EKSPLORASI BIBLIOMETRIK BERBASIS PEMODELAN *LATENT DIRICHLET ALLOCATION* PADA TOP-3 JURNAL BIDANG SISTEM INFORMASI MANAJEMEN

A LATENT DIRICHLET ALLOCATION -BASED BIBLIOMETRIC EXPLORATION OF TOP-3 JOURNALS IN MANAGEMENT INFORMATION SYSTEMS

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ABSTRACT

Studying research trends in a certain topic has various benefits to academics and practitioners, including the capacity to predict future research paths, establish networks and collaborations, and obtain insights into market and industry demands. This research aims to use bibliometric analysis to examine the intellectual structure and thematic evolution of the field of management information systems (MIS). A comprehensive analysis of publication characteristics was performed on the top three MIS journals (IJIM, JSIS, and MIS Quarterly: Management Information Systems) from the SCOPUS database between 1980 and 2021. This work broadened and improved scientometric research on MIS by incorporating latent Dirichlet allocation (LDA) into the approach, resulting in a more thorough and up-to-date analysis. Our findings indicate the trend of publishing articles, the structure of science, and the topics that stand out in the top three journals.

Keywords: *Topic modeling, bibliometric analysis, management information system, Latent Dirichlet Allocation.*

ABSTRAK

Mempelajari tren penelitian dalam topik tertentu memiliki banyak manfaat bagi akademisi dan praktisi, antara lain kemampuan untuk memprediksi arah penelitian di masa depan, membangun jaringan dan kolaborasi, serta mendapat wawasan mengenai permintaan pasar dan industri. Penelitian ini bertujuan untuk mengkaji struktur intelektual dan evolusi tematik bidang sistem informasi manajemen (MIS) melalui analisis bibliometrik. Analisis komprehensif karakteristik publikasi dilakukan pada tiga top jurnal MIS (IJIM, JSIS, dan MIS Quarterly: Manajemen Information System) dari database SCOPUS antara tahun 1980 dan 2021. Karya ini memperluas dan memberikan kontribusi dalam penelitian ilmiah tentang MIS dengan memasukkan metode *latent Dirichlet allocation* (LDA) ke dalam metode sehingga menghasilkan analisis yang lebih menyeluruh dan terkini. Temuan kami menunjukkan tren penerbitan artikel, struktur sains, dan topik yang menonjol di tiga jurnal teratas.

Kata Kunci: Pemodelan topik, analisis bibliometrik, sistem informasi manajemen, *Latent Dirichlet Allocation*.

1. INTRODUCTION

Trends represent the general tendency of changes in a data set (Robb, 2018), whereas trend analysis captures the past and present to predict the future. Knowing research trends in a specific sector has various advantages. It assists academics and practitioners in discovering essential research topics, forecasting future changes, and comprehending market and industry requirements. Previously, specialists mainly assessed the state of technical development through literature evaluations. However, the increased availability of digital scientific articles and information opens up new opportunities for streamlining this procedure. As a result, text mining is increasingly used in topic analysis to uncover research trends.

The primary goal of this research is to gain insights and descriptions about the intellectual structure and evolution of research themes in the field of management information systems over

time by conducting a bibliometric analysis of articles published in the top three MIS journals by employing latent Dirichlet allocation (LDA). A management information system (MIS) is a system that organizes, analyzes, and provides data to management in order to increase the effectiveness of decisions and policies. There are over 100 journals in the field of MIS, and it is continually evolving. This study obtained the top three management information systems journals based on SCOPUS citation scores to identify trends in the MIS research topic. The top three journals are the International Journal of Information Management (IJIM), Strategic Information Systems (JSIS), and MIS Quarterly: Management Information Systems. We performed a bibliometric analysis of scientific articles published in these top three journals and employed LDA to analyze the evolution of research topic trends in the MIS field.

The International Journal of Information Management (IJIM) is a UK-based publication that is included in 16 international databases. It was formerly called Social Science Information Studies, and its first volume was released in 1976. IJIM received almost 10,000 citations between 2017 and 2020, with a cite score of 18.1 and a citation percentage of 93. According to these citation criteria, IJIM is among the top three MIS journals. Since 2019, IJIM has been classified as a Q1 journal in the discipline of MIS.

The journal of Strategic Information Systems (JSIS), on the other hand, was launched in 1991, making it the youngest publication when compared to MISQ and IJIM. JSIS is concerned with integrating information technology into organizational strategy alignment, strategic thinking, change management, and organizational governance. Since 2007, it has been labeled as a Q1 journal in MIS, with a cite score of 17.4. JSIS received 1371 citations between 2017 and 2020, with 87% of its articles cited.

Third on our list is "MIS Quarterly" (Management Information Systems). It is a peer-reviewed journal issued by the Management Information Systems Research Centre at the Carlson School of Management, University of Minnesota. The first volume of MISQ was released in 1977 and possessed three research, two theory, and two review papers. However, MISQ was not included in SCOPUS until 1980. From 2017 to 2020, MISQ received 3639 citations, with a citation rate of 14.7 and a citation percentage of 86%. This massive citation record places MISQ among the top three journals in the discipline. MISQ is published quarterly, with volume released in March, June, September, and December. From 1999 until 2020, it was constantly recognized as a Q1 journal on information systems and management.

Management Information Systems is concerned with more than just developing computer software; it is also concerned with people, organizations, businesses, and technology. The term "management information system" first emerged in a United States Navy report on using computers to establish a single integrated system to manage all of the Navy's resources (Harizanova, 2003). There are various definitions of MIS, which are presented in Table 1.

