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Ensemble Community-  
Based Keyword Network  
Analysis**

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## Summary

COVID-19's rapid shift to remote working has sparked interest in synthetizing the growing body of research in order to gain a comprehensive understanding into the scholarship structure of the field. This study explores the issue of pandemic-induced remote working from a multidisciplinary perspective, paving the way for further investigation and effective decision-making. A co-occurrence network analysis of keywords in scientific articles is employed to comprehensively analyze the international literature on pandemic-induced remote working. We use bibliometric analysis, network centrality measures, and community detection algorithms to identify key concepts, trends, and interconnections within the pandemic-induced research landscape. As a result of our literature review, several prominent themes and topics were identified, emphasizing distinct keyword communities. These communities address essential aspects of remote working, such as human resource management, well-being, technology adoption, leadership, and socioeconomic implications. Based on the extracted concepts, we propose directions for future research focusing on the prospects of remote work in the post-pandemic era. Additionally, we recommend policy implications for organizations and policymakers.

**Keywords:** remote work, telework, virtual work, covid-19, pandemic, bibliometric analysis

**JEL classification:** J8, J80, C19, C38

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## **Abstract**

COVID-19's rapid shift to remote working has sparked interest in synthetizing the growing body of research in order to gain a comprehensive understanding into the scholarship structure of the field. This study explores the issue of pandemic-induced remote working from a multidisciplinary perspective, paving the way for further investigation and effective decision-making. A co-occurrence network analysis of keywords in scientific articles is employed to comprehensively analyze the international literature on pandemic-induced remote working. We use bibliometric analysis, network centrality measures, and community detection algorithms to identify key concepts, trends, and interconnections within the pandemic-induced research landscape. As a result of our literature review, several prominent themes and topics were identified, emphasizing distinct keyword communities. These communities address essential aspects of remote working, such as human resource management, well-being, technology adoption, leadership, and socioeconomic implications. Based on the extracted concepts, we propose directions for future research focusing on the prospects of remote work in the post-pandemic era. Additionally, we recommend policy implications for organizations and policymakers.

**Keywords:** remote work, telework, virtual work, covid-19, pandemic, bibliometric analysis.

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## **1. Introduction**

Remote work (RW) has evolved into a widespread practice among workers' of modern organizations. It has been gaining substantial attention in recent years due to increasing advancements in ICTs and changing work dynamics (Lamovšek & Černe, 2023). Since the Covid-19 pandemic has brought the largest-ever global “enforced work from home” experiment, the research field of remote work has been rapidly growing, becoming the focus of many studies across disciplines. At practice level, transitioning to remote work during the pandemic was a sudden shift for many organizations. Although the global covid-19 emergency is over, working from home is likely to stay (Barrero et al., 2021; Alexander et al., 2023) and it is increasingly considered as the “new normal” for post-pandemic employment (Delany, 2022; Smite et al., 2023). As a result, challenges persist for managers and practitioners in implementing remote work effectively (Adekoya et al., 2022; Pokojski et al., 2022; Smite et al., 2023).

The large corpus of knowledge about remote work generated by rapid responses of the academic and practice communities to the Covid-19 pandemic has revealed the importance to synthesize the growing body of research in order to gain a comprehensive understanding into the recent scholarship structure of the field, identify potential directions for future research along with deriving practical insights for organizations and managers faced with the challenges and complexities of remote work becoming the new norm post-COVID pandemic. Multiple literature reviews on remote work have been produced so far; they have undoubtedly contributed to un-pack the complexity of the phenomenon and understand various dimensions in more depth. However, they also suffer from important drawbacks. First of all, most available reviews on the topic are qualitative in nature; although they offer in-depth explorations of themes, meanings, and subjective interpretations within the literature, they heavily rely on subjective interpretations of data, which can introduce researcher bias and influence the conclusions drawn from the literature. Qualitative reviews labelled as “systematic” reduce bias and enhance replicability by employing explicit and transparent methods, and are preferable to non-systematic approaches. However, this kind of synthesis is still scantily adopted by scholars in the field (e.g., Athanasiadou & Theriou, 2021; Mele et al., 2023) or, when used, it is focused on specific subdomains or aspects of remote work, such as success factors (Gohoungodji et al., 2023), organizational practices (Pianese et al., 2023), workers’ well-being (Crawford, 2022) and work-life balance (Bulińska-Stangrecka et al., 2023). Such a restricted focus is not suitable if we are interested in a comprehensive and unified understanding of remote work arrangements and uncovering the intellectual structure of a broad research domain. Into this direction, systematic

quantitative reviews, including those based on bibliometric analysis, can be a valuable complement to qualitative ones (Kumar Hota et al., 2023).

The expanding body of literature on RW underscores the need for statistical methodologies that effectively synthesize the extensive scientific knowledge generated recently. Bibliometric analyses can offer a comprehensive knowledge map of the research domain on RW by relying on repeatable, quantitative, and objective methods (Drago et al., 2023; Mukherjee et al., 2022), bridging research gaps, advancing theory and yielding valuable insights to guide researchers, managers, and policymakers in navigating the expansive realm of this corpus of literature.

The study aims at discovering the scientific structure of pandemic-induced remote work research. We address the shortcomings in the existing review articles by providing an holistic view of research that investigated remote working in the context of a pandemic disease such as the Covid-19 crisis through a bibliometric analysis. A few review studies on remote work adopting bibliometric techniques have been retrieved in the literature. The only review works related to the pre-pandemic period are those by Raghuram et al (2019) on virtual work and Lamovšek & Černe (2023) on distributed work. However, the number of publications on RW significantly grew during the period 2020-2023, in relation to the Covid-19 outbreak. As other scholars, we recognized the importance to keep track of how this research field has been developing. Most bibliometric reviews on remote work relied on basic tecnicas of performance analysis and science mapping, while few others went a step further and enriched the outcomes of the core techniques, by relying on network metrics, visualization and/or clustering methods (Donthu et al., 2021). In our study the enrichment toolbox becomes even more sophisticated, including an innovative approach based on community detection using different algorithms (see also Drago & Fortuna 2023) and an ensemble analysis that allows to obtain consistent and meaningful results and identify robust “semantic cores”. These are groups of keywords (or “nodes” in the network) that identify some relevant meanings and contents and are helpful to resume the entire pandemic-induced literature on remote work. This allowed us to explore the semantic conceptual space, by identifying dominant themes and suggest potential directions for future research.

