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Understanding Social Isolation, Loneliness, and Digital Society: A Bibliometric Analysis

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Abstract

The fast normalization of remote and hybrid work has exposed a fundamental paradox of digital modernity i.e., greater technological connectivity does not necessarily reduce social isolation. This paradox of digital modernity is that the more hyper-connected we are, the less we are socially connected. Social isolation and loneliness are commonly viewed as individual psychological or medical issues, but this approach commonly neglects the technological and structural aspects of the issue. This research investigates the development of studies on social isolation in technology-mediated contexts through a bibliometric analysis of 1,285 Scopus-indexed documents published between 2015 and 2026. The results indicate a post-pandemic increase in publication activity and a paradigmatic shift from human-centered vulnerability studies to artificial intelligence and digital transformation. Nevertheless, the knowledge structure is still core-periphery, with behavioral and ageing studies being prominent, and organizational and structural studies being underdeveloped. In conclusion, this research contends that social isolation in the digital age is not only a psychological issue but also a socio-technical and structurally mediated phenomenon that is affected by workplace design, digital ecosystems, and global disparities

Keywords: Social isolation; Loneliness; Digital society; Digital transformation; Bibliometric analysis

1. Introduction

In the modern world, technological advancements, globalization, and lifestyle changes have caused a dramatic shift in human interaction, social well-being and global health. Social behavior and mental and physical health are now impacted by digital communication networks, working culture in urban areas, and demographic changes (Batra et al. 2024). Global health as discussed by the World Health Organization have highlighted that loneliness and social isolation are becoming serious public health issues. There is scientific evidence that loneliness can be a health risk similar to smoking and physical inactivity, which impacts mental and physical health. This problem is most evident in the elderly population. For example, in Japan, the trend of nuclear families, lower birth rates, and longer life expectancy have increased the number of older people living alone,

which sometimes results in mental problems and lack of social support (Kusumota et al. 2022; Campbell & Ross 2022).

Social and behavioral issues in the younger generation have also been brought to light by news reports (Sukaesih & Zuriah 2025). News agencies such as BBC News have reported that overuse of social networking sites can lead to anxiety, decreased attention span, exposure to cyberbullying, and decreased communication skills. In today's urban society, people tend to have large social networks online and experience emotional loneliness in their real-life surroundings (Amin & Zinaida 2024). This has also been observed in highly urbanized cities like Seoul, where the competitive work environment and high cost of living have led to single-person households and long working hours, resulting in less community interaction (Kim et al. 2021). Moreover, urbanization and modern work patterns have changed social interactions. Rapidly growing urban areas have shown increased work pressure, living in a migrant society, and a breakdown of traditional social ties. Students and working professionals tend to use digital platforms more for learning, entertainment, and social interactions. It is in this context that the current study explores the complex relationship between human behavior, social isolation, and technological advancements.

1.1. Literature Review

Social isolation and loneliness have appeared as important interdisciplinary topics of research in the current digital era, which are characterized by complex interactions between psychological experience, social structure, and technological change (Nowland et al. 2018). While both concepts are interrelated, they constitute two different fields of analysis. Loneliness is a subjective emotional experience that results from a perceived lack of significant social relationships, while social isolation is an objective structural lack of social interaction in digital world (Moroney & Jarvis, 2020). Neuropsychological studies conducted by Cacioppo (2008) have shown that loneliness is more than a social phenomenon, as it is also a biological mechanism of stress response that is characterized by increased threat perception, behavioral defensiveness, and long-term physiological risk. Chronic loneliness has been empirically associated with depression, cognitive impairment, and cardiovascular risk, which indicates that loneliness should be understood as a multidimensional public health issue rather than a psychological phenomenon.

From a macro-sociological point of view, the degradation of community-based social integration in modern society can be explained by the theory of social capital. Robert D. Putnam (2000) suggested that the process of modernization, increased mobility in urban areas, and lifestyle changes have led to a decrease in civic engagement and a lack of interpersonal trust. His seminal book *Bowling Alone* illustrated that modern societies are undergoing a shift from collective community participation to individualized social conduct. This shift is especially apparent in virtual environments, where online communication is increasingly replacing traditional face-to-face communication. Nevertheless, those who oppose the theory of structural degradation suggest that online connectivity can create new social capital instead of merely depleting existing ones.

The emergence of digital communication networks has further added to the complexities of human relational structures (Hansen et al. 2025). The concept of network individualism, explained by Barry Wellman (2001), is a critical interpretation of the contemporary social structure. Unlike the traditional community-based social structure, the contemporary individual is now situated in a digital network that has flexible and weak tie interactions. Although digital communication networks have expanded the accessibility of communication and its geographical reach, they may also be contributing to a reduction in the intensity of emotionally significant relations (Tsang & Ho, 2025). Social interaction is now being dispersed over various virtual spaces, and this phenomenon is referred to as relational dispersion by digital sociology.

The psychological paradox of connectivity through technology is expressed in the works of Dhal (2025), who described the phenomenon of the “alone together” society. The permanent presence of people in the digital world does not necessarily mean the presence of emotional closeness (Dhal, 2025). On the contrary, the communication process through the screen can lead to the formation of shallow interaction patterns that lack empathic depth and social presence. At the population health level, loneliness is increasingly viewed as a determinant of public health, rather than a purely social or behavioral issue. The World Health Organization (2022) has identified social isolation as a significant risk factor, on a par with established lifestyle factors such as smoking, lack of exercise, and unhealthy eating. This view supports the contention that loneliness has a significant impact on both psychological well-being and physiological health outcomes. The increasing epidemiological concern about loneliness reflects a move from individual-level understanding to structural prevention policy frameworks.

The workplace is an important analytical setting for examining the issue of social isolation, especially in technology-driven sectors. The processes of rapid digitalization, teleworking arrangements, and platform capitalism have radically transformed interaction patterns in organizations. Although virtual work environments are more efficient and flexible, they also limit the scope of informal social interactions, which previously helped build social capital in organizations. The growing use of teleworking arrangements has replaced casual workplace interactions with organized online communication. Technology professionals are a special at-risk group for research on social isolation in the digital age because they are simultaneously producers and users of technology (Barbosa Neves et al. 2023). Theoretical models of occupational disconnection can be developed from traditional sociological theories. The idea of anomie, developed by Emile Durkheim, describes how the pace of technological and organizational change can undermine traditional social regulation, resulting in psychological disorientation and social alienation. Georg Simmel's theory of social distance also describes how the modern technological and urban space can structurally increase the distance of social separation. In addition, Erving Goffman's dramaturgical approach to communication suggests that digital communication spaces limit the possibility of self-expression because communication takes place through mediated technological interfaces rather than physical social presence.

However, despite the increasing body of literature on loneliness and digital behavior, there are still many research gaps, especially in terms of organizational and industry experiences of loneliness. The current literature is largely concentrated on health outcomes, while workplace structural issues, digital organizational culture, and technology-mediated social relations are relatively understudied. In the technology-driven workplace, loneliness is not only a psychological state but also an organizational issue that can be influenced by organizational communication design, leadership, and workflow architecture. Therefore, this study uses a network-informed analytical approach to investigate knowledge structure and thematic development in the field.

This Bibliometric analysis aims to address four specific research questions (RQs)

RQ1. What are the major research themes and emerging trends in social isolation and loneliness research within the technology sector, and how have these thematic patterns evolved and transformed over time? (2015–2026)

Objective: To examine temporal changes in the focus of literature and theoretical themes.

Approach: Co-word analysis, temporal trend mapping, and thematic cluster analysis using bibliometric visualization techniques.

RQ2. Who are the most influential scholarly sources, including journals, authors, institutions, and countries, contributing to research on social isolation and loneliness in the technology sector, and how do their citation networks interact within the knowledge structure of the field?

Objective: To assess the overall pattern of scholarly influence.

Approach: Citation network analysis, bibliographic coupling, and co-citation mapping.

RQ3. What are the dominant research themes, topics, and subfields in happiness research within the management discipline, and how have these themes evolved over time?

Objective: To capture the evolution of themes and emerging intersections of interdisciplinary research.

Approach: For this purpose, a longitudinal bibliometric study using co-word clustering, theme evolution, and visualization-based knowledge structure analysis will be employed.

Through the integration of behavioral psychology, sociological theory, digital communication studies, and bibliometric network science, this study can contribute to a more comprehensive understanding of social isolation in technology-mediated environments. The analytical framework of this study stresses that social isolation in the digital age is not merely a technological issue but a complex socio-technical phenomenon that arises from the intersection of human behavior, organizational structure, and network communication systems.

1.2. Conceptual Framework

Figure 1 presents the conceptual framework reconceptualizes social isolation in the digital society, not as a psychological deficiency or a natural consequence of technological progress, but as a structurally mediated socio-technical condition that is embedded in the contemporary network capitalism. The framework begins with a conceptual separation between social isolation as an objective structural withdrawal from meaningful social integration and loneliness as a subjective experiential state of relational inadequacy. This is important because much of the existing literature

has tended to conflate the two concepts, thereby neglecting the ways in which technological systems can mediate structural disconnection without necessarily producing a uniform emotional experience. The framework thus resists the reductionist impulse to interpret loneliness solely as a psychological outcome and locates it within the larger technological transformations.

At the center of the framework is the claim that digital modernity entails a paradoxical relation of hyper-connectivity and relation thinning. The proliferation of online networks increases the range of communicative connectivity even as it fragments interaction into scattered and low-intensity forms. Networked individualism transforms the conditions of social embeddedness from community-based to fluid and individualized networks maintained through screen-based interfaces. This does not necessarily lead to the degradation of social capital but rather alters its topology: bonding capital declines, bridging capital expands, and the depth of relations becomes differentially allocated. The "alone together" relation embodies this contradiction—individuals are perpetually connected yet increasingly estranged from emotionally rich interaction. The framework thus repudiates technological determinism in both its optimistic and pessimistic variants; digital technology neither necessarily destroys nor strengthens social bonds. Rather, it reshapes the conditions of intimacy, recognition, and solidarity.

