Advanced International Journal of Business, Entrepreneurship and SME's
EISSN: 2682-8545
AIJBES
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

ADVANCED INTERNATIONAL JOURNAL OF BUSINESS, ENTREPRENEURSHIP AND SMES (AIJBES)
www.aijbes.com

A BIBLIOMETRIC ANALYSIS OF EMPLOYEE DIGITAL LITERACY: CURRENT STATUS AND FUTURE RESEARCH DIRECTIONS

Zhang Ziqiong[1*], Rosmah Mohammed[2], Rozanah Ab Rahman[3], Fang Fang[4]

[1] School of Business and Economics, Universiti Putra Malaysia, Malaysia
Email: zhang.ziqiong@student.upm.edu.my
[2] School of Business and Economics, Universiti Putra Malaysia, Malaysia
Email: m_rosmah@upm.edu.my
[3] School of Business and Economics, Universiti Putra Malaysia, Malaysia
Email: rozanah@upm.edu.my
[4] School of Business and Economics, Universiti Putra Malaysia, Malaysia
Email: gs62467@student.upm.edu.my
[*] Corresponding Author

Article Info:

Article history:
Received date: 30.01.2024
Revised date: 19.02.2024
Accepted date: 13.03.2024
Published date: 19.03.2024

To cite this document:

Ziqiong, Z., Rosmah, M, Fang, F (2024). A Bibliometric Analysis Of Employee Digital Literacy: Current Status And Future Research Directions. *Advanced International Journal of Business, Entrepreneurship and SMEs, 6* (19), 258-275.

DOI: 10.35631/AIJBES.619019.

Abstract:

This paper presents a bibliometric analysis of employee digital literacy, examining its status, scientific structure, and future research directions. Following the PRISMA diagram and employing bibliometric methods, the study evaluates academic articles on employee digital literacy, analyzing 99 selected articles through descriptive analysis, citation analysis, and cluster analysis. The results indicate a thriving development phase in the research on employee digital literacy. Noteworthy subject areas, influential authors, journals, articles, and countries have been identified. The present state of progress in this domain and five future directions are outlined through keywords and term co-occurrence analysis. Given the limited availability of literature reviews on employee digital literacy, this study contributes to the theoretical foundation and offers guidance for digital learning and training in academia. Organizations can strengthen their competitive edge by enhancing employee digital literacy and adapting effectively to digital transformation challenges.

Keywords:

Bibliometric Analysis, Employee Digital Literacy, Future Themes, Publication Trend

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Introduction

The workforce has undergone notable changes due to the increasing presence of technology, resulting in shifts in working conditions and the requisite skills and competencies (Bejakovic & Mrnjavac, 2020). The progress of digitalization has not only boosted societal productivity but has also brought forth fresh employment prospects. Although many research studies predict the creation of millions of new jobs, many traditional jobs are at risk of being lost due to digitalization (Bejakovic & Mrnjavac, 2020). Under this background, employees need to enhance their digital literacy to maintain and improve their competitiveness.

Employee digital literacy defines employees' knowledge and competency in using digital technologies and applications successfully and efficiently in their work (Zulu et al., 2023). It includes basic computer skills, software program competency, information literacy, cybersecurity awareness, digital communication and cooperation, and adaptability for ongoing learning. Therefore, it is crucial to study how to cultivate and promote employees' digital literacy for organizations to maintain competitiveness and benefit from the career possibilities generated by digital advancements.

Scholars and organizations have greatly benefited from research on employee digital literacy. A bibliometric analysis of employee digital literacy contributes to identifying research gaps, identifying influential studies, evaluating research quality, and uncovering publication trend. On the other hand, by leveraging bibliometric analysis, organizations can make informed decisions, drive research excellence, and enhance employee digital literacy initiatives.

Scholars are conducting bibliometric studies of the literature on digital literacy from a broad perspective due to the positive implications for organizations and individuals. However, limited bibliometric research has been conducted specifically on employee digital literacy. This study aims to perform a bibliometric evaluation of research on employee digital literacy, summarize its development, and propose recommendations for future direction. This study uses the Scopus database to analyze employee digital literacy research employing bibliometric methods by answering the subsequent questions:

- What is the publication trend of employee digital literacy research?
- Which is the most influential article on employee digital literacy research?
- What is the status of employee digital literacy research?
- What are the future directions of employee digital literacy research?

Literature Review

Bibliometric Analysis

Bibliometric analysis has gained popularity in multidisciplinary studies in the past decade. (Donthu et al., 2021). Scholars employ bibliometric analysis primarily to uncover new trends, collaboration patterns, and research components exhibited by articles and journals and to explore the knowledge structure within specific domains in existing literature (Donthu et al., 2021). The bibliometric analysis utilizes bibliographic information sourced from databases of publications to create visual representations of the structure and evolution of scientific domains (Zupic & Čater, 2015), which serves two primary purposes: descriptive analysis and scientific cartography. The descriptive analysis assesses the performance of individuals and institutions

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019
regarding their research and publications (Zupic & Čater, 2015). Scientific cartography uncovers the knowledge framework and evolution of scientific fields. (Zupic & Čater, 2015).

Zupic and Čater (2015) introduce three bibliometric techniques commonly used in research: citation analysis, co-citation analysis, and co-occurrence keyword analysis. Citation analysis and co-citation analysis employ information from citations to create impact and similarity measures (Zupic & Čater, 2015). Co-word analysis relates terms that occur in article titles, keywords, or abstracts. (Zupic & Čater, 2015). There are several software tools available for conducting bibliometric analysis that are commonly used: VOSviewer (Perianes-Rodriguez et al., 2016), CiteSpace (Chen, 2016), Rstudio (Derviş, 2019), Publish or Perish (Hall, 2011). The above softwares greatly improve the efficiency of bibliometric analysis.

Employee Digital Literacy

Digital literacy encompasses individuals' ability to identify, appraise, and disseminate knowledge using typing or digital media platforms (Tinmaz et al., 2022). Law et al. (2018) indicated that this encompassing framework incorporates a variety of skills, often denoted "computer literacy, ICT literacy, information literacy, data literacy and media literacy." Transformative technology companies demonstrate a keen interest in digital literacy, which they associate with recent advancements like cloud computing, big data, artificial intelligence, and automation (Sousa & Rocha, 2019). Compared to other digital-related phrases, digital literacy primarily focuses on information-related capabilities (Falloon, 2020).