Table 1. Management information systems definitions

No	Source	Definition
1	Stata and Almond (1989)	"Transform data into information and then help managers transform information into knowledge and knowledge into action."
2	O'Brien (1999)	"A term given to the discipline focused on the integration of computer systems with the aims and objectives of an organization."
3	Shah (2014)	"System that uses the information required by the organization's management at every level in making operational, tactical, and strategic decisions. Its main objective is to design and implement procedures, processes, and routines that provide suitably detailed reports in an accurate, consistent, and timely manner."

In this work, Latent Dirichlet allocation (LDA) is utilized for topic trend analysis in the MIS field. LDA is a statistical model based on probabilistic modelling used for topic finding in text sources (Lau, 2013). Such models rely on the premise that documents have a latent semantic structure that may be represented as the combination of topics, with each topic getting a probability distribution over words (Blei et al., 2003). LDA is regarded as the most basic topic model (Blei, 2011). It inputs text data (for example, scientific publications or news stories) and outputs three results: topic assignments per word, topic proportions per document, and corpus-wide topic vocabulary. Even though considering that LDA has been present for a while, it remains the most extensively used and popular algorithm for examining topics from research articles.

Despite its slowness, LDA produces more semantically interpretable results (Suri & Roy, 2017). This unsupervised learning methodology is classed specifically as a clustering method. LDA is a soft clustering technique since it allows documents to be associated with various clusters due to the multiple topics in a single document. However, extracting exact and meaningful clusters in LDA remains a significant challenge, like other clustering techniques.

Previous similar studies addressed the investigation of research in the MIS field. Özköse and Gencer (2017) conducted a study on bibliometric analysis in the MIS discipline. The study focused on 24 journals with 20497 articles to evaluate, and it used BibExcel and VOSViewer as tools to analyze and illustrate the structure of the MIS field. As a result, three clusters, namely industrial engineering, business/management, and computer science, play an important role in the MIS sector. Furthermore, Sharma et al. (2021) conducted a current bibliometric analysis with MIS as the primary topic in 2021, which provides a full overview of the same domain from 1970 to 2019. This study investigates trends in knowledge by institutions, countries, themes, and authors to capture the evolution of knowledge in this discipline. The structural topic modeling method was applied to extract topics from the research articles. This study emphasizes the six most prevalent information management themes: data management, knowledge management, the environment, mobile and web, projects, and services.

A bibliometric examination of the top three journals is particularly interesting because it has represented MIS journals since 1980. There have been 2463 research articles published in these three journals. The top 20 publications received almost 125,000 citations in total. This study updates and extends prior scientometric studies on MIS by including Latent Dirichlet Allocation into the technique.

2. RESEARCH METHODS

Figure 1 describes the stages conducted in this study, namely data aggregation, data pre-processing, topic extraction, and analysis. The details of the four stages are explained as follows:

2.1. Data Aggregation

For the experiment in this study, data were collected from the Scopus database on November 30, 2021. The dataset consists of 3665 bibliographic data from all published research articles from the journals IJIM, JSIS, and MIS-Q indexed by Scopus. Titles, abstracts, and keywords were used as input for the topic modeling.

2.2. Data Pre-processing

Nowadays, computer science and linguistics have advanced the study of language in the disciplines of natural language processing and computational linguistics (Roque et al., 2019). In order to obtain rich topical terms, the necessary steps to clean and filter the data based on linguistic information and natural language processing techniques were designed and constructed in this

study. These steps were then applied to documents related to the topic of interest. In this regard, the MIS research area was considered to be explored. Some standard pre-processing methods that were used in this study include case folding, particular character and punctuation removal, stop word removal, tokenization, part-of-speech (POS) filtering, lemmatization, and vectorization.