## **2. Theoretical background**

### ***Remote work research: the scientific debate until Covid-19 times***

RW has witnessed a tremendous amount of exposure in recent years. Before the crisis generated by the coronavirus pandemic it was growing at a much slower pace that most previsions would suggest

(Felstead, 2022). With the COVID-19 outbreak, work from home rapidly extended as a response of governments to new social distancing conditions. These constrained employers and employees to re-organize work activities at a distance from traditional offices to remain operationally active and resilient to a black swan event (Dogra & Parrey, 2022).

Since its first introduction in the workplace in the early nineteenth century, a number of definitions and conceptualizations of remote work have been produced in the literature, and a variety of forms have been empirically identified and investigated by researchers over the last five decades. Terms including “telework”, “telecommuting”, “mobile work”, “work from home”, “mobile work”, “virtual work”, “smart work”, “distributed work”, etc. can all be found in a corpus of study that is now depicted as a complex conceptual “labyrinth” (Schäfer et al., 2023). Remote work refers to various forms of performing job duties outside of their traditional office settings (Olson, 1983; Felstead & Henseke, 2017), often relying on digital technology (Soga et al., 2022) and choosing work location among different places at a geographic distance from supervisors or colleagues (Olson & Olson, 2000).

Although such a richness in terminology partially reflects the specificities of different co-evolving, and sometimes isolated research streams (e.g., research on telework and virtual teams), there are also many overlaps and redundancies in topics and issues (Schäfer et al., 2023) to justify the need of a comprehensive mapping of what has evolved over time to become an articulated corpus of literature. In fact, this exercise would be valuable to understand the overall intellectual structure, detect connections and interdependencies among sub-fields, and guide future research accordingly.

It is worthy to highlight that the proliferation of terms and the growing number of scholars attracted by the the study of remote work arrangements has gone hand in hand with two primary trends: the constant technology evolution and the profound transformation in ways of working until Covid-19 times. Remote work clearly depends on the availability of ICTs so that its rapid development have shaped the content and meaning of remote work over decades: the evolution across the conceptual generations of “home office”, “mobile office” and “virtual office” paralleled the shift from old to new generations of ICTs and the integration of information and communication tools (Messenger & Gschwind, 2016; Messenger, 2019). Virtual office settings, in particular, ramped up during the Covid-19 pandemic (Amankwah-Amoah et al., 2021) when full-time remote working was enabled by a rich portfolio of tools and technological resources: fast internet connection, laptops, tables, smart phones, company databases and softwares, cloud-computing applications, social media and digital platforms allowed distributed workers and teams to communicate, interact and collaborate from remote locations (Alashhab et al., 2021; Mariani et al., 2023; Vargo et al., 2021). At the same time we assisted

at a wide array of transformations in the temporal and spatial organization of work activities, that become increasingly flexible and collaborative and are increasingly carried on outside the traditional workspaces and formal organizational boundaries (Aroles et al., 2019), such as smart work centers (Errichiello & Pianese, 2020). In this respect, it can be argued that the covid-19 pandemic did not stop the manifestations of new work practices; on the contrary, it sustained the ongoing transformation of the fabric of work, by making “distance”, “remoteness”, “distribution” and “virtuality” more straightforward features. At the same time, the exceptional circumstances put by the pandemic and the enforced nature of remote work have unavoidably shaped the research debate, influencing the main investigated themes and the nomologic conceptual structure of the scientific literature on the field.

### ***Review studies on remote work before and during Covid-19***

The domain of remote work has grown over time and multiple review studies have been conducted to systematize and synthetize existing knowledge on this articulated research field (Baruch, 2001; Bailey & Kurland, 2002; Athanasiadou & Theriou, 2021; Shin et al., 2000; Siha & Monroe, 2006; Raghuram et al., 2019; Lamovšek & Černe, 2023; Dogra & Priyashantha, 2023). However, most of them are related to the pre-pandemic period and, thus, they do not allow to trace the tremendous evolution of this corpus of literature throughout last years. As a result, we lack an adequate and systematic knowledge of the main trends in the scientific debate and issues and themes recently addressed through empirical investigation. In addition, as underlined in the recent review work by Lamovšek & Černe (2023), “they address a limited scope of distributed work phenomena; are narrative, subjective, or not systematic, and this lack objectivity, comprehensiveness, and reproducibility” (pag. 3).

By restricting the focus on literature reviews covering also the Covid-19 period or restricted to this temporal window, it emerged that most review works focused on specific issues related to individuals, e.g., performance and productivity (Anakpo et al., 2023; Hall et al., 2023), work-life balance (Shirmohammadi & Beigi, 2022a; Atkinson, 2022), health and well-being (Beckel & Fisher, 2022; Urien, 2023), or the organization, e.g, success factors of implementation (Gohoungodji et al., 2023), challenges (Arunprasad et al., 2022), pitfalls (Soga et al., 2022) or economic performance (Mutiganda et al., 2022); others looked at specific organizational contexts, such as public organizations (Mele et al., 2023) or health care institutions (Garavand et al., 2022). Very few recent literature reviews covering also the Covid-19 period are systematic and ensure objective evaluation and robust analysis though statistical techniques and procedures, including bibliometrics and artificial intelligence-based approaches. Moreover, even fewer review studies are able to capture the multiple facets of remote

work, through adopting a broad variety of search terms beyond the more common, i.e., telework, home work and telecommuting. Table 1 provides a comparative prospect of more recent and comprehensive systematic literature reviews on remote work research that are more relevant for our study.