Due to the rapid growth of digitalization, the job market, work environment, and job content have undergone a dramatic transformation, which poses a significant challenge to the digital literacy of employees (Bejakovic & Mrnjavac, 2020). Therefore, some scholars have focused on defining employee digital literacy, particularly emphasizing the skills required by the workforce and their significance in terms of employability and competitiveness (Bejakovic & Mrnjavac, 2020). Employee digital literacy refers to an employee's aptitude in confidently and proficiently employing the necessary technology to perform their tasks seamlessly and efficiently. Therefore, employees' digital literacy is crucial in implementing digital technologies within organizations, which has garnered significant attention from academia and industry.

A growing body of scholars is investigating the correlation between employee digital literacy and job-related factors. Cetindamar et al. (2021) carried out a study examining the influence of employee digital literacy on the adoption of digital technology within organizations. Their findings revealed a favorable connection between employee digital literacy and the integration of cloud technologies within companies. Nikou et al. (2022) discovered that digital literacy directly affects perceived technological ease of use and indirectly influences employees' willingness to use digital technology in their work through their attitudes toward its usage. Lei et al. (2023) uncovered that employee digital literacy is a mediator between enterprise digitalization and R&D collaboration, highlighting the importance of employees' digital literacy in enterprise digitalization and exploring the micro-level mechanisms underlying enterprise digitization and collaboration in R&D.

Comparison of Previous Bibliometric Review

Given the current prominence of digital literacy, an increasing number of scholars are reviewing and analyzing the existing literature on this domain. Over the past few years, several literature review articles on digital literacy have gradually emerged, including both systematic

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

and bibliometric literature. However, most research on digital literacy takes a macro perspective rather than focusing on the digital literacy of employees.

Tinmaz et al. (2022) conducted a systematic review of 43 articles using five databases. The findings show that the field was flourishing in academia. Moreover, they proposed four themes of digitally relevant articles: “digital literacies,” “digital competencies,” “digital skills,” and “digital thinking.” This research found that digital literacy encompasses and correlates with 'computer literacy, media literacy, cultural literacy, and subject literacy', suggesting that digital literacy extends beyond specific activities and includes the complete realm of computer functionality and media utilization within a cultural framework (Tinmaz et al., 2022).

Chawla and Goyal (2021) carried out a bibliometric analysis of 234 publications on digital transformation using the Web of Science database. They attribute the boom in digital transformation to the ongoing demand for digital technology from customers, competitors, and employees. The results indicate that the United States has the most significant influence among countries, while Harvard University is the most influential institution in this field. Moreover, they summarize four key areas of investigation, including the effects on organizations, practical applications and insights, operational procedures, and social factors. These areas encompass 18 research streams surrounding research conducted within digital transformation.

Cetindamar et al. (2022) used the Scopus database to perform a bibliometric review of 270 AI literacy articles. This study proposed four distinct groups of abilities linked to AI literacy among employees, including skills pertaining to technology, work, human-machine interactions, and learning. The study highlights the significance of implementing AI literacy for employees who do not specialize in AI, underscoring the importance of AI literacy in various roles and job functions. They suggested that future research should be devoted to studying the abilities linked to AI literacy within all covered industries.

Wang and Si (2023) conducted a bibliometric analysis of 7523 digital literacy publications using the Web of Science database. The finding shows that 2011 is considered the most active year, the United States is the most productive country, and the University of Sydney is the most prolific institution in this domain. The results indicated that digital literacy research could be divided into two categories: digital literacy challenges and digital literacy instruction. Additionally, they uncovered emerging trends in digital literacy studies, including digital health, e-learning, and online classrooms.

In conclusion, the existing literature on digital literacy has witnessed substantial growth, with scholars conducting systematic reviews and bibliometric analyses to capture the evolving landscape of this domain. The research has predominantly taken a macro perspective, exploring digital literacy at a broader level. Tinmaz et al. (2022) emphasized the comprehensive nature of digital literacy, spanning various literacies such as computer, media, cultural, and subject literacy. Chawla and Goyal (2021) focused on digital transformation, highlighting its impact on organizations across different research streams. Cetindamar et al. (2022) delved into AI literacy, identifying key abilities associated with technology, work, human-machine interactions, and learning. Wang and Si (2023) contributed a bibliometric analysis that delineated digital literacy publications into challenges and instructional aspects, identifying emerging trends like digital health and e-learning.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Although there is a wealth of literature on digital literacy from a broader perspective, more targeted investigations are needed into the digital literacy of employees. Further research is needed to fill this gap that informs tailored interventions and strategies to improve digital literacy at the individual employee level. This review focus on employee digital literacy that contribute significantly to understanding the nuanced dynamics of digital literacy in the workplace and its implications for professional development and organizational success.

Methodology

Figure 1 shows the bibliometric analysis methodology for employee digital literacy research. The first step was to identify databases and search for keywords. This review used the Scopus database and followed the PRISMA flowchart (Moher et al., 2009). The search yielded 157 bibliometric information on staff digital literacy, and 99 records were filtered for bibliometric analysis. The subsequent step is data collection, with 99 records in exported value form and bibliometric data exported from the Scopus database. The third step is data analysis, the descriptive analysis (e.g., Year of publications, most active subjects, and most productive authors, etc.), citation analysis (e.g., citation metrics, most cited articles, etc.), and cluster analysis (e.g., keyword co-occurrences analysis, term co-occurrences analysis, etc.) were employed.

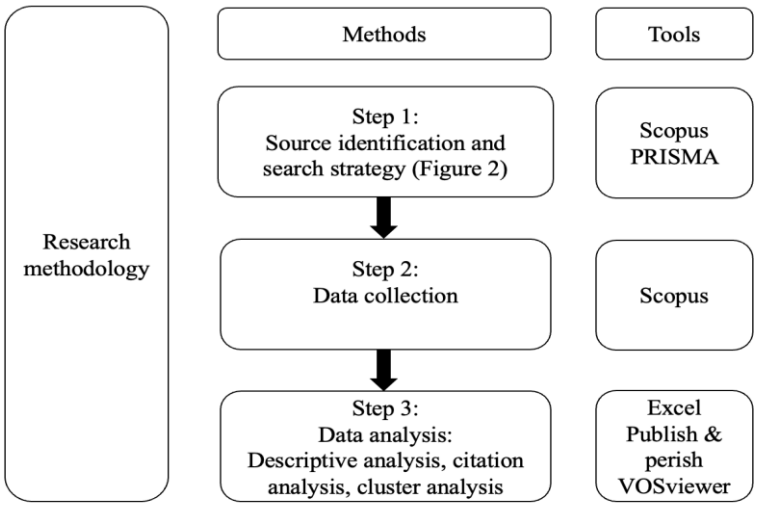

Figure 1: The Sequential Steps of Bibliometric Analysis

Source: By author

Source Identification

Figure 2 shows the PRISMA flowchart (Moher et al., 2009) of bibliometric analysis. Scopus was chosen for this review because it covers a broader range of disciplines (Airyalat et al., 2019). Based on the selection of this database, we initially formulated the subsequent search strategy within the Scopus database.

