental model, boundary objects, affordances, innovation.
- Ives, Blake (*College of Charleston, Charleston, United States*): business schools, management education, engaged scholarship, consumer search, price dispersion, community participation, bitcoin, ethereum, internet of things.
- Zmud, Robert W. (Price College of Business, Management Information Systems, The University of Oklahoma, United States): Firm, Disclosure Control, Sarbanes-Oxley Act.
- *Rai, Arun (Georgia State University, Atlanta, United States*): Technology Acceptance Model, Mobile Payment, E-Learning, Digital Transformation, Strategic Alignment, COBIT, Open-Source Software Development, User Innovation, Photographic Developers.
- *Pavlou, Paul A. (Fox School of Business, Philadelphia, United States):* social media, online reviews, brand community, information systems, it outsourcing, offshoring, crowdfunding, lending, fintech.
- *Pinsonneault, Alain (Université McGill, Montreal, Canada):* social media, online reviews, brand community, personnel, innovative behavior, creative performance, alliance portfolios, firm, open innovation.
- *Dennis, Alan R. (Indiana University Bloomington, Bloomington, United States*): brainstorming, idea generation, artificial intelligence, information systems research, congresses, knowledge management, social media, online reviews, brand community.
- *Grover, Varun (Sam M. Walton College of Business, Fayetteville, United States*): digital transformation, strategic alignment, cobit, information systems research, congresses, knowledge management, boundary objects, affordances, innovation.
- *Gupta, Alok (Carlson School of Management, Minneapolis, United States),* first-price auction, auctions, independent

private values, combinatorial auctions, vehicle routing, pickup and delivery, electronic trading, automated trading, trading agent competition.

- *Karahanna, Elena (Terry College of Business, Athens, United States):* privacy concerns: online shopping, electronic commerce, communication, transactive memory systems, shared mental model, work-family conflict, work-life balance, personnel.

Therefore, especially new researchers in the field of MIS would infer on which topics the leading researchers of the field intensively have focused. These findings also indicate trends and current issues in the journal. Detailed findings on the topics handled in the journal from past to present are presented in Section 4.4 with enriched visualizations.

Creating and supporting an environment and conditions appropriate for new researchers by bringing together qualified professionals in a particular sector has become a prerequisite for the long-term sustainability of research and development activities. Governments, higher education institutions, and other funding organizations promote these ecosystems. The results of these analyses, in particular, provide significant information for evaluating the potential of partnering with other countries for conducting joint research during and after PhD processes.

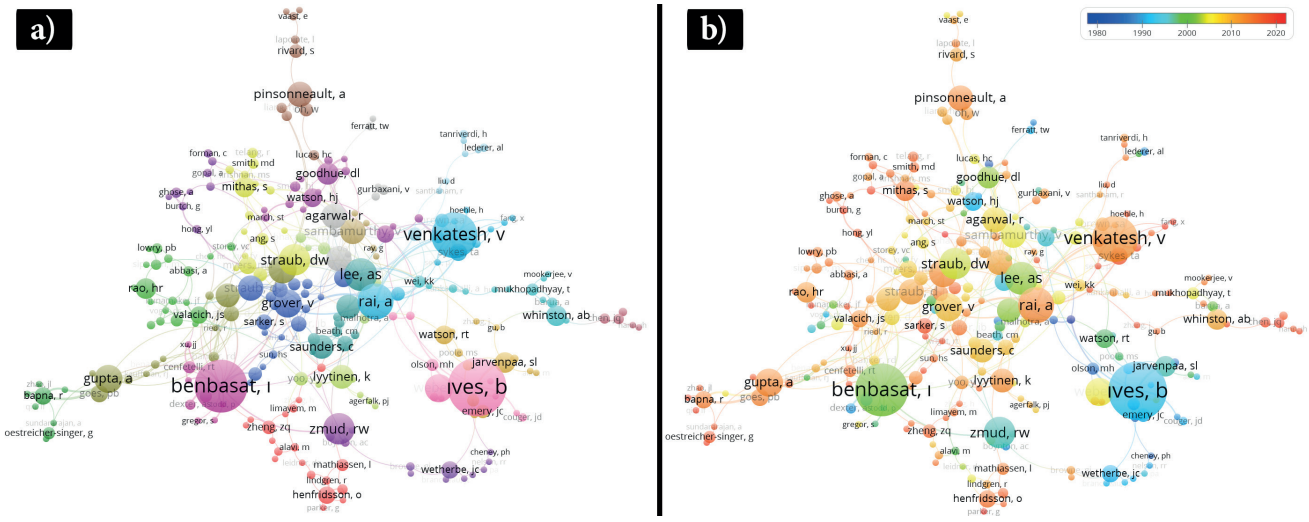

Figure 4. Co-authorship Network by Authors (Min. 3)

4.3. Citation Statistics and References

According to Culnan (1987), publishing and citation practices provide an empirical foundation for the socialization of novices in the field by transferring professional standards to science. Understanding the intellectual roots of fields with a certain maturity in the literature, such as MIS, and identifying the core concepts rely heavily on citation patterns. When this assessment is specialized to MIS Quarterly, it can be observed that 1,550 papers published over the forty years under examination received a total of 256,062 citations. Self-citations account for 7,807 of these citations. The dataset's papers acquired a total of 165.2 citations on average. 230 is the *H*-index value. These are the most often used statistics for assessing the impact of research. Compared to overall statistics in various fields, the statistics acquired within the publication's scope are comparable. In this regard, MIS Quarterly can be described as a high-quality, research-impacting journal that frequently serves as a reference for new studies.

The references in the papers are also worthwhile considering if one wants to learn more about the theoretical framework of these research attempts. Text analytics is used to process and analyze bibliometric data reference lists to uncover information such as which research in the literature are inspired by and which studies are discussed. The dataset's publication portfolio includes references to 19,172 different references. The number of sources used five times or more is 1,816; ten or more 891; 50 or more 184; and 100 or more is 91. In this context, several findings such as the most cited sources, the linkages between

the publications employing common references or common journals can be revealed. In this regard, Table 4 highlights journals that the papers in the journal most cited. Although these sources are classified as journals, books, papers, or a website, it is apparent that the journals constitute the majority of the references.. While scientific breakthroughs continue, researchers who are new at handling this research subject encounter an extensive portfolio in the first stage. When you have such a vast portfolio, it is not easy to swiftly and effectively choose where to begin your research, which studies to focus on, and which journals to search first. The most striking outcome of Table 4 is how frequently journals connected with the research topic Business & Economics have been cited during a forty-year publication trend of a major journal of MIS. Then it was discovered that computer science, information science, library science, psychology, and operations research and management science had a priority. In particular, in a multidisciplinary field such as MIS, it can be noticed that various research areas also produce the appearance of the major and primary patterns focused by the researchers.