In this wider context of digital transformation, the workplace, especially in the tech industry, is identified as a key site of structural isolation. The adoption of remote and hybrid work arrangements, platform-based coordination, and asynchronous communication systems diminishes informal interaction contexts that previously enabled the emergence of trust and weak tie relationships in an ad-hoc manner. Digitalization of the workplace transforms the social regulation of the organization and changes the normative structure of work, resonating with traditional sociological worries about anomie and social distance. In the tech-mediated context, interaction is formalized, task-centered, and performance-transparent, making it difficult to enable embodied co-presence and authentic relational interaction. The framework thus contends that workplace isolation is more than a secondary consequence of efficiency-oriented innovation and is instead a structurally embedded outcome of workflow architecture and communication design. Social isolation in the tech industry must therefore be understood as an organizational problem with its roots in structural incentives, managerial culture, and digital infrastructure, rather than being exclusively a problem of individual coping capacity.

Finally, the framework places social isolation in the context of interlocking explanatory realms: the digital technological context, organizational features, and psychosocial aspects. Social isolation cannot be explained by any one realm. Technological affordances drive communication patterns; organizational features condition interaction possibilities; and psychosocial tendencies shape subjective feelings of loneliness. These realms interact with each other in complex ways, leading to disparate results across groups and regions. Further, global bibliometric trends indicate a focus of knowledge production in a few countries, which indicates that the very knowledge of digital isolation is itself subject to geopolitical disparities in research ability and agenda-setting influence.

Overall, the framework promotes that social isolation in the digital society is neither a secondary consequence of modernization nor a simple psychological predisposition of the individual. It is a structurally mediated phenomenon that arises at the intersection of technological systems, organizational structures, and changing patterns of social integration. The digital era does not cancel social relations but reconfigures their density, visibility, and durability. Social isolation cannot be grasped through a description of connectivity but through a structural analysis of how digital technology reconfigures the social architecture of belonging.

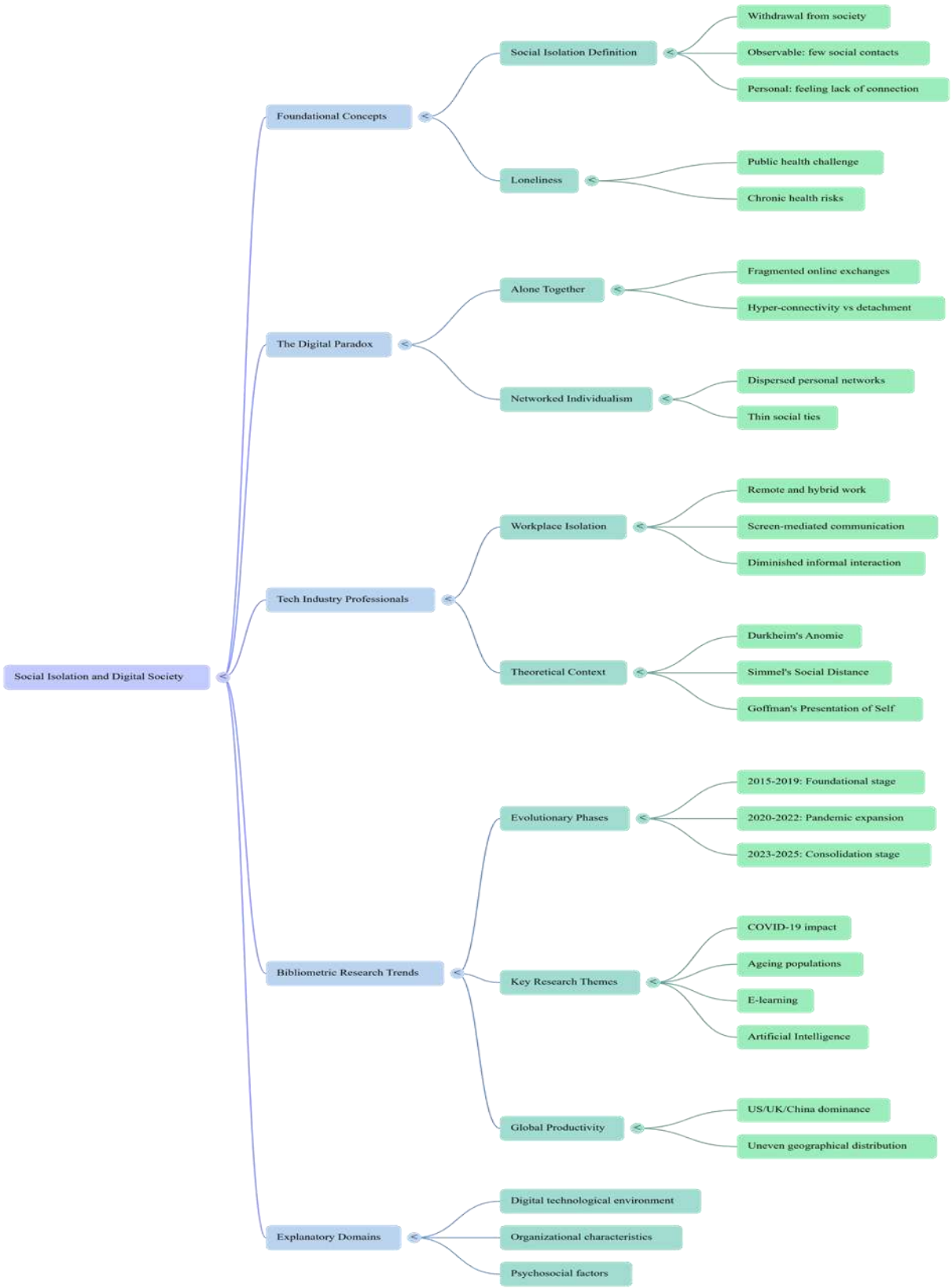


Fig1: Conceptual Framework

2. Methodology

Bibliometric research was performed on the published literature that pertains to the topic of social isolation in the technology sector. Bibliometric analysis can have several purposes, including looking at shifts in the trends of individual and overall article and journal performance, patterns of collaboration, attributes of research, and investigating the distinctive characteristics of sub-disciplines of the current literature (Donthu et al. 2021; Verma & Gustafsson 2020; Donthu et al. 2020).

2.1. Research design - In the research design, the main steps consisted of identifying the optimal bibliographic databases, developing search parameters, and selecting software tools for the analysis. Considering all the factors, the Scopus database was the best for this study. Scopus is considered optimal rather than simply adequate due to its comprehensive multidisciplinary coverage, inclusion of a wider range of peer-reviewed literature, and its superior citation indexing features compared to other mainstream databases. In particular, Scopus includes more journal sources across social sciences, technology, and health, offering a more extensive range of time for developing and evolving studies and performing citation analyses (20% further than the Web of Science, which was the most popular database for bibliometric analysis) (Flores-Romero et al. 2021). Additionally, Scopus reliably indexes all authors in cited references, which enhances the validity of co-authorship and citation network measurements in bibliometric studies (Zupic & Cater 2015). According to Waltman's guidelines for database selection, Scopus's broader journal and citation coverage is especially important for network-based bibliometric analyses, as it allows for more accurate mapping of scholarly impact and thematic evolution within interdisciplinary fields.

In addition, Scopus also allows the data to be exported directly and is compatible with most bibliometric software. Spotting these trends can also help organizations formulate more effective responses to the crises since the value of social isolation is likely clearer during these challenging times. Specific research objectives and questions provided the research criteria. At the outset, the search term was "social isolation." The present study conducted a comprehensive bibliometric analysis using the Scopus database. The database was searched using the following search string: Thus, this study includes all articles published in English from 2015 to 2026 (inclusive) and search string is: (TITLE-ABS-KEY (Social Isolation) OR TITLE-ABS-KEY (Loneliness) AND

TITLE-ABS-KEY ("Technology") AND NOT TITLE-ABS-KEY (Mental Health)) AND PUBYEAR > 2014 AND PUBYEAR < 2027 AND (LIMIT-TO (SUBJAREA , "SOCI")) which focus on the research regarding social isolation, specifically for technology sector. To enhance replicability and theoretical transparency, the exclusion of "mental health" from the search was a deliberate methodological decision. The intent was to focus the analysis on studies of social isolation and loneliness as independent constructs, rather than limit the pool to articles predominantly addressing social isolation in the context of mental health disorders, which could otherwise dominate the literature retrieved. This approach is grounded in the understanding that while social isolation, loneliness, and mental health are interconnected, they constitute distinct fields of study; the explicit exclusion helps mitigate thematic conflation and aligns with Waltman's assertion that clear inclusion and exclusion criteria improve the validity and reproducibility of bibliometric studies. Table 1 depicts the inclusion and exclusion criteria for document selection. The excludes articles from prior to 2015 and dissertation/thesis, and other (e.g., meetings, abstracts).

Table 1: **Inclusion and exclusion criteria for document selection**

Inclusion criteria	**Exclusion criteria**
Selection of a list of documents with the keyword "social isolation"	Articles or reviews that did not mention the keywords "social isolation"
Published between January 2015 and January 2026	Published before January 2015 and after January 2026
Article, review, conference paper, book chapter and Editorials	Dissertation/thesis, and Other (e.g., Meetings, Abstracts)
Online available journals	Articles available in print

2.2. Data Collection

This study utilized two bibliometric analysis tools, VOSviewer and Biblioshiny, accessed through R Studio. In the last 10 years, bibliometric analysis has become a prominent research method for providing a holistic overview of literature in various disciplines (Ghorbani 2024). Bibliometric analysis comprises two broad categories: performance analysis and science mapping, which seeks to visualization a body of knowledge, providing a view towards its previous, present, and future state and/or time (Donthu et al. 2021; Lim & Kumar, 2024; Mukherjee et al. 2022). There have

been many gestures using VOSviewer (a freemium software) because it allows researchers to perform a bibliometric analysis using large datasets and create rich visualizations of the network relationship of the dataset (Bukar et al. 2023)

The titles and abstracts of all studies were screened to identify articles that would meet the inclusion criteria. Studies were independently selected, and the outcomes were discussed to reach a consensus on the final selection. The study included for the final review was only when we had comprehensively studied the entire article. The article's data or information was extracted using a structured process. The data extracted was based on the following criteria: definition, year of publication, outcome, sample, and study limitation. Of the articles we included, two reviewers completed the quality appraisal independently, and any discrepancies or uncertainty in the appraisal was resolved by adding a third reviewer to ensure consistency and objectivity in the appraisal process. A search was conducted, which yielded a total of 5115 records; within that dataset, filtering was initiated based on pre-determined parameters filter years (2015-2026) - (4112); area of research (social sciences) resulting a final dataset of 1285 records suitable for the study. The authors provided an extensive, thorough review of the noted articles.