- Search field and string:

TITLE-ABS-KEY (("digital competence" OR "digital literacy" OR "digital ability" OR "digital skills") AND ("employee"))

- Search frame: All (Based on the search results, the final period is from 2009 - 12 June 2023).
- The language is limited to English.
- The source type is limited to journals.
- The document type is limited to article.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

157 articles were identified based on the above stages.

The following strings have been added to the search for more precise targeting of employee digital literacy literature:
(LIMIT-TO ("digital skills") OR ("digital literacy") OR ("digital competence") ("digital transformation") OR ("digitalization") OR ("employee") OR ("digitization") OR "digital technologies") OR ("workplace") OR ("digital literacies") OR ("digital competencies") OR ("human resource management") OR ("employees") OR ("employability") OR ("digital workplace") OR ("digital inclusion") OR ("digital exclusion") OR ("digital competencies")).
After the selection, 58 articles were removed and 99 were selected for data extraction and bibliometric analysis.

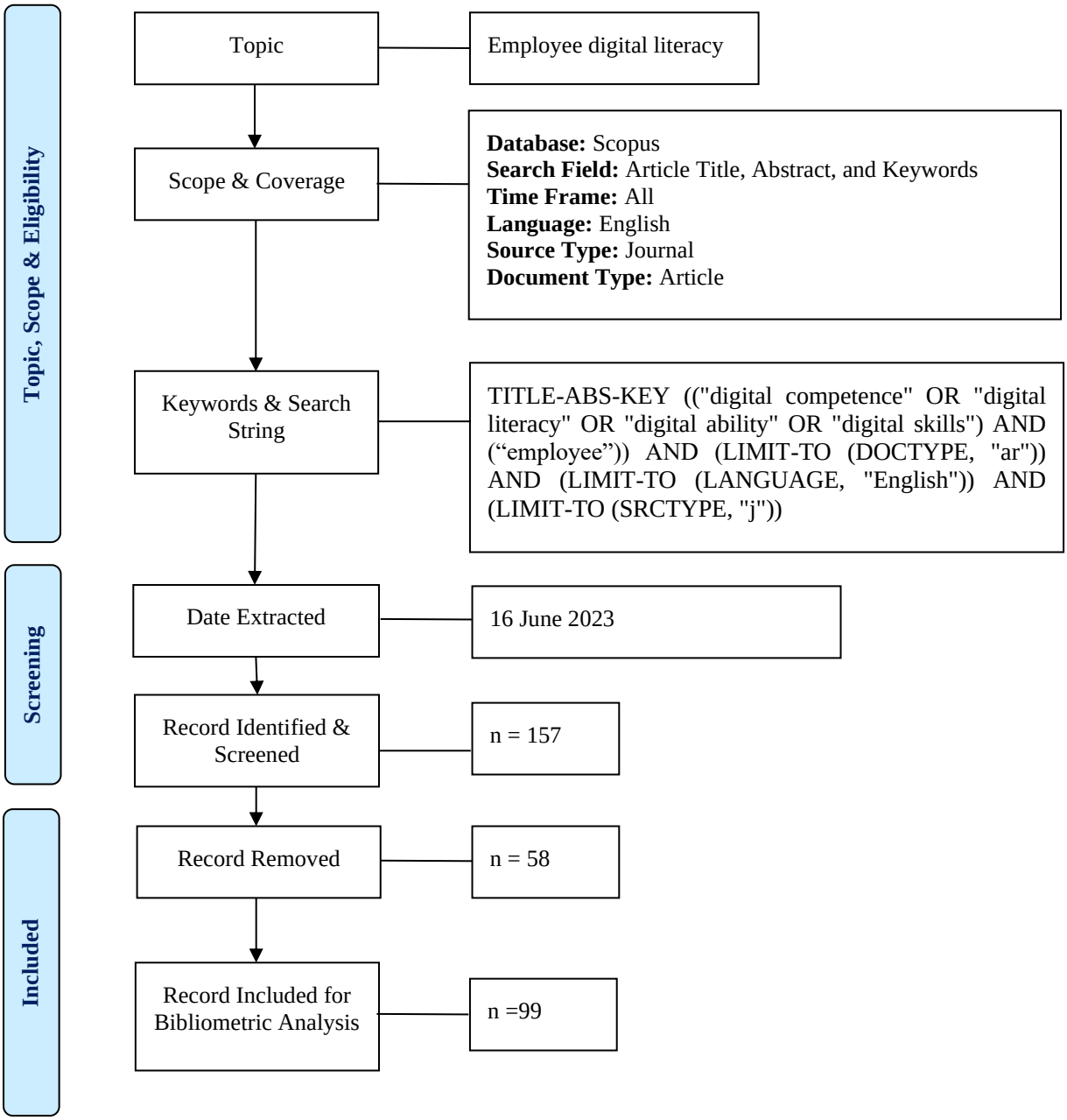

Figure. 2: PRISMA Flow Diagram

Source: Modified from Moher et al. (2009)

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Data Analysis

Data analysis is primarily separated into three main parts: descriptive analysis, citation analysis, and cluster analysis. Descriptive analysis involves examining and presenting quantitative measures and characteristics of the selected literature (Farooq, 2022), such as publication output. In this review, the Excel sheet summarizes the year of publication, the most productive subject areas, active journals, prolific countries, and productive authors. The descriptive analysis describes the performance of employee digital literacy publications, providing the publication trend in this field.

Citation analysis is a method employed in bibliometric analysis to evaluate the references or citations in the scholarly literature (Bernatović et al., 2022). This review uses Publish & Perish software to generate citation metrics and identify the most cited countries and articles. This review also adopts co-citation analysis by cited authors to examine the most influential authors. Citation analysis helps identify significant publication years, articles, and countries, detect emerging research trends, and evaluate the significance of researchers within employee digital literacy.

Cluster analysis can also be used in bibliometric studies to identify patterns and group similar publications based on citation patterns or other bibliometric indicators (Crum et al., 2022). In this review, the VOSviewer software is employed for analyzing the co-occurrence of keywords, the co-occurrence of terms, and citation analysis based on countries. Cluster analysis helps uncover underlying structures and patterns within complex employee digital literacy datasets.