Except for Aleem et al. (2023), that adopted AI-based machine learning tools (i.e., LDA approach), all the retrieved systematic and quantitative review studies covering (at least in part) the Covid-19 period relied on bibliometric techniques. These always went beyond basic performance analysis to include a variety of science mapping techniques, notably co-citation and world co-occurrence. Primary document search is alternatively based on the two most important bibliometric database, i.e., Scopus and Web of Science. However, the overall number of documents included in the subsequent statistical analysis is influenced by a number of factors: 1) the time span, that in some cases is limited to the period 2020-2022 (e.g., Dogra & Parrey, 2022), while in others cover a larger numbers of years, including also the pre-pandemic time (e.g., Lamovšek, & Černe, 2023); 2) the number of keywords on which the studies focused; 3) the deliberate adoption of a systematic literature review approach, usually based on the so-called PRISMA protocol, that contributes to significantly reducing the number of documents included in the analysis, as they have to respect stringent qualitative standards. In this respect, the number of documents varies from 104, in Carrasco-Garrido et al (2023), to 12.304, in Lamovšek, & Černe (2023). In some cases, the reduction of documents is also influenced by the selection of specific sub-areas, e.g., “business” and “management” in WoS (Šimová & Zychová, 2023) or “social science” in Scopus (Dogra & Parrey, 2022).

In our study, we deliberately did not impose a specific time-frame, as our interest was in reviewing pandemic-induced remote work research, also beyond the Covid-19 disease. This is a relevant issue if we consider that it cannot be excluded a priori that the topic has received attention also before the pandemic in the context of similar crisis events to which remote work could have offered a potential temporary solution. Into this direction, the present work can trace a line of continuity with previous research on the relation between remote work and a pandemic state and represents a more comprehensive basis to build organizational resilience in front of new outbreaks highly expected in the future (Ge et al., 2023).

As for the selection of keywords, Lamovšek & Černe (2023) were the only ones who deliberately included a high number keywords in order to capture various forms of distributed work and represent

**Table 1: An overview and comparative analysis of systematic literature reviews on remote work**

Authors (year of publication)	Title	Review technique	No. articles	Time span	Database	Keywords for search	Key contributions
Our study	Remote work amidst the Covid-19 outbreak: Insights from an Ensemble Community-Based Keyword Network Analysis	<ul style="list-style-type: none"> <li>Bibliometric analysis:           <ul style="list-style-type: none"> <li>- performance analysis (e.g., the most significant authors and papers)</li> <li>- science mapping (i.e., co-occurrence keywords analysis)</li> <li>- network metrics</li> <li>- community detection using different algorithms and an ensemble analysis</li> </ul> </li> </ul>	1821	2007-2023	Scopus	<ul style="list-style-type: none"> <li>sub-fields of “economics”, “business” and “psychology”</li> <li>“telework*”, “telecommut*”, “work* from home”, “home-based-work*”, “work* at home”, “remote work*”, “smart work*”, “virtual work*”, “mobile work*”, “virtual team*”, “distributed work*”, “distance work*” (matched with a variety of terms expressing a pandemic disease)</li> </ul>	<ul style="list-style-type: none"> <li>identified 6 key research communities or “semantic cores” within the pandemic-induced remote work research:           <ol style="list-style-type: none"> <li>1) Human Resource Management and Remote Work;</li> <li>2) Individual work-related outcomes of the remote work experience;</li> <li>3) Remote work, work-life stress and performance;</li> <li>4) Technology-driven remote work practices in times of crisis;</li> <li>5) Leadership and virtual team dynamics;</li> <li>6) Responses and Impacts of Covid-19 induced Remote Work for Economy, Society, and People</li> </ol> </li> </ul>
Dogra & Parrey (2022)	Work from home amid black swan event (Covid-19): a bibliometric analysis from a social science perspective	<ul style="list-style-type: none"> <li>bibliometric analysis:           <ul style="list-style-type: none"> <li>- performance analysis (e.g., highly cited publications)</li> <li>- science mapping (i.e., co-word analysis through text mining and trend topics)</li> </ul> </li> </ul>	500 (limited to “Social Science” and including all type of publications)	2020-2022 (August)	Scopus	<ul style="list-style-type: none"> <li>“work from home”, “remote work”, “virtual work” (matched with a variety of terms expressing the covid-19 pandemic)</li> </ul>	<ul style="list-style-type: none"> <li>identified 9 key clusters of themes of Covid-19 and WFH research:           <ol style="list-style-type: none"> <li>1) leadership;</li> <li>2) mental health during quarantine;</li> <li>3) role of technology in online education;</li> <li>4) crisis management;</li> <li>5) gender;</li> <li>6) challenges while social distancing;</li> <li>7) well-being;</li> <li>8) work-life balance;</li> <li>9) academic libraries.</li> </ol> </li> </ul>