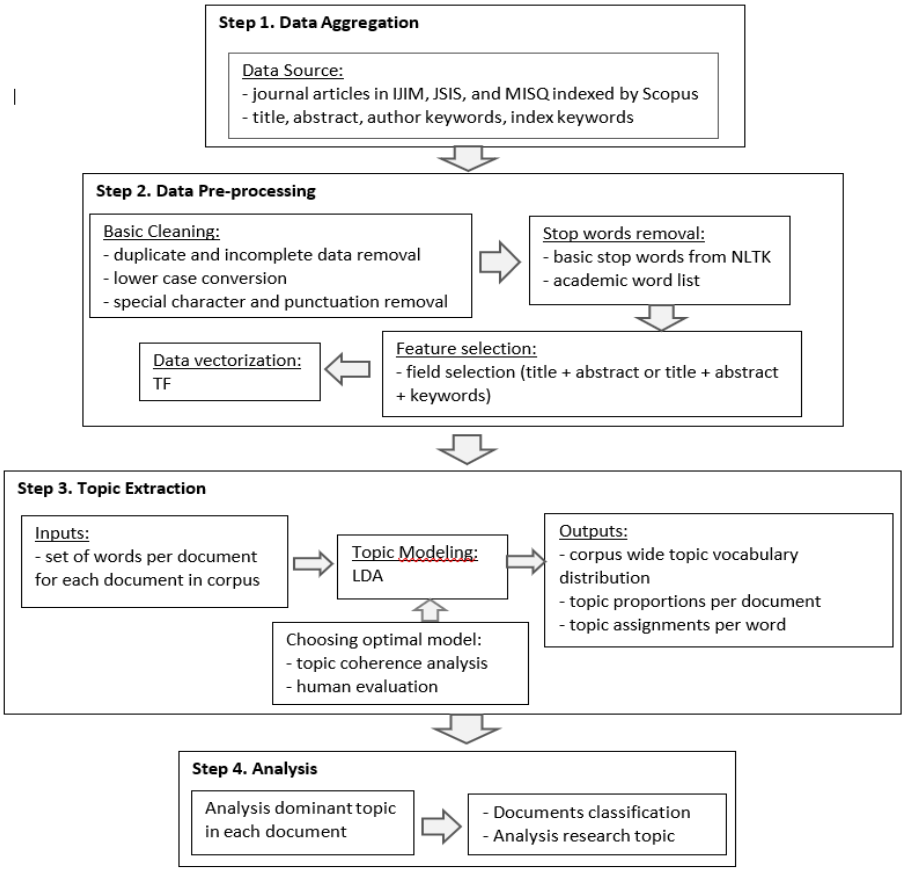

Figure 1. Research Stages

2.3. Topic Extraction

The topic model in this study was obtained from the implementation of LDA on a clean dataset. LDA takes in text data and produces three outcomes: topic assignments per word, topic proportions per document, and corpus-wide topic vocabulary. As with other clustering cases, choosing an adequate number of topics is a common problem. Choosing too few topics will result in topics that are too broad, while choosing too many topics will result in many very similar small topics (Greene et al., 2014). There is no standard method for determining the optimal number of topics. The optimal number of topics is selected by calculating the coherence value of the number of different topics within a certain range and by human evaluation. This study conducted experiments with some topics between 10-35. The topic coherence value shows a level of word similarity for a topic and distinguishes whether a topic can be interpreted semantically (Stevens et al., 2012). In this study, the coherence score of each LDA model was calculated using the c_v coherence measure from Gensim (Syed & Spruit, 2017).

2.4. Analysis

In this study, general data analysis was performed to determine the number of publications per year, the number of publications per institution, the number of publications per country, and the number of citations per document.

3. RESULTS

3.1. Journal Publication from 1980 to 2021

Three journals published their first volumes in different years. IJIM's first volume was published in 1976, followed by MIS-Q in 1977 and JSIS in 1991. We concentrated on data available on SCOPUS, so the IJIM data for the analysis began in 1986, and the MIS-Q data began in 1980. Figure 2 depicts a comparison of the top three journal publications between 1980 and 2021. The number of journal publications per year from 1980 to 2021 shows a stagnant increase trend, and this increment is evident in the year 2020. 2020 is the most active year for IJIM and MISQ, with 203 and 58 journals published, respectively.

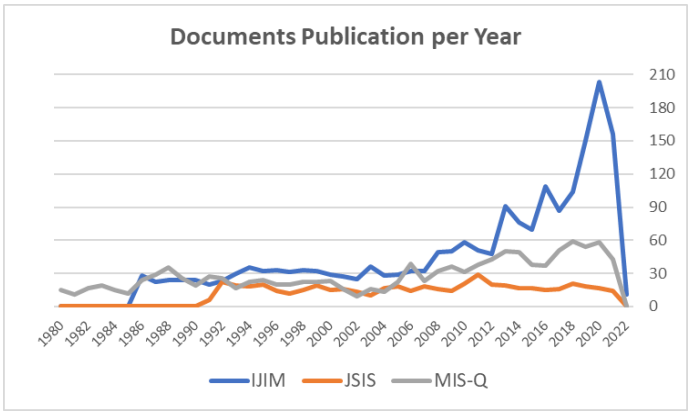

Figure 2. Documents publication per year for the three journals

3.2. Top 10 Countries with Publication

Figure 3 shows that the United States and the United Kingdom dominated MIS publication in the top three journals. The United States accounted for 43% of total publications, with 1552 journals published in the three journals. The United Kingdom comes in second with as many as 19% of total publications.

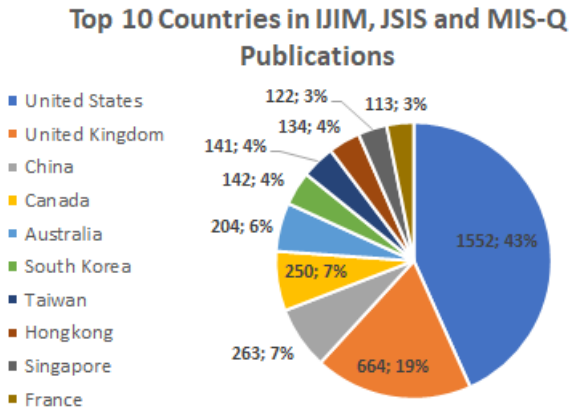

Figure 3. Top 10 countries in IJIM, JSIS and MIS-Q publications

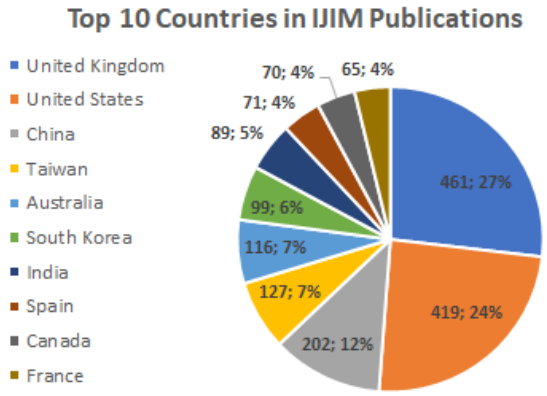

Figure 4. Top 10 countries of publications on IJIM.