Results

Publication Trend

Year of Publications

Figure 3 shows the process of development of the literature on employee digital literacy, starting from the initial stage observed between 2009 and 2017, progressing to a slow development stage from 2018 to 2020, and then transitioning to a rapid development stage from 2020 to 2022 that demonstrates that the field has gained significant attention and interest.

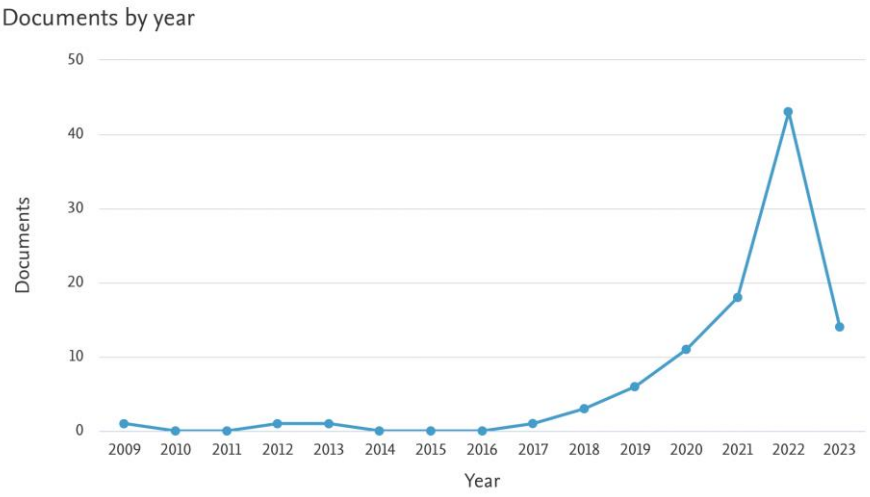

Figure. 3: Year of Publications

Source: Scopus

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Subject Area

Table 1 shows the top six subject areas in which the concentration of research in employee digital literacy is observed in 19 disciplines. Social science has the most publications (TP: 50) in this field, followed by Business, Management and Accounting (TP: 41), Computer Science (TP: 27), Engineering (TP: 18), Economics, Econometrics and Finance (TP:12), and Environmental Science (TP:11).

Table 1: Top 6 Subject Areas

Subject Area	Total Publications (TP)	Percentage (%)
Social Sciences	50	24.27%
Business, Management and Accounting	41	19.90%
Computer Science	27	13.11%
Engineering	18	8.74%
Economics, Econometrics and Finance	12	5.83%
Environmental Science	11	5.34%

Source: Scopus

Most Active Journals

Table 2 displays the Journal with the most publications in employee digital literacy research. *Sustainability (Switzerland)* is the most active journal (TP: 8). The rest of the active journals are *Administrative Sciences* (TP: 2), *Education Sciences* (TP: 2), *IEEE Transactions on Engineering Management* (TP: 2), *International Journal of Environmental Research and Public Health* (TP: 2), *Management Research Review* (TP: 2), and *Nordic Journal of Digital Literacy* (TP: 2).

Table 2: Top 7 Active Journals

Source Title	Total Publications	Percentage (%)
Sustainability (Switzerland)	8	8.08%
Administrative Sciences	2	2.02%
Education Sciences	2	2.02%
IEEE Transactions on Engineering Management	2	2.02%
International Journal of Environmental Research and Public Health	2	2.02%
Management Research Review	2	2.02%
Nordic Journal of Digital Literacy	2	2.02%

Source: Scopus

Most Productive Authors

Table 3 presents the most prolific authors of employee digital literacy research. Considering the relatively nascent stage of this topic and the limited number of comprehensive investigations available, identifying authors associated with the most significant contributions remains ongoing. Nevertheless, a select few authors have exhibited a relatively higher volume of academic output within this field. Noteworthy among them are Abdinagoro, SB, Abedin, B., Arief, M., Barboutidis, G., Bokek-Cohen, Y., Rantanen, T., Santoso, H., Stiakakis, E., De Haan, J., Van Deursen, A.J.A.M. and Van Dijk, J.A.G.M. It is worth noting that, apart from the authors mentioned above, only one publication has been documented by other researchers in this specific domain.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Table 3: Most Productive Authors

Author's Name	Number of publications	Percentage (%)
Abdinagoro, S.B.	2	1.17%
Abedin, B.	2	1.17%
Arief, M.	2	1.17%
Barboutidis, G.	2	1.17%
Bokek-Cohen, Y.	2	1.17%
Rantanen, T.	2	1.17%
Santoso, H.	2	1.17%
Stiakakis, E.	2	1.17%
De Haan, J.	2	1.17%
Van Deursen, A.J.A.M.	2	1.17%
Van Dijk, J.A.G.M.	2	1.17%

Source: Scopus

Citation Analysis

Table 4 displays the citation metric of employee digital literacy research. This research spans 14 years (2009-2023), having an overall of 1081 citations for 99 publications, with an average of 77.21 citations each year, an average of 10.92 citations per article, and an h-index of 13, and a g-index of 31.

Table 4: Citation Metric

Metrics	Data
Publication years	2009-2023
Citation years	14 (2009-2023)
Papers	99
Citations	1081
Citations/year	77.21
Citations/paper	10.92
h-index	13
g-index	31

Source: Publish or Perish

Most Cited Countries

Table 5 displays the five countries cited most. Canada is the most cited country, with 219 total citations and four publications, followed by the United States (TC:216, TP:7), Poland (TC:83, TP:6), Spain (TC:51, TP:6), and India (TC:29, TP:7). Despite being a prolific country, India's impact in the field is still considered insufficient when considering the number of citations. Therefore, Canada, the United States, Poland, and Spain are the most influential countries in this domain.

Table 5: Most 5 Cited Countries

Country	Total number of citations (TC)	Total number of publications (TP)
Canada	219	4
United States	216	7
Poland	83	6

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Spain	51	6
India	29	7

Source: Scopus

Most Cited Articles

Table 6 lists the top 5 cited publications on employee digital literacy. The most cited article was from Blake et al. (2020), with 324 citations. Followed by Meyers et al. (2013) (TC: 182), Van Laar et al. (2018) (TC: 60), Duplaga (2020) (TC: 55), and Cetindamar & Abedin (2021) (TC: 46).