2.3. Data Analysis

The data analysis was carried out using both descriptive and network-based bibliometric analysis to gain a better understanding of the research trends. The descriptive analysis focused on publication productivity, evolution patterns, citation performance, and research influence on important dimensions such as authors, journals, articles, and countries. Furthermore, keyword frequency and subject trend distributions were also analyzed to determine the most prominent research themes.

To gain a deeper understanding of knowledge structure and thematic interlinkages, network-based science mapping analysis was also carried out. The analysis covered cluster analysis, thematic evolution mapping, and keyword co-occurrence analysis to determine the structural linkages between research themes and their evolution patterns over time. Data visualization and network modeling were carried out using RStudio (version 2024.04.2+764), which enabled systematic bibliometric calculations and graphical representation of research trends.

2. Results and Discussion of Bibliometric Analysis

The outcome of the bibliometric analysis is discussed in relation to the three research questions that form the basis of this study. Through the combination of quantitative bibliometric data and qualitative analysis, this section identifies the most important publication trends, authoritative sources of research, and the evolving themes in the field. The outcome of the analysis will also be discussed in relation to the development of scholarly communication and research focus over time.

3.1. RQ1.What are the major research themes and emerging trends in social isolation and loneliness research within the technology sector, and how have these thematic patterns evolved and transformed over time?

The bibliometric data set for the period 2015-2026 offers a moderately large but highly complex set of 1,285 documents sourced from 859 sources, which indicates a wide spread of disciplines; but the inclusion of 2026 introduces the problem of partial-year bias, which is likely to influence the negative annual growth rate of -3.73%, thus making it difficult to determine whether the discipline is actually shrinking or whether the data is not yet fully indexed. The average citation per document of 14.79 indicates a moderate level of impact, but without comparison with the norms of the discipline, this data point is more descriptively helpful than analytically useful.

The fact that the document average age is quite young (4.36 years) suggests an emerging or developing field of research, but this is a matter of interpretation in context. The fact that there are 3,824 author keywords and 3,173 Keywords Plus suggests a high degree of thematic diversity, although the effectiveness of any network mapping analysis would be highly dependent on a rigorous process of keyword cleaning and standardization, which would need to be clearly addressed in order to ensure the validity of the analysis. In our own research, we have standardized our keywords prior to mapping by following a rigorous keyword cleaning procedure. This involved case normalization, removal of generic or ambiguous terms, and manual examination of frequent keywords to eliminate semantic duplicates.

Authorship network data reveals a collaborative network (3.27 co-authors per document) but low international co-authorship (15.72%), indicating that while there is active collaboration within the country, international integration of the research community is still limited. Moreover, the presence of multiple document types, including articles, book chapters, conference papers, editorials, and even retracted documents, adds variability to citation patterns and research quality,

which could otherwise diminish impact factor analysis unless properly filtered. To mitigate this, we performed additional sub-analyses to distinguish original research articles from editorials, retractions, and other document types, as recommended by Traag (2025) to ensure homogeneous document sets when comparing impact factors. This step is useful in reducing the distortions of citation inflation by ensuring that the citation rates are measured on an apples-to-apples basis, which gives a better indication of the actual scholarly impact (Table 2). In general, although the data set shows evidence of scope and collaboration, there is a need for stronger methodological explanations.

In nutshell, the bibliometric data (2015-2026) represents a mature but complex research area with a growing number of citations and disciplines. Nevertheless, the inclusion of partial data for 2026 may affect the accuracy of the negative growth rate. The young document age indicates an emerging area, but this needs to be considered in the context of benchmarks. The high diversity of keywords indicates a broad topic, but validity is dependent on strict standardization processes, which are critical for precise network visualization. The lack of international co-authorship indicates a low level of global integration. In addition, the diversity of document types may lead to citation inflation, which needs to be filtered.

Table 2: Main information about data

Description	**Results**
Timespan	2015:2026
Sources (Journals, Books, etc)	859
Documents	1285
Annual Growth Rate %	-3.73
Document Average Age	4.36
Average citations per doc	14.79
References	10806
DOCUMENT CONTENTS	
Keywords Plus (ID)	3173
Author's Keywords (DE)	3824
AUTHORS	
Authors	2453
Authors of single-authored docs	198

The publication data in the Figure 2 indicates a structural shift in the publication pattern over the years, but it needs to be interpreted properly to draw the right inferences. From 2015 to 2019, the number of publications remains more or less stable, ranging between 41 and 54 per year, thus indicating a modest and steady level of research interest in the subject during its early stages. However, there is a sudden spurt in the number of publications from 2020 onwards (130 in 2020, 174 in 2021, 184 in 2022), thus possibly indicating either a global event that triggered research interest in the subject or its rising academic and policy relevance, or possibly an extension of the indexing coverage to include more publications. The slight drop in 2023 (171) and 2024 (162) may not necessarily indicate a decline in the field but possibly a normalization of the growth rate after the initial spurt.

The rise again in 2025 (192) indicates that the field remains alive and well. The very low number for 2026 (27) is problematic in terms of methodology, as it likely represents a partial year because of the ongoing indexing process at the time of data collection. Including partial-year data in trend or growth rate calculations can lead to incorrect negative annual growth rates, as demonstrated by Waltman. To improve the accuracy of analysis, the number for 2026 is not included in the calculations for growth rate or trend analysis, and data from 2015 to 2025 are used as the basis for phase identification and evaluation.

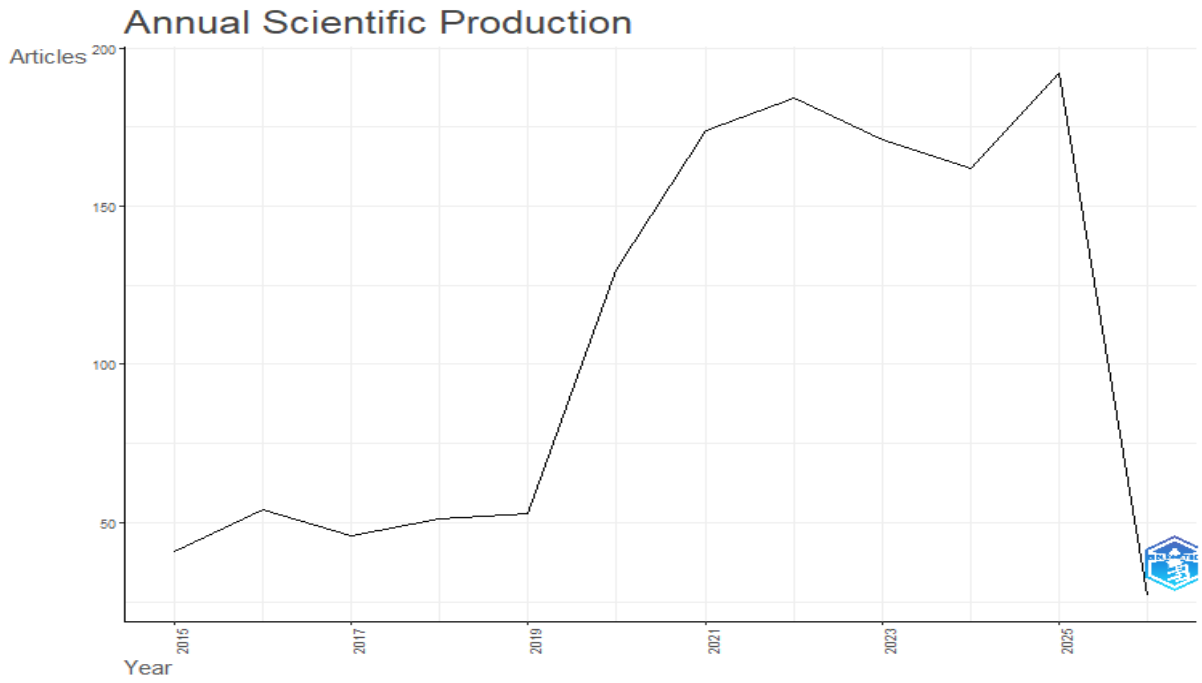


Fig 2: Annual publication pattern over the years

3.2.RQ2. Who are the most influential scholarly sources, including journals, authors, institutions, and countries, contributing to research on social isolation and loneliness in the technology sector, and how do their citation networks interact within the knowledge structure of the field?

Journals' contribution to productivity and impact

Table 3 shows a highly skewed distribution of publication productivity, where a very large number of journals have contributed only one or a few publications, while a very small number of journals have contributed a large number of publications. For instance, JMIR Aging has the highest contribution with 31 publications, followed by Sustainability (Switzerland) with 28 publications and Journal of Gerontological Social Work with 14 publications. This indicates that there is a core group of preferred journals, which may have a significant influence on the academic visibility and productivity of the researcher. In terms of impact, many of the journals that are highly represented are from interdisciplinary areas such as digital health, aging studies, technology-society interaction, and educational technology. Journals such as Behaviour and Information Technology and Information Communication and Society show a high level of engagement with human-computer interaction and socio-digital studies. Such publication patterns can be beneficial for academic impact if these journals are included in the citation databases and have high citation metrics. However, the productivity in terms of publication output may not necessarily be a measure of academic impact because the relationship between impact and productivity is more closely linked to citation metrics and quality of research.

Figure 3 shows a wide dissemination of research work across many outlets, as a large number of journals have only one publication each. This could be due to inter-disciplinary research collaboration or exploratory publication approaches. Although publication in many outlets may help in disseminating research work, publishing in too many outlets may result in a reduced cumulative impact if the research work is published in low visibility outlets. This indicates the careful selection of high relevance inter-disciplinary journals to increase academic visibility. However, the number of publications does not determine the research impact, as it depends on citation rates, journal ranking, and quality factors.

