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Remote work and the COVID-19 pandemic: An artificial intelligence-based topic modeling and a future agenda

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ABSTRACT

As remote work has become more common than ever throughout the COVID-19 pandemic, it has drawn special attention from scholars. However, the outcome has been significantly sporadic and fragmented. In our systematic review, we use artificial intelligence-based machine learning tools to examine the relevant extant literature in terms of its dominant topics, diversity, and dynamics. Our results identify-eight research themes: (1) Effect on employees at a personal level, (2) Effect on employees' careers, (3) Family life and gender roles, (4) Health, well-being, and safety, (5) Labor market dynamics, (6) Economic implications, (7) Remote work management, (8) Organizational remote work strategies. With further content analysis, we structure the sporadic research into three overarching categories. Finally, for each category, we offer a detailed agenda for further research.

1. Introduction

Remote work is an integral part of the contemporary business landscape (Jooss, McDonnell, & Conroy, 2020; Wang, Liu, Qian, & Parker, 2021). The term "remote work" refers to organizational personnel performing their job responsibilities outside of traditional office environments (Hill & Schmutz, 2020; Olson, 1983). For businesses that transcend geographic boundaries and operate within different time zones, remote work is indispensable for ensuring the smooth running of almost every organizational function, including marketing, finance, and supply chain management (Hafermalz & Riemer, 2021; Jackowska & Lauring, 2021; Sharma, Luthra, Joshi, & Kumar, 2022).

However, the recent coronavirus (COVID-19) pandemic has placed renewed focus on the phenomenon of remote working (Orsini & Rodrigues, 2020). To conquer the various barriers induced by the pandemic, most businesses have adopted some form of remote working protocol to ensure uninterrupted productivity and minimize the risk of contracting and spreading the virus (Bonacini, Gallo, & Scicchitano, 2021; Chong, Huang, & Chang, 2020). For instance, in response to Europe's second COVID-19 outbreak, organizations are being urged to implement a remote work policy that will cover at least 50 % of their

workforce (Athanasidou & Theriou, 2021). Existing studies clearly demonstrate that countries, regions, industries, and businesses that have shifted a higher proportion of their employees from in-office to remote work have reported a lower number of infections (Alipour, Fadinger, & Schymik, 2021; Dingel & Neiman, 2020; Hasan, Rehman, & Zhang, 2021).

The widespread use of remote work has brought about significant changes in organizational work practices and the means of carrying them out (Donnelly & Johns, 2021). The development and diffusion of digital technologies (especially those supporting communication, collaboration, and social networking), along with the pervasive dissemination of powerful and easy-to-use mobile devices, are supporting businesses and employers in their quest to develop a smart working system. These new practices have resulted in a permanent change in organizational policies and, in some instances, work culture. Google, for example, is allowing 20 percent of its workforce to permanently work remotely at any given time.¹ Similarly, Twitter and Facebook have gone the extra mile by allowing all of their personnel to permanently adopt remote working if their jobs can be satisfactorily completed remotely and the individual employees are comfortable with this new arrangement.² And yet, conducting remote work properly is

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¹ <https://www.cnbc.com/2021/05/05/google-relaxes-remote-work-plan-will-let-20percent-of-employees-telecommute.html>.

² <https://www.bbc.com/news/technology-52628119>.

challenging as technological advances occur at a faster pace, forcing many businesses to abandon inappropriate working configurations in support of new organizational principles, such as autonomy within the context of choices of work settings (Leonardi & Bailey, 2008).

The critical importance of remote work and the diverse shifts in the phenomenon brought about by the COVID-19 pandemic are reflected in recent studies, as researchers have exerted significant efforts to examine the different aspects. The topics of interest include, but are not limited to, managerial and leadership dimensions (Antonacopoulou & Georgiadou, 2021; Hafermalz & Riemer, 2021), newer patterns of interactions and communication challenges within remote working contexts (Waizenegger, McKenna, Cai, & Bendz, 2020), and the increased gender gaps due to the sudden implementation of remote work and its implications for social and family life (Bhumika, 2020; Daraba, Wirawan, Salam, & Faisal, 2021; Frize et al., 2021). However, despite a large number of studies in this area, the research has been fragmentary; for example, most of the studies have been focused on and within Anglo-European countries (Athanasiadou & Theriou, 2021). As a result, certain culturally specific characteristics of remote work remain underrepresented, resulting in a high proportion of skewed results. Similarly, extant understanding of interrelated issues, such as the relationship between gender and work-life balance, is scant (Daraba et al., 2021). The current body of knowledge lacks not only a comprehensive and integrated understanding but also deep insights.

Given the critical nature of remote work in terms of ensuring business continuity during the pandemic, systematically recognizing and developing dedicated remote work research will aid academics and managers in navigating and comprehending this nascent phenomenon (Athanasiadou & Theriou, 2021). A deeper organization, integration, synthesis, and critical assessment of the existing literature will lay the foundations for future studies (Mustak, Salminen, Plé, & Wirtz, 2021; Russell & Norvig, 2016) and a more cohesive research agenda.

Against this background, *our study aims to develop a coherent and holistic understanding of remote work in relation to the COVID-19 pandemic through a systematic literature review.* We identify and analyze 198 relevant peer-reviewed articles published in business journals, applying artificial intelligence-based modeling tools to uncover the hidden semantic structures and topics in this large body of literature (Mustak et al., 2021; Nikolenko, Koltcov, & Koltsova, 2017).

We make three contributions that will enhance the existing knowledge base. First, our systematic, data-driven approach reveals eight dominant remote working topics concerning the pandemic: Effect on employees at a personal level; Effect on employees' careers; Family life and gender roles; Health, well-being, and safety; Labor market dynamics; Economic implications; Remote work management; and Organizational remote work strategies. We have combined these themes into three categories: Employee-related research, Organization-related research, and Labor market and economy-related research. Second, by mapping the current knowledge field, we have accumulated, scrutinized, and presented the key research topics and themes requiring future attention. Third, our analysis provides a clear understanding of how the different topics are related, thus paving the way for integrated trans-disciplinary research in the domain of remote work strategies. These contributions offer a foundation upon which we can build and move forward with research in this critical and promising area.

The remainder of the paper is organized as follows. In the next section, we outline the conceptual underpinnings of this study. This is followed by details of the applied methodology. We then present our findings. We conclude by further discussing the results and proposing an agenda for future research, along with implications and limitations.

2. Conceptual underpinnings

Remote work has gained considerable prominence as an integral work method for organizations during the last few decades (Gilson, Maynard, Jones Young, Vartiainen, & Hakonen, 2015; Kulik, 2022; Olson, 1983; Staples, Hulland, & Higgins, 1998). There is no standard definition of remote work in the literature; instead, a variety of terms such as virtual work, hybrid work, distance working, telework, teleworking, working from home (WFH), and work from anywhere (WFA) have been used to characterize this phenomenon (Athanasiadou & Theriou, 2021; Bailey & Kurland, 2002; Garrett & Danziger, 2007; Martínez-Sánchez, Pérez-Pérez, De-Luis-Carnicer, & Vela-Jiménez, 2007). Despite definitional disagreements that stem from contextual differences among researchers, the two most widely accepted characteristics of remote work are: (1) it is performed away from the formal workplace, and (2) it involves the use of information technologies to conduct work for an employer.

In the pre-pandemic era, studies in this area generally presented remote work as a new organizational form (Hoegl, Ernst, & Proserpio, 2007; Siebdrat, Hoegl, & Ernst, 2014; Zander, Mockaitis, & Butler, 2012). From an employee perspective, it has been associated with benefits such as superior work-life balance, healthier lifestyle, increased flexibility and autonomy, and the promotion of employee well-being (Poulsen & Ipsen, 2017; Wohlers & Hertel, 2018). Apart from these benefits, researchers have placed emphasis on fostering conducive work environments for employees through a multifaceted approach to remote work. These studies have examined a variety of topics, the most prominent of which are communication mechanisms and processes (Gibbs, Sivunen, & Boyraz, 2017; Sivunen, 2006), the development of trust and relationships (De Jong, Dirks, & Gillespie, 2016; Gilson et al., 2015; Maynard, Mathieu, Gilson, Sanchez, & Dean, 2019), and the training needs of employees (Adamovic, 2018; Butler et al., 2018).

Global adoption of pandemic-induced mandatory remote work has resulted in the emergence of new issues within employee-organization relationships (Biron, Casper, & Raghuram, 2022; Kuknor & Bhattacharya, 2021). Employee-related research has expanded to encompass new areas, such as gender disparities (Shockley, Clark, Dodd, & King, 2021), mental health (Docka-Filipek & Stone, 2021; Poulsen & Ipsen, 2017), and work-life balance (Bhumika, 2020; Irawanto, Novianti, & Roz, 2021). Waizenegger et al. (2020) discovered that pandemic-induced remote work is substantially different from any pre-pandemic crisis remote working scenario as none of the employees had a choice but were compelled by government regulations. Similarly, when faced with unexpected daily job setbacks while working from home, employees with a high degree of task dependency face numerous productivity and communication challenges. (Chong et al., 2020).