Table 6: Top 5 Cited Articles

No.	Authors	Title	Year	Total Cites
1	Blake et al.	Mitigating the psychological impact of covid-19 on healthcare workers: A digital learning package	2020	324
2	Meyers et al.	Digital literacy and informal learning environments: An introduction	2013	182
3	Van Laar et al.	21st-century digital skills instrument aimed at working professionals: Conceptual development and empirical validation	2018	60
4	Duplaga	The determinants of conspiracy beliefs related to the COVID-19 pandemic in a nationally representative sample of Internet users	2020	55
5	Cetindamar & Abedin	Understanding the role of employees in digital transformation: conceptualization of digital literacy of employees as a multi-dimensional organizational affordance	2021	46

Source: Extracted from Scopus

Co-citation Analysis

Figure 4 illustrates the co-citation network among cited authors. A threshold of at least ten citations per author was established, resulting in 38 authors meeting this criterion and forming three distinct clusters. The red cluster, comprising 14 items, includes authors such as Sarstedt.M. and Ringle. C.M., and Hair.J. F, exhibit strong connections with other authors based on shared references in the literature. Similarly, the green cluster, consisting of 14 items, features authors like Alexander J.A.M. van Deursen, Van Laar.E., and De Haan. J., who has stronger links with other authors. Finally, the blue cluster, composed of 10 items, authors such as Ryan. R.M., Deci. E.L. and Schaufeli.W. B, who exhibit robust connections based on citations from other authors. Therefore, the authors highlighted above are considered the most influential in employee digital literacy.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

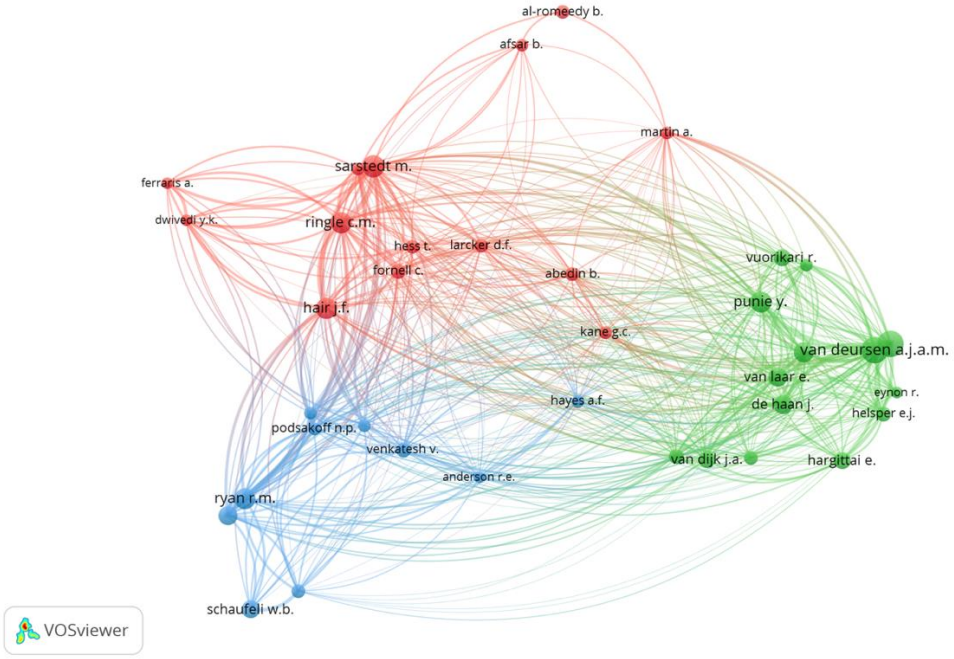

Figure. 4: Co-citation Network by Cited Authors

Source: Extracted from VOSviewer

Cluster Analysis

Keywords Co-occurrence Analysis

Figure 5 presents the keyword co-occurrence network related to employee digital literacy, using title and abstract keywords. A frequency threshold of five occurrences is applied, resulting in the inclusion of 21 keywords satisfying this threshold. The aggregate strength of the co-occurrence linkages to other keywords will be computed for each of the 21 keywords. Keywords that demonstrate the strongest cumulative link strength will be carefully chosen and displayed within the network visualization. The analysis yielded a result indicating the presence of five distinct clusters. The blue cluster encompasses a set of 4 items that primarily focus on enhancing “digital literacy” and facilitating “digital transformation”. Similarly, the green cluster comprises four items that emphasise the development of “digital competencies”. The yellow cluster is characterized by its focus on 'workplace' and contextual factors, exemplified by the relevance of the 'COVID-19' pandemic. The purple cluster is dedicated to exploring and advancing “digital skills.” Lastly, the red cluster delves into individuals actively engaging with digital technologies, exemplifying this through specific instances such as “employees.”

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

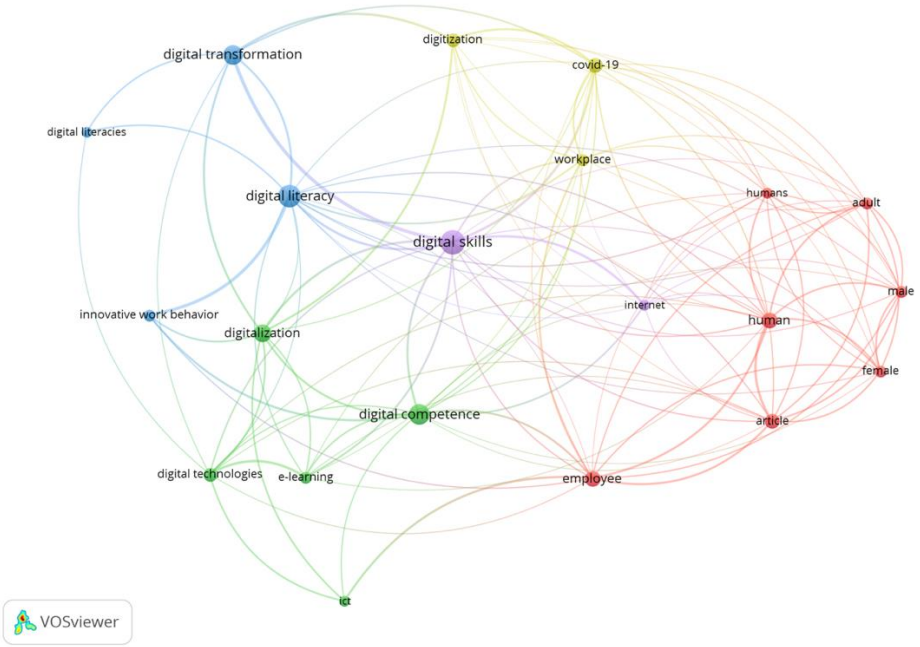

Figure. 5: Network Visualization Map of all Keywords Co-occurrence
Source: Extracted from VOSviewer