Table 4

Most Cited Journals in the Papers

Rank	Journal	Research Domain	5YIF	C
1	MIS Quarterly	Computer Science; Information Science & Library Science; Business & Economics	9.917	8,409
2	Information Systems Research	Information Science & Library Science; Business & Economics	5.634	3,761
3	Management Science	Business & Economics; Operations Research & Management Science	5.467	2,861
4	Organization Science	Business & Economics	4.947	1,869
5	Communications of The ACM	Computer Science	6.064	1,542
6	Academy of Management Review	Business & Economics	12.397	1,349
7	Academy of Management Journal	Business & Economics	11.807	1,248
8	Journal of Management Information Systems	Computer Science; Information Science & Library Science; Business & Economics	5.399	1,163
9	Administrative Science Quarterly	Business & Economics	9.787	1,057
10	Harvard Business Review	Business & Economics	6.849	977
11	Strategic Management Journal	Business & Economics	7.843	929
12	Journal of Marketing Research	Business & Economics	6.542	911
13	Journal of Applied Psychology	Psychology; Business & Economics	8.025	873
14	Journal of The Association for Information Systems	Computer Science; Information Science & Library Science	4.644	788
15	Journal of Marketing	Business & Economics	9.917	696
16	European Journal of Information Systems	Computer Science; Information Science & Library Science; Business & Economics	5.131	687
17	Journal of Personality and Social Psychology	Psychology	7.748	600
18	Journal of Management Information Systems	Computer Science; Information Science & Library Science; Business & Economics	5.399	599
19	Journal of Consumer Research	Business & Economics	7.366	563
20	Decision Sciences	Business & Economics	3.000	533

* C: Citation Count, 5YIF: Five Year Impact Factor

Table 5 also shows the top 15 most cited articles in the MIS Quarterly over forty years. Davis's (1989) paper, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology", is by far the most cited. Venkatesh V, one of the most productive researchers, is also notable for his most frequently mentioned works. Venkatesh V is among the authors of two papers in a top-15 list of the most-cited articles. These papers are "User Acceptance of Information Technology: Toward a Unified View", and "Consumer Acceptance and Use of Information Technology: Extending The Unified Theory of Acceptance and Use of Technology", respectively. Karahanna E, among the most productive authors, is in sixth place in the most-cited article list with his study entitled "Trust and TAM in Online Shopping: An Integrated Model".

Table 5

Most Cited 15 Papers

Rank	Article Title	Year	Authors	C
1	Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology	1989	Davis, F. D.	18,951
2	User Acceptance of Information Technology: Toward a Unified View	2003	Venkatesh, V., Morris, M.G.,…& Davis, F.D.	12,571

3	Design Science in Information Systems Research	2004	Hevner, A.R., March, S.T.,... & Ram, S.	4,576
4	Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues	2001	Alavi, M., & Leidner, D. E.	4,287
5	Consumer Acceptance and Use of Information Technology: Extending The Unified Theory of Acceptance and Use of Technology	2012	Venkatesh, V., Thong, J. Y., & Xu, X.	3,283
6	Trust and TAM in Online Shopping: An Integrated Model	2003	Gefen, D., Karahanna, E.,& Straub, D.W.	3,085
7	Understanding Information Systems Continuance: An Expectation-Confirmation Model	2001	Bhattacherjee, A.	2,933
8	Analyzing The Past to Prepare for The Future: Writing A Literature Review	2002	Webster, J., & Watson, R. T.	2,534
9	Computer Self-Efficacy - Development of A Measure and Initial Test	1995	Compeau, D.R., & Higgins, C.A.	2,469
10	Why Should I Share? Examining Social Capital and Knowledge Contribution in Electronic Networks of Practice	2005	Wasko, M.M., & Faraj, S.	2,357
11	Business Intelligence and Analytics: From Big Data to Big Impact	2012	Chen, H., Chiang, R.H.,& Storey,V. C.	2,141
12	Behavioral Intention Formation in Knowledge Sharing: Examining The Roles of Extrinsic Motivators, Social-Psychological Forces, and Organizational Climate	2005	Bock,G.W., Zmud, R.W.,…& Lee, J. N.	2,128
13	A Resource-Based Perspective on Information Technology Capability and Firm Performance: An Empirical Investigation	2000	Bharadwaj, A.S.	2,012
14	Task-Technology Fit and Individual-Performance	1995	Goodhue, D. L., & Thompson, R. L.	1,973
15	A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems	1999	Klein, H.K., & Myers, M. D.	1,928

* C: Citation Count

Co-citation networks among these publications can assess the frequency of publications being cited by other articles. The approach for analyzing and visualizing co-citation networks is similar to the method for analyzing and visualizing co-authorship networks described previously. This technique was applied to examine the references used in articles published in the MIS Quarterly, and the linkages between clusters and journals were discovered (Figure 5).

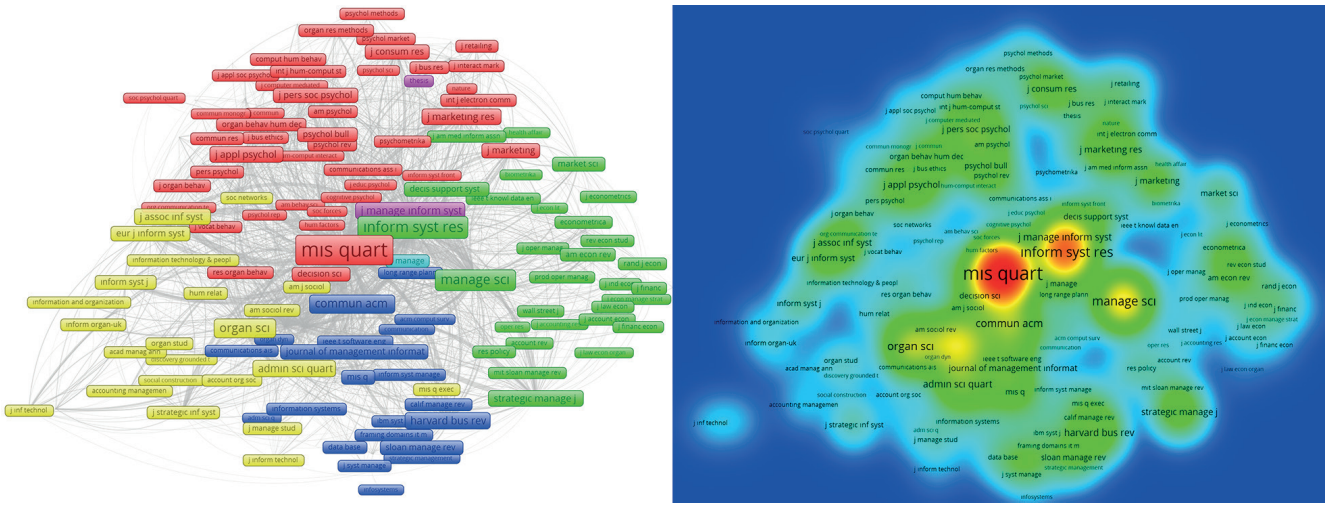

Figure 5. Co-citation Network of Journals (Min. 40 references)

Data from at least 40 co-cited publications were included in the analysis to ensure the readability of the network and the most cited sources, and it was discovered that the journals in which these papers were published were grouped into six different clusters.

4.4. Keywords and Topic Structures

Keywords are another dimension in bibliometric data. Keywords that have been carefully chosen to reflect best the papers provide information about the topics covered in the publications. Network and text analysis can also reveal the composition of keywords and patterns embedded in the keywords in the portfolio. Accordingly, the Conceptual Structure Factorial Analysis

based on Multiple Correspondence Analysis was applied through Bibliometrix package of R embedded into Biblioshiny user interfaces to reveal the topic structures as shown in Figure 6. When the position of the journal in the MIS field is examined, keyword analysis of the papers carried out through title, author keywords, keyword plus, and abstract allows the movement of the field from the 1980s to 2020 to be seen more clearly.