Analysis of the journal distribution shows a concentrated but dispersed pattern of publication. There is a core of interdisciplinary journals, especially in digital health, aging, and technology-

society studies, that publishes a disproportionately large number of papers, suggesting targeted efforts at high-visibility publication. Nevertheless, the long tail of the distribution, in which many journals have published only one paper, suggests a broad range of topics but may also dilute the cumulative citation potential. Productivity in core journals raises the visibility of academics, but the number of publications does not necessarily measure their impact. Citation rates, journal rank, and quality of research are more reliable measures of research impact.

Table 3. Source impact

Jmir Aging	12	20	1.3	436	31	2018
Sustainability (Switzerland)	11	23	1.2	572	28	2018
Journal of Gerontological Social Work	9	14	1	440	14	2018
Information Communication and Society	8	10	0.6	462	10	2015
Journals of Gerontology - Series B Psychological Sciences and Social Sciences	8	11	0.8	879	11	2017
Proceedings of The Acm On Human-Computer Interaction	8	12	1	408	12	2019
Frontiers in Education	7	11	1	285	11	2020
Technology in Society	7	12	0.58	182	12	2015
Clinical Gerontologist	6	9	1	138	9	2021
Innovation in Aging	6	10	0.6	206	10	2018

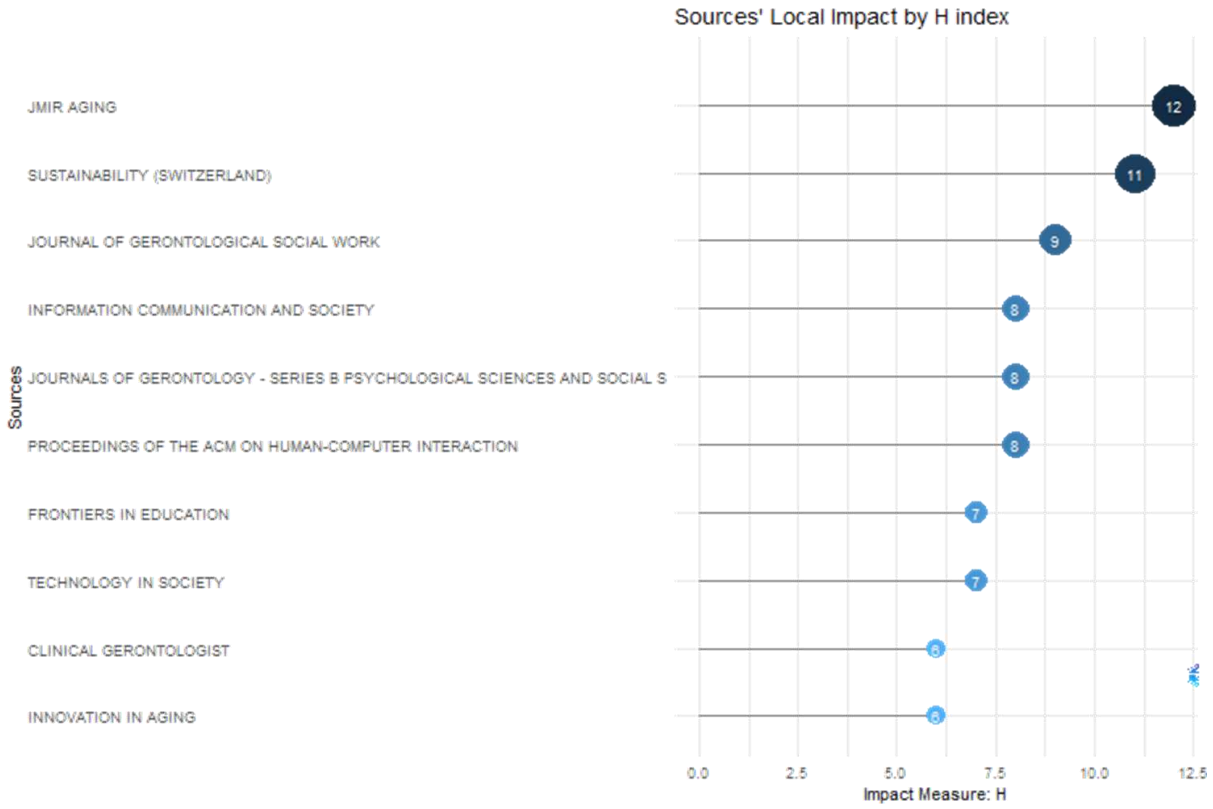


Fig 3: Journals' contribution to productivity and impact

Authors 'contribution in terms of productivity and impact

Figure 4 offers a longitudinal view of the productivity of five major publication channels in the field of research, including JMIR Aging, Sustainability (Switzerland), Journal of Gerontological Social Work, Proceedings of the ACM on Human-Computer Interaction, and Technology in Society. The data clearly indicates an upward trend in the number of publications, especially after 2020, which indicates a rise in research productivity in the areas of digital health, sustainability, aging, and socio-technology. However, the productivity trend is not consistent, with research publication concentrated in a few top-tier specialized journals, indicating some disciplinary grouping rather than widespread interdisciplinary research communication. Since the study relies solely on cumulative publication data, future studies should include citation impact, indexing, and research influence to more accurately measure research significance.

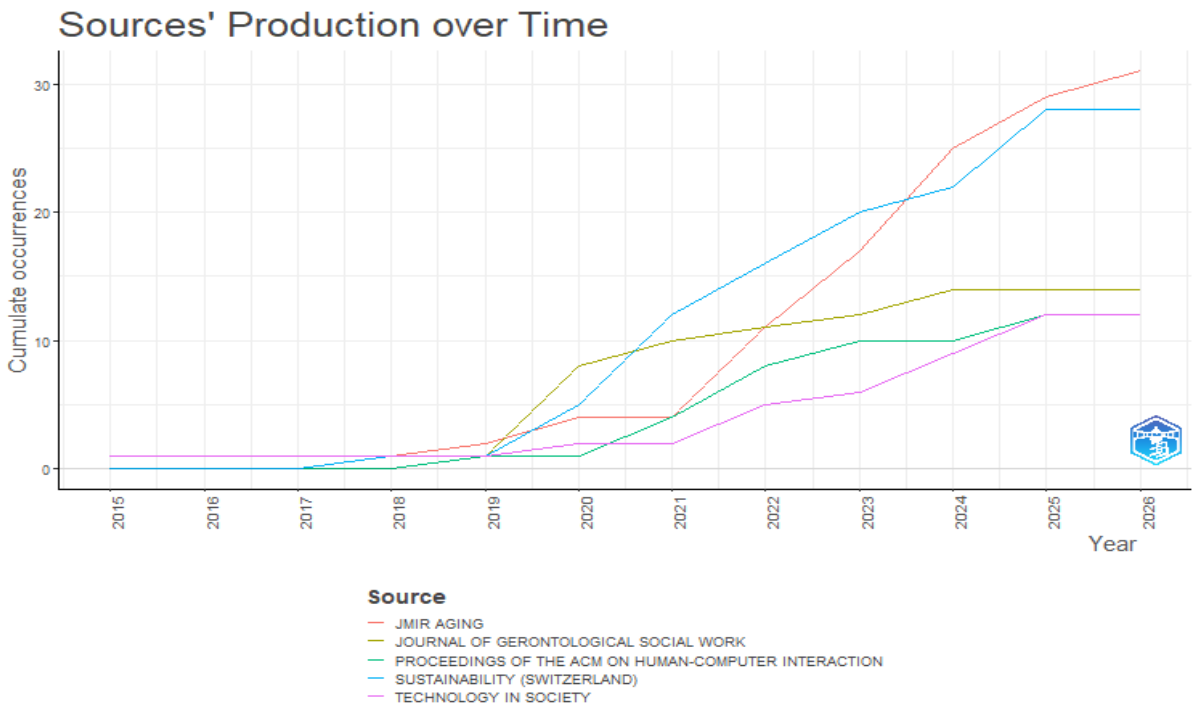


Fig 4: Source dynamics.

Authors 'contribution in terms of productivity and impact

Figure 5 represents a highly unequal and fractionalized structure of authorship productivity, where a very small number of authors account for the majority of the publications, and the rest of the authors have only one publication to their name. This is a clear indication that there is a core group of highly productive authors and a peripheral group that is largely unproductive. The very high number of publications by one author compared to the rest of the authors raises questions about the dynamics of authorship and the nature of collaboration and productivity. While fractionalized authorship is an attempt to correct the inflation of co-authorship, it still fails to measure the qualitative aspects of influence, citation, and intellectual leadership in research networks.

The authorship structure indicates an unequal distribution of productivity, which signifies inequality in knowledge production. The fractionalized data does not measure the influence of research or intellectual contribution.