Looking at the research through an organizational lens, one can see that pre-pandemic remote work has been associated with benefits such as employee engagement with higher retention rates, greater aptitude among employees, and cost savings (Kurkland & Bailey, 1999; Olson, 1983). Organizations have altered their processes and mechanisms over time to better meet the evolving needs of their employees by engaging resources in knowledge management, human resource management and change management (Butler et al., 2018; Martínez-Sánchez et al., 2007; Staples et al., 1998) that address issues relating to communication, trust, organizational procedures, and relationship development.

Within pandemic-induced mandatory remote work, employee-related issues have put a strain on organizations by forcing them to complete a large portion of value-creating activities remotely, thus transforming the characteristics, design, process, and management of

work in an unprecedented manner. The implementation of pandemic-induced mandatory remote work necessitated that organizations modify their remote work policies to address issues such as employee well-being and mental health (Donnelly & Johns, 2021). As a result, internal organizational processes are being re-aligned to reflect the new realities and expectations of employees.

The adoption of communication technologies is another organizational front that has altered dramatically. As communication technologies are fundamental to remote work, the widespread use of powerful and simple-to-use mobile devices, as well as the invention and distribution of digital technologies, support enterprises in the development of smart working systems (Carrillo, Cachat-Rosset, Marsan, Saba, & Klarsfeld, 2021). Methods and technologies for carrying out remote work have been significantly advanced, compelling many organizations to reject inefficient working arrangements in favor of new organizational concepts, such as autonomy in remote work settings (Leonardi & Bailey, 2008). However, additional difficulties have evolved as a result of the excessive use of these technologies, including burnout, reduced work satisfaction levels, and work-life balance management (Ninaus, Diehl, & Terlutter, 2021). This has meant that businesses and organizations have had to further develop their remote work protocols.

Overall, research on remote work had been expanding steadily prior to the pandemic, both at the employee and organizational levels, and research has accelerated significantly since then. While pre-pandemic research on remote work focused primarily on employee and organizational levels across different areas, pandemic-induced remote work has altered labor market dynamics by creating, changing, and eliminating a variety of jobs. At the global level, the pandemic has resulted in significant economic distress, including GDP contraction (Brum & De Rosa, 2021) and increased inflation (Forsythe, Kahn, Lange, & Wiczer, 2020), with remote work serving as a buffer against these effects. In this context, the domain of remote work is now open to institutional intervention, with governments stepping in to support the workforce and activate labor markets to mitigate economic losses.

From a conceptual standpoint, pre-pandemic era remote work was limited to certain types of organizational employees and tasks. Therefore, any strategic decision making was focused on those employees in particular (Herbert, Mockaitis, & Zander, 2014; Zander, Zettinig, & Mäkelä, 2013). The organizational support, processes, and technologies were formulated around specific tasks (Dixon, 2017). However, remote work has not only gained mainstream industry acceptance but also resulted in the emergence of new research streams at the employee and organizational levels. An additional third level of institutional policy has played a significant role in diversifying the phenomenon of remote work.

3. Methodology

To conduct this study, we adopted the natural language processing (NLP)-based Latent Dirichlet Allocation (LDA) approach to developing a coherent and holistic understanding of extant literature on remote work in relation to the COVID-19 pandemic. The statistical algorithms of LDA eliminate human biases that are often present in traditional literature reviews, allowing us to conduct and present a much more robust and objective analysis (Vanhala et al., 2020). Below, we report the step-by-step data collection and analysis process.

3.1. Data collection

To find the relevant literature for review, we used documents indexed in the Web of Science (WoS) database. This collection includes a

Table 1

Search terms and criteria used to identify the relevant articles.

Line 1 (Search terms) = "online work*" OR "remote work*" OR "distan* work*" OR "Work* from home*" OR "virtual work*"
AND
Line 2 (Search terms) = "COVID*" OR "Corona*" OR "pandemic*"
AND
Line 3 (Time period) = January 2020- January 2022

reference index with more than one billion cited references dating back to 1900, as well as scientific articles from 3,300 carefully chosen publishers and more than 12,000 high-impact journals (Vanhala et al., 2020). Garfield's law of document sets and Bradford's discrete law are reflected in the index, which is subject to tight protocols and high standards (Borgman & Furner, 2002; Zhao, Tang, & Zou, 2019). The database allows users to curate data for each cited reference in any bibliographic record.

Following Mustak et al. (2021), we systematically identified keywords for use in our study. First, we performed an initial search using the keywords "remote work and COVID/coronavirus," and downloaded the top 20 most cited papers. We looked over these papers extensively, making a list of the phrases and word combinations used to describe the same or roughly comparable themes.

In our search for related data, we used all combinations of these terms as keywords. Our search query is illustrated in Table 1. Keywords that end with asterisks (*) capture various endings of those terms; for instance, "distan*" can capture words like "distance," "distant," "distancing," and "distances." The word "AND" in the table denotes any combinations of lines 1, 2, and 3. This exercise produced 1619 publication entries.

As shown in Fig. 1, to determine which articles to include in our sample, we applied a carefully selected set of inclusion/exclusion criteria. First, we included publications from the business, management, and economics disciplines as designated in WoS, excluding papers from other disciplines like linguistics or gerontology. Next, we selected the articles published in peer-reviewed journals, because journals represent a field's most recent validated knowledge and offer the highest impact (Booth, Sutton, Clowes, & Martyn-St James, 2021; Mustak, Jaakkola, Halinen, & Kaartemo, 2016). We excluded other types of documents, such as dissertations and book chapters.

We kept the articles published in English because of our language limitations. To ensure the quality of our sample, we selected articles published in journals included in the Academic Journal Guide, one of the most generally acceptable standards of journal quality (Khanra, Dhir, Parida, & Kohtamäki, 2021). Finally, we read each article's abstract (and, if warranted, its introduction and conclusion) to ascertain whether the article fits within the scope of this study (Ameer & Halinen, 2019; Mustak et al., 2016). Consequently, eight articles were excluded for lack of relevance. Our final sample contained 198 articles.

We recorded the titles, authorship details, abstracts, and keywords of each relevant article in an Excel file. In addition, print features, authors' names, corresponding authors' countries, the total number of publications, citation counts, average article citations, the number of citing articles with and without self-citations, journal sources, keywords, countries and regions, and author-level metrics were all downloaded as metadata (e.g., h-, m-, g-indices) for further analysis (Martynov, Klimafrysch, & Schoenberger, 2020).