Dogra & Priyashantha (2023)	Review of work from home empirical research during Covid-19	<ul style="list-style-type: none"> <li>A systematic literature review (PRISMA guidelines)</li> <li>Bibliometric techniques: <ul style="list-style-type: none"> <li>- performance analysis (e.g., highly cited publications</li> <li>- science mapping (i.e., co-word analysis)</li> </ul> </li> </ul>	108 (only quantitative empirical papers; limited to "Social Science" and including only articles)	2020-2022	Scopus	"work from home", "WFH", "remote work", "telework", "telecommuting", "home office" (matched with a variety of terms expressing the covid-19 pandemic)	<ul style="list-style-type: none"> <li>identified five cluster themes: <ol style="list-style-type: none"> <li>1) work attitudinal outcomes and means;</li> <li>2) gender-related outcomes;</li> <li>3) leadership challenges and mental health outcomes;</li> <li>4) work-related outcomes;</li> <li>5) mobility-related outcomes;</li> </ol> </li> <li>the areas that are not common in WFH practices in the empirical research landscape during COVID-19: <ol style="list-style-type: none"> <li>1) Determinants of WFH;</li> <li>2) Occupational health outcomes of WFH.</li> </ol> </li> </ul>
Febriani & Churiyah (2022)	Homework for new changes in the future: A bibliometric analysis.	<ul style="list-style-type: none"> <li>Bibliometric analysis <ul style="list-style-type: none"> <li>- performance analysis (e.g., publishing networks, top-cited articles)</li> <li>- science mapping (e.g. key-word co-occurrence)</li> </ul> </li> </ul>	315 (including only journal articles and proceedings)	2020-2022 (March)	Scopus	"work from home" OR "telecommuting" OR "teleworking" OR "remote work"	<ul style="list-style-type: none"> <li>propose a framework for academics and researchers to conduct additional research on relevant themes.</li> </ul>
Šimová & Zychová (2023)	Who and What is Driving Remote Working Research? A Bibliometric Study	<ul style="list-style-type: none"> <li>Systematic literature review (adopting PRISMA guidelines)</li> <li>Bibliometric analysis <ul style="list-style-type: none"> <li>- performance analysis (e.g., the most significant authors and papers);</li> <li>- science mapping (i.e. multiple correspondence analysis and k-means clustering)</li> </ul> </li> </ul>	1,996	2010-2020	Web of Science (limited to "Business" and "Management" categories)	"virtual team" "online team" "remote work" "telework" "work from home"	<ul style="list-style-type: none"> <li>identified the core concepts within the literature that are: <ol style="list-style-type: none"> <li>1) organization and capabilities of remote working;</li> <li>2) behaviour in remote working;</li> <li>3) consequences of remote working;</li> <li>4) management of remote working;</li> <li>5) home and gender</li> </ol> </li> <li>The historical direct citation network shows two clusters of publications respectively focused on: a) the multicultural dimension of remote working; b) various factors associated with remote working (notably trust and communication, knowledge sharing, virtualness and leadership)</li> <li>Developed a theoretical framework for remote work adaptation that contains</li> </ul>

							core themes divided into three levels (personal, organizational and governmental) to orient future research and practice.
Carrasco-Garrido et al. (2023)	Exploring hybrid telework: A bibliometric analysis	<ul style="list-style-type: none"> <li>Systematic literature review (adopting PRISMA guidelines)</li> <li>bibliometrics - scientific mapping (e.g., co-word analysis)</li> </ul>	104	1969-2023	Web of Science	“hybrid work*” “hybrid Telework” “hybrid job” “hybrid teaching”	<ul style="list-style-type: none"> <li>categorized themes into four groups: <ol style="list-style-type: none"> <li>the driving themes (time, impact, engagement, home-office, and remote-work);</li> <li>Highly developed and isolated themes, making them marginally important for the scientific field (attitude);</li> <li>(3) Transversal and basic themes, indicating importance in the research field and, in a need for further development (i.e. productivity);</li> <li>(4) underdeveloped or peripheral topics. expressing emerging or declining problems (i.e., occupational health, pandemic, job-demands, organizations).</li> </ol> </li> </ul>
Aleem et al. (2023)	Remote work and the COVID-19 pandemic: An artificial intelligence-based topic modeling and a future agenda	<ul style="list-style-type: none"> <li>Systematic literature review</li> <li>artificial intelligence-based machine learning tools to uncover the hidden semantic structures and topics (i.e., Latent Dirichlet Allocation (LDA) approach)</li> </ul>	198 (including only articles present in Academic Journal Guide)	January 2020-January 2022	Web of Science (limited to “Business” and “economics” categories)	“online work” “remote work*” “distan* work*” “work* from home*” “virtual work*” (matched with a variety of terms expressing the covid-19 pandemic)	<ul style="list-style-type: none"> <li>identify eight dominant research themes concerning the pandemic grouped into three main categories: <ol style="list-style-type: none"> <li><i>Employee-related research:</i> <ol style="list-style-type: none"> <li>Effect on employees at a personal level</li> <li>Effect on employees' careers</li> <li>Family life and gender roles</li> <li>Health, well-being, and safety</li> </ol> </li> <li><i>Organization-related research:</i> <ol style="list-style-type: none"> <li>Remote work management</li> <li>Organizational remote work strategies</li> </ol> </li> <li><i>Labour-market and economy-related research:</i> <ol style="list-style-type: none"> <li>Labor market dynamics</li> <li>Economic implications</li> </ol> </li> </ol> </li> <li>identified how the different topics are related paving the way for transdisciplinary research</li> </ul>

Lamovšek, & Černe (2023)	Past, present and future: A systematic multitechnique bibliometric review of the field of distributed work	<ul style="list-style-type: none"> <li>Bibliometric analysis: - <i>science mapping</i>: (i.e., co-citation, co-occurrence, bibliographic coupling)</li> </ul>	12.034	1990-2020	Web of Science	virtual team*" “virtual group*” “virtual work*” “distributed team*” “distributed group*” “distributed work*” “mobile work*” “remote work*” “dispersed group*” “dispersed team*” “dispersed work*” “technology-mediated work*” “technology mediat*team*” “technology-mediated group*” “computer-mediated group*” “computer mediat* team*” “computer mediat* work” “telework*” “telecommut*” “distance work*” “distance team*” “work* from home” “home working” “working remotely” “e-work*”.	<ul style="list-style-type: none"> <li>identify the main theories and determine the field's basic structure and its development</li> <li>identifying main themes and popular trends</li> <li>provide a diagram to show the proliferation of concepts used under the umbrella term of distributed work</li> <li>propose important fields of research to develop and related research questions and theoretical perspectives to adopt.</li> </ul>
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a comprehensive picture of the field. On the contrary, the analysis of other review studies is quite limited in terms of selected keywords, mostly restricted to the more common, i.e., “telework”, “home work” and “telecommuting”, thus leaving out relevant terms able to capture important aspects of remote work that have become even more relevant during the pandemic, such as “smart work”, “virtual work”, “distance work”. It is also worthy to evidence that, these reviews tend to neglect the “group” dimension of remote work, that is captured by terms, such as “distributed work” or “virtual team”. Although our study does not encompasses the richness of Lamovšek & Černe’s study (2023), it aims at being more comprehensive picture of remote work and its facets along with representing the collective dimension.