Text Analysis

Figure 6 represents the network diagram of a term co-occurrence by title and abstract field. A term's minimal threshold for occurrences is 10, and 82 terms match this requirement. Figure 8 visually shows 49 terms and forms five clusters with the most robust connections or associations, grouping employee digital literacy into five themes. In the red cluster, consisting of 13 items, the term 'digital literacy' has the strongest vital link with other terms, followed by 'role', 'digital technology' and 'practical implication'. The green group, consisting of 13 items, reveals a strong association between 'digital competence' and other terms. The terms 'manager' and 'person' also show notable associations within this cluster. The blue cluster, which encompasses 12 elements, is led by the term 'development' as the most closely related term, followed by 'digitalization' and 'business'. The yellow cluster, consisting of 6 items, shows the term “COVID” as the most highly associated term, followed by “pandemic” and “job”. The purple cluster consists of five items, the 'relationship' has the strongest link strength with other terms, followed by 'performance', 'relationship', 'innovation' and 'innovative work behavior'.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

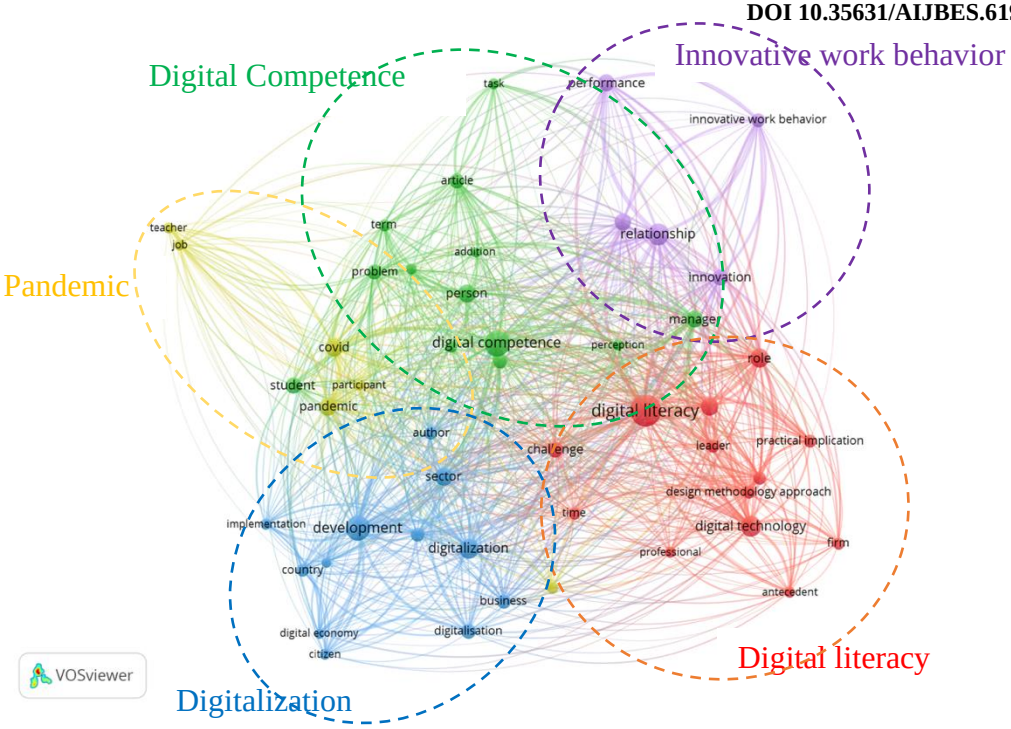

Figure. 6: Network Visualization of a Term Co-occurrence Network by Title and Abstract

Source: Extracted from VOSviewer

Figure 7 shows the overlay visualization of a term co-occurrence network by title and abstract. In 2020, most research revolved around 'work innovation behaviors'. By 2021, terms like 'digital technology', 'digital economy', 'digital literacy', and 'digital competence' gradually emerged as high-frequency terms in research. In 2022, there was a noticeable shift towards literature that emphasises individuals and digitalization, with emerging terms such as “teacher”, “leader”, “managers”, and “digitalization”.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

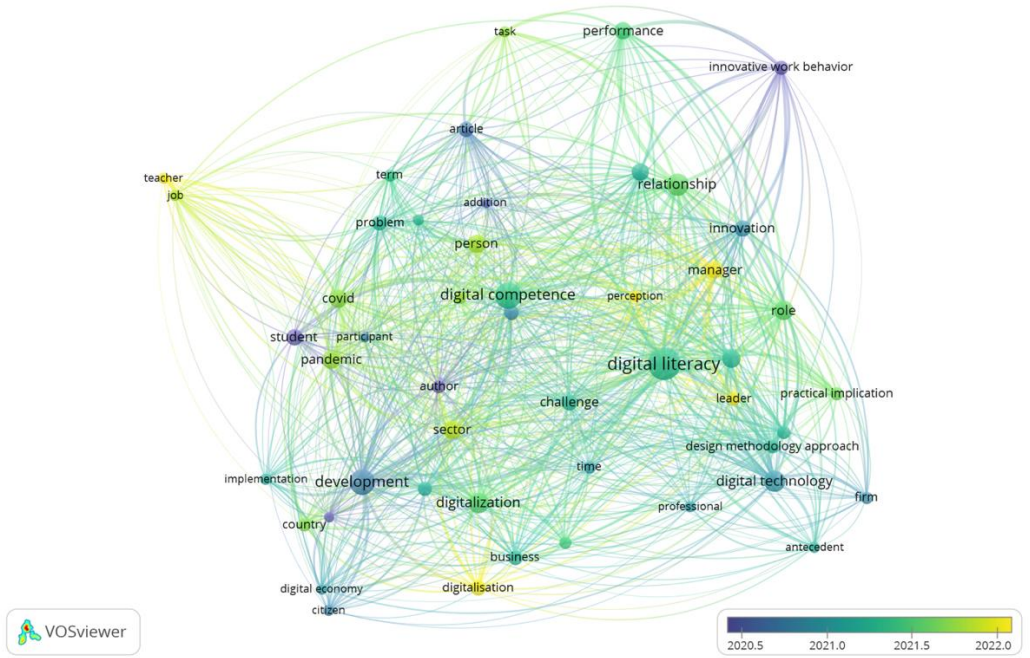

Figure. 7: Overlay Visualization of a Term Co-occurrence Network by Title and Abstract

Source: Extracted from VOSviewer

Discussion

According to the four research questions, the study discusses the results of the analysis in the following four perspectives.