3.2. Data analysis

We applied LDA-based topic modeling to analyze the data (Mustak

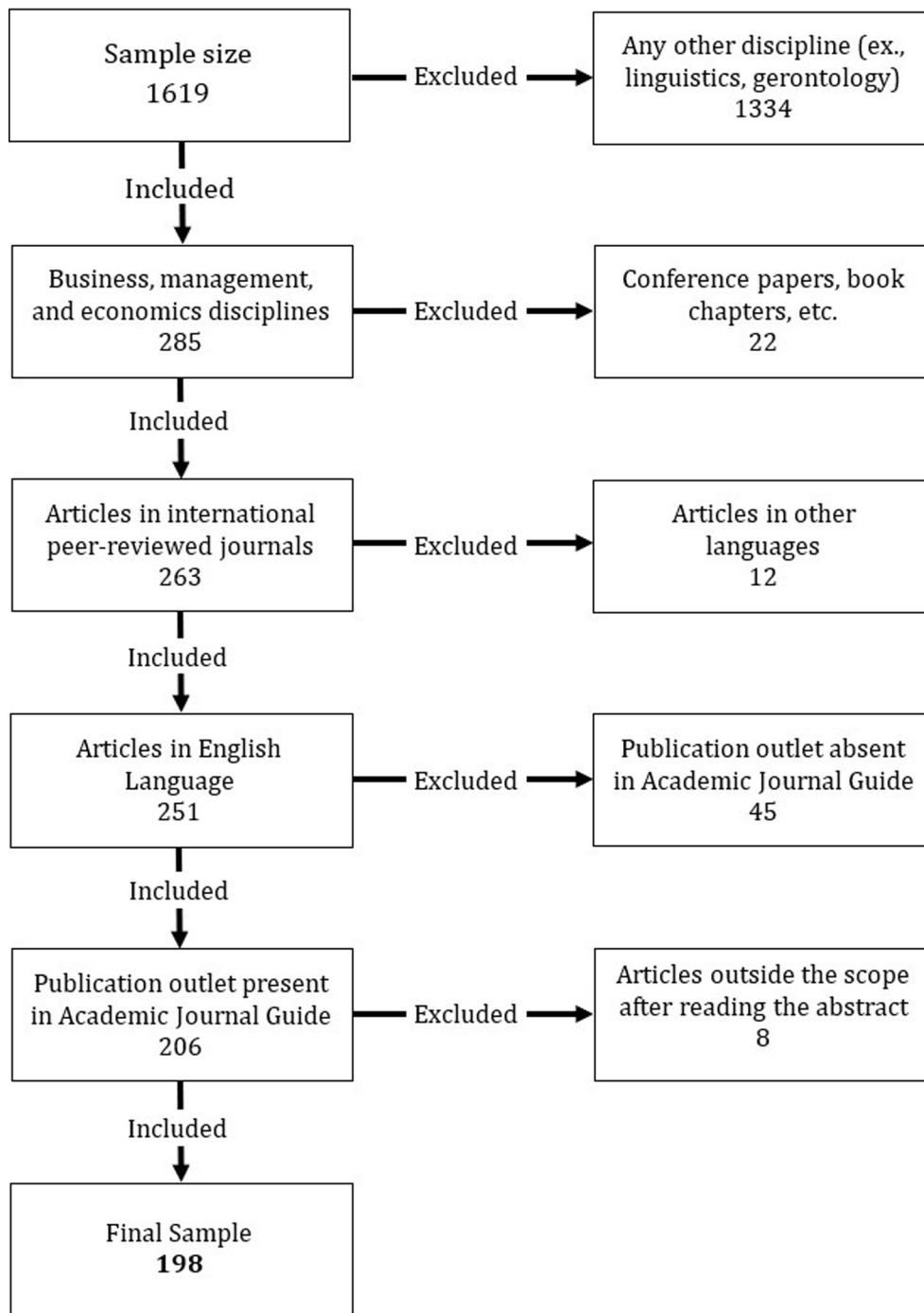


Fig. 1. Application of inclusion/exclusion criteria to determine the final sample.

et al., 2021; Nikolenko et al., 2017). LDA algorithms apply a specific type of statistical model that uses unsupervised machine learning (ML) and natural language processing (NLP) to discover latent topics in a collection of documents (Blei, Ng, & Jordan, 2003; Nikolenko et al., 2017). The modeling approach is capable of scanning a collection of documents, finding the word and phrase patterns within them, and automatically grouping word groups and related phrases that best describe a collection of documents (Jacobi, van Atteveldt, & Welbers, 2016). With this information, it is possible to deduce the focus of those texts.

The core principle of topic modeling is as follows (Nikolenko et al., 2017). The collection of D articles is presumed to comprise T topics that are articulated through W different words. Each article $d \in D$ of length N_d is modeled as a discrete distribution (d) over the set of topics ($z_j = t$) = (d) t . Here, z is a discrete variable that outlines the topic for each word instance $j \in d$. (Mustak et al., 2021). Each topic, in turn, links with a multinomial distribution over the words, $p(w|z_j = t) = \phi_w^{(t)}$. The Dirichlet priors α can be allocated to the distribution of topic vectors θ , $\theta \sim \text{Dir}(\alpha)$, parallel to β for the distributions of words in topics, $\phi \sim \text{Dir}$

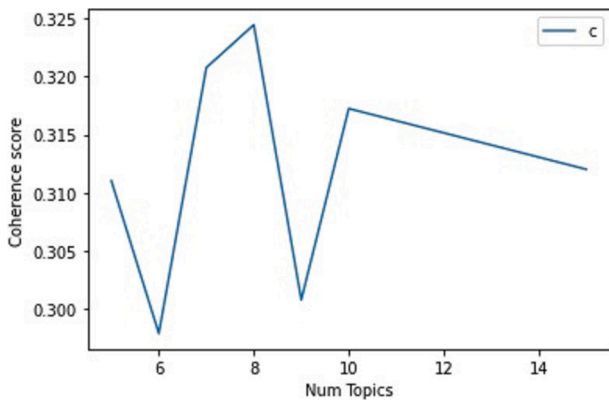


Fig. 2. Identification of the optimal number of topics through coherence scores.

(β). (Mustak et al., 2021; Nikolenko et al., 2017).

After importing the dataset from Excel into Python, we concatenated all columns and dropped the null values. We then processed the data—for instance, removing underscores and non-ASCII (American Standard Code for Information Interchange) characters. Next, we performed tokenization and lemmatization and built a dictionary of the complete corpus. After that, multiple iterations of “topic coherence” were performed to identify the optimal number of latent topics that captured the essence of the dataset in the best possible manner. As presented in Fig. 2, we found that eight topics best served the purpose at hand.

Finally, we applied the LDA model library to model the topics according to the optimal topic numbers. This statistical generative model uses Dirichlet distributions (Blei et al., 2003), ML, and NLP to identify semantic topics and their clusters with clear dominance in the overall domain (Andrzejewski, Zhu, & Craven, 2009). An illustration of the modeling algorithms is presented in Fig. 3. The particular topics identified by the algorithms are presented in the Findings section.

After identifying the core and latent topics in the dataset, we performed a content analysis (Khanra et al., 2021). First, we organized the data in MS Excel according to “main idea,” “methods,” “major themes and related key findings,” and “future research” fields in relation to the topics identified by LDA topic modeling. Each article was analyzed to identify its correspondence with the topics. All 198 articles were annotated according to the preidentified topics. We selected one topic at a time and retrieved its associated articles for further analysis. For each topic, corresponding articles were analyzed according to the core findings and arguments, along with their theoretical positioning and conceptual developments. We also recorded the future research directions and questions proposed by these studies.

4. Results

4.1. Descriptive details

Our 198 articles of interest were published across 94 journals, indicating that the phenomenon has received attention from a wide range of outlets. Table 2 provides an overview of the journals that published at least two or more articles included in our sample.

As shown in Fig. 4, Matthew J. Beck and David A. Hensher are the most productive authors; they are both from the University of Sydney Business School and have published eight articles together. They are followed by Camila Balbontin from the Institute of Transport and Logistics Studies, University of Sydney, Australia (three articles). Kristen M. Shockley of the University of Georgia also published three articles, with Hope Dodd and Tammy D. Allen serving as co-authors in two of those (Shockley et al., 2021; Shockley, Allen, Dodd, & Waiwood, 2021). Other authors with two articles are Chu-Hsiang Chang (Michigan State University), Brendan Church (School of Social and Political Sciences,

Table 2

Top journals (with at least two publications) and the corresponding number of articles.

Name of the Journal	No. of Articles
Gender, Work & Organization	16
Journal of Applied Psychology	15
Transport Policy	8
International Journal of Organizational Analysis	6
Journal of Corporate Real Estate	5
Journal of Public Economics	5
Transportation Research Part A: Policy and Practice	5
Feminist Economics	4
Gender in Management	4
Review of Economics of the Household	4
World Development	4
European Journal of Information Systems	3
Human Systems Management	3
International Journal of Manpower	3
Journal of Transport Geography	3
Small Business Economics	3
The B.E. Journal of Macroeconomics	2
Business Horizons	2
Canadian Journal of Economics	2
Economic and Labour Relations Review	2
European Economic Review	2
Human Resource Development International	2
Human Resource Management Review	2
International Journal of Innovation Science	2
Journal of Global Mobility	2
Journal of Organizational Effectiveness: People and Performance	2
Journal of Regional Science	2

```
In [48]: # train Lda model on Best Number of Topics value
best_model = models.LdaModel(corpus, num_topics=best_topic_number, id2word=dictionary_LDA, passes=40, iterations = 100, alpha=0.05, eta=0.01)

In [49]: # calculate coherence score
coherencemodel = CoherenceModel(model=best_model, texts=text_data, dictionary=dictionary_LDA, coherence='c_v')
coherence_score = coherencemodel.get_coherence()

print("Num Topics =", best_topic_number, " has Coherence Value of", round(coherence_score, 4))

Num Topics = 8 has Coherence Value of 0.2702

In [50]: # display all topics with weight of all keywords
for i,topic in best_model.show_topics(formatted=True, num_topics=best_topic_number, num_words=10):
    print(str(i)+": "+ topic)
    print()
```

Fig. 3. Illustration of the topic modeling algorithms used in this study.

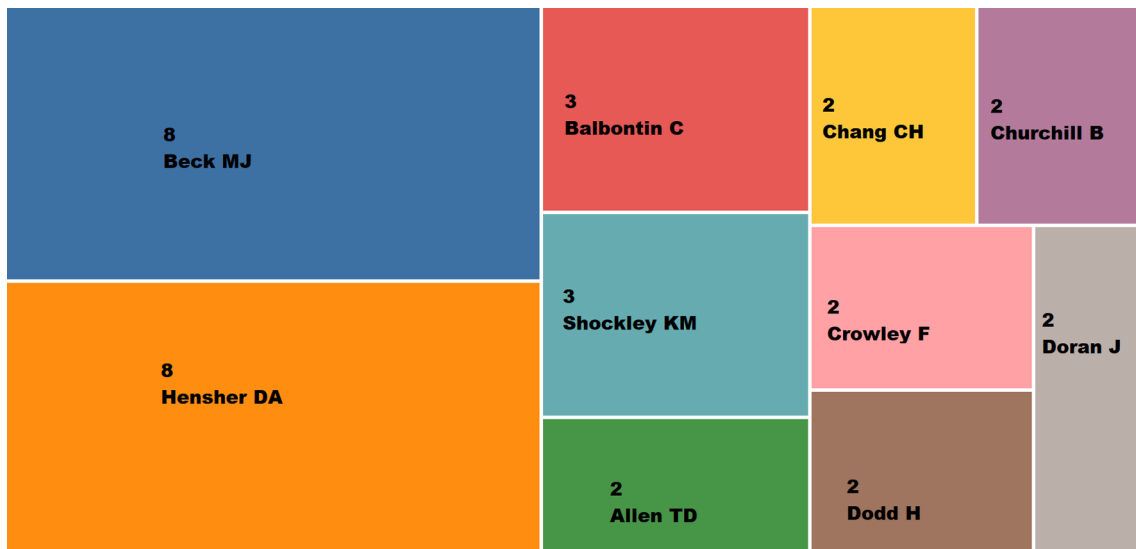


Fig. 4. Top authors who have published on global virtual teams in relation to the COVID-19 pandemic.