Looking at each journal separately, the United States accounted for 24%, 33%, and 66% of total publications in IJIM, JSIS, and MSI-Q, respectively. Asia-Pacific countries such as China, Taiwan, Australia, South Korea, and India appeared in the top 10 countries in IJIM Publications (Figure 4). While in JSIS, only Singapore and Australia appeared on the list.

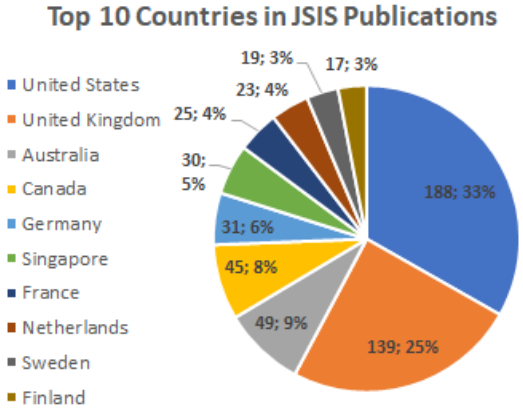

Figure 5. Top 10 countries of publications on JSIS

Figure 5 reveals that the United States and the United Kingdom dominated the publications in JSIS, with only Singapore and Australia representing Asia-Pacific countries in the list. A similar pattern is seen in the MIS-Q publication chart (Figure 6), in which the USA and Canada dominate. MIS-Q, on the other hand, is more diverse, with five Asian countries on the list.

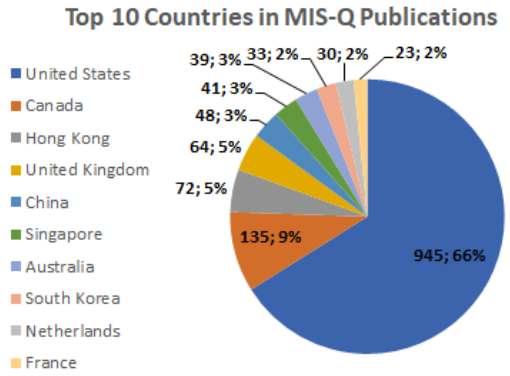

Figure 6. Top 10 countries of publications on MIS-Q

3.3. Top 10 Institution with Publication

In terms of the top-10 institutions in publications, each journal has different entries. Three out of ten institutions in the IJIM publication are located in the United Kingdom. The National University of Singapore comes in at No. 3 with 30 publications in the journal, as shown in Figure 7.

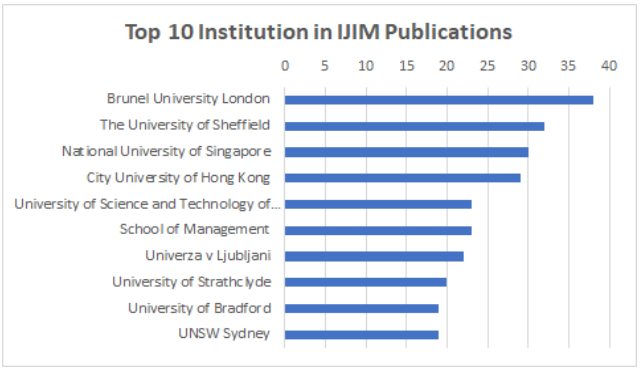

Figure 7. Top 10 institutions of publication on IJIM

Meanwhile, Figure 8 depicts that Warwick Business School and the University of Warwick lead the number of publications at JSIS. The National University of Singapore and Nanyang Technical University, both in Singapore, are surprisingly among the top 10 institutions in JSIS publications.

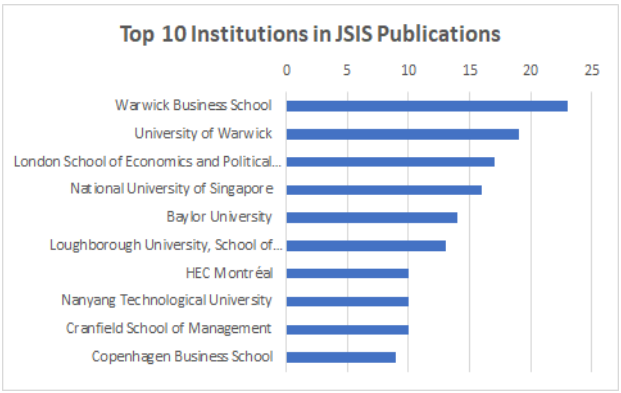

Figure 8. Top 10 institutions of publication on JSIS

It can be seen from Figure 9 that most of the institutions in our top 10 list of MIS-Q publications are located in the US. This fact shows that US institutions mostly dominate MIS-Q.

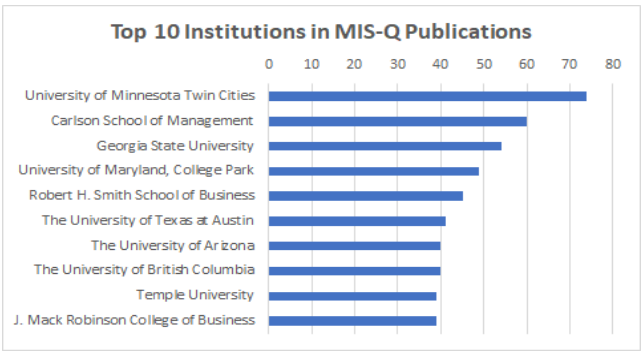

Figure 9. Top 10 institutions of publications on MIS-Q

3.4. Top 10 Most Cited Articles

Table 2 portrays the top 10 most cited articles from the three journals. The ten articles on the list are all from the journal MIS-Q. Three of the ten articles on the list were published before 2000. An article by Davis F.D. (Davis, 1989) on the technology acceptance model (TAM) published in 1989 has over 25,000 citations. Venkatesh (V. Venkatesh et al., 2003) (V. Venkatesh et al., 2012) further developed the model into a new model entitled UTAUT. Gefen et al. (Gefen et al., 2003) added a trust construct to the TAM. These four articles show that TAM topics have the highest impact in the MIS field. Moreover, Venkatesh's study of the expansion of UTAUT is the newest article on the list (V. Venkatesh et al., 2012).