### **3. Methodology**

The methodological approach adopted in this study relies on bibliometric analysis. The term “bibliometrics” has been originally used to refer to mathematical and statistical methods used to shed light on patterns arising in bibliographic data, such as publications and citations (Pritchard, 1969; Broadus, 1987). Bibliometrics methods offer the potential to describe, evaluate and synthesize a large corpus of literature through rigorous, repeatable, quantitative and nonsubjective procedures (Drago et al.. 2023). It has the potential to analyze the structure of a large body of literature, discover more impactful researches, scholars and institutions, identify themes researched, key trends over time, derive connections among disciplines, knowledge gaps, implications and future research direction, presenting a complete picture of massive research in a field (Aria & Cuccurullo, 2017; Mukherjee et al., 2022). In this sense, bibliometrics can be considered as complementary to other types of literature reviews, including meta-analysis, narrative and systematic literature reviews, having the potential to enhance the robustness of qualitative interpretations (Zupic & Čater, 2015; Donthu et al., 2021). Beyond contributing to theory development and advance a line of research, its evidence-based insights can be particularly valuable for assessment and evaluative purposes (Kajikawa, 2022) and to orient decision-making among managers, professionals and policy-makers (Drago et al., 2023; Mukherjee et al., 2022).

The adoption of bibliometrics is swiftly expanding across all fields and gaining momentum in social science research in recent years, where it has attracted the interest of scholars in business, management and organization studies and stimulated systematic guidelines for using this methodology in quantitative review studies (Donthu et al., 2021; Mukherjee et al., 2022; Lim & Kumar, 2023). It seems particularly useful to analyze and synthesize past research findings of remote work literature, whose production has exploded during the last years, contributing to fragmentation

and, sometimes, to inconsistent results. Triggered by the increasing access to bibliometric databases (e.g., Scopus and WoS) and the rapid development of bibliometric softwares (e.g., VosViewer and Gephi), techniques for bibliometrics analysis can be grouped into two main categories (Noyons et al., 1999; Zupic & Čater, 2015; Donthu et al., 2021): a) performance analysis, used in most reviews to manage complex data and evaluate the field's performance through a number of metrics applied to different research constituents, such as journals, authors, countries, subject areas, etc. (e.g., metrics to measure the productivity and impact of research and authors); b) science mapping, used to uncover the intellectual structure of a research field (e.g., key themes and topics, research trends, knowledge gaps, etc.) and present structural connections among research constituents (e.g., citation, co-citation, co-authorship, co-occurrence of keywords analysis). In this study both kinds of core techniques were used. Moreover, the integration of additional techniques, including network metrics, clustering and visualization tools (Donthu et al., 2021), enriched and made more robust the analysis.

### **3.1 Database and search procedures**

In order to create the bibliometric dataset we used the interdisciplinary Scopus database. Scopus provides an extensive and affordable access to bibliometric data (e.g., Archambault et al. 2009). It offers advanced search and filter options that allow precise retrieval of relevant articles. Some scholars favor it over other databases because of its broader journal coverage in comparison to Web of Science, which tends to be more selective (Mongeon & Paul-Hus, 2016). About 99.11% of the journals indexed in Web of Science are also indexed in Scopus (Singh et al., 2021). In addition, Scopus covers more conference papers than WoS (Gavel & Iselid, 2008). Consequently, Scopus is itself viable for bibliometric analysis. The overall performance of Scopus is encouraging: it spans a broad spectrum of scientific disciplines, and advanced queries are easy to submit, making it an invaluable tool for bibliometric databases.

The bibliometric analysis search was conducted on 1st February 2023. We used a keyword Boolean by combining two categories of terms: final search terms in the first category included: “telework\*” OR “telecommut\*” OR “work\* from home” OR “home-based-work\*” OR “work\* at home” OR “remote work\*” OR “smart work\*” OR “virtual work\*” OR “mobile work\*” OR “virtual team\*” OR “distributed work\*” OR “distance work\*”. These terms were matched with the operator “AND” with the following search terms: “covid-19” OR “pandemic” OR “coronavirus”. The number and variety of keywords used to capture remote work research, that also include terms, e.g., “work from home”, “smart work”, “mobile work”, has the capacity to represent a comprehensive picture of the field whereas the inclusion of terms such as “distributed work” and “virtual teams” allows to map the intellectual structure of the literature both from an individual and group/collective perspective. As for

pandemic-related terms, the deliberate choice of the search term “pandemic” allows to explore pandemic-induced remote work research also regardless the Covid-19 outbreak. Using the above terms we searched titles, abstracts and keywords of documents. We limited the search to documents published in English in the field of social science and specifically to the sub-fields of “economics”, “business” and “psychology”. No other restrictions were applied, so we used all types of documents (not only articles). In this way, we can better exploit the potential of bibliometric analysis to manage a big amount of data. Simultaneously, opting for Scopus allows us to rely on a reliable bibliometric source for quantitative research (Baas et al., 2020). The search analysis results in 1821 primary documents which form the basis of the bibliometric analysis and covered the period between 2007 and 2023.

### **3.2 Analytical approach**

The analytical process was articulated into six steps: 1) general bibliometric analysis; 2) creation of the co-occurrence network of keywords; 3) network visualization; 4) network centrality analysis; 5) community detection (using different algorithms); and finally, 6) ensemble analysis.