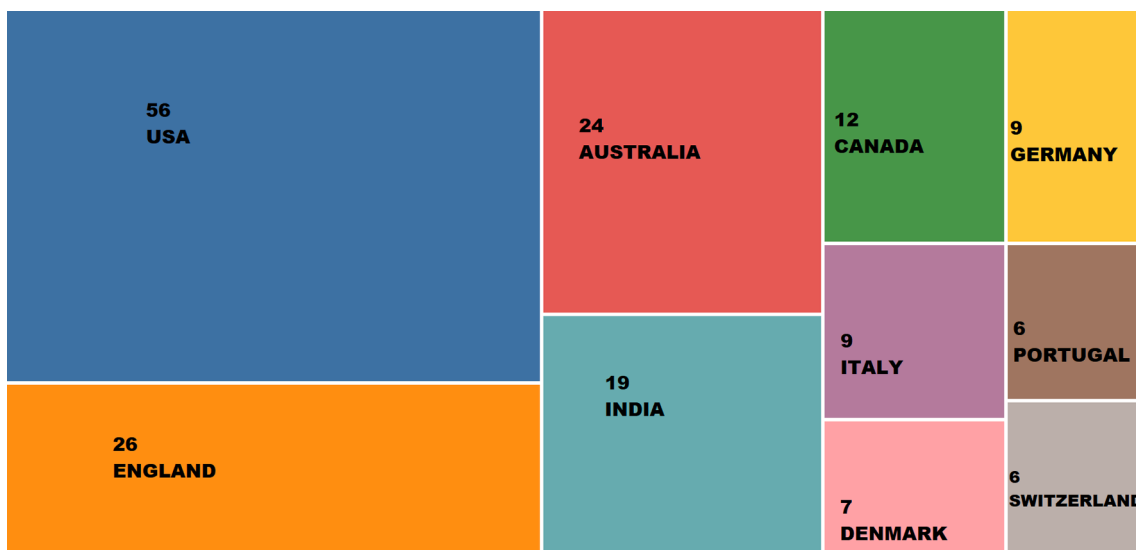


Fig. 5. Countries with the highest number of publications on remote working in relation to the COVID-19 pandemic.

University of Melbourne, Australia), Frank Crowley and Justin Doran (University College Cork), and Brenden Churchill (University of Melbourne).

The highest number of articles were published by researchers from the USA (56), followed by researchers from England (26) and Australia (24). Regarding institutional affiliation, researchers from the University of Sydney (11, Australia) have had the most publications, followed by Aarhus University (6, Denmark) and the National Bureau of Economic Research (6, USA). These details are illustrated in Figs. 5 and 6.

4.2. Key themes of research on remote work in relation to the COVID-19 pandemic

Our topic modeling analysis reveals eight key topics in the relevant literature (see Table 3). To structure our analysis, we grouped these topics into three categories: (i) Employee-related research, (ii) Organization-related research, and (iii) Labor market and economy-

related research. Next, we discuss the significance of the eight topics and the content and inter-connectedness across these three categories.

We used Python latent Dirichlet allocation visualization (pyLDAvis) to create an inter-topic distance map (Fig. 7). The bar chart in Fig. 7 shows the 30 most salient terms used within the data set. The circle size shows the significance of each topic within the total literature base, while the distances between the circles demonstrate the connectivity among the themes. Topic 1 (Effect on employees at a personal level) is among the most significant in this research domain, with Topic 2 (Effect on employees' careers) following in second place.

Topics 3 and 4 (Family life and gender roles and Health, well-being, and safety, respectively) also hold significant positions in the existing research with a significantly less distance between them. Overall, all the topics are relatively distant from each other and do not overlap, indicating that the existing research is rather fragmented and that the different themes are generally not well connected.

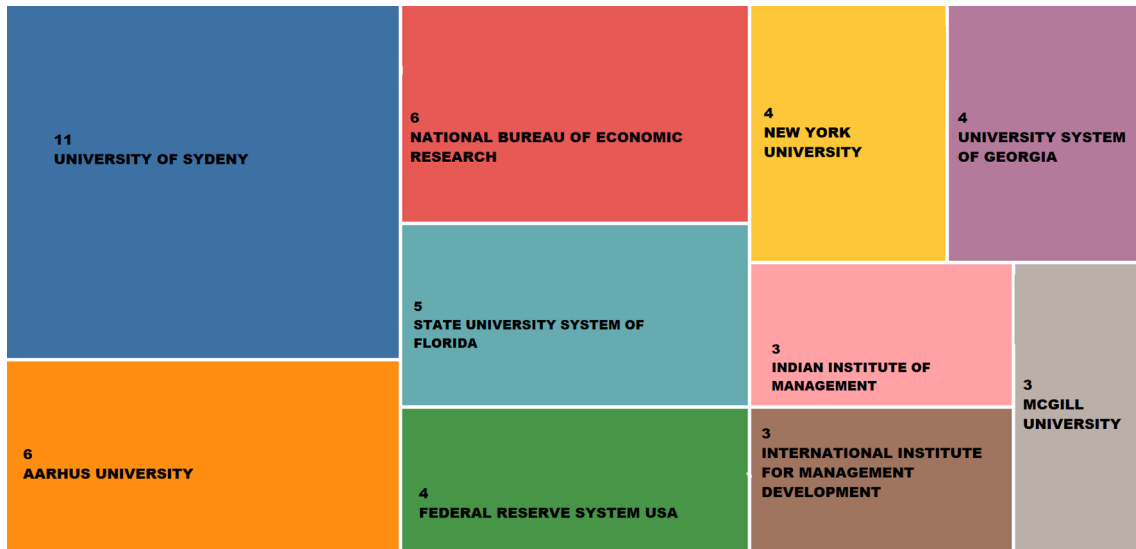


Fig. 6. Universities with the highest number of publications on remote work in relation to the COVID-19 pandemic.

Table 3

Key topics of investigation on remote working in relation to the COVID-19 pandemic.

Topic Number	Basis of the Model	Topic
Category 1: Employee-related Research		
1	Employee, crisis, satisfaction, support, work_home, stress, social, performing, flexibility, implication	Effect on employees at a personal level
2	Career, women career, management_support, employee, survive, family, conflict, remote_work, full_time, resource	Effect on employees' careers
3	Couple, men, gender_gap, feminist, child_care, employment, employee_benefit, working_arrangement, house_work, team	Family life and gender roles
4	Emotions, perceived, work_life, positive_negative, curb_spread, balance, people, layoff, knowledge_worker, crisis, enforced	Health, well-being, and safety
Category 2: Organization-related Research		
8	Digital_technology, switching, structure, employer, flexible, commuter, global_mobility, approach, productivity, employment_loss	Organizational remote work strategies
7	Job, share_job, job_satisfaction, exploit, engaged, internet, job_performed, characteristics, worker_forced, disaggregated	Remote work management
Category 3: Labor Market and Economy-related Research		
5	Policy, worker, country, labor_market, unemployment, job_search, vulnerable, employee_productivity, stay_home, scenario	Labor market dynamics
6	Sector, lock_down, health, effect, shock, burden, unpaid_care, women, price, disadvantaged	Economic implications