Publications Trends

In accordance with the year of publication, the initial research on employees' digital literacy was introduced in 2009. Still, there was limited focus on the subject until 2012-2017, when additional studies were initiated (see Figure 3). Subsequently, with the advancement of the digital economy, an increasing number of scholars began investigating this area from 2018 onwards (see Figure 3). The widespread impact of the COVID-19 pandemic in 2020 has resulted in a rapid diversification of the workplace environment, resulting in a significant increase in research on digital literacy (see Figure 3). This interest and enthusiasm have persisted until the present time.

According to the descriptive analysis, the results show that Social Sciences and Business, Management and Accounting are popular subject areas for employee digital literacy publications (see Table 1); the journal *Sustainability (Switzerland)* has the most publications in the field (see Table 2); Abdinagoro, S.B., Abedin, B., Arief, M., Barboutidis, G., Bokek-Cohen, Y., Rantanen, T., Santoso, H., Stiakakis, E., De Haan, J., Van Deursen, A.J.A.M., and Van Dijk, J.A.G.M have contributed more publications compared to other authors (see Table 3). These findings provide insights into the subject areas, journals, and authors prominent in employee digital literacy, which provide a literature reference for the development of this field.

According to the citation analysis, Canada, the United States, Poland, and Spain emerge as the most influential countries, exhibiting the greatest number of citations in this discipline (see Table 5). Based on the analysis of co-citations among authors (see Figure 4), Sarstedt.M.,

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Ringle, J.A.M. van Deursen, and Ryan. R.M. emerged as the most significant contributors in the area because of their high frequency of co-citations within their respective clusters.

Most Influential Article

Based on the most cited article, the most influential article on employee digital literacy is "Mitigating the psychological impact of COVID-19 on healthcare workers: A digital learning package" (Blake et al., 2020)". This paper was published within the year of the COVID-19 breakout in 2020 and garnered the most citations in the scientific literature (See Table 6). Their article proposes an evidence-based digital resource for healthcare professionals focusing on mental health. The article is highly cited as it explores the digital resource needs of healthcare professionals from the perspective of providing such a resource, ultimately benefiting healthcare professionals, academics, and students across the field.

Current Themes

According to the analysis of keyword co-occurrence, the keywords associated with employee digital literacy were categorized into five clusters (see Figure 5): Digital literacy (blue cluster), digital competence (green cluster), digital skills (purple cluster), Covid-19 (yellow cluster), and employee (red cluster). These clusters represent the five main research themes in the field. The first theme focuses on employees' digital literacy and digital transformation, and digital literacy is the foundation that enables individuals and organizations to embrace digital transformation, while digital transformation initiatives, in turn, drive the need for continuous digital skill development and literacy (Farias-Gaytan et al., 2022). The second theme pertains to employees' digital competence, and digital competence refers to the comprehensive set of expertise, abilities, and mindsets required to effectively use digital technologies, which is vital for individuals to thrive in the age of technology and for organizations to navigate digital transformation initiatives successfully (Zhao et al., 2021). The third theme relates to employees' digital skills, and digital skills are necessary for individuals to participate in the technological age properly, access information, communicate effectively, and succeed in the job market (Van Laar et al., 2018), which is crucial for organizations to drive digital transformation, innovate, and remain competitive. The fourth theme addresses the employees' work context. With the increasing integration of digital technology across numerous industries and job positions, the significance of employee digital literacy in the workplace has expanded dramatically. The fifth theme revolves around employees and individuals. Organizations need to recognize the importance of employees' digital literacy and provide support, resources, and a supportive work environment that fosters the development and application of their digital literacy.

Future Trends

Based on the term co-occurrence network, research on employee competence revolves around five developmental themes. By summarizing the terms from the five clusters, we have identified five emerging trends in the future development of employee digital literacy. The red clusters are dominated by the words "digital literacy," "digital technology," "practical implication" and "firm". Thus, the group focuses on the practical implication of digital literacy and digital technology in the firm (see Figure 6). The green clusters are dominated by the terms "digital competence," "manager," and "person," focusing mainly on the digital competence of managers and individuals (see Figure 6). The blue clusters are dominated by the terms "development," "digitalization," and "sector," which focus on how organizations can develop their digitalization strategies (see Figure 6). The yellow clusters predominantly revolve around the keywords "COVID" and "Pandemic" and emphasize digital literacy development within

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

the background of the "COVID-19 Pandemic" (see Figure 6). The purple cluster focuses on "relationships," "performance," "innovation," and "innovative work behaviors." Its research explores the correlation between the innovation and performance (see Figure 6). Combined with the overlay visualization of a term co-occurrence network (see Figure 7). The five future directions can be outlined as (1) The role of digital literacy in the workplace. (2) The digital competence of individuals. (3) The development of digitalization. (4) The context of employee digital literacy. (5) The relation between innovation and performance in employee digital literacy.

Compared with previous bibliometric articles on digital literacy (Chawla & Goyal, 2021; Cetindamar et al., 2022; Wang & Si, 2023), this review narrows down the scope of analysis and focuses specifically on examining employee digital literacy. Furthermore, this paper incorporates overlay visualization of a term co-occurrence network, which displays the term analysis at different time points, providing a more explicit depiction of the field's rapid development.

Conclusion

This study reviews previous studies of employee digital literacy and proposes future research directions in accordance with the current state of research. This review found that there is limited research on employee digital literacy, indicating that the field is in a flourishing phase. Current employee digital literacy revolves around five main themes: employees' digital literacy and digital transformation, employees' digital competence, employees' digital skills, employees' work context, and employees and individuals. Moreover, this study also proposed five future directions: The role of digital literacy in the workplace, the digital competence of individuals, the development of digitalization, the context of employee digital literacy, and the relation between innovation and performance in employee digital literacy.

Due to the limited number of comprehensive bibliometric analyses on employee digital literacy, this review provides an analysis and summary of the field's current state and future directions, contributing to further research. In addition, this article emphasizes the significance of employee digital literacy for both organizations and employees, providing a solid foundation for future employees to enhance their digital literacy and for companies to support the improvement of employee digital literacy. Therefore, practitioners can enhance companies' innovation capabilities and industry competitiveness by strengthening employee digital literacy.

This study has some limitations. First, we relied on only one database, namely Scopus, and to address this limitation, future research could consider integrating data from multiple databases. Second, we solely employed quantitative analysis methods in this study. Future studies could incorporate quantitative and qualitative analysis approaches to enhance the research depth further. Third, we only analyzed journal articles. Future research should apply multiple sources and types of publications, such as books, conferences, and book reviews.