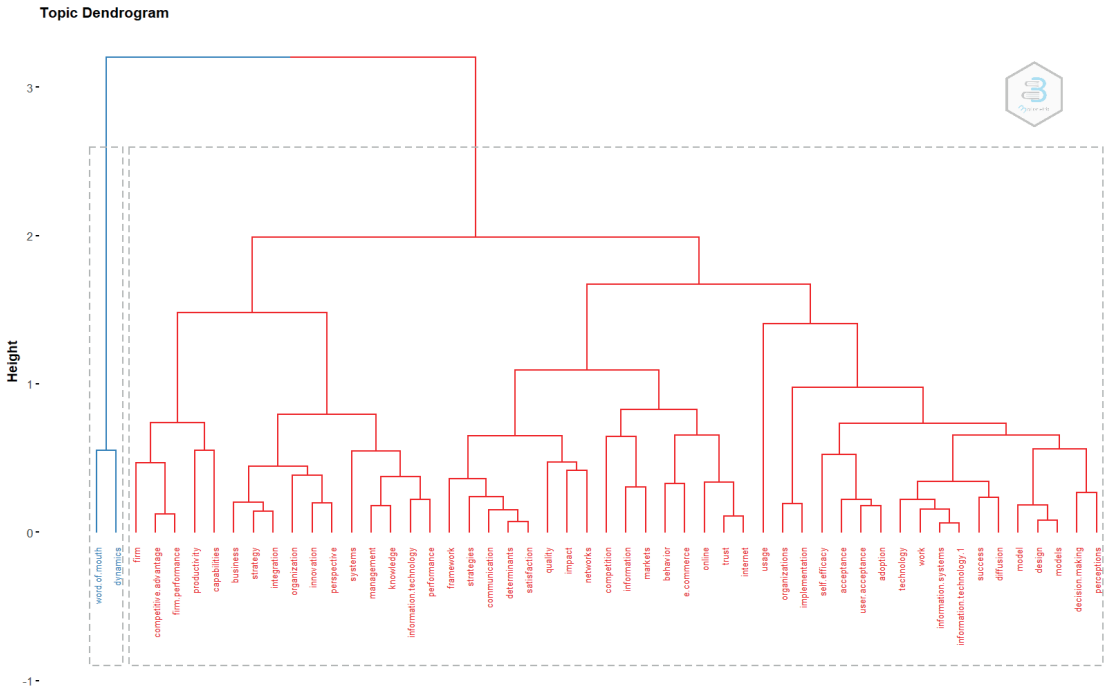

Figure 6. Topic Dendogram (1980-2020)

When analyzing the topics addressed in the MIS Quarterly for forty years at once, the issues that stood out in the period compared to the overall statistics in this large-scale dataset may disappear. Likewise, a partition should be created in order to see how the age and dynamics of the period are reflected in the publications in the field of MIS. While the forty years between 1980 and 2020 are divided into ten-year sub-periods as 1980-1990, 1991-2000, 2001-2010 for the first periods, the remaining ten years are separated into five-year segments as 2011-2015 and 2016-2020 for the later periods. In this approach, readers will be able to have a better sense of current trends in the foremost journal of the field, and they will be able to learn more about the debates in international literature.

Co-occurrence analysis was performed for the keywords used in each period, and the findings were represented in three distinct ways: network, overlay, and density visualizations. Network visualization is the display of the relationships (edges or links) between data components that take roots from network analysis which is a collection of techniques for evaluating and visualizing the structure of those interactions (**John Hopkins, 2022**). To display changes over time, overlay visualization might be employed. As a heatmap, density visualization gives a simple summary of the key terms in a field (**VOSviewer, 2022**).

4.4.1. Period 1: 1980-1990

Between 1980 and 1990, 319 papers were published in MIS Quarterly. 422 authors from 203 different institutions from nine countries collaborated on these studies. The papers include a total of 361 author keywords, and among them, information systems and analysis, MIS, MIS management and development, decision support systems, management information systems, office automation, systems analysis and development, strategic planning, life cycle, user involvement, and critical success factors have more weights and are heavily preferred. On the network, words like telephones, electronic mail, and office systems also stand out (Figure 7).

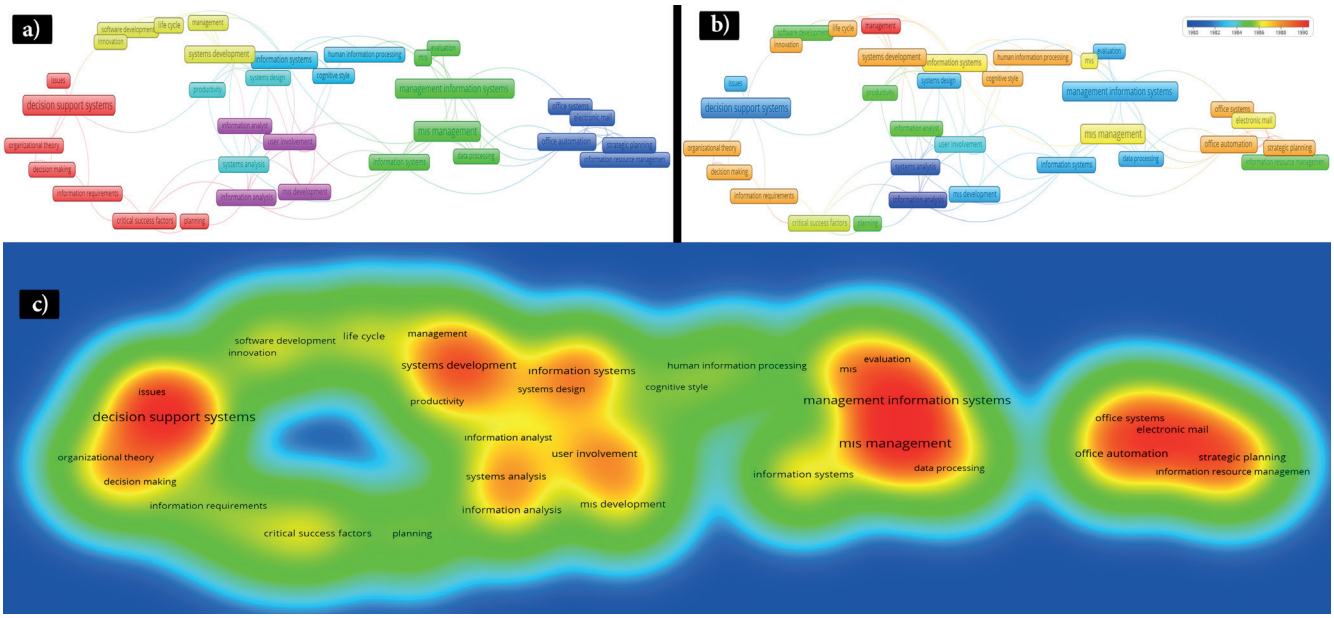

Figure 7. Keyword Network Patterns and Heatmap of Frequencies (1980-1990)

According to the findings collected from keyword clusters, the research primarily focuses on computer science, management science, and organization science. It naturally corresponds to Culnan and Swanson's (1986) findings, published in the same period and context. Figure 7a depicts the co-occurrence network of keywords; Figure 7b, the network for the most popular research terms on the same network by year, and Figure 7c, heatmap for most frequently used keywords. In terms of today's equivalent, 1980-1990 can be considered to be the foundation years for information systems. The frameworks that guide MIS research arose in the 1980s according to Ives et al. (1980). The subject became more structured in the 1990s, introducing a classification scheme for MIS research (Barki et al., 1993) and discussing diversity issues (Benbasat and Weber 1996). Topics found not to be problematic in recent years (such as telecommunications, electronic mail, and office systems) were debated in that period. At the beginning of the period, time-dependent topic changes were accumulated on technological topics such as systems analysis, data processing, and decision support systems, while the topics focused on organizational dimensions of MIS such as office automation, organizational theory, cognitive approaches, and strategic planning toward the end of the period.

Alican (2006) evaluated the issue of Israel, Ireland, and India, which are referred to as the 3I countries, with their success in the global software sector, and Ireland's entry into the telecommunication sector to be strong in the information and communication technologies sector, particularly in the 1980s and 1990s. He added that he places a high value on addressing the sector's infrastructural issues by developing cybercities, technoparks, and research institutions. He also mentioned that state regulations had been formed to design curricula in training programs following the requirements of the telecommunications industry. After a proper development environment was created for the sector, foreign investors were attracted. This program serves as a model for developing countries seeking a role in the software industry or information and communication technologies. These issues, which were explored at a macro level, were also reflected in the literature at those times.