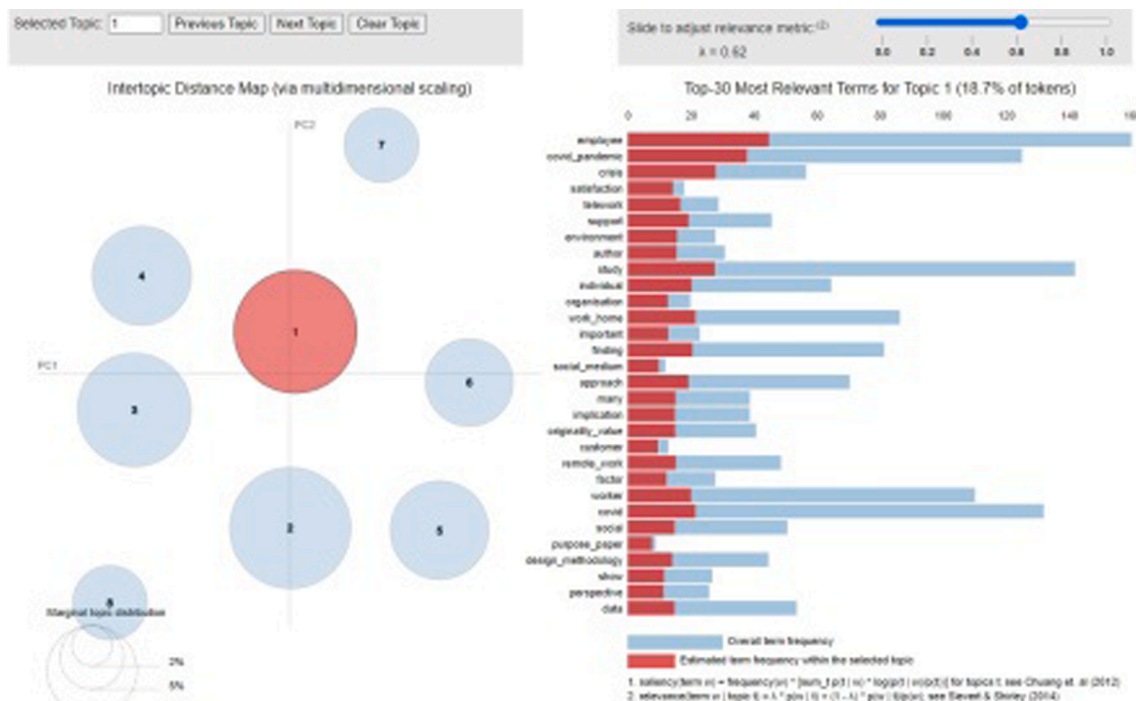


Fig. 7. Inter-topic distance map of the reviewed literature.

4.2.1. Category 1: Employee-related research

The first group of studies—employee-related research—focuses on four key topics: the diverse effects of remote work on employees at a personal level (Topic 1), effects on employees' careers (Topic 2), family life and gender roles (Topic 3), and health, well-being, and safety (Topic 4).

The studies referring to Topic 1 focus on multiple issues that employees have to contend with due to a sudden shift from traditional to remote work settings. In the early stages of the pandemic, the major subjects that attracted the attention of researchers were employees' willingness to accept the remote work model (Kooij, 2020; O'Rourke, 2021), the new technologies necessary for supporting job performance (Brodsky, 2021; Chong et al., 2020; Nash & Churchill, 2020), and the roles of social relationships with co-workers for maintaining performance levels (Shockley et al., 2021). As the pandemic progressed, the research focus shifted toward examining employees' stress levels, emotional exhaustion, and perception of their leaders (Chong et al., 2020; Min, Peng, Shoss, & Yang, 2021; Yang, Soltis, Ross, & Labianca, 2021).

The findings of these studies indicate that because the prolonged crisis and COVID-19 induced remote working, employees faced many stressors concerning their time management and performance (Cameron, Thomason, & Conzon, 2021), often leading to emotional exhaustion (Lee, 2021; Leroy, Schmidt, & Madjar, 2021). Furthermore, these developments have skewed employees' perceptions of their bosses when it comes to exercising control or allowing staff to work independently (Antonacopoulou & Georgiadou, 2021; Kulik, 2022). Finally, some researchers argue that the adoption of digital technologies for remote work has a detrimental effect on employees' psychological and physical well-being (Bennett, Campion, Keeler, & Keener, 2021; Shockley et al., 2021).

The second topic in this category—effects on employees' careers—mainly investigates the influence of COVID-19-induced remote working on various aspects of an employee's career, such as career development path (Yoon, Chang, Sadique, & Al Balushi, 2021), emerging career development needs, and the impact of socio-psychological factors on career development (Barhate & Hirudayaraj, 2021; Hughes & Niu, 2021). Our findings indicate that new professional development requirements have emerged, with employees expecting and demanding virtual coaching and mentorship (Yarberry & Sims, 2021). In particular, female workers are rethinking their career paths in response to growing gender inequalities resulting from an imbalance in work-life issues (Clark et al., 2021; Kossek, Dumas, Piszczek, & Allen, 2021; Walters, Mehl, Piraino, Jansen, & Kriger, 2022). Finally, our review of the literature reveals that abrupt changes in work practices, such as the adoption of COVID-19-induced remote work, have exacerbated workers' careers and health-related stressors (Shao, Fang, Wang, Chang, & Wang, 2021; Van Zoonen & Sivunen, 2021; Yang et al., 2021). Multiple stressors have had a detrimental effect on work performance, resulting in employee concern over career development (Shao et al., 2021). These studies call upon organizations to include such stressors in their future career development strategies (Shockley et al., 2021; Walters et al., 2022).

Examination of the third topic of employee-related research—family life and gender roles—reveals that this subset of studies focuses primarily on the effects of abrupt adoption of remote work on an employee's work-life balance and inter-family relations. The findings of these studies have demonstrated how COVID-19-induced remote work has blurred the line between personal and professional life (Clark et al., 2021; Kossek et al., 2021; Utoft, 2020), thus creating tense relationships between family members (Yang et al., 2021). Such tensions intensified during lockdowns, when all family members, including children, were required to work from home (Couch, O'Sullivan, & Malatzky, 2021).

Notably, our analysis further reveals that most of the studies in this area have applied a gendered perspective to explore the remote work implications for women workers. Studies have indicated that women are

in a disadvantaged position compared to their male counterparts regarding the adoption of remote work (Frize et al., 2021). Though the extent to which working hours interfere with personal life has increased for both men and women, the amount of family work has increased considerably for women, who may also need to take care of children, aging parents, or household work (Akuoko, Aggrey, & Mengba, 2021; Clark et al., 2021; Foley & Williamson, 2021; Smith, 2022). Women are more likely to face more non-work-related interruptions (e.g., intrusions, breaks, distractions) while working from home (Leroy et al., 2021). However, this situation is not found to be the same across all demographics; for example, women confront more challenging conditions in collectivist societies where they have to take care of extended family members (Akuoko et al., 2021; Parlak, Cakiroglu, & Gul, 2021).

Additionally, our analysis reveals that the increased complexity of women's work-life balance has resulted in adverse outcomes, both in their personal and professional lives. At the personal level, it has increased pressures (Akuoko et al., 2021), anxiety, depression (Docka-Filipek & Stone, 2021), feelings of insecurity, distress, guilt (Smith, 2022), loneliness (Gao & Sai, 2020), and emotional exhaustion (Clark et al., 2021; Gao & Sai, 2020; Leroy et al., 2021).

At the professional level, research suggests that women's productivity (Parlak et al., 2021), performance (Walters et al., 2022), and career progression (Clark et al., 2021; Docka-Filipek & Stone, 2021; Frize et al., 2021; Smith, 2022) have been negatively impacted by COVID-19-induced remote work, sometimes forcing women to leave their jobs (Kossek et al., 2021). Nevertheless, our findings demonstrate that the provision of appropriate support from the government (Smith, 2022), organizations, and social networks can play a significant role in enabling women to effectively maintain work-life balance (Yang et al., 2021).

The fourth and final topic of employee-related research—health, well-being, and safety—primarily examines two interrelated issues: how COVID-19-induced remote work impacts the health, well-being, and safety of the employees and how different interventions can help improve them. First, evidence from the extant literature exhibits that remote working can influence health and well-being positively and negatively. On the positive side, remote working ensures that fewer people get exposed to large gatherings, thus reducing the spread of infections (Alipour et al., 2021; Aum, Lee, & Shin, 2021). However, most researchers argue that remote working creates individual, social, and work-related situations that lead to deterioration in health and well-being (Park, Jeong, & Chai, 2021; Park, Kim, Jeong, & Minshall, 2021).

At the individual level, our findings show that employees have expressed their concerns about careers, work-family balance, job security, anxiety, and depression, all of which contribute to deterioration in health and well-being (Van Zoonen & Sivunen, 2021). To this end, Zhang, Yu, and Marin (2021) applied topic modeling to analyze one million tweets and found that mental health was one of the main concerns of COVID-19-induced remote work. At the social level, COVID-19-induced remote work has resulted in dispersed and mediated work practices that create feelings of isolation and loneliness among workers (Guy & Arthur, 2020; Islam, 2021; Van Zoonen & Sivunen, 2021).

In addition to drawing attention to these problems, existing research has focused on how to mitigate the negative consequences. Studies in our sample suggest that individuals with certain characteristics are better prepared to maintain favorable health and well-being in the context of COVID-19-induced remote work (Pattnaik & Jena, 2021). For example, individuals who practice mindfulness can effectively disconnect from work when needed, thus increasing their attention span when needing to tackle work tasks and allowing them to facilitate better management of screen fatigue, resulting in an improved feeling of health and well-being (Toniolo-Barríos & Pitt, 2021). Similarly, individuals with more social connections, who are more creative, or who do not shy away from asking for support are more likely to maintain good health and well-being (Guy & Arthur, 2020). We also found that egalitarian families—where male members equally share the burden of household

activities—can better manage their health and well-being (Shockley et al., 2021).