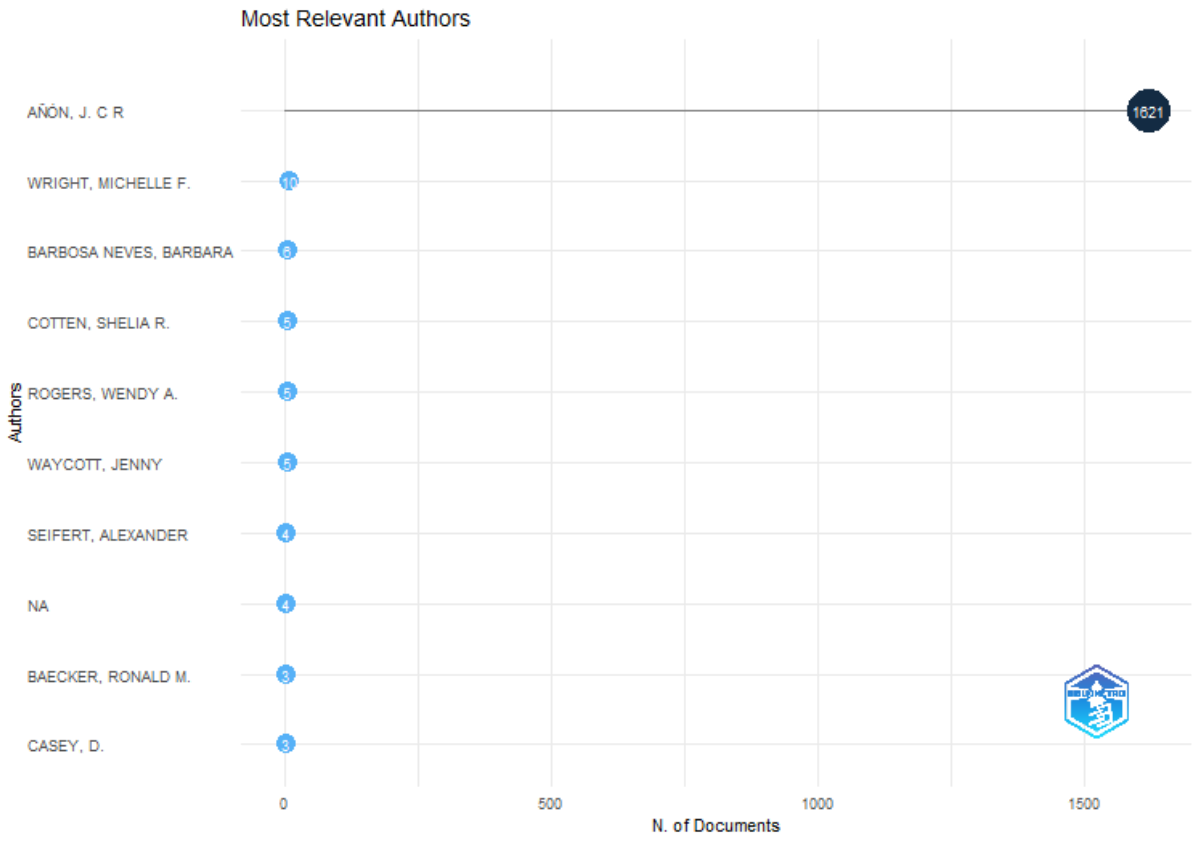


Fig 5: Authors' productivity and impact

Contribution of nations in terms of productivity and impact

Fig 6 provides information on the pattern of international collaboration and country-wise contribution to publications, categorized into single-country publications (SCP) and multi-country collaborative publications (MCP). The data available reveals a very imbalanced geographical distribution of research production, where the publication of research is dominated by a few countries. The largest contribution to articles (15.33%) comes from the United States, which reveals a strong position in research leadership and publication dominance. The next largest contributors are the United Kingdom, China, and Australia, but the share is much lower.

Critically, from the figure, the intensity of collaboration differs among countries. While some countries like Malaysia and Austria have high percentages of MCP, indicating a high level of international research networking, others like South Africa and Sweden have zero MCP contribution, indicating that they are mainly publishing their research domestically. A high percentage of MCP does not necessarily ensure research impact and quality.

The findings from the analysis indicate the existence of an imbalanced global knowledge system where research on social isolation and digital society is dominated by a few powerful nations, especially the United States. This dominance indicates that the theoretical approach, methodological focus, and research agenda are dominated by advanced Western research economies, which may lead to the marginalization of the Global South perspective. The imbalance in the distribution of single-country (SCP) and multi-country publications (MCP) further indicates the imbalance in collaboration patterns. Although countries such as Malaysia and Austria demonstrate strong international collaboration, this may be an indication of network dependency rather than intellectual leadership. On the other hand, countries with zero MCP are structurally isolated, which may limit their global visibility and citation impact. It is essential to note that high collaboration rates do not necessarily indicate higher research quality and impact.

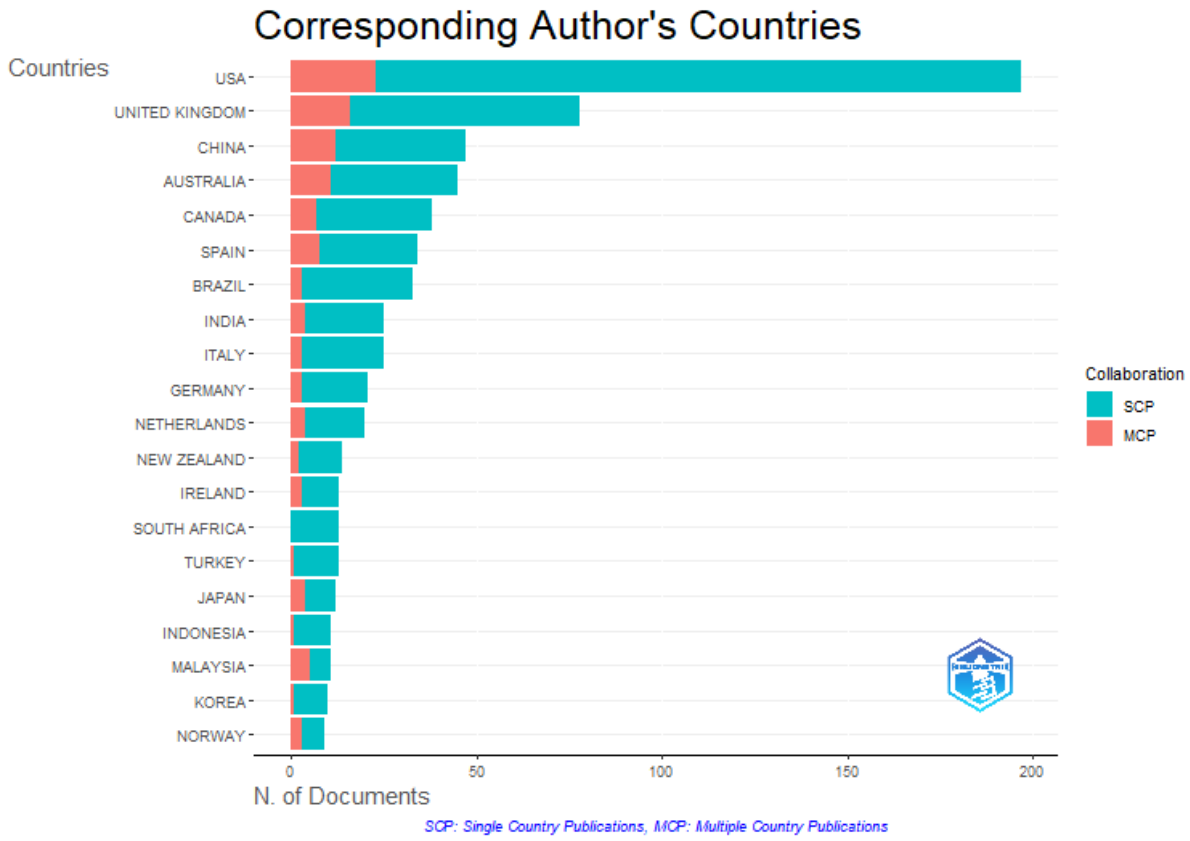


Fig 6: Country-wise contribution to publications

Citation impact analysis at the country level

Figure 7 shows the citation impact analysis at the country level, where total citations (TC) and average article citation performance are combined to assess not only the productivity of research but also its impact. What has been achieved is the assessment of research impact intensity instead of mere publication numbers. It is clear from the data that the highest producers of research are not necessarily the ones with the highest citation efficiency. For instance, the United States has the highest total citation number (5550), which is an indication of its leading position in the production of knowledge worldwide, but the average citation per article (28.2) is not the highest among the smaller producers. It is, however, surprising to find that some countries like Switzerland and Pakistan have the highest average citations (67.8 and 76.3, respectively), which may indicate that it is possible to have a high impact even when the number of publications is low. Notably, the results demonstrate a gap between productivity and impact. Countries with high research production, such as China and India, have a moderate average citation rate, indicating that a high increase in research production may not necessarily lead to a corresponding increase in impact. On the other hand, some countries with low research production have high average citation rates, perhaps because of strategic publication in high-impact journals or international collaboration.

Analysis of citation impact shows that the relationship between research impact and publication output is not directly proportional. While United States has the highest number of citations, its average citation efficiency is exceeded by smaller contributors like Switzerland and Pakistan, which may indicate that focused publication or collaboration can lead to greater impact. At the same time, countries with high publication output like China and India have only moderate citation efficiency, which may indicate that increased productivity does not necessarily lead to impact.

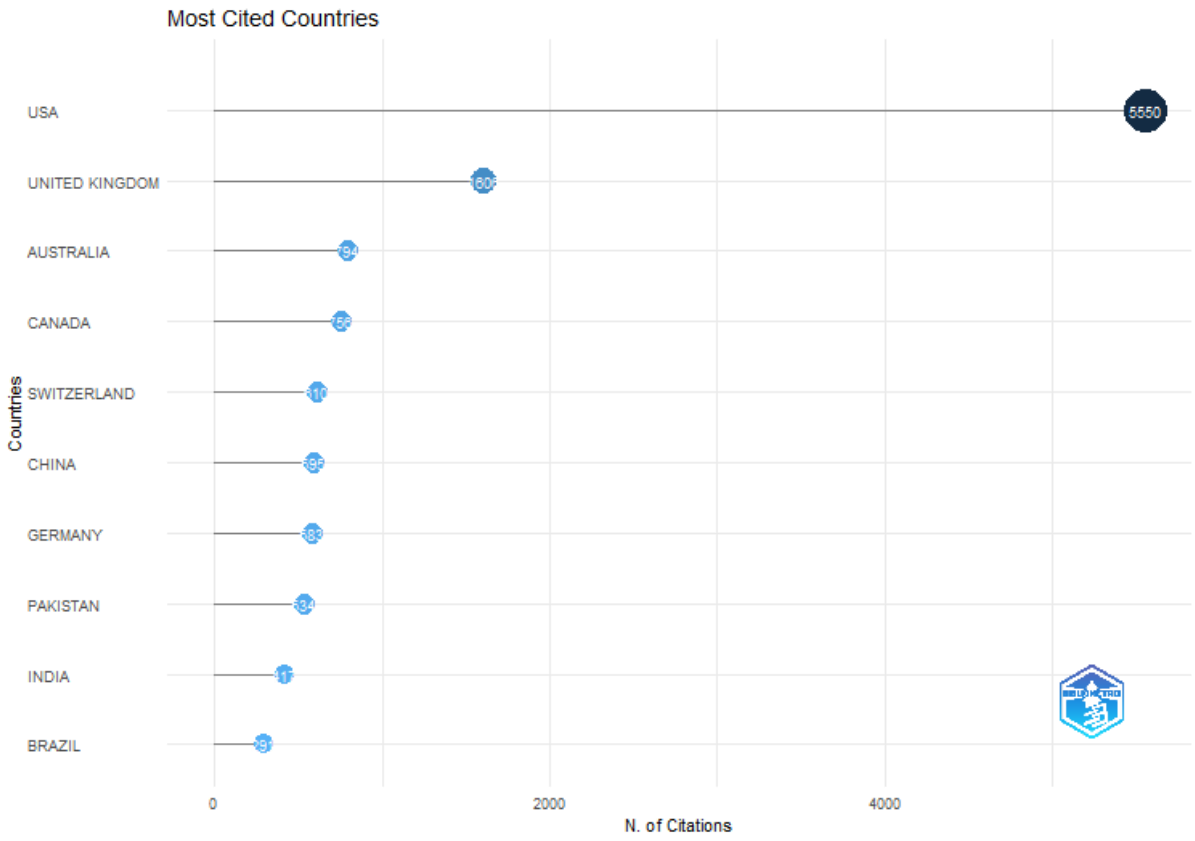


Fig 7: Most Cited Countries

3.3.RQ3. What are the dominant research themes, topics, and subfields in happiness research within the management discipline, and how have these themes evolved over time?