4.4.2. Period 2:1991-2000

There were 293 research papers published in the journal between 1991 and 2000. 437 authors from 195 different institutions from 22 countries collaborated on these papers. There were 907 author keywords used during that period. Figure 8 summarizes the keyword clusters, trends by year, and their densities In that sense, information systems and information systems types, systems advances, personnel skills, and management are among the topics that came to the fore and were extensively addressed in the 1991-2000 period. The other hot topics of the period are management, group support systems, expert systems, executive information and executive support systems, decision support and group decision support systems, management of information

systems, electronic meeting systems, information requirements determination, information technology, information systems personnel, implementation, information systems development, measurement, and end-user computing, information systems, software project management, software engineering, service quality, software quality, career management, and human competencies and skills.

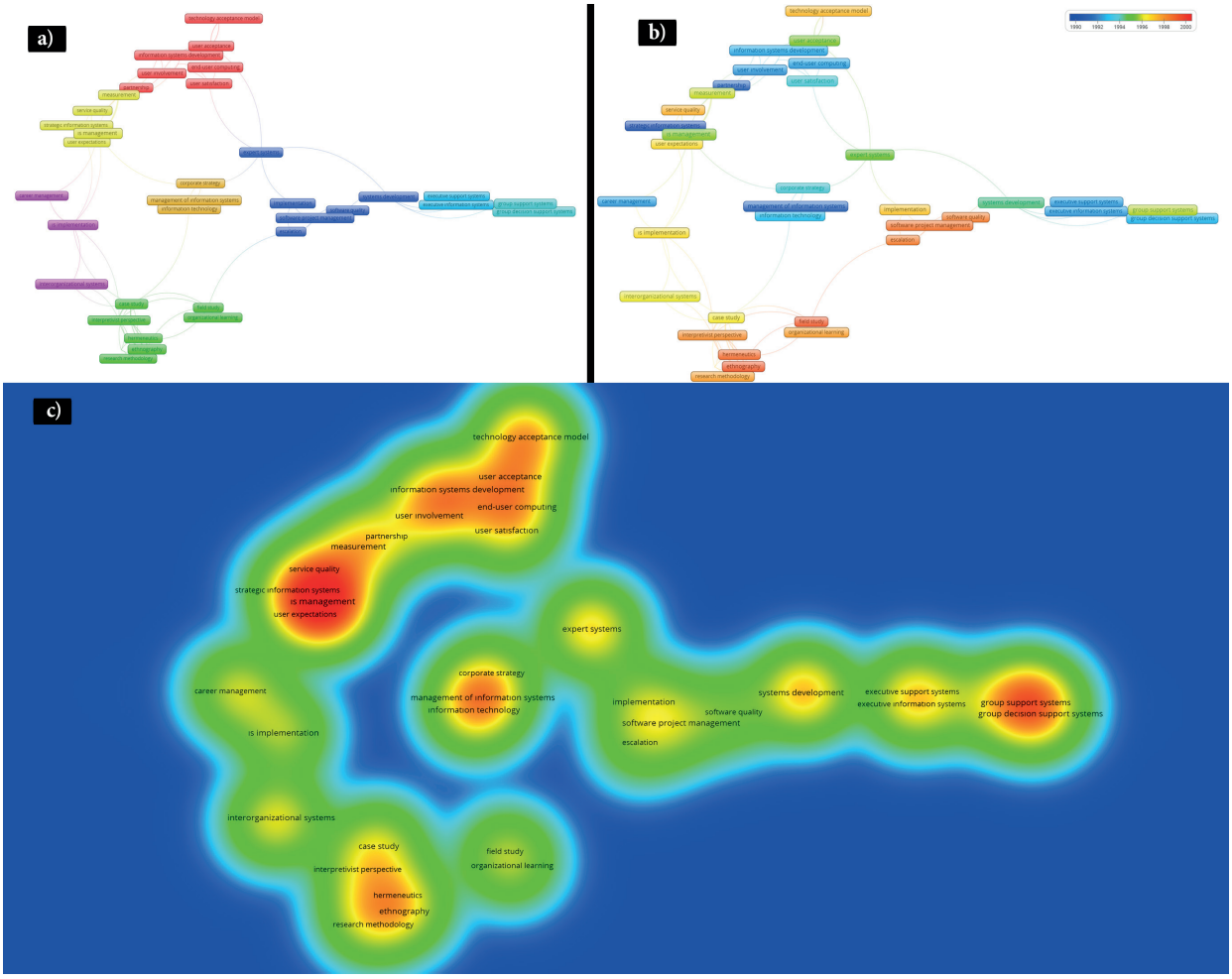

Figure 8. Keyword Network Patterns and Heatmap of Frequencies (1991-2000)

In the early 1990s and early 2000s, studies concentrating on organizational approaches from the preceding analytical period continued. As a result, at this level, the keyword networks established in the time dimension provide vital insights into the future of the relevant literature. Naturally, rapid technological advancements are reflected in MIS research. These studies, along with system analysis and design, system performance measurement, decision support systems, expert systems, and group decision-making systems, are commonly studied topics. The issues of user participation and satisfaction in the design process were handled more compared to the preceding period. Putting the user at the center of the system design was becoming more popular. Near the end of the period, issues such as software development and related service quality and project management became apparent. Project management methodologies were investigated in studies connected to the design of information systems and the development and licensing of relevant software.

Other research undertaken regularly in the literature has discussions in the same direction. The dimensions of the change in information and communication technologies that emerged toward the end of the 1990s, bringing memories and functional circuits to micro dimensions enhanced intelligent functionality, the interconnectivity of various systems, portability and wireless systems, distributed systems that can support parallel architecture or interoperability, and system integration through open system interface, hardware or software (Bowonder et al., 1993). According to Benbasat and Zmud (1999), the focus of

the MIS study during that time turned to the consideration of information technologies as artifacts, the search for MIS's identity, and the questioning of its relationship with related MIS research.

According to Anderson and Lee (2000), the advent of the Internet has significantly altered established business practices and competition regulations and introduced new value propositions and business models. As a result, it depicts the effects of information systems on the organization and its stakeholders and the sector's competitiveness in the research topics of the period. Development, strategic information systems, organizational learning, strategy, corporate strategy, inter-organizational systems, escalation, systems adoption, user involvement, participation, behavior and expectations, partnership, technology acceptance model, and user acceptance and satisfaction are topics covered in these studies.

According to Palvia et al. (2004), the issues of information systems sources and management are addressed extensively and even at the top of the list of topics in research on information systems management in the field of MIS. Figure 8 backs these assertions. This condition can be described as causing information systems to diversify by focusing on business demands and being employed more in organizational processes. The diversification of information systems has had a significant influence. This productivity has been examined as a production process, with software project management and people competencies being called into question more frequently. While interest in electronic commerce, the Internet, information systems, global information technology, artificial intelligence, expert systems, neural networks, and knowledge management issues grew in the same study, interest in executive information systems, information system planning, the internal and external environment, and information management issues decreased. Interest in system function applications has dwindled according to reports.

According to Reddy et al. (2009), MIS allows businesses to deliver the appropriate information to the right people at the right time by boosting interaction between the organization's employees, the data collected in information systems, and the procedures it employs. Of course, as rapidly developing information systems and information technology impact business processes, it is unavoidable for organizations and businesses to be prepared for this, to accept the relevant technologies, and many discussions and research in the field of MIS are taking place during this period. Keyword associations represent these principles in our paper.