4.2.2. Category 2: Organization-related research

The second category of studies focus on the organizations—mainly, the way they implement and support remote work. Our modeling reveals two main topics in this category: (i) organizational remote work strategies and (ii) remote work management.

Studies on organizational remote work strategies (Topic 8) complement Topic 1 (effect on employees at a personal level). While the studies in Topic 1 focus on employees, the articles in Topic 8 provide an organizational perspective on the changing nature of operations within businesses forcing the adoption of remote work (del Rio-Chanona, Mealy, Pichler, Lafond, & Farmer, 2020; Shockley et al., 2021), workforce and unemployment issues (Barrero, Bloom, & Davis, 2020), finding a better technology-task fit (Abelsen, Vatne, Mikalef, & Choudrie, 2021), and addressing employee stressors by improving human resource practices. We found that organizations can facilitate the task, process, and relational interactions among employees to enable remote work (Whillans, Perlow, & Turek, 2021). For instance, providing the necessary technological tools to facilitate task and process interactions is often considered crucial (Abelsen et al., 2021; Karl, Peluchette, & Aghakhani, 2021). Offering psychological support in developing relational interactions is also critical (Kulik, 2022) and can be enabled through techniques such as mindfulness (Toniolo-Barríos & Pitt, 2021) and reactivation of network ties while working from home (Wu, Antone, Srinivas, DeChurch, & Contractor, 2021; Yang et al., 2021).

Strategic changes are also needed to mitigate employee stressors through the adaptation of organizational HR practices. These include drawing the organizations' attention toward supporting employees to alleviate their stress and ensure their well-being and psychological safety (Abelsen et al., 2021; Karl et al., 2021). According to our findings, these studies underpin the need for changes in organizational practices in terms of the resources required for task performance (Abelsen et al., 2021; Shockley et al., 2021) as well as changes in performance evaluation (Gashi, Kutllavci, & Zhushi, 2021) due to changing working patterns. To summarize the debate from Topic 8, we posit that changes in the structure of the workplace have initially been focused on safety and providing necessary support for remote working, but in the longer term, strategies will be shaped in response to the diverse range of personal and professional demands and preferences of the workers.

The second topic in this category—remote work management (Topic 7)—offers a more focused understanding of managerial and leadership roles in relation to remote work strategies. Such studies investigate issues such as job satisfaction (Karani, Trivedi, & Thanki, 2021), the perceived influence of the managers in the form of control, exploitation, and work engagement (Khan, 2021), and the need to develop new leadership capabilities (Antonacopoulou & Georgiadou, 2021; Kirchner, Ipsen, & Hansen, 2021; Semenets-Orlova, Klochko, Shkoda, Marusina, & Tepluk, 2021). Decision making concerning overcoming remote work-related challenges and their solutions also received some attention (Hughes, 2021).

Managers consider themselves to have less control during periods of remote working (Kulik, 2022; O'Rourke, 2021). However, some studies show that the loss of control is a positive sign, arguing that exercising excessive control is tantamount to micro-management and is often counterproductive (Lee, 2021). Our analysis further indicates that employing emotional intelligence (Semenets-Orlova et al., 2021), adopting authentic and empathetic leadership styles, and changing supervisory mindset are crucial for the effective and successful implementation of remote work strategies (Antonacopoulou & Georgiadou, 2021; Bartsch, Weber, Buttgen, & Huber, 2021). We found that some studies advocate that organizations should further develop leadership behaviors through more effective training (Hughes, 2021) and organizational inclusion techniques, by way of which every-one feels a sense of belonging, respect, and appreciation for who they are as individuals

(Bennett et al., 2021; Kuknor & Bhattacharya, 2021).

4.2.3. Category 3: Labor market and economy-related research

Our third category highlights labor market dynamics (Topic 5) and economic implications (Topic 6). Studies included in Topic 5 put forward the argument that COVID-19-induced remote work has transformed the labor market dynamics by creating, changing, and eliminating various jobs (Adams-Prassl, Boneva, Golin, & Rauh, 2020).

However, we found that very little research has been conducted that examines how COVID-19-induced remote work has created an entirely new class of jobs (Barrero et al., 2020), such as digitalization-oriented positions and careers in the medical and other fields that are considered essential. Some researchers argue that COVID-19-induced remote work has significantly altered a large number of jobs, most of which now require the use of digital technologies to collaborate with geographically dispersed team members (Waizenegger et al., 2020). Ultimately, the majority of existing research has emphasized the negative consequences of pandemic-induced remote work by examining job losses (Bradley, Ruggieri, & Spencer, 2021; Hadjisolomou, Mitsakis, & Gary, 2021).

Barrero et al. (2020) estimated that during the pandemic, for every ten redundant workers, only three new workers were hired, demonstrating that job losses exceeded job creation. They further noted that 42% of these redundancies are likely to result in long-term unemployment (Barrero et al., 2020). More specifically, job losses have been high for jobs that cannot be performed remotely (Zimpelmann, von Gauder, Holler, Janys, & Siflinger, 2021). Therefore, individuals who work in low-skilled, non-essential jobs or occupations that cannot be performed from home are at higher risk of having their employment terminated (Adams-Prassl et al., 2020; Bradley et al., 2021; Lopes & Carreira, 2021). Some studies show that the aforementioned issues relate to the level of available technological infrastructure needed to perform a job remotely.

Our review of the studies conducted on Topic 6—economic implications—indicates that the COVID-19-induced shift to remote work has resulted in significant economic distress across nations, including GDP contraction (Brum & De Rosa, 2021) and an increase in inflation (Forsythe et al., 2020). Additionally, we discovered that countries with less developed infrastructure and a higher proportion of jobs that are incompatible with remote work are more vulnerable to the pandemic (Brum & De Rosa, 2021). Our review further demonstrates that the remote work capability of a job acts as a buffer against the economic decline of a country during the COVID-19 pandemic and ensures diverse economic participation from individuals (Aum et al., 2021). In this regard, Dingel and Neiman (2020) presented empirical evidence from 85 countries to show that developing nations have been challenged by a number of economic problems for having fewer jobs that can be performed remotely.

Studies focusing on economic implications further show that, overall, tourism and hospitality (Forsythe et al., 2020), transportation (Beck & Hensher, 2020; Crowley, Daly, Doran, Ryan, & Caulfield, 2021), and office space businesses (O'Rourke, 2021) have suffered the most severe repercussions in comparison to other industries. The negative consequences are directly connected with rising unemployment rates (Barrero et al., 2020) and decreasing GDPs (Aum et al., 2021; King, Randolph, Floro, & Suh, 2021). Enterprises have contracted, putting governments under double pressure as they must provide aid to the unemployed workforce while offering economic assistance to keep businesses afloat (Brum & De Rosa, 2021). In addition to giving financial support, governments have leveraged remote work as a tool for reducing unemployment by way of mapping out the jobs that can be performed remotely (Zhange, Gerlowski, & Acs, 2022).

5. Conclusion

5.1. General discussion

Our application of LDA-based modeling has introduced a novel AI-based approach by conducting systematic reviews broadly within the domain of human resource management and, specifically, remote working literature. Thus, we have identified key themes in the extant literature through objective and robust analysis and the elimination of human biases found in traditional reviews. Our results indicate that pandemic-induced remote work literature primarily revolves around eight key topics that can be grouped into three broad categories for detailed analysis: employee-related research, organization-related research, and labor market and economy-related research. Though the three categories are broadly in line with the extant pre-pandemic research on remote working, the issues within each category have significantly changed.

Our broader categorization has mitigated the fragmentation of the literature on remote work. We have also facilitated the comparison of findings both before and during the pandemic. A deep dive into the analysis of the reviewed literature within the three categories revealed that pandemic-induced remote work adoption is different from pre-pandemic remote work because it is unplanned, sudden, and widespread (Adams-Prassl et al., 2020). As a result, employees, organizations, and policymakers face novel challenges and opportunities due to the adoption of pandemic-induced remote work.

First, our literature review has expanded the understanding of the individual implications associated with adopting pandemic-induced remote work. On the positive side, it has allowed more autonomy and flexibility among employees (Poth, Kottke, & Riel, 2020) and has reduced the chances of contracting an infection by way of reducing exposure to high-risk environments (Alipour et al., 2021; Dingel & Neiman, 2020; Hasan et al., 2021). Nevertheless, our review concludes that pandemic-induced remote work has mainly resulted in adverse outcomes for employees. It has increased employee anxiety, stress, and emotional exhaustion (Chong et al., 2020; Lee, 2021; Leroy et al., 2021; Min et al., 2021), in turn leading to an overall decline in employee health and well-being (Bennett et al., 2021; Shockley et al., 2021). Employees who practice mindfulness, have social support, and are better prepared to adopt sudden changes are more likely to buffer the negative implications of adopting pandemic-induced remote work (Toniolo-Barrios & Pitt, 2021). Notably, these issues were not prominent in the pre-pandemic research on remote work.