Thematic Distribution of Research Keywords and Content Focus in the Dataset

Thematic distribution is a representation of keyword thematic mapping of the research corpus and has been employed to identify the conceptual areas that are dominant in the dataset. What has been done is essentially a descriptive bibliometric content analysis, where the counts of occurrence of research terms are measured to identify the themes. The data reveals that the research is highly focused on the COVID-19 and social consequences of the pandemic, with high frequencies of keywords like covid-19, social isolation, loneliness, and older adults (Welch et al. 2023; Patulny & Bower 2022). This reveals that the research is focused on the social behavior of public health and interaction with digital society, as well as vulnerability to the ageing population. The presence of keywords like technology, e-learning, social media, and artificial intelligence reveals the integration of digital transformation themes in social and behavioral research.

However, the approach is limited in that it only considers the occurrence of terms and not their thematic importance, semantic links, or research innovation. Frequent terms could be a result of the number of publications rather than their intellectual value. For instance, the frequent use of generic terms like human, article, or aged could be an indication of poor keyword optimization. In sum, the thematic mapping by term frequency indicates the dominance of research on pandemics and social vulnerability studies, especially in the areas of public health, ageing, and online interactions.

Themes that are addressed the most

Figure 8 identified through the clustering of important themes in the dataset, which portrays the development of themes in the field from its origins in e-learning to the ever-expanding frontiers of artificial intelligence and digital society. The early stages of research focused on human-related themes, including human behavior, ageing, loneliness, social isolation, and the impact of the pandemic. However, as the digital transformation picked pace, the trajectory of research moved from human-related themes to technology integration, which includes artificial intelligence, digital technologies, information and communication technology (ICT), and complex information systems.

The emphasis on education technology and learning systems, especially the emphasis on e-learning, online learning, and innovations in the students' environment, indicates the key role of digital education as a springboard for many of these innovations. Over the years, the themes of sustainability and socio-economic impact have also emerged in the story, indicating an increasing focus on societal challenges. Taken together, the research environment paints a picture of a community of research that started with the exploration of the human and educational implications of digital transitions and has now mapped a trajectory towards the nexus of social behavior, digital society, health vulnerability, and the opportunities afforded by intelligent technologies.

The thematic mapping evolution shows the longitudinal bibliometric study of research themes in two time periods: 2015-2022 (CL1) and 2023-2026 (CL2). What has been done in this study is the identification of emerging and declining research clusters based on the transition of keywords over time. The thematic mapping shows the evolution of research themes from older topics such as e-learning, social isolation, innovation, and human-centered research to newer high-growth areas such as artificial intelligence, digital technologies, and information systems. The indicators used

to measure the importance, strength of transition, and persistence of research themes include Inc_Weighted, Inc_index, occurrence frequency, and stability score.

The thematic development pattern shows a marked transition from human-related research themes like loneliness, ageing, and pandemic studies to technology-related themes like digital transformation, artificial intelligence, and information systems. This transition has been influenced by the increasing focus on the intersection of social behavior and intelligent technologies, as well as the rising concerns related to sustainability and socio-economic issues. The research pattern clearly indicates an active development of knowledge, with new themes acquiring importance while the old themes undergo a transformation.



Fig 8: Themes that are addressed the most

Time Period 1 (2015–2022) – Thematic Structure and Network Centrality Analysis

Figure 9 shows the thematic pattern of Time Period 1 is dominated by human-centric behavioral, educational, and social technology studies. The most prominent group of themes is related to e-learning and online education, where keywords like "e-learning," "social networking (online)," "teaching," and "ICT tools" have high values of occurrence and centrality. This suggests that the initial research activities were mainly focused on online learning environments and online educational transformations.

The second prominent thematic area is related to social isolation and pandemic-related behavioral studies, which turned out to be highly dominant in the later periods. The keywords "social isolation," "COVID-19," "internet," "social support," and "social media" have high values of betweenness centrality, which suggest that this area of study was acting as a "bridge" between different research areas like public health, education, and online social interactions. The human behaviour and ageing research cluster is also strongly represented, with high-frequency terms such as *human, aged, psychology, pandemic, and epidemiology*. The presence of these nodes with strong pagerank centrality indicates that ageing, vulnerability, and health-related social behaviour formed the intellectual backbone of the research network.

The analysis is the mapping of the structure of keyword co-occurrence and the calculation of the network influence indicators like betweenness centrality, closeness centrality, and PageRank centrality. These indicators can be used not only to identify the themes that frequently appear but also to identify the bridging concepts that appear to be structurally significant in linking different areas of research. Notably, the findings indicate that research during this time was reactive to the challenges of global health and digital transformation, specifically the social implications of technology adoption and pandemic exposure. However, there are limitations to this analysis since it only focuses on the structural connectivity and not on the intellectual novelty or citation impact.

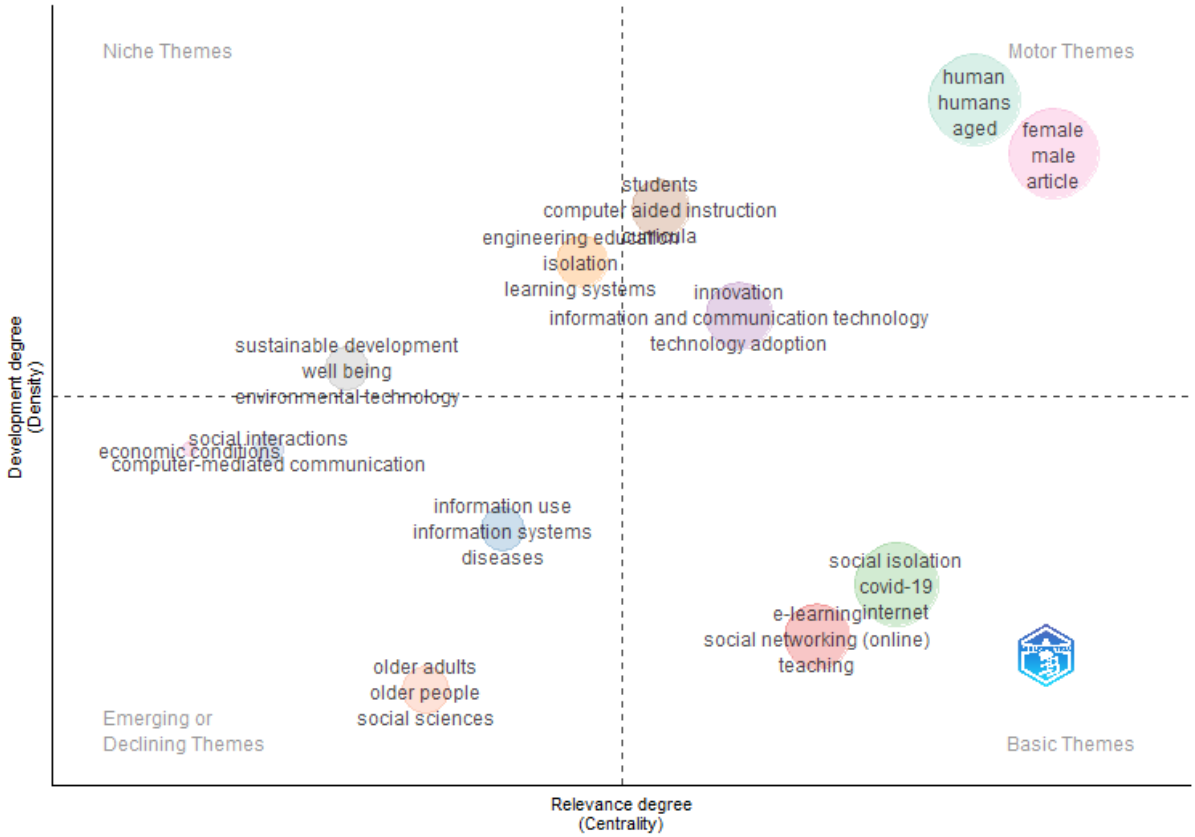


Fig 9: The thematic pattern of Time Period 1

Time Period 2 (2023–2026) – Emergence of Artificial Intelligence, Digital Transformation, and Human-Centric Technology Themes

Figure 10 illustrates the thematic pattern of Time Period 2 which shows a substantial movement towards research that is technology-driven and advanced, specifically in the areas of artificial intelligence, digital communication systems, and socio-technical interactions. The group of themes surrounding artificial intelligence was extremely prominent, with keywords such as technology adoption, social media, students, virtual reality, robotics, and machine learning reflecting the swift integration of intelligent computing into the social and behavioral research areas. The high betweenness and PageRank values of nodes such as social media and technology adoption reveal that these themes are structural bridges between the research streams of education, health, and digital society.

Another prominent area of research is the social isolation and pandemic impact cluster, which is intellectually central despite the transition in time. The keywords like social isolation, COVID-19,

thematic analysis, wellbeing, and quality of life have a high frequency of occurrence and centrality in the network, which reveals that the area of research is being constantly focused upon.