Most articles discuss theories built and their extensions, such as the technology acceptance model (TAM), the unified theory of acceptance and use of technology (UTAUT), and social capital theory. These articles, along with their theories, received a combined citation of more than 58,000. This data shows that the MIS research society focuses on articles that propose a new model or theory and extend it. This finding is not surprising as articles that were published earlier have the chance for more readers. However, our finding here is among the first that expose the articles' focus on top-3 MIS journals.

Table 2. Top 10 most cited articles

No.	Authors	Title	Year	Cited by
1.	Davis (Davis, 1989)	Perceived usefulness, perceived ease of use, and user acceptance of information technology	1989	25806
2.	Venkatesh et al. (V. Venkatesh et al., 2003)	User acceptance of information technology: Toward a unified view	2003	16829
3.	Hevner et al. (Hevner et al., 2004)	Design science in information systems research	2004	7673
4.	Alavi & Leidner (Alavi & Leidner, 2001)	Review: Knowledge management and knowledge management systems: Conceptual foundations and research issues	2001	6028
5.	Venkatesh et al. (V. Venkatesh et al., 2012)	Consumer acceptance and use of information technology: Extending the unified theory of acceptance and use of technology	2012	4256
6.	Gefen et al. (Gefen et al., 2003)	Trust and tam in online shopping: AN integrated model	2003	4245
7.	Bhattacherjee A. (Bhattacherjee, 2001)	Understanding information systems continuance: An expectation-confirmation model	2001	3938
8.	Wasko & Faraj (Wasko & Faraj, 2005)	Why should I share? Examining social capital and knowledge contribution in electronic networks of practice	2005	3369
9.	Compeau & Higgins (Compeau & Higgins, 1995)	Computer self-efficacy: Development of a measure and initial test	1995	3316
10.	Klein & Myers (Myers & Klein, 1999)	A set of principles for conducting and evaluating interpretive field studies in information systems	1999	3093

3.5. Topic Interpretations of LDA Results

To get the optimum number of topics, we conducted a preliminary experiment with the number of topics: 10, 15, 20, 25, 30, and 35. The results of calculating the coherence value for each number of topics are displayed in Figure 10. Following manual analysis, it was determined that the number of topics k = 25 provides a sufficient variety of topics while still making semantic sense. Each subsequent word group is assigned an appropriate label, reflecting the topic. These twenty-five topics are prominent in the top three journals. The visualization of the word groups on each topic is presented in Figure 11. Moreover, the labels and top 20 keywords are described in Table 3 and Appendix A, respectively.