Second, from an organizational perspective, our literature review has advanced our understanding of remote work from several perspectives. Our findings reiterate the importance of communication patterns and processes, from pre-pandemic research to the context of pandemic-induced remote work (Gibbs et al., 2017; Sivunen, 2006). Furthermore, pandemic-induced remote work has resulted in a permanent change in organizational policy and culture. For instance, businesses are required to adopt human resource practices, such as novel training approaches (Adamovic, 2018; Butler et al., 2018), to ensure they have the required human resources with well-developed capabilities. In summary, pandemic-induced remote work has brought both benefits and challenges for organizations as businesses can now attract and retain talented employees worldwide (Kurkland & Bailey, 1999; Olson, 1983). However, organizations need to tackle novel issues such as employee burnout, work-life balance, and satisfaction (Biron et al., 2022; Ninaus et al., 2021).

Lastly, we have revealed the economic implications of adopting remote work across a large range of industries. Pandemic-induced remote work has resulted in GDP contraction and an increase in inflation. In particular, developing countries are more vulnerable because they have a lower proportion of jobs that are performed remotely (Dingel & Neiman, 2020). Economic implications have been more severe for sectors like tourism and transportation and for jobs requiring office

space (Forsythe et al., 2020).

5.2. Future research agenda

This section outlines possible future research directions for remote work during and after the COVID-19 pandemic. We offer the agenda in accordance with the three core themes of existing research identified in this study, i.e., research in the fields of employees, organization, and labor market and economy.

5.2.1. Employee-related future research

Studies in this category need to explore several critical research questions, which are summarized and presented in Table 4.

Extant research only provides preliminary evidence that the adoption of digital technologies lies at the core of remote work (Brodsky, 2021; O'Rourke, 2021). Therefore, future researchers should consider focusing on employee perspectives to ascertain how the barriers associated with emerging remote work technologies—for example, video conferencing, virtual reality, artificial intelligence, and 3D printing—can be overcome (Salminen, Mustak, Corporan, Jung, & Jansen, 2022). It would be of interest from a research point of view to investigate why and how employees of various ages adopt technologies differently.

Table 4

Future research suggestions for employee-related research.

Research Topic	Future Research Suggestions	Exemplary Studies
Effects of remote work on employees	1. How do employees exploit the opportunities and tackle the challenges of adopting remote work-related technologies?	(Brodsky, 2021; O'Rourke, 2021)
	2. How does the widespread adoption of remote work influence the social interactions among employees?	
	3. How does COVID-19-induced remote work impact the psychological and professional aspects of various individuals?	
	4. How can individual interventions facilitate the adoption of remote work?	
Effect on employees' careers	5. How have employees' careers changed, progressed, or been terminated due to uncertainties associated with COVID-19-induced remote work?	(Barhate & Hirudayaraj, 2021; Hughes & Niu, 2021)
	6. How have individual stressors influenced the career choices of various groups of individuals?	
	7. How can employees learn new skills to ensure career progression?	
Family life and gender	8. How has COVID-19-induced remote work created tensions in inter-family relations?	(Clark et al., 2021; Kossek et al., 2021)
	9. How can women in various professions and institutional settings cope with the severe repercussions of imbalance in a work-life balance due to remote work?	
	10. How have various stressors for female workers changed over time during different pandemic waves?	
Health and well-being	11. How can remote work-induced individual stressors lead to issues with long-term health and well-being?	(Alipour et al., 2021; Aum et al., 2021)
	12. How does the well-being influence of the pandemic vary across different settings and occupations?	

More research is also needed regarding the social side of digitally mediated interactions among various employees and their performance implications, as digital interactions may differ from face-to-face interactions in terms of communication, trust-building, knowledge exchange, resource sharing, and relationship deepening (Shockley et al., 2021).

Though a few studies have examined anxiety, depression (Docka-Filipek & Stone, 2021), social isolation (Gao & Sai, 2020), and emotional exhaustion (Leroy et al., 2021) as consequences of remote working, their findings are inconclusive. Some researchers have, however, examined the implications for psychological health and well-being (Bennett et al., 2021), professional career development, and loss of productivity (Ali-pour et al., 2021; Aum et al., 2021). Future research could focus on what employees should do at an individual level to avoid the aforementioned negative consequences. For example, if employees practice mindfulness and reactivate redundant social activities, they will feel proactive and supported in coping with crises (Toniolo-Barríos & Pitt, 2021). Similarly, self-regulation and emotional intelligence may provide valuable insights.

Another critical aspect that has not yet received attention from researchers is how remote work enhances employees' psychological and physical well-being, as well as their performance. We expect positive results for many individuals, given that remote work has reduced both traveling time and cost, thereby giving employees extra control over routine work and life. Some may also feel positive and excited about working in a "greener" mode because of a lack of travel.

Since individual stressors and career choices may be linked, future research should explore how various stressors may lead to different career choices. For example, it would be worthwhile to examine under what conditions employees decide to change or terminate a specific career path. We suggest that more research be conducted that will examine how employees differ in their learning of technical, social, and professional aspects of remote working and how these learning variations result in varied pursuit of career paths and performance outcomes. Interestingly, most of the individual research has focused on gender, creating a gap concerning the implications for (and coping strategies of) men and other groups of individuals. In addition, initial evidence suggests that women in egalitarian societies rely on support from their husbands while, in collectivist societies, they rely more on social support from extended family and relatives. Thus, examining the different mechanisms that can support or hinder the maintenance of a positive work-life balance will further enrich this field of research.

Since the findings initially point to tensions within family dynamics, future research can provide valuable insights into how COVID-19-induced remote work creates these tensions and, more importantly, how these tensions can be mitigated to create a healthy home environment. In addition to exploring how to address increased family challenges, researchers may also undertake empirical studies on whether or how spending more time together at home has strengthened families. It would be interesting to explore how these relationships have evolved, considering the pandemic has yielded several variations over time. In this regard, qualitative studies that adopt ethnographic and process-oriented approaches may be more appropriate.

Theoretically, the papers included in this review examined individual-level phenomena from a variety of theoretical approaches. For instance, affiliate coping theory has been used to explain the significance and relevance of dormant ties and active relationships (Yang et al., 2021). Similarly, during times of crisis, career development and intervention approaches have been studied from a hope-action theory perspective to support workers (Yoon et al., 2021).

While these examples illustrate some theoretical views, additional studies are required to better understand the various effects of remote work on employees. A multidimensional investigation is needed—for example, following in the footsteps of Staples et al. (1998), whose research examined remote working behaviors through the lens of self-efficacy theory (Bandura, 1977). In the current situation, where

remote work has become mandatory and taken on the form of hybrid work, we predict that self-efficacy theory will uncover additional attitudinal and behavioral implications associated with employees' responses to remote work.

Several researchers have proposed new frameworks that serve to address employee difficulties through different theoretical approaches. For example, Zettinig, Aleem, Majdenic, and Berry (2021) used the sensemaking approach (Weick, 1988) to build a three-dimensional model of learning and remote work, concentrating on sociocultural self-awareness, practices, and circumstances. We would encourage future studies to take a similar approach when investigating other contexts, such as human resource practices embedded within the broader domain of remote work.

Future researchers would do well to employ new approaches to cope with the massive amounts of data generated inside academic and industrial sectors regarding remote work. Because these data sets are constantly shifting because of the uncertainties associated with remote work, it is vital to apply AI-based methodologies such as BERT (Min et al., 2021) to build macro-level understandings of employee-related issues.

5.2.2. Organization-related future research

Considering that organizational support is a vital component for enhancing remote work adoption at the individual and collective level, we present a summary of possible future directions in Table 5.

A literature review of studies in this category cites the lack of organizational support as one key reason behind the negative repercussions for both individuals and organizations engaged in remote work. However, little research explores how COVID-19-induced remote work has triggered changes at all levels and across all departments. We suggest that future scholars offer a deeper understanding of the organizational implications of a sudden transition to remote work. It would be worthwhile to examine strategies adopted by organizations to enhance the digital connectivity of employees.

We suggest that future research explore and document the responses of organizations to better prepare employees to effectively maintain work-life balance. This body of knowledge also needs a greater understanding of how organizational interventions can help employees manage their stress, emotions, and well-being (Couch et al., 2021; Yang et al., 2021) while remaining productive (Shao et al., 2021). To this end,

Table 5
Future research suggestions for organization-related research.