*General bibliometric analysis:* First of all, data were analysed through descriptive statistics techniques in order to detect the dataset’s general structure (i.e., content and trends).

*Creation of the co-occurrence network of keywords:* Secondarily, we built the “co-occurrence network” to study the cognitive structure of pandemic-induced remote work research. Co-occurrence analysis is a form of “co-word analysis”, i.e., a science mapping technique (Callon et al., 1983; Cobo et al., 2011), based on all the keywords for each document, that form the basis for the construction of a relational dataset. Keywords are obtained from primary documents and are the unit of analysis. Keyword co-occurrence analysis is based on the actual content of publications (Zupic & Čater, 2015) and assumes that a thematic relationship exists between keywords that frequently appear together (Donthu et al., 2021). Co-occurrence networks show the relationships between keywords, where two keywords appear together in one article and are connected. More specifically, since different keywords can appear in many papers, by assuming each keyword as a node of the network, it can be connected to other nodes through the papers containing the same keyword (Drago et al., 2023). A keyword’s co-occurrence determines the strength of its connection with another keyword. This technique is helpful to explore the intellectual structure of a corpus of literature, allowing to identify subareas in a research field, study their characteristics and trend, detect hot topics and connections among them (Huang et al., 2020; Lamovšek & Černe, 2023; Zhao et al., 2018).

*Network visualization:* Science mapping bibliometric analysis could be enhanced with network visualization softwares, also used in the context of social network analysis, such as VosViewer (Van

Eck & Waltman, 2010), Gephi (Bastian et al. 2009), CitNetExplorer (Van Eck & Waltman, 2014) and Biblioshiny, a bibliometrix package in R (Aria & Cuccurullo, 2017) (see Moral-Muñoz et al., 2020 for an overview of softwares). Among these, VosViewer is an entirely graphical user interface-based software widely used in bibliometrics research carried in bibliometrics studies in the field of remote work (e.g., Dogra & Parrey, 2022, Lamovšek, & Černe, 2023). In this study, R and other relevant command-based packages including statistical and computation techniques (see Aria & Cuccurullo, 2017; Csardi & Nepusz, 2006) were chosen for the co-occurrence network visualization since they allow greater flexibility in the analysis compared to other softwares. A keyword co-occurrence network illustrates the connections between these keywords through a network diagram (Huang et al., 2020). In this network, each node stands for a keyword. Node size depicts how frequently the keyword occurs, so that larger nodes signify higher occurrence of the keyword; connections between nodes show when keywords occur together, so that thicker connections signify more frequent co-occurrences of keywords. In addition, colours are used to represent different clusters of themes, where nodes and connections within each cluster help explain the range of topics covered and the relationships between them within that theme (see Dontu et al., 2021).

*Network centrality analysis:* The analyses performed to identify the most relevant themes is augmented by important network metrics centrality used in social network analysis (Zhang & Duo, 2017; Wasserman & Faust, 1994) calculated for the keyword co-occurrence: 1) degree centrality; 2) betweenness centrality; 3) and, closeness centrality. Degree centrality indicates the number of links between a keyword and other keywords and is a measure of local centrality. The greater the degree, the more central the keyword is in the network. Betweenness centrality quantifies the degree to which a keyword is situated along the shortest path between other keywords (Kadushin, 2012) and is a measure of global centrality. A greater betweenness indicates that the keyword is more significant in connecting other keywords. The closeness centrality of a keyword indicates its proximity to all other keywords in the network. More excellent proximity indicates that the keyword is more central and easily accessible from other keywords. By integrating these measures, it is possible to detect the overall structure of te newwork and the role of nodes within the co-occurrence network. Overall, these measures unveil the fundamental framework of the study domain by discerning the most impactful terms. When a term possesses a substantial centrality value, it connects various topics or ideas within the existing body of literature.

*Community detection (using different algorithms):* Within the co-occurrence network, community detection algorithms identify groups of closely related keywords. Based on the density of connections between keywords, the use of different algorithms, such as Louvain, Infomap, or Girvan-Newman, allowed to partition the network into distinct communities (Drago, 2018; Drago & Balzanella 2015,

Drago & Ricciuti 2017). The objective of the community detection analysis was to identify clusters of nodes that exhibit a higher degree of interconnectedness among themselves compared to the other network parts (Fortunato, 2010). In the scientific literature, communities often represent discrete topics or themes. Therefore, keyword communities provide insight into the main areas of research in the field by clustering keywords around common themes and topics. Network community finding (or detection) algorithms are still scantily exploited in bibliometric studies although they hold a huge analytical potential (Zupic & Čater, 2015) with in business and management research not being an exception (see Drago & Fortuna, 2023). In our research, diverse methodologies were employed to construct a data matrix, which was subsequently analyzed through multiple correspondence analysis (MCA). Within this matrix, columns represent the various community memberships identified through different algorithms (Drago, 2018). A clustering approach, utilizing the extracted dimensions, is employed to discern the final community structure. To this end, hierarchical clustering was conducted using the Euclidean distance and Ward method on the initial two MCA components. This approach effectively organized the observations into distinct groups, as supported by the silhouette criterion (Brock et al., 2008). This criterion aids in consistently interpreting and exploring the dendrogram, thereby facilitating the identification of distinct clusters within the dendrogram structure and assessing the adequacy of the obtained clusters in relation to the observed data structure. To determine the ideal number of clusters for cutting the dendrogram, a valuable validation approach was applied (Henning et al., 2015) (see Drago & Fortuna, 2023 for detailed information about the methodology).

By establishing consistency across various community detection algorithms used within the dataset, information extracted from the network can be maximized and the robustness and reliability of research outcomes enhanced. Indeed, employing various algorithms often yields disparate outcomes, potentially introducing bias into the community detection process (Leskovek et al., 2010). In this consensus approach, based on different algorithms, we were able to identify “robust” structures of data (i.e content) representing authentic theme patterns in the pandemic-induced remote work research field. The primary objective was to identify fundamental themes, developing patterns, and research areas within these communities, providing a comprehensive guide for researchers and presenting potential avenues for future research development.