Acknowledgements

In this project, the authors would like to acknowledge the generosity of Universiti Putra Malaysia, Malaysia, which granted them the Publication Grant Scheme.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

References

Airyalat, S. A. S., Malkawi, L. W., & Momani, S. M. (2019). Comparing Bibliometric Analysis Using PubMed, Scopus, and Web of Science Databases. *Journal of Visualized Experiments*, *152*, e58494.

Bejakovic, P., & Mrnjavac, Z. (2020). The importance of digital literacy on the labour market. *Employee Relations*, *42*(4), 921–932.

Bernatović, I., Slavec Gomezel, A., & Černe, M. (2022). Mapping the knowledge-hiding field and its future prospects: A bibliometric co-citation, co-word, and coupling analysis. *Knowledge Management Research & Practice*, *20*(3), 394–409.

Blake, H., Bermingham, F., Johnson, G., & Tabner, A. (2020). Mitigating the Psychological Impact of COVID-19 on Healthcare Workers: A Digital Learning Package. *International Journal of Environmental Research and Public Health*, *17*(9), 2997.

Cetindamar, D., Abedin, B., & Shirahada, K. (2021). The Role of Employees in Digital Transformation: A Preliminary Study on How Employees' Digital Literacy Impacts Use of Digital Technologies. *IEEE Transactions on Engineering Management*. 1-12.

Cetindamar Kozanoglu, D., & Abedin, B. (2021). Understanding the role of employees in digital transformation: Conceptualization of digital literacy of employees as a multi-dimensional organizational affordance. *Journal of Enterprise Information Management*, *34*(6), 1649–1672.

Cetindamar, D., Kitto, K., Wu, M., Zhang, Y., Abedin, B., & Knight, S. (2022). Explicating AI Literacy of Employees at Digital Workplaces. *IEEE Transactions on Engineering Management*, 1–14.

Chawla, R. N., & Goyal, P. (2021). Emerging trends in digital transformation: A bibliometric analysis. *Benchmarking: An International Journal*, *29*(4), 1069–1112.

Chen, C. (2016). *CiteSpace: a practical guide for mapping scientific literature* (pp. 41-44). Hauppauge, NY, USA: Nova Science Publishers.

Crum, M., Nelson, T., de Borst, J., & Byrnes, P. (2022). The use of cluster analysis in entrepreneurship research: Review of past research and future directions. *Journal of Small Business Management*, *60*(4), 961–1000.

Derviş, H. (2019). Bibliometric analysis using bibliometrix an R package. *Journal of Scientometric Research*, *8*(3), 156–160.

Donthu, N., Kumar, S., Mukherjee, D., Pandey, N., & Lim, W. M. (2021). How to conduct a bibliometric analysis: An overview and guidelines. *Journal of Business Research*, *133*, 285–296.

Duplaga, M. (2020). The determinants of conspiracy beliefs related to the COVID-19 pandemic in a nationally representative sample of internet users. *International Journal of Environmental Research and Public Health*, *17*(21), 7818.

Falloon, G. (2020). From digital literacy to digital competence: The teacher digital competency (TDC) framework. *Educational Technology Research and Development*, *68*(5), 2449–2472.

Farias-Gaytan, S., Aguaded, I., & Ramirez-Montoya, M.-S. (2022). Transformation and digital literacy: Systematic literature mapping. *Education and Information Technologies*, *27*(2), 1417–1437.

Farooq, R. (2022). Knowledge management and performance: A bibliometric analysis based on Scopus and WOS data (1988–2021). *Journal of Knowledge Management*, *27*(7), 1948-1991.

Hall, C. M. (2011). Publish and perish? Bibliometric analysis, journal ranking and the assessment of research quality in tourism. *Tourism Management*, *32*(1), 16–27.

Advanced International Journal of Business, Entrepreneurship and SME's
AIJBES
EISSN: 2682-8545
Volume 6 Issue 19 (March 2024) PP. 258-275
DOI 10.35631/AIJBES.619019

Law, N. W. Y., Woo, D. J., de la Torre, J., & Wong, K. W. G. (2018). *A global framework of reference on digital literacy skills for indicator 4.4. 2*. Retrieved from: UNESCO Institute for Statistics website: https://hub.hku.hk/bitstream/10722/262055/1/Content.pdf?accept=1

Lei, H., Tang, S., Zhao, Y., & Chen, S. (2023). Enterprise digitalization, employee digital literacy and R&D cooperation: The moderating role of organizational inertia. *Chinese Management Studies*.

Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: An introduction. *Learning, Media and Technology*, *38*(4), 355–367.

Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. (2009). Preferred reporting items for systematic reviews and meta-analyses: The PRISMA statement. *BMJ*, *339*, b2535.

Nikou, S., De Reuver, M., & Mahboob Kanafi, M. (2022). Workplace literacy skills—How information and digital literacy affect adoption of digital technology. *Journal of Documentation*, *78*(7), 371–391.

Perianes-Rodriguez, A., Waltman, L., & Van Eck, N. J. (2016). Constructing bibliometric networks: A comparison between full and fractional counting. *Journal of Informetrics*, *10*(4), 1178–1195.

Sousa, M. J., & Rocha, Á. (2019). Skills for disruptive digital business. *Journal of Business Research*, *94*, 257–263.

Tinmaz, H., Lee, Y.-T., Fanea-Ivanovici, M., & Baber, H. (2022). A systematic review on digital literacy. *Smart Learning Environments*, *9*(1), 21.

Van Laar, E., van Deursen, A. J., van Dijk, J. A., & de Haan, J. (2018). 21st-century digital skills instrument aimed at working professionals: Conceptual development and empirical validation. *Telematics and Informatics*, *35*(8), 2184–2200.

Wang, C., & Si, L. (2023). A Bibliometric Analysis of Digital Literacy Research from 1990 to 2022 and Research on Emerging Themes during the COVID-19 Pandemic. *Sustainability*, *15*(7), 5769.

Zhao, Y., Pinto Llorente, A. M., & Sánchez Gómez, M. C. (2021). Digital competence in higher education research: A systematic literature review. *Computers & Education*, *168*, 104212.

Zulu, S. L., Saad, A. M., & Gledson, B. (2023). Individual Characteristics as Enablers of Construction Employees' Digital Literacy: An Exploration of Leaders' Opinions. *Sustainability*, *15*(2), 1531.

Zupic, I., & Čater, T. (2015). Bibliometric Methods in Management and Organization. *Organizational Research Methods*, *18*(3), 429–472.