Research Topic	Future Research Suggestions	Exemplary Studies
Organizational remote work strategies	<ol style="list-style-type: none"> How has COVID-19-induced remote work changed organizational strategies to ensure the creation of appropriate work culture, policies, and human resource development? How can organizations better support remote work and prepare for post COVID-19 scenarios? How can organizational interventions facilitate employee well-being and performance? 	(Shockley et al., 2021)
Remote work management	<ol style="list-style-type: none"> How can organizational leaders' capabilities be developed to effectively manage employees' remote working? How can organizational leaders adapt their leadership style according to situations to better fit with the environment? 	(Antonacopoulou & Georgiadou, 2021; Walters et al., 2022)

organizational interventions, such as giving more autonomy, building a trustworthy environment, offering flexible working hours, and ensuring privacy, need further scrutiny from researchers. Others should investigate the adaptations of HR practices (Arora & Suri, 2020; Lee, 2021; Toniolo-Barrios & Pitt, 2021), such as changes in training (Van Zoonen & Sivunen, 2021), career development plans (Park et al., 2021; Park et al., 2021), and performance evaluation systems (Gashi et al., 2021), serving to ensure that employees are not penalized by and for remote working arrangements.

Regarding the managerial aspect of COVID-19-induced adoption of remote work, most studies have focused on the role of leaders who manage remote work. The papers we analyzed emphasize the importance of authentic, shared, and inclusive leadership styles (Antonacopoulou & Georgiadou, 2021; Bartsch et al., 2021; Zhang et al., 2021). These approaches have been promoted to address issues of well-being and to be more humanistic. There is still a need to investigate the type of leadership required to ensure an organization's productivity and its meeting of goals in the aftermath of permanent changes to its operations. We recommend that future research begin by comparing pre- and post-pandemic leadership requirements in the context of remote work. After highlighting any distinctions, future studies could focus on adapting established leadership theories, such as situational leadership (Hersey & Blanchard, 1969), and the evolving requirements of this role. We further suggest that researchers examine how managerial exploitation in remote work settings can be minimized to give employees a sense of psychological safety (Khan, 2021). Another interesting aspect for future studies is the exploration of how organizational leaders can develop new cognitive, managerial, and social capabilities for effectively leading in remote work contexts (Antonacopoulou & Georgiadou, 2021; Kirchner et al., 2021; Semenets-Orlova et al., 2021).

Our publications of interest viewed organizational phenomena through various theoretical lenses. For instance, Shockley et al. (2021) employed self-presentation theory (Goffman, 1978) to describe how employees behave toward one another and technology within an organizational setting while coping with the fatigue caused by remote work. Their findings emphasize the critical need to establish best organizational practices for remote work.

Similarly, other researchers (McFarland, Reeves, Porr, & Ployhart, 2020; Min et al., 2021) used event system theory to describe employees' emotional responses and adaptive capabilities regarding changing organizational processes. These studies were conducted during the unfolding of the pandemic and provide insightful directions for organizational practices. However, holistic research on the permanent changes and their adaptation within business contexts as a result of remote work is necessary. In particular, labor process theory could be used to describe how a pandemic affects several aspects of organizational processes and outcomes. For instance, Donnelly and Johns (2021) used this theory to show that businesses are moving toward a unification of HR practices while ignoring geographical and cultural differences. Therefore, future research could study methods of resolving such differences from the same theoretical perspective.

Methodologically, we recommend more qualitative research at the organizational level to better understand the aforementioned aspects. Using process approaches for analysis will be valuable in capturing how organizational and managerial dynamics have changed throughout the pandemic. Quantitative studies using a survey approach would also enrich the remote work literature by comparing pre- and mid-pandemic research.

5.2.3. Labor market and economy-related future research

Our suggestions related to possible future research directions in the category of labor market and economy-related research are summarized in Table 6.

Our literature review shows that little research has explored the positive impacts of COVID-19-induced remote work with regard to creating new jobs (Barrero et al., 2020). Future researchers should probe

how this sudden transition to remote work has created a new set of digital transformation professions. This area is salient because emerging digital technologies are believed to be key shapers of labor markets in the information age. Initial evidence from the reviewed literature shows that having a higher proportion of jobs that can be performed remotely makes labor markets more resilient and sustainable.

Further exploration is needed to document how various actors play their roles, individually and collectively, to develop sustainable labor markets. This sub-stream of literature needs a thorough understanding of the role that governments, public institutions, organizations, and individuals play in ensuring labor markets remain resilient during crises. For example, governments could create new positions while ensuring the performance of current jobs (Adams-Prassl et al., 2020; Bradley et al., 2021; Lopes & Carreira, 2021) by providing appropriate digital infrastructure and formulating supportive policies (Holgersen, Jia, & Svenkerud, 2021). Governments and their associated public institutions are also vital for newer placements or the re-skilling of many workers who have lost their jobs over the widespread transition to remote work.

It would be valuable to explore how organizational adaptations and integration of digital tools and technologies for collaborating various value-creating processes can escalate, thus creating sustainable labor markets. We found that this aspect of the labor market needs much more attention from future researchers. In this regard, a thought-provoking research question could be: "How do individuals face the challenges and adopt various strategies to remain employed in the labor market?" (Waizenegger et al., 2020). Answering this question may highlight the individual-level learning mechanisms important for maintaining labor market participation.

Lastly, research related to economic implications needs to be better studied and understood, with particular attention paid to the question of how institutional environments can support or constrain the adoption of remote work employment arrangements (Brum & De Rosa, 2021). This is an important question because our initial evidence demonstrates that some countries have better endured the economic consequences of COVID-19 than others (Dingel & Neiman, 2020). Building on this line of research, more exploration is required to document how institutional support can facilitate and protect industries such as travel and tourism (Forsythe et al., 2020) and transportation (Beck & Hensher, 2020;

Table 6
Future research suggestions in relation to labor market and economy related research.

Research Topic	Future Research Suggestions	Exemplary Studies
Dynamics of Labor market	1. How has COVID-19 induced shift to remote work created new kinds of jobs? How have jobs in various professions changed due to the emergence of digital technologies, and widespread adoption of remote working practices?	(Bonacini et al., 2021; Crowley et al., 2021)
	2. How can governmental interventions facilitate in the creation of more resilient labor markets of the future?	
Economic Implications	3. How can macro policy measures support sectors most impacted by the pandemic better prepare them for the future?	(Beck & Hensher, 2020; Brum & De Rosa, 2021)
	4. How can governments achieve greater coherence among fiscal, monetary, labor market, and development policy measures to support sectors undermined during the Pandemic?	
	5. How can governmental support for informal workers address the unique needs of various groups of workers?	

Crowley et al., 2021) from collapse. The questions related to the labor market and economic implications can be further addressed by applying economic and institutional theories. Methodologically, econometric models could offer meaningful analysis of the available secondary data so that better macro-level explanations are provided.

5.3. Practical implications

A crisis that caused a major shift in working culture and norms—demonstrating employee care through feedback, timely and specific information sharing, and a participatory form of communication—contributes to the positive perception of procedural and interactional fairness. Supervisors' support may occur in the form of open communication by conveying the need to either exercise control or flexibility depending on the tasks. When making decisions, open communication in shared goals, assurance, and trust are crucial. Hence the necessity of employee empowerment to achieve better workplace results.

Organizations and human resource professionals were able to create opportunities for remote workers to develop critical characteristics and competencies during the COVID-19 pandemic. In general, being open to new experiences, showing resilience, and having a breadth of knowledge and abilities give employees a greater sense of psychological well-being. Developing and implementing interventions that enable employees to learn quickly in unfamiliar situations, such as during the COVID-19 pandemic, would not only ensure remote workers' psychological well-being but also greatly aid their decision-making abilities regarding the maintenance and growth of career paths.

Societal stressors significantly hamper the work-life balance and psychological well-being of all workers. Practitioners should consider the societal implications of remote work when developing organizational strategies—for example, by facilitating solutions for services such as childcare and daycare that are no longer available to workers.

Finally, our analysis of the data revealed substantial changes within the labor market, bringing to the fore the economic impact of remote work strategies. For instance, it can be seen that well-developed economies (e.g., Canada or Norway) have greater capacity than developing ones (e.g., Pakistan) with regard to implementing remote work strategies. This necessitates the transfer and exchange of knowledge at the organizational and national levels. Multinational corporations operating in developed and developing markets must establish and grow more effective coordination and knowledge transfer mechanisms to address employment issues. Public organizations, such as unemployment offices, must also develop regional (for example, EU-wide) and, where possible, global collaborations to address the needs of the workforce that are not currently addressed by remote work strategies.

5.4. Limitations

Our study avoids subjective biases that are commonly associated with non-systematic literature reviews, expert surveys, and opinion articles by using machine learning and natural language processing in the form of topic modeling. However, the results still carry some limitations. Our study is influenced by the keywords we have chosen and the manual analyses we have used to provide the intricacies of each topic generated through topic modeling. Similarly, because we only reviewed articles in the “business” and “economics” categories (based on WoS categorization), there is a chance that knowledge from other disciplines has been missed. Our exclusion of other forms of publications—other than articles—also carries limitations.

CRediT authorship contribution statement

Majid Aleem: Formal analysis, Methodology, Writing – original draft, Writing – review & editing. **Muhammad Sufyan:** Writing – original draft, Writing – review & editing. **Irfan Ameer:** Writing –

review & editing, Writing – original draft, Supervision, Project administration, Conceptualization. **Mekhail Mustak:** Software, Methodology, Conceptualization.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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