*Ensemble analysis:* In the final step, an ensemble approach is used to integrate the findings from all analyses and provide an overview of the research landscape.

## 4. Results

### 4.1 Descriptive bibliometric analysis

The results of the descriptive and exploratory bibliometric analysis are reported in table 2, 3, 4, 5 and 6. According to the data, the number of scholarly publications about pandemic-related remote work has increased with an annual growth rate of 31.51%. We can observe that although the time frame is the period 2007-2023, the scientific production registered a substantial increase only from 2020, i.e. the year of the Covid-19 outbreak, when remote work became the prevailing way of working. In addition, the existence of documents before the covid-19 pandemic evidenced that remote work was already investigated in the contexts of other pandemics. However, empirical scientific production remained very limited, accounting for only 9 documents covering the period 2007-2015. The pattern registered in the year 2020 persisted in 2021 and 2022, with even more published articles. It is worth noting that only 80 articles have been reported for 2023 thus far since the query in Scopus was submitted at the beginning of February 2023. As a result, most publications related to that year were not included in the bibliometric analysis, although it can be assumed that this development will continue throughout the year and in the future. Overall, the data indicates the increased scholarly attention that remote work research is actively receiving, significantly triggered by the Covid-19 disease (table 3). Among the works, the large majority were articles (1486 out of 1821) followed by book chapters (109) and conference paper (100).

We identified the most productive authors and the top ten articles ranked by total citations (table 4 and 5). Table 5 lists the top 10 countries in terms of the number of articles, their frequencies (Freq) representing the proportion of total articles, the number of single-country publications (SCP), multi-country publications (MCP), and the ratio of MCP to total articles (MCP\_Ratio) for each country. The analysis shows that publications were centered in USA, United Kingdom, India, Italy, Germany, China, Spain, Netherlands, Canada and Portugal. The United States was in first place with 219 articles (18.45 percent of the total), followed by the United Kingdom with 94 articles (7.92 percent) and India with 92 articles (7.75 percent). China had the highest MCP\_Ratio (0.449), followed by the Netherlands and Great Britain. United States, the United Kingdom, and India conducted the most research on pandemic-induced remote work. In addition, the data indicates that China, the Netherlands, and the United Kingdom had the highest levels of international collaboration in this research field.

Regarding total citations (table 6), the United States leaded with 3,205, followed by the United Kingdom with 1,195 and Ireland with 564. Denmark rated first regarding average article citations with 60,4 per article, followed by Ireland with 37,6 and Singapore with 27,33. The table indicates that research on teleworking, productivity, and collaboration from the United States, the United

Kingdom, and Ireland received the maximum number of citations, indicating that it has substantially influenced the discipline. In addition, articles from Denmark, Ireland, and Singapore had the highest average number of citations per article, suggesting that these nations may have produced the most influential research in this field.

**Table 2. General information about data**

Timespan	2007 : 2023
Sources (Journals, Books, etc)	807
Documents	1821
Document Average Age	1.56
Average citations per doc	8.448
Average citations per year per doc	2.711
References	94685

Document Types	
article	1486
book	14
book chapter	109
conference paper	100
conference review	7
editorial	20
erratum	3
letter	5
note	21
review	56

Document contents	
Keywords Plus (ID)	2746
Author's Keywords (DE)	4469

Authors	
Authors	5574
Author Appearances	6175
Authors of single-authored docs	267

Authors collaboration	
Single-authored docs	285
Documents per Author	0.327
Co-Authors per Doc	3.39
International co-authorships %	26.03

Annual Scientific Production	
Year	Articles
2007	1
2008	2
2009	2
2011	1
2012	2
2015	1
2020	187
2021	615
2022	930
2023	80
Annual Percentage Growth Rate	31.50%

**Table 3: Most productive authors**

<b>Ranking</b>	<b>Authors</b>	<b>Articles</b>
1	Fernet, C.	6
2	Alipour, G.V.	5
3	Austin, S.	5
4	Gillet, N.	5
5	Huyghebaert-Zouaghi, T.	5
6	Kumar, N.	5
7	Morin, A.J.S.	5
8	Taras, V.	5
9	Alok, S.	4
10	Amsler, A.	4

**Table 4: Top ten manuscripts, as determined by their number of citations in Scopus**

<b>Ranking</b>	<b>Authors (year)</b>	<b>Title</b>	<b>Journal (DOI)</b>	<b>Total citations (Scopus)</b>
1	Kniffin et al. (2021)	COVID-19 and the workplace: Implications, issues, and insights for future research and action	American Psychologist (10.1037/amp0000716)	465
2	Dingel & Neiman (2020)	How many jobs can be done at home?	Journal of Public Economics (10.1016/j.jpubeco.2020.104235)	394
3	Wang, Liu & Parker (2021)	Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective	Applied Psychology (10.1111/apps.12290)	340
4	Adam-Prassl et al. (2020)	Inequality in the impact of the coronavirus shock: Evidence from real time surveys	Journal of Public Economics (10.1016/j.jpubeco.2020.104245)	331
5	Dé, Pandey & Pal (2020)	Impact of digital surge during Covid-19 pandemic: A viewpoint on research and practice	International Journal of Information Management (10.1016/j.ijinfomgt.2020.102171)	296
6	Kramer & Kramer (2020)	The potential impact of the Covid-19 pandemic on occupational status, work from home, and occupational mobility	Journal of Vocational Behavior (10.1016/j.jvb.2020.103442)	270
7	Waizenegger et al. (2020)	An affordance perspective of team collaboration and enforced working from home during COVID-19	European Journal of Information Systems (10.1080/0960085X.2020.1800417)	222
8	Del Boca et al. (2020)	Women's and men's work, housework and childcare, before and during COVID-19	Review of Economics of the Household (10.1007/s11150-020-09502-1)	219
9	Caligiuri et al. (2020)	International HRM insights for navigating the COVID-19 pandemic: Implications for future research and practice	Journal of International Business Studies (10.1057/s41267-020-00335-9)	205
10	Rudolph et al. (2021)	Pandemics: Implications for research and practice in industrial and organizational psychology	Industrial and Organizational Psychology (10.1017/iop.2020.48)	175