On the other hand, Kızıl et al. (2014) stated that as technology evolves, the ecosystem in which businesses operate evolves as well. Companies can improve their competitiveness within this ecosystem by adapting to information technologies, a qualified workforce, and reliable and quality information. This review supports the conclusions drawn by Reddy et al. (2009). The processing, access, classification, protection, and use of information when necessary are examined within the framework of information management in another study (Henkoğlu and Erefoğlu, 2019), which reaches conclusions in parallel with these investigations. Information centers and information professionals mostly carried out these processes before the 1990s. With the increased volume of information produced and the more extensive use of information technologies, particularly for information access, studies on information management in several disciplines have increased since the 1990s.

The rapid rise of the Internet, intranets, extranets, and other interconnected worldwide networks in the 1990s, according to Ergüner Özkoç (2019), considerably boosted the capacities of information systems in the corporate world at the dawn of the twenty-first century. They noted that the role of information systems has changed dramatically and that the usage of internet-based and web-supported businesses and global e-commerce and e-commerce systems has become prevalent in today's commercial organizations' operations and internal processes.

Different conclusions stand out in other research examining the 1990-2000 timeframe regarding the development of the MIS field. These are usually concerned with developing field theories and the construction of a distinct identity. According to Palvia et al. (2004), the subject of MIS Theory, which was intensively explored in earlier years, has seen a dramatic fall throughout the relevant time. According to Benbasat and Zmud (2003), the discipline has yet to establish a distinct identity despite a thirty-year existence due to frequent changes in research techniques and constantly changing technical innovations. The approaches such as action research, case study, field study, research methodology, qualitative research, interpretive perspective, hermeneutics, learning, and ethnography are frequently used in the papers. These findings are similar to Palvia

et al. (2003)'s investigations, in which he reviewed publications from seven top MIS journals from 1993 to 1997. It is worth noting that the survey technique always comes out on top, followed by conceptual models, laboratory tests, and case studies.

Although the conclusions of this study are similar to those of systematic studies in the literature, the transitions between topics and the evolution of subjects in the MIS area can be understood holistically because of the continuous examination of the study over forty years.

4.4.3. Period 3: 2001-2010

Between 2001 and 2010, 346 papers were published in MIS Quarterly. A total of 1,368 keywords were defined for these papers, which were carried out by 555 authors working in 235 different institutions from 24 other countries. According to Henry and Dalton (2002), due to the digital economy, there has been an increase in information technology expenditures in modern organizations in the 2000s. As a result of this transformation, the competencies of business department students for information systems have begun to be discussed. The effect can also be observed in the common word network created by studies published in the MIS Quarterly (Figure 9).

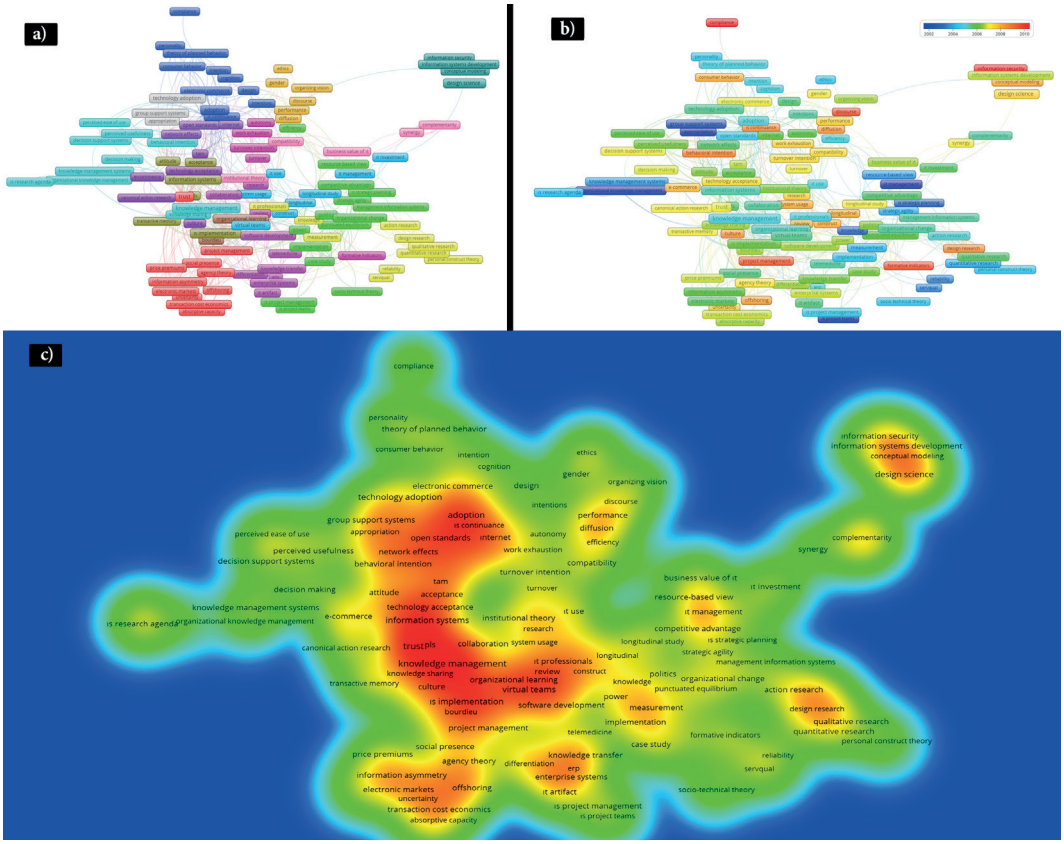

Figure 9. Keyword Network Patterns and Heatmap of Frequencies (2001-2010)

Topics of the period are around the keywords such as technology adoption, technology acceptance model, acceptance, technology acceptance model (TAM), culture, collaboration, IT use, agency theory, the business value of IT, IT investment, adoption, organizational learning, organizational change, competitive advantage, knowledge transfer, knowledge management, knowledge management systems, decision making, theory of planned behavior, and perceived usefulness. These discussions appear to focus mainly on the impact of information technology on businesses, their internal and external stakeholders, their implications for organizational processes, and their competitive advantage. Within the framework of the managerial approach, it is possible to say that the technology acceptance situations, cultural changes, created values, knowledge, and technology transfers experienced in this transformation of organizations that develop in conjunction with technology and adopt MIS are also the subjects of research.

According to US Bureau of Labor Statistics forecasts for the period 2000-2010, computer-related occupations occupy eight of the top ten fastest increasing occupations are as follows: Desktop publishers, database administrators, and systems analysts are examples of software applications engineers, support professionals, systems software engineers, network and systems administrators, network systems and data communications analysts, network and systems administrators, network systems and data communications analysts, and desktop publishers, database administrators, and systems analysts (Noll and Wilkins, 2002). Information systems, software development, information systems development, and implementation, information technology, outsourcing, trust, measurement, performance, relevance, design science, virtual teams, the existence of topics, the product produced in information technology, the production process of this product, and its satisfaction with the product are among the main topics that have been extensively studied and come to the fore.

According to Palvia et al. (2004), the scope of MIS study areas has expanded and become more diverse since 2000. As can be seen from the network, the obtained topic distribution confirms this thesis. Information systems, software development, approaches for these information systems, the necessity for individuals with practical competence, and the diversification of these information systems have still been debated.