The human behavior and aging research cluster remains the biggest thematic structure. The words "human," "loneliness," "aged population," "psychology," and "epidemiology" have a very high frequency and centrality, which indicates that human vulnerability, the aging society, and health behavior are core research issues. Compared to Time Period 1, the network indicates a higher level of technological integration, especially in the areas of human-computer interaction, digital technology, and information systems, which indicates a global research shift towards intelligent and data-driven societies.

In this analysis, thematic changes were tracked using co-word network metrics such as occurrence frequency, betweenness centrality, closeness centrality, and PageRank centrality. Notably, Time Period 2 reflects knowledge modernization, in which conventional social behavioral studies are progressively integrated into frameworks of AI-driven and digital ecosystems. Nevertheless, the stability of some low-frequency nodes is found to be weak, indicating that a number of new themes could be exploratory or transitional research instead of established knowledge areas.

The thematic organization of Time Period 2 clearly indicates a movement towards technology-intensive and AI-based research environments, which symbolizes the modernization of social and behavioral sciences through technology integration. Although themes such as social isolation, ageing, and wellbeing continue to be intellectually core, they are increasingly situated within human-computer interaction and intelligent systems paradigms. The rising visibility of themes such as artificial intelligence and digital communication indicates trend-based thematic expansion rather than the stabilization of knowledge consolidation. As has been argued in network society theories by Barry Wellman, knowledge development, in addition to technology use, requires networked scholarly collaboration.

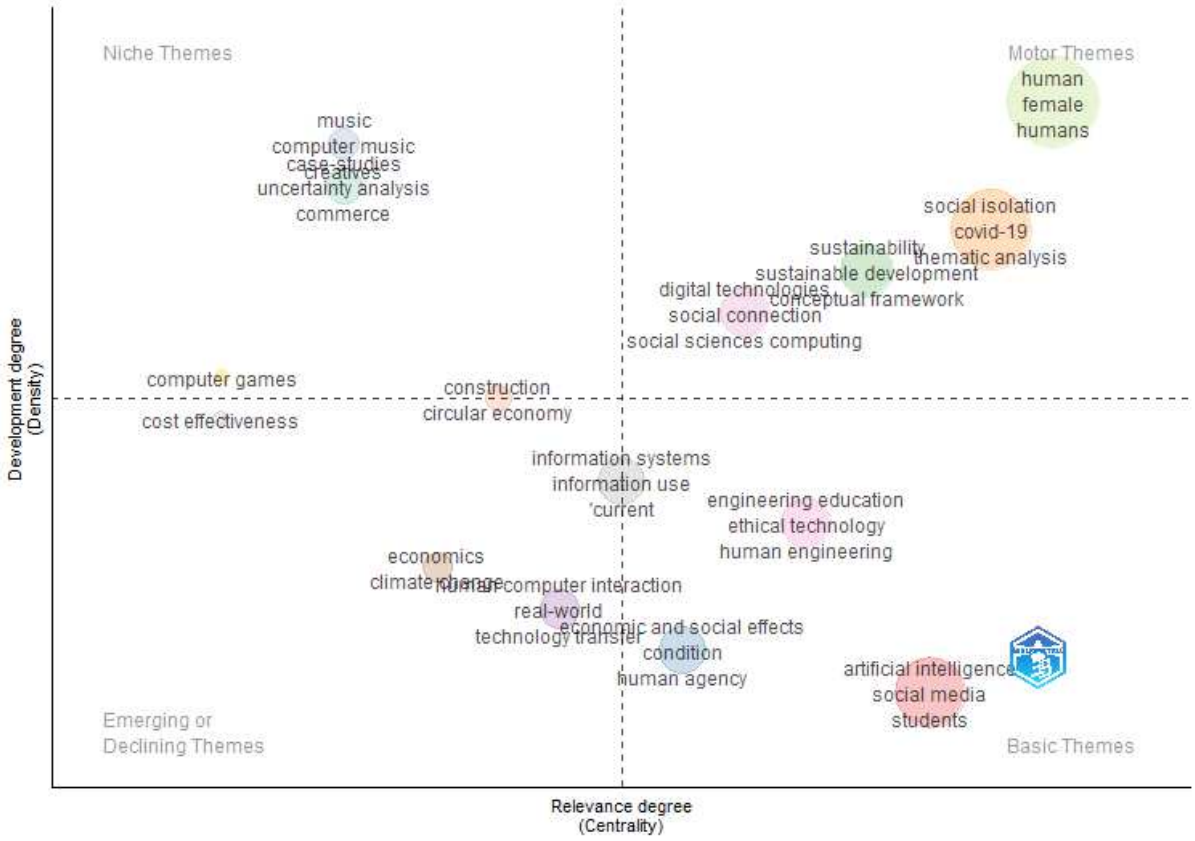


Fig 10: The thematic pattern of Time Period 2

Cluster Structure and Knowledge Maturity Analysis of Research Themes

Fig 11 indicates the network analysis at the cluster level reveals a core-periphery structure of thematic knowledge, where human-centered behavioral research occupies the central position. The cluster human has the highest frequency (631) and very high Callon density (85.30), which clearly reveals that this particular cluster acts as the central knowledge hub that integrates various research areas like psychology, aging, and pandemic-related social behavior. The cluster female and social isolation also have very high frequency values (573 and 363, respectively), which clearly reveals that these research areas have been continuously focused on gender-related behavioral studies and vulnerability-related social outcomes.

The bridging function of digital education and technology-related clusters is clear from the moderate centrality and density values of themes like e-learning, innovation, and engineering education. These clusters act as intermediate knowledge hubs that bridge the research areas of social behavior with technological transformation themes. The high Rank Centrality values of clusters like students and human clearly reveal their importance in maintaining connectivity in the

network. On the other hand, clusters like economic conditions and social interactions have very low frequency and low centrality, indicating low integration into the overall research framework. The cluster older adults have moderate thematic specialization and low network dominance, which indicates a niche but stable research focus.

Cluster analysis is the calculation of network cohesion (density), structural prominence (centrality), and thematic productivity (frequency) on the clusters. High density values represent high thematic cohesion, and high centrality values represent knowledge brokerage activities. The cluster network shows that the knowledge structure is core-periphery, with a focus on human behavioral, vulnerability, and social isolation studies, which implies that the social and psychological aspects are still the intellectual bedrock of the subject. The digital education and technology-related clusters act as a bridging knowledge area, which connects behavioral science with technological change. The economic and structural themes in social studies are still not fully explored.

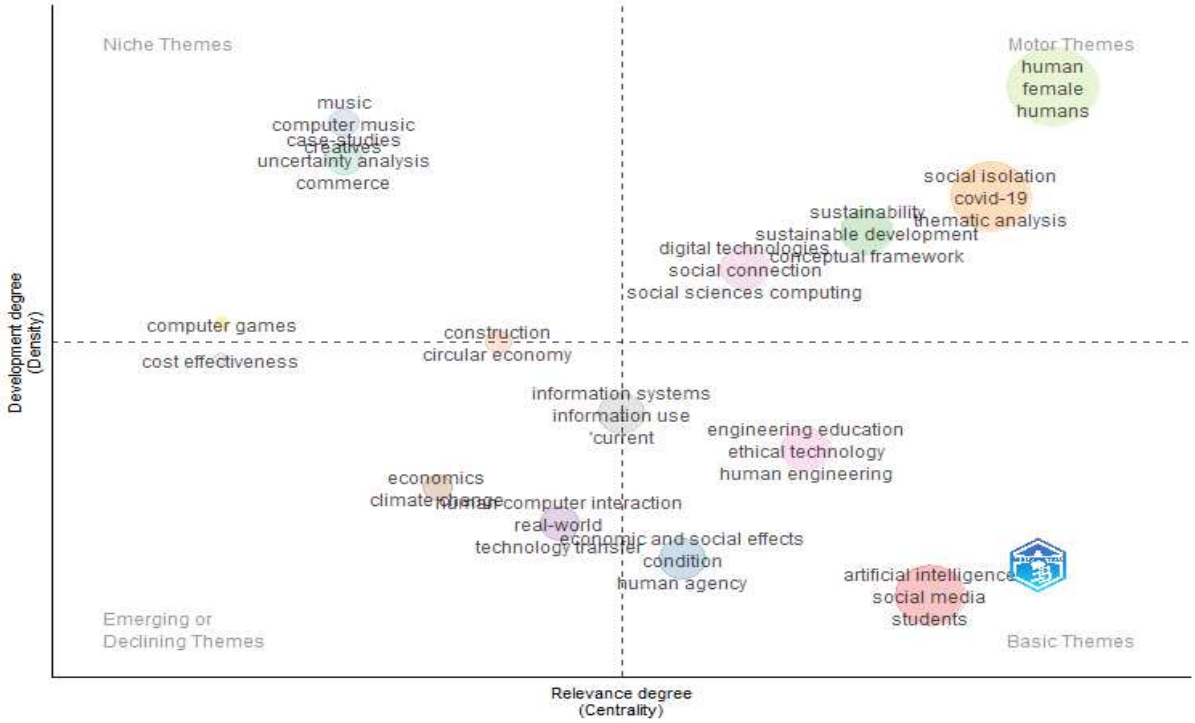


Fig 11: Cluster Analysis

Interpretation and Conclusion of Topic Positioning Metrics

Figure 12 shows the topic positioning features of key research terms based on two-dimensional analysis scores (presumably indicating relevance and structural power) with the value "1"

signifying normalized clustering membership. The research network is clearly dominated by human behavior and health vulnerability topics such as COVID-19, social isolation, and loneliness, reflecting the intellectual power of pandemic-related social research. High positive coordinate scores for topics such as female, male, and psychology indicate high behavioral and demographic research centrality. Negative coordinate scores for technological topics such as digital technologies and online learning indicate that these topics are more supporting or peripheral research areas than intellectual powerhouses.

In summary, the topic positioning is marked by a health-behavior-society research core with digital transformation and educational technology as secondary research extensions. This indicates that research development has been more driven by social vulnerability research than technological innovation. Future research should focus on improving the integration of technological and human-centered research areas.