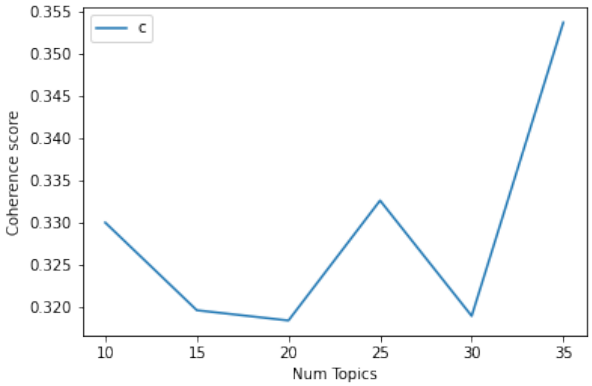

Figure 10. Topic coherence values for number of topics k = 10,15,20,25,30,35

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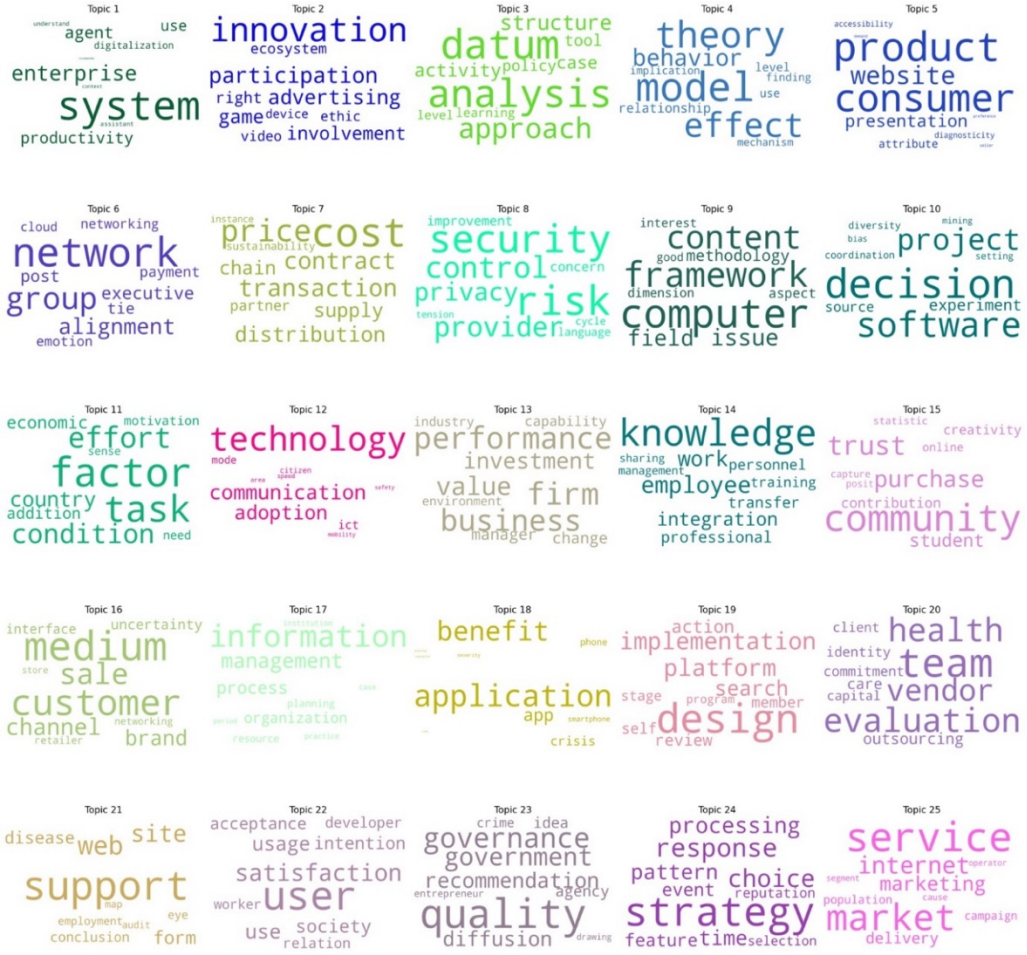

Figure 11. Visualization of keywords distribution over topics

Table 3 Topic labels

Topic Number	Label	Topic Number	Label
Topic # 01	Enterprise system and productivity	**Topic # 14**	Knowledge management
Topic # 02	Innovation ecosystem, user involvement and game	**Topic # 15**	Community trust and purchase, education
Topic # 03	Data analysis and education	**Topic # 16**	Brand loyalty, customer relationship management
Topic # 04	Theory/model use and implication	**Topic # 17**	Information management
Topic # 05	Consumer and product presentation	**Topic # 18**	Application benefit
Topic # 06	Network analysis and group alignment	**Topic # 19**	Design implementation and search platform
Topic # 07	Blockchain and supply chain	**Topic # 20**	Team evaluation, online Healthcare
Topic # 08	Security risk and privacy control	**Topic # 21**	Disease control
Topic # 09	Content management and framework	**Topic # 22**	User acceptance
Topic # 10	Decision support system	**Topic # 23**	E-Government
Topic # 11	Economic development	**Topic # 24**	Disaster response system
Topic # 12	Technology adoption and smart city	**Topic # 25**	Internet service marketing
Topic # 13	Business performance and value investment		

3.6. Topic Proportions

Figure 12 presents the topic's proportions over documents. In terms of topic proportion, Topic 13 (business performance and value investment), Topic 4 (theory/model use and implications), Topic 3 (data analysis and education), and Topic 17 (information management) ranked as the top-4 highest proportions.