Outsourcing software development projects has become a popular topic in recent years, and it is a significant concern in MIS systems that use holistic information technology. The outsourcing of software development to subcontractors outside the client organization's home country is known as global software outsourcing. Customers and software developers have indicated that global outsourcing connections should be prioritized to reap more immense rewards (Heeks et al., 2001). Outsourcing in this area allows a company to focus on its core competencies while making use of vendors' technological competence, economies of scale and scope, and capacity to moderate labor demand changes across multiple customers (Dey, 2010). India, realizing this, is one of the top countries in the area, although the competition is fierce. In the 1990s and 2000s, other nations such as Ireland, Israel, Russia, China, the Philippines, Taiwan, Singapore, and Vietnam gained a reputation for offshore outsourcing (Amoribieta et al., 2001; Nidumolu and Goodman, 1993). According to Athreye (2005), there was a slowdown in software demand in the 2000s, although there was a general increase in the outsourcing market. As a result, it can be said that the term outsourcing, which is one of the most hotly debated topics at the moment, backs up these claims. In the related years of the software business, it can be said that outsourcing of some jobs to overseas countries has been popular, and there has even been a diversification in this study field. According to Babar et al. (2007), reliance on outsourcing partnerships is a relatively recent field of research in software engineering in addition to software outsourcing. Customers and vendors, who are typically from diverse cultural backgrounds, are increasingly conscious of the importance of understanding the dynamics of developing and retaining trust.

Internet is one of the most prominent words in Figure 9. The Internet's power and the rapid growth of information and communication technologies have significantly impacted today's global business and service delivery models (Balaraman and Kosalram, 2013). The quick Internet entrance into our lives since the 1990s and the rapid installation of telecommunication infrastructure in the 2000s have accelerated the spread of global information technology.

Many positive and bad situations experienced during the commissioning of these systems in organizations are worth examining, and sharing the findings with the scientific world will add to the field. In this regard, the inclusion of sociotechnical theory in word networks is also a discovery that should be considered. The following is how O'Brien and Marakas (2011) described the evolution of information systems in processing management across time. Electronic data processing systems from the 1950s to the 1960s, management information systems for business decision processes from the 1960s to the 1970s, decision support systems from the 1970s to the 1980s, end-user information systems from the 1980s to the 1990s, expert and strategic systems from the 1990s. According to him, management information systems and the Internet-based e-commerce systems from the 1990s to the 2000s as well as enterprise resource planning, business intelligence, data visualization, customer and supply chain management systems from the 2000s and later play a critical role in business processes. Internet, e-commerce, electronic marketplaces, offshore, electronic commerce, and network effects are aspects that enable this situation during the period.

Another critical idea set is a computer and, in particular, communication networks. It should not be forgotten that the introduction of social media platforms into our lives, particularly after the first half of the period, resulted in significant

changes and transformations in personal and professional communication and business practices. Virtual teams, remote working environments, and large corporations' outsourcing of these environments are all on the agenda of this period. Keyword clusters in Figure 9 demonstrate this well-known phenomenon using an analytical approach based on scientific study data. While the concepts of Internet, e-commerce, e-government, privacy, and security were at the forefront in the 1990s, information systems, communication, and computer networks were addressed in the 2000s, notably in the 2000s and later according to Henkoğlu and Erefoğlu (2019). With the rapid entrance of media tools into our life, he remarked that access to knowledge and big data concepts are hotly debated topics.

In addition to these topics, the types of studies and methodologies studied in the relevant period, such as resource-based view, qualitative research, structural equation modeling, meta-analysis, case study, empirical research, action research, and so on, were studied in the relevant period, as they were in previous periods. The change in word clusters and diversity reflects itself in the co-occurrence of keyword networks as the period's progress. This shows that as the MIS field has matured, it has become increasingly intertwined with other ecosystems and the dynamics of the age, resulting in a plethora of discoveries and difficulties to investigate. This condition is particularly apparent between 2000 and 2010 when digital transformation signals are enhanced, and technology transfer is accelerated.

4.4.4. Period 4: 2011-2015

Between 2011 and 2015, 1,408 keywords were used to characterize 298 articles published in the MIS Quarterly. 620 authors from 295 different institutions from 32 countries collaborated on these studies. The widespread issues in the preceding period are still prevalent in that period. Figure 10 depicts the research word density.

Information systems, information systems development, information technology (IT), digital infrastructure, enterprise systems, information privacy and security, information privacy concerns, knowledge management, cognition, recommender systems, sociomateriality, digital business strategy, organizational change, and information privacy and security are all terms that are frequently used. Organizational learning, coordination, the business value of information technology, firm performance, information technology, its effect on internal processes, and its value for the business are all concepts and subjects that can be counted. Compared to previous times, there has been an increase in the number of research looking into MIS and related technological breakthroughs in the field of health, and they have become visible in the common-word network. Electronic commerce has become one of the most popular topics as numerous company models have developed.

During this time, research fields such as business intelligence, business analytics, and big data analytics have grown significantly. All research and projects conducted to produce applications for lower-level users and provide application skills in this field to users at all levels with distant learning platforms maintain their leading position in the subject. Chen et al. (2012) stated that business intelligence and analytics have emerged as a field of study that is important for practitioners and researchers, reflecting the size and impact of data-related problems that need to be resolved in contemporary business organizations. It is seen that this field of study, with the motto of decision support not only for managers, but for everyone, surpasses information systems such as expert systems and decision support systems, which were frequently used in keyword co-occurrences networks of previous periods.

Topics like social network analysis and sociomateriality have been quite popular during this time. The most notable research from this period are Cecez-Kecmanovic et al. (2014), Jones (2014), and Scott and Orlikowski (2014). The relational basis of sociomaterialism, according to Carlile et al. (2013), has profound consequences for present conceptions of technology, agency, society, materialism, morality, and ethics. The tremendous rise in the global popularity of social media platforms such as Facebook, Twitter, Instagram, and others has drawn the attention of MIS experts. In their studies, the researchers extensively covered social networks and media, social, social network analysis, collaboration, network effects, networks, society, online communities. Oestreicher-Singer and Sundararajan (2012), Kane et al. (2014), Butler et al. (2014), Johnson et al. (2014) can be referenced for these inferences.