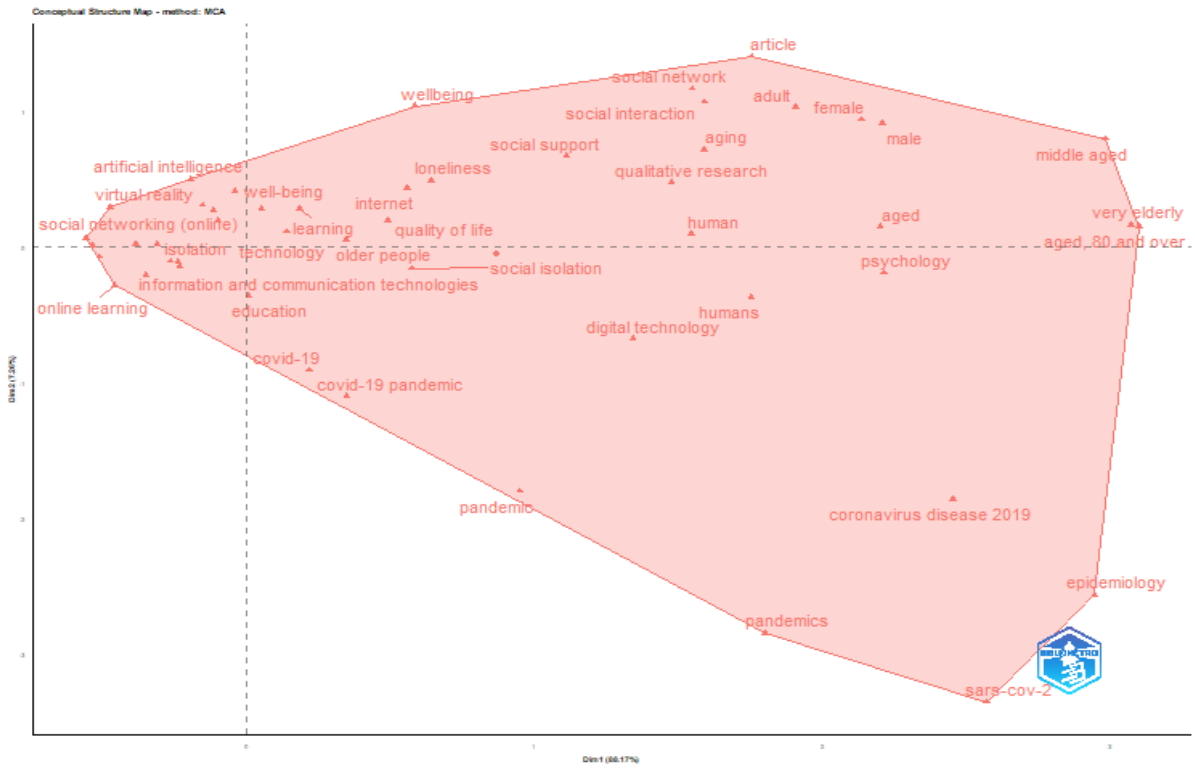


Fig 12: Topic positioning features

4. Conclusion

The research covered three aims: to identify the themes in social isolation and loneliness studies in the technology industry, to identify the most influential journals, authors, institutions, and

countries and their citation patterns in the field, and to identify the themes in happiness studies in management. The filtered dataset of 1,285 social science publications from 2015 to 2026 was analyzed using bibliometric software (VOSviewer and Biblioshiny).

The findings show that the research environment is wide, collaborative, and thematically dynamic, but still methodologically descriptive rather than deeply inferential. The knowledge domain is dominated by human-focused behavioral and vulnerability studies, especially themes of social isolation, loneliness, ageing, and pandemic-induced social outcomes. Research productivity has been steadily increasing since 2020; though, the interpretation of trends is constrained by the partial indexing of the recent years, especially 2026. Thus, publication trend increases or decreases cannot be considered as evidence of actual scientific progress. The area shows a core-periphery structure in its network, in which the core consists of themes related to behavior and public health, while the periphery includes areas like artificial intelligence, digital communication, and digital learning. Global collaboration is not balanced, as the output of research is dominated by a few highly productive countries, which shows inequality in global participation and impact in the field. Authorship and publication of journals are represented by a long tail, in which a core of authors is highly productive, while the majority of authors are peripheral.

The study has several limitations. It relies primarily publication counts rather than citation-weighted measures of impact, the diversity of document types, the possible semantic noise in keywords despite cleaning, and the lack of data for the last years in the time series. Network and thematic analysis are considered to be exploratory in nature and cannot be used as evidence for causation of influence of knowledge. Implications for future studies include the need to focus on the integration of social behaviour science studies and new digital technologies, collaboration networks, and the use of new bibliometric models such as citation-adjusted impact measures and thematic evolution analysis. Social sustainability at work as a remedy against isolation brought about by the digital age should also be taken into consideration by policymakers and technology companies. The area is in a process of evolution rather than revolution.

Declarations

i. **Ethics declaration:** not applicable.
ii. **Informed consent:** This work did not involve human participants or their data.
iii. **Competing Interests**: The author certifies that they have no affiliations with or involvement in any organization or entity with any financial interest or non-financial interest in the subject matter or materials discussed in this work.

References

Amin Z, Zinaida RS (2024) Digital loneliness in social media: the epoch of our connected and distraction world. In: Islamic finance: new trends in law and regulation. Springer Nature Switzerland, Cham, pp 807–827.

Barbosa Neves B, Waycott J, Maddox A (2023) When technologies are not enough: the challenges of digital interventions to address loneliness in later life. Sociol Res Online 28:150–170.

Batra R, Flatt JD, Pharr JR, Sharma M, Khubchandani J, Kanekar A et al (2024) Exploring social support strategies and socio-cultural factors influencing social isolation and loneliness: the role of digital literacy. Healthcare 12:2149.

Bukar UA, Sayeed MS, Razak SFA, Yogarayan S, Amodu OA, Mahmood RAR (2023) A method for analyzing text using VOSviewer. MethodsX 11:102339.

Campbell SW, Ross MQ (2022) Re-conceptualizing solitude in the digital era: from "being alone" to "noncommunication". Commun Theory 32:387–406.

Dahl JMR (2025) Alone together? In: Teen boys and their smartphones as worldmaking devices. Palgrave Macmillan, Cham. https://doi.org/10.1007/978-3-031-93010-2_4.

Donthu N, Kumar S, Pattnaik D (2020) Forty-five years of Journal of Business Research: a bibliometric analysis. J Bus Res 109:1–14.

Donthu N, Kumar S, Mukherjee D, Pandey N, Lim WM (2021) How to conduct a bibliometric analysis: an overview and guidelines. J Bus Res 133:285–296.

Flores-Romero MB, Perez-Romero ME, Alvarez-Garcia J, del Río-Rama MLC (2021) Bibliometric mapping of research on magic towns of Mexico. Land 10:852.

Ghorbani BD (2024) Bibliometrix: science mapping analysis with R Biblioshiny based on Web of Science in applied linguistics. In: A scientometrics research perspective in applied linguistics. Springer Nature Switzerland, Cham, pp 197–234.

Hansen T, Johansen R, Kirkøen B, Stene-Larsen K, Straiton M, Tornes RA, Reneflot A (2025) Digital bridges to social connection: a systematic review and meta-analysis of digital interventions for loneliness and social isolation. Internet Interv 41:100856.

Kim MH, An JH, Lee HR, Jeong SH, Hwang SJ, Hong JP (2021) Social isolation, loneliness, and their relationships with mental health status in South Korea. Psychiatry Investig 18:652–660. https://doi.org/10.30773/pi.2021.0067.

Kusumota L, Diniz MAA, Ribeiro RM, Silva ILCD, Figueira ALG, Rodrigues FR, Rodrigues RAP (2022) Impact of digital social media on the perception of loneliness and social isolation in older adults. Rev Latino-Am Enfermagem 30:e3573.

Lim WM, Kumar S (2024) Guidelines for interpreting the results of bibliometric analysis: a sensemaking approach. Glob Bus Organ Excell 43:17–26.

Moroney M, Jarvis A (2020) Loneliness and digital inclusion: a literature review. Aging Better, Middlesbrough.

Mukherjee D, Lim WM, Kumar S, Donthu N (2022) Guidelines for advancing theory and practice through bibliometric research. J Bus Res 148:101–115

Nowland R, Necka EA, Cacioppo JT (2018) Loneliness and social internet use: pathways to reconnection in a digital world. Perspect Psychol Sci 13:70–87.

Patulny R, Bower M (2022) Beware the “loneliness gap”? Examining emerging inequalities and long-term risks of loneliness and isolation emerging from COVID-19. Aust J Soc Issues 57:562–583.

Putnam RD (2000) Bowling alone: America’s declining social capital. In: Culture and politics: a reader. Palgrave Macmillan, New York, pp 223-234.

Sukaesih A, Zuriah N (2025) Lived experiences of loneliness in digital connectivity among young adults. Humanexus J Hum Soc Connect Stud 1:469-478.

Traag VA (2025) Science of science: citation models and research evaluation. In: Handbook of computational social science. Edward Elgar Publishing, Cheltenham, pp 780-808.

Tsang Y, Ho S (2025) Loneliness and solitude in the digital age. In: Loneliness: the ultimate suffering in modern society. IntechOpen.

Verma S, Gustafsson A (2020) Investigating the emerging COVID-19 research trends in the field of business and management: a bibliometric analysis approach. J Bus Res 118:253–261.

Welch V, Ghogomu ET, Barbeau VI, Dowling S, Doyle R, Beveridge E et al (2023) Digital interventions to reduce social isolation and loneliness in older adults: an evidence and gap map. Campbell Syst Rev 19:e1369.

Wellman, B. (2001). Little boxes, glocalization, and networked individualism. In Kyoto workshop on digital cities (pp. 10-25). Berlin, Heidelberg: Springer Berlin Heidelberg.

World Health Organization (2022) WHO European regional obesity report 2022. World Health Organization Regional Office for Europe.

Zupic I, Cater T (2015) Bibliometric methods in management and organization. Organ Res Methods 18:429–472

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- scopusexport.csv
- BiblioshinyReport.xlsx