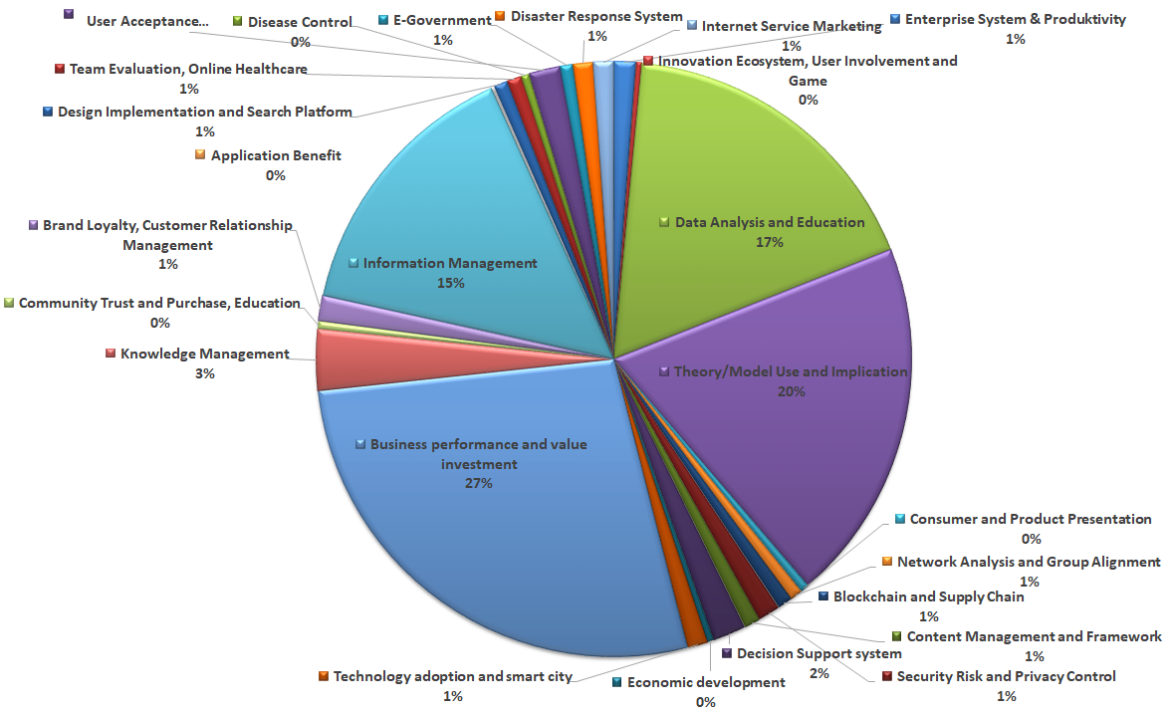

Figure 12. Topic's proportions over documents

4. DISCUSSION

4.1. Theory Building Gain Higher Attention

Most articles discuss theories built and their extensions, such as the technology acceptance model (TAM), the unified theory of acceptance and use of technology (UTAUT), and social capital theory. These articles, along with their theories, received a combined citation of more than 58,000. This data shows that the MIS research society focuses on articles that propose a new model or theory and extend it. This finding is not surprising as articles that were published earlier have the chance for more readers. However, our finding here is among the first that expose the articles' focus on top-3 MIS journals.

4.2. MIS Quarterly dominated Top-10 Most Cited Articles

Based on our findings for the Top 10 Most Cited Articles, it is apparent that MIS Quarterly (MIS-Q) is the most cited journal. The journal has consistently published influential research that has drawn the interest of scholars and researchers in management information systems. The oldest article on the list was published in 1989, illustrating the journal's longstanding contribution to the field over several decades. This lifespan reflects the publication's long-term significance and impact. In contrast, the most recent work on the list was published in 2012. Although this indicates that papers from prior years dominate the list, it is important to note that citation patterns frequently exhibit a lag. More recent articles may continue to gain citations over time.

The sheer volume of citations received by MIS Quarterly articles is a remarkable aspect of the journal's impact. The fact that these 10 most referenced articles have been referred to over 74,000 times illustrates the academic community's widespread recognition and application of MIS-Q knowledge. This high citation count highlights the journal's scholarly significance and contributions to the advancement of the management information systems discipline.

4.3. Predicting Trend in MIS Domain

A bibliometric analysis on blockchain conducted in 2019 shows that the topic is mostly emerging in computer science research (Dabbagh et al., 2019). Our results show that blockchain is indeed starting to get attention from MIS researchers. Miau and Yang (2018) described three stages of blockchain research: cryptocurrencies, bitcoin and blockchain techniques, and smart contracts. The first stage of blockchain research, estimated to last from 2008 to 2013, is filled with papers discussing cryptocurrencies and bitcoin. Researchers were more interested in the bitcoin topic in the following stage as it proliferated from 2014 to 2015. During the third stage, researchers paid more attention to blockchain and smart contracts techniques.

We believe that the recent development of Non-Fungible Token (NFT) will contribute to research discussing blockchain topics and predict that the trends will continue forward. We predict that blockchain research will indeed add a new stage, that we called NFT research.

One short-term trend that we predict will appear is the discussion related to COVID-19. Kusumarani and Parlina (2021) suggested that COVID-19 catalysts in research publication be focused on information research journals. Our findings confirmed this, as two out of the top three journals show an increase between 2019 - 2021.

The term mental-health will likely arise from the MIS domain as an effect of long-term social distancing and lockdown (World Health Organization, 2022; Venkatesh and Edirappuli, 2020; Panchal et al., 2021). During the lockdown and social distancing measurement, studies reported an increase in the amount of free time that people have (Colizzi et al., 2020; Liu et al., 2020), allowing people to have more time to attend online education (X. Liu et al., 2020) and get exposed to social

media. As people seek to cope with mental health issues (S. Liu et al., 2020), MIS researchers might swarm the journals with online innovations to cope with mental health issues.

The smart city concept is directed at the use of digital technology and innovation to support economic growth. With COVID-19, researchers will expand the topic into the health and well-being sector. The topic of the smart city will still attract researchers to explore its potential and future applications.

Big Data and artificial intelligence will still gain attention as the word "metaverse" starts to become hype. Metaverse, a portmanteau of "meta" and "universe," is typically used to describe the concept of a future iteration of the internet, made up of persistent, shared, 3D virtual spaces linked into a perceived virtual universe (Hackl, 2020). Currently, there is a limited amount of research discussing the potential of the metaverse to change everyday aspects of life. We predict that metaverse tagging will be a future trend in the MIS domain, alongside big data and AI topics.

5. CONCLUSION AND MANAGERIAL IMPLICATION

This research aims to examine research trends and provide insights into the intellectual structure and research landscape of the MIS discipline. Furthermore, by including latent Dirichlet allocation into the technique, the work extends and updates earlier scientometric research on MIS. Our findings show that publications from developed nations such as the United States, the United Kingdom, Canada, and countries in the European Union have a strong influence on the top three journals in the MIS area. Future research should examine the underrepresentation of Asia-Pacific countries and institutions in these prestigious journals.

This study aims to capture research trends and provide insight into the intellectual structure and research landscape in the MIS field. Furthermore, this study extended and updated scientometric studies on MIS by incorporating latent Dirichlet allocation into the methodology. Our results show the top 3 journals in the MIS domain are mostly dominated by publications from developed countries such as the United States, the United Kingdom, Canada, and countries from the European Union. Future studies should further explore the lack of representation of Asia-Pacific countries and institutions within the top 3 journals. Moreover, although the three top journals released their first volumes in different years, they achieved a high citation score of more than 14 points. The most cited articles revealed that the journals are primarily flooded with research on developing hypotheses or expanding current beliefs. A call to action is required to attract articles that go beyond this. This study includes forecasts of MIS trends, such as the rise of NFT and metaverse themes, COVID-19-related discussions, and smart city applications. Another significant discovery is the growth of blockchain in healthcare as a new MIS trend. Future studies can take the findings to a higher level of detail.