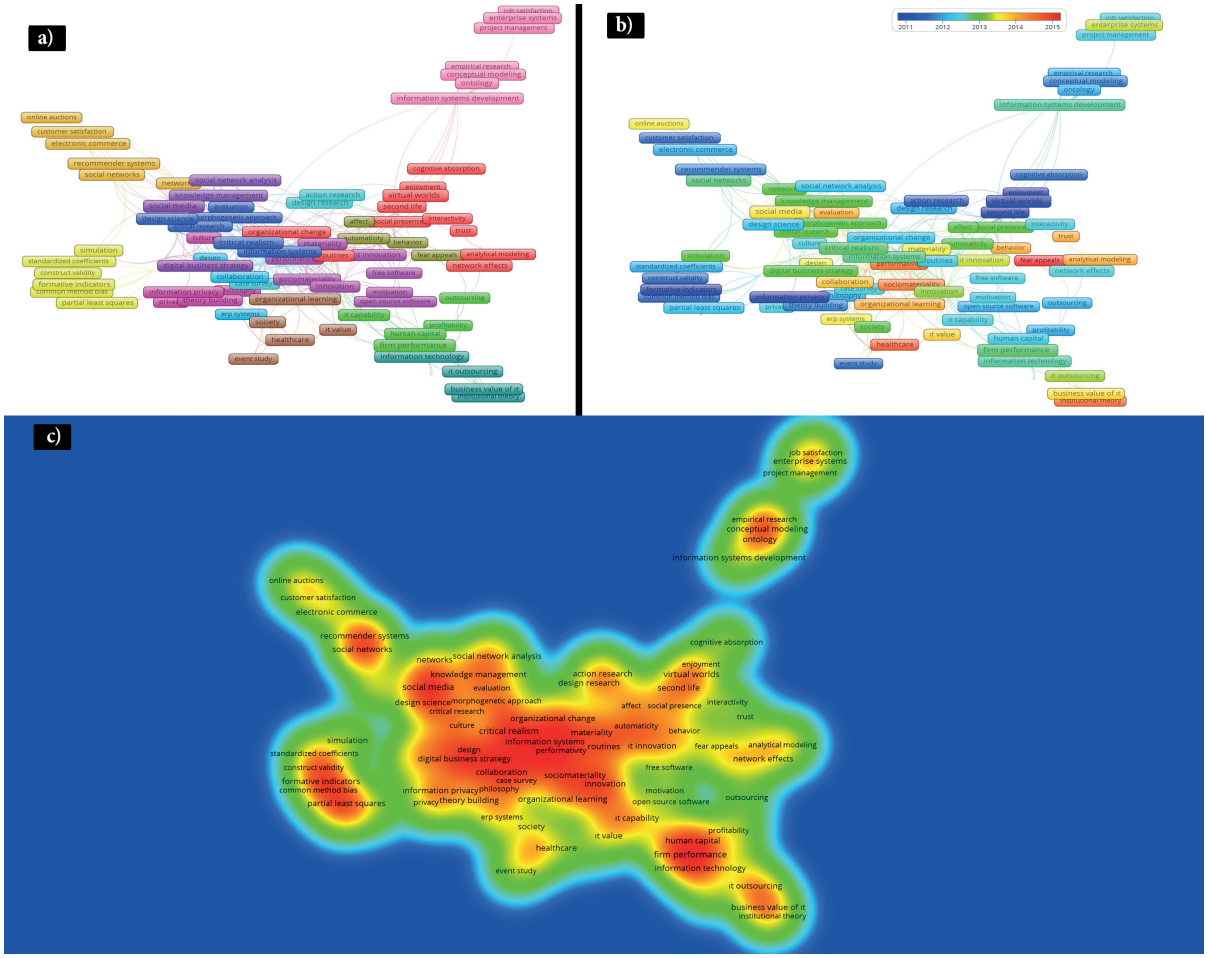

Figure 10. Keyword Network Patterns and Heatmap of Frequencies (2011-2015)

Another concept set that stands out in Figure 10 is gathered around Web 2.0 applications. Along with Web 2.0, online environmental search offers executives unprecedented opportunities to leverage aggregated web intelligence to develop better insights into cross-border sociocultural and political-economic factors (Lau et al., 2012). In this context, many different business models have taken their place in the literature and practice. With the development of data mining, machine learning, and artificial intelligence applications, applications within the scope of recommender systems have also developed rapidly, and opportunities have been created to automatically offer many options to users at mass and personal levels, at the shopping or selection stage. These practices have effectively gone beyond the classical marketing understanding and made digital marketing more dominant in related research. While digital marketing consisted of advertising tools on websites, Google ads, or essential websites in the previous years, in this period, it has advanced to the level of shaping user trends by finding different ways to reach users with Facebook, Instagram, and similar tools (Al-Waked, 2013; Joseph, 2012; Chen and Stallaert, 2014).

In this period, the software infrastructure of information systems, which was discussed in earlier periods, grew in density. This is assumed to be due to the globalization of the market, the increase in human resources entering the market, and the ambition of information technology and software businesses to gain more market share. Keywords of information technology innovation and competence, IT outsourcing and value, human capital, productivity, and performance have high frequencies in this context (Kotlarsky et al., 2014; Su, 2015; Gupta and Zhdanov, 2012; Mehra and Mookerjee, 2012).

In addition to these topics, as in other periods, keywords for research methodology can be listed as partial least squares, text mining, monte carlo simulation, regression, research methods, meta-analysis, theory, structural equation modeling, mixed methods, conceptual modeling, theory building, formative indicators, validity, case study, resource-based view, action

research, practice. Although the Industry 4.0 revolution announcement occurred during this period, concepts such as Industry 4.0 and the Internet of Things did not reach such a frequency that they could be included in the keyword network. Relative terms that can be used in the network have been gathered around the concept of digital transformation.

4.4.5. Period 5: 2016-2020

The MIS Quarterly published 294 research between 2016 and 2020. Given that the latest two periods of the study are each five-year long, it can be concluded that the publishing frequency of the journal has increased in the last ten years. It is assumed that during these periods of rapid digital transformation, communication networks, and business model advancement, substantially more work is involved due to the necessity for more MIS research or increased opportunities. Of course, that rise did not affect the journal's quality or impact. Over five years, 685 authors from 302 different institutions and 30 different countries. 1,548 distinct keywords were used in the articles published in the journal. Figure 11 depicts the period's co-occurrences of keywords.

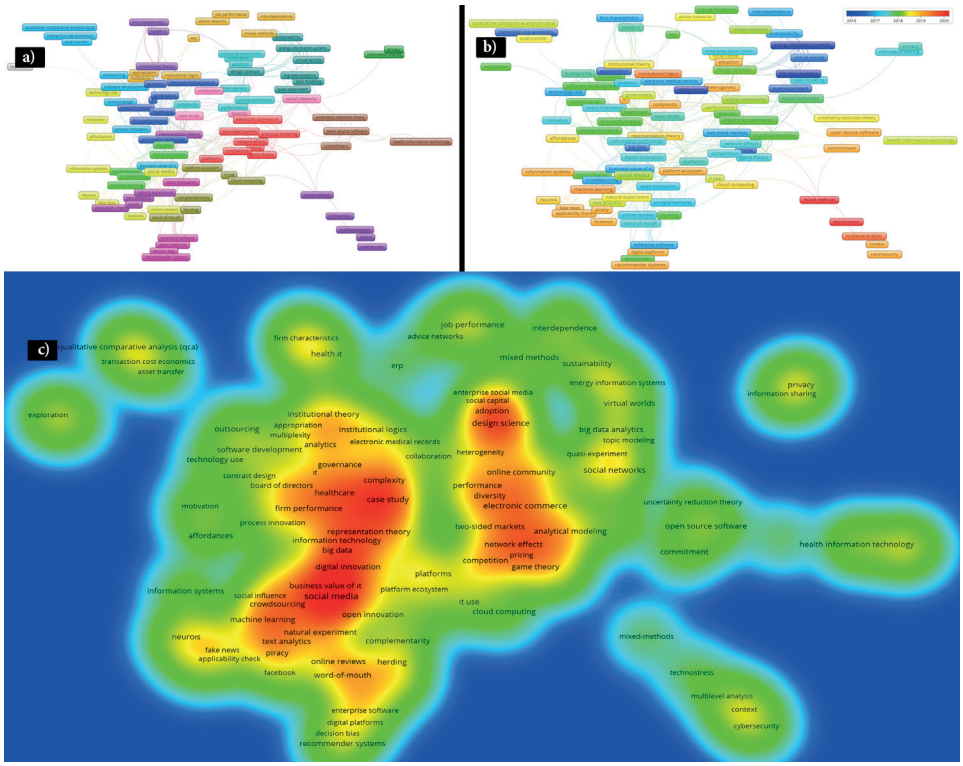

Figure 11. Keyword Network Patterns and Heatmap of Frequencies (2016-2020)

It is seen that understanding the sources of sustainable competitive advantage (Seviçin, 2006) (resource-based view), which was put forward in the 1980s, was one of the topics studied in that period as well (Faulkner and Runde, 2019; Ayabakan et al., 2017). However, software development, performance, job performance and satisfaction, knowledge management, information systems, electronic commerce, the economics of information systems, information technology, the business value of information technology, platforms, digital innovation and transformation, technology adoption and use, adoption, topics such as open innovation, firm performance, privacy, trust, piracy, and security are also up-to-date. With the acceleration of the digital transformation dynamics of the period, the density of concepts such as big data, big data analytics, cloud computing, software-as-a-service, platforms, crowdsourcing, and crowdfunding has increased. It is thought that the studies related to Industry 4.0 are considered around concepts such as digital transformation, digital innovation, and big data. However, it is interesting that the term Industry 4.0 is not directly involved in the network. The problem here may be the preference or frequent use of these terms in the MIS field.

One of the terms observed in Figure 11, Crowdfunding is a new generation investment and funding system that relies on small donations from prominent individuals. Crowdfunding is a method of fundraising that, due to advancements in

communication technologies and the participatory atmosphere provided by the Internet, allows people with innovative ideas and entrepreneurial spirit to pursue their dreams (Yazıcı, 2018; Fettahoğlu and Khusayan, 2017), especially for the developing countries that have low the entrepreneurial capital. Another advantage of the Internet and media is that it facilitates crowdsourcing, an open innovation technique. As traditional innovation relies solely on internal resources, it places a financial strain on businesses by resulting in high-cost items (Bozat, 2017). In this period, utilizing the activities of the virtual crowd or developing related approaches linked to them has been a prevalent issue (Mo et al., 2018; Jian et al., 2018).

In addition to these concepts, the institutional theory, which provides a basis for research in sociology and organizational studies (Angst et al., 2017), and institutional logic, which focuses on how systems shape the cognitive and organizational behaviors of actors (Berente et al., 2019; Faik et al., 2020); recommender systems aiming to present the right advertising points for businesses and the right services and products for users by analyzing mass and personal preferences through machine learning; complex search matching problems (Adomavicius et al., 2019; Malgonde et al., 2020); panel data analyzed in the field of statistics and econometrics (Angst et al., 2017) are among the subjects that left their marks on this period.

The development of digital tools has also closely affected the sociological characteristics and dynamics of activism, causing people to communicate more in virtual environments with the influence of environmental dynamics (Selander and Jarvenpaa, 2016). Therefore, these topics were displayed in the keyword network in Figure 11, with the terms herding, social change, networks and communities, diffusion, network effects, digital activism taking their place among the topics covered in MIS research.

Another area that receives a lot of attention is health informatics. Health information technology, healthcare, electronic health records, chronic disease self-management, health care patient systems, clinical decision making, healthcare predictive analytics, regional health services, information technology, and digital advantages for health services are some of the subtitles attached to the keyword network in this context (Lin et al., 2017; Bernardi et al., 2019; Son et al., 2020). The reflection of the Covid 19 pandemic affecting the entire world in the literature was also investigated, especially in 2019 and 2020; however, no publication on the global epidemic was discovered in the dataset. At this point, MIS researchers can conduct a variety of studies on how to handle epidemics in various ways, as well as their impact on business processes, organizational structure, and system actors. In reality, it has been observed that many distinct issues have been explored on this topic in prior periods. (Venkatesh et al., 2017; Salovaara et al., 2019; Tan et al., 2020). The fact that the pandemic was declared in 2019 and that research on the subject takes time to conduct and publish could have an impact on the outcome. Given that research in the social and technological sciences is published considerably faster on the epidemic, this might be viewed as MIS researchers progressing more slowly to develop solutions for providing information and knowledge. It is also worth noting that there is the possibility of conducting further in-depth research to get more concrete results.

Global warming and the difficulties it generates have also been examined in the literature in the field of MIS, with sustainability being one of recent debated topics (Jha et al., 2016; Vaast et al., 2017; Wunderlich et al., 2019) since MIS and the related information technologies are the essential tools for addressing climate change (Damar and Gökşen, 2018).

In this period and the previous period, we encountered other exciting topics: virtual worlds, second life, critical realism, virtual worlds, virtual reality, and virtual environments (Baskerville et al., 2019; Harrison and Windeler, 2020;). It is also common for these concepts, which have an important place in the historical development of the metaverse phenomenon (Damar, 2021a; Damar, 2021b), which is expressed as the future of the Internet, to be one of the research titles in a critical journal in the field of MIS. Especially in recent years, developments in blockchain technology, sensor technology, the advancement of augmented and virtual reality technologies, along with the latest statements of South Korea and Facebook founder Zuckerberg about Metaverse (Yonhap News Agency, 2021; Alang 2021), have come to the fore on these issues, and research on these issues is predicted to increase even more (Damar, 2021a).

In addition to these topics, as in other periods, such as game theory, mixed methods, machine learning, case study, natural experiment, representation theory, online reviews, qualitative comparative analysis, sentiment analysis, text analytics, literature review, theory development, and analytical modeling are the types of methodologies studied in the period.

MIS was initially defined as a relatively new academic discipline with its tradition and history, focusing on the strategic, managerial, and operational use of different information systems at different levels (Culnan1987; Baskerville and Myers, 2002; Katerattanakul et al., 2006). The trends observed in this study, in which we evaluated the field's forty years, show that MIS has always been one of the leading research areas, with studies that assess all of today's dynamics from its perspective, in a variety of fields, and conjunction with the foundations in this definition.

5. CONCLUDING REMARKS

The study contributes to the MIS literature in many ways. The forty-year development of the field has been evaluated through the MIS Quarterly, one of the most critical journals in the MIS research field. The findings reveal the prominent publications, authors, journals, citations, and the relationships among these dimensions. In addition to descriptive statistics, analysis within the scope of cluster analysis, network model, and text analytics reveals the field's situation since the 1980s.

Field researchers and journal editors can learn a lot from the findings of such investigations. Researchers can learn about commonly utilized approaches and subject areas and know which topics are popular in the field. It allows researchers to compare their positions in the field as well as popular study topics to their own. It provides an overview of the overall structure of the field for journal editors, as well as a notion of the gaps in the literature (Palvia et al., 2004)

When the patterns among researchers and the diversity of referenced journals are evaluated together with word and subject analysis, it has been seen that the MIS field is related to many disciplines from human-computer interaction, user tendencies, use of information systems to data analysis. The transformation of the MIS field has directly paralleled the development of information and communication technologies. Researchers have revealed essential findings over the years on the impact of information and communication technologies on business. In the analyses made on the subject types, it is revealed that the journal approaches to the MIS field from a managerial and philosophical point of view. Although it parallels with the technological developments, the concepts such as the Internet of Things and Industry 4.0, which have left their marks on the agenda, especially in organizational levels recently, have not reached the level of visibility yet.

There have been particular bibliometric studies on MIS Quarterly or in the context of MIS in previous years. However, it is beneficial to repeat some research over time to update knowledge, conclusions and trends because the literature is a dynamic entity in constant motion and development. From this point of view, this study varies from others in that it deals with a forty-year-old portfolio with holistic and sub-fractions supported by various tools and visuals and its comparative findings to their literature counterparts.

From the window of the MIS Quarterly, this bibliometric and scientometric research conducted over forty years would provide useful information for researchers and practitioners who need to evaluate the MIS field holistically and find precursor studies that would provide a basis for future research. It is thought that such studies also have a catalytic effect by revealing the topics that have been effective in the historical process, especially for researchers in developing countries other than those published in this journal.

Researchers in countries with low productivity in MIS Quarterly such as Turkey, Kenya, Egypt, Malaysia, Qatar can be advised to focus on opportunities to study or participate in projects in these prominent institutions. Collaboration opportunities with leading institutions and academics can be created by making use of government scholarships, post-doc or visiting researcher funds. By doing so, it is possible for researchers to make significant contributions both to their personal academic development and to the development of the national MIS domain.

The foundation of MIS Quarterly is an unmissable success story. The Management Information Systems Research Center, one of the field's most important centers, publishes MIS Quarterly. Both the center's and journal's contributions to the field can serve as a source of inspiration for countries looking to improve in this area and generating policies. Such initiative is expected to have a good impact on academics' viewpoints and global collaborations.

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