One of the study's major drawbacks is that it only used data from SCOPUS and concentrated on the top three journals. Another restriction we discovered was that we did not use expert opinions when determining which keywords to include. Future studies can address this constraint to acquire more comprehensive and full data.

Appendix A. Topics Labels and Top 20 Keywords

	Label	**Top 20 Keywords**
Topic # 01	Enterprise system and productivity	system, enterprise, agent, productivity, use, digitalization, assistant, understand, context, recommender, seller, simulation, engineering, dependency, demand, analyst, failure, skill, unit, architecture
Topic # 02	Innovation ecosystem, user involvement and game	innovation, participation, advertising, game, involvement, right, ecosystem, video, ethic, device, guidance, ownership, appeal, gamification, shortage, penetration, advertisement, mobile, million, seller
Topic #	Data analysis and	datum, analysis, approach, structure, activity, case, tool, policy, learning, level, term,

03	education	measure, context, order, literature, number, work, practice, expert, study
Topic # 04	Theory/model use and implication	model, theory, effect, behavior, relationship, level, use, finding, implication, mechanism, job, outcome, influence, role, experience, difference, perception, impact, survey, commerce
Topic # 05	Consumer and product presentation	product, consumer, website, presentation, attribute, diagnosticity, accessibility, seller, demand, preference, recommender, cannibalization, profit, welfare, profitability, surplus, generation, piracy, placement, party
Topic # 06	Network analysis and group alignment	network, group, alignment, executive, post, tie, payment, emotion, networking, cloud, sample, strength, experiment, appropriation, force, structuration, likelihood, willingness, other, play
Topic # 07	Blockchain and supply chain	cost, price, transaction, contract, distribution, supply, chain, partner, sustainability, instance, routine, commerce, uncertainty, volatility, market, index, prospect, block, drawback, emerge
Topic # 08	Security risk and privacy control	risk, security, control, provider, privacy, improvement, concern, language, cycle, tension, ease, course, today, signal, movement, individual, deal, possibility, trade, opinion
Topic # 09	Content management and framework	computer, framework, content, issue, field, methodology, aspect, dimension, interest, good, regression, computing, collaboration, contribution, entity, compliance, culture, range, scenario, share
Topic # 10	Decision support system	decision, software, project, experiment, source, coordination, diversity, setting, mining, bias, maker, class, return, oss, frequency, version, length, determine, tendency, judgment
Topic # 11	Economic development	factor, task, effort, condition, country, economic, addition, motivation, need, sense, habit, driver, resistance, barrier, respect, paradigm, debate, credibility, situation, shape
Topic # 12	Technology adoption and smart city	technology, communication, adoption, ict, mode, citizen, area, speed, mobility, safety, era, transportation, city, transport, preference, infrastructure, feedback, standardization, mortality, adaptation
Topic # 13	Business performance and value investment	performance, firm, business, value, investment, manager, change, capability, industry, environment, time, company, impact, success, competition, complexity, role, world, advantage, requirement
Topic # 14	Knowledge management	knowledge, employee, work, integration, professional, transfer, personnel, training, management, sharing, category, practice, allocation, efficacy, boundary, organization, budget, turnover, stock, individual
Topic # 15	Community trust and purchase, education	community, trust, purchase, student, contribution, creativity, online, statistic, capture, posit, university, networking, intention, instruction, learning, other, auction, infrastructure, premium, demand
Topic # 16	Brand loyalty, customer relationship management	medium, customer, sale, channel, brand, uncertainty, interface, retailer, networking, store, message, instrument, presence, richness, media, loyalty, retailing, interactivity, experience, encourage
Topic # 17	Information management	information, management, process, organization, planning, resource, institution, practice, case, period, year, space, perspective, error, evolution, center, variation, lesson, people, author
Topic # 18	Application benefit	application, benefit, app, crisis, phone, smartphone, severity, simulation, side, auditing, download, saas, code, seller, portfolio, browsing, replacement, recommender, preference, architecture
Topic # 19	Design implementation and search platform	design, implementation, platform, search, action, review, member, self, stage, program, literature, examination, agenda, protection, investor, blog, form, element, detail, determination
Topic # 20	Team evaluation, online Healthcare	team, evaluation, health, vendor, outsourcing, care, commitment, identity, client, capital, healthcare, validity, panel, norm, item, image, identification, organisation, cognition, estimation
Topic # 21	Disease control	support, web, site, form, disease, conclusion, eye, employment, map, audit, exert, limit, spread, virus, sns, piracy, patient, auction, feedback, meeting
Topic # 22	User acceptance	user, satisfaction, use, usage, society, intention, acceptance, developer, relation, worker, partnership, human, other, similarity, crowd, report, work, mobile, tracking, interaction
Topic # 23	E-Government	quality, governance, government, recommendation, diffusion, agency, idea, crime, entrepreneur, drawing, corruption, intermediary, branch, motive, inclusion, establishment, fulfill, policymaker, stakeholder, underpinning
Topic # 24	Disaster response system	strategy, response, choice, processing, pattern, time, event, feature, reputation, selection, text, utility, threat, accuracy, material, constraint, disaster, classification, affordance, argument
Topic # 25	Internet service marketing	service, market, internet, marketing, delivery, population, campaign, cause, operator, segment, food, audience, modularity, landscape, start up, scalability, revolution, fintech, auction, seller

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