**Table 5: Distribution of analyzed documents by countries**

Corresponding Author's Countries	Country	Articles	Freq.	SCP (Single Country Publication)	MCP (Multiple Country Publication)	MCP_Ratio
1	USA	219	0.1845	180	39	0.178
2	United Kingdom	94	0.0792	64	30	0.319
3	India	92	0.0775	81	11	0.120
4	Italy	69	0.0581	49	20	0.290
5	Germany	56	0.0472	44	12	0.214
6	China	49	0.0413	27	22	0.449
7	Spain	37	0.0312	26	11	0.297
8	Netherlands	36	0.0303	21	15	0.417
9	Canada	35	0.0295	23	12	0.343
10	Portugal	35	0.0295	26	9	0.257

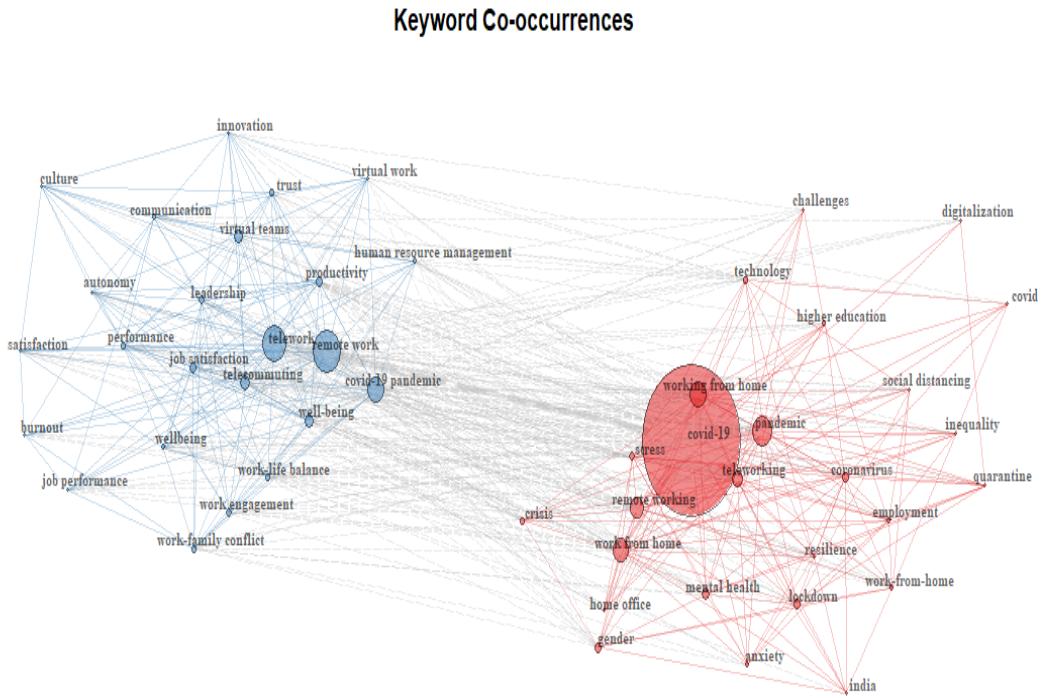
**Table 6: Geographical Distribution of analyzed documents by total citations**

Ranking	Country	Total citations	Average Article Citations
1	USA	3205	14.635
2	United Kingdom	1195	12.713
3	Ireland	564	37.600
4	India	563	6.120
5	Germany	548	9.786
6	Spain	540	14.595
7	Italy	506	7.333
8	Australia	402	12.182
9	Singapore	328	27.333
10	Denmark	302	60.400

#### 4.2 Co-occurrence keywords network analysis

Figure 1 shows the network of co-occurrences created by considered the first 50 keywords (i.e., keywords in title, index, defined by author(s)). The map enables the observation of the most central concepts within the various keyword networks. These are depicted by nodes (i.e., keywords) with significant centrality among other nodes. In the figure, points represent keywords, while their size corresponds to their frequency of occurrence. Keyword network were grouped into two main clusters. The blue cluster includes terms that are lexically linked to attitudinal and behavioural consequences of remote working, both at individual (i.e. telework) and collective level (i.e. virtual teams), including performance, job satisfaction, work engagement, work-life balance. Furthermore, the impacts of COVID-19 have led to the growing attention to the impact of remote working for workers and the challenges put to organizations in terms of HR practices, leadership, culture and innovation. The red cluster contains keywords related to the impacts of a disruptive event, i.e., the Covid-19 pandemic, on the individual psychological and health conditions of workers constrained to work from home (e.g., mental health, anxiety and stress) and some key social issues (e.g., gender roles, social inequality).

**Fig. 1: Network of keywords co-occurrences (first 50 keywords by centrality)**



In order to evaluate the different keywords centrality, table 7 reports the values of the three metrics that have been calculated for the first ten keywords: the network degree (or “Freeman degree”), the level of betweenesses and the level of closeness. These three measures of centrality offer different and complementary information about data. The Freeman degree can be interpreted as a measure of “local centrality”, whereas the level of betweenness allows to measure the “global centrality” (Freeman, 1979): the first index, measuring the number of links by each node, shows the capacity of some keywords (i.e., nodes in the network) to be most central for their network position but not the entire network. These keywords can be considered as active and relevant themes of research that nurtured the study of other conceptually-related themes over time. However, since this metric expresses a local centrality, it is not able to capture the capacity of a theme (i.e. keyword) to attract researchers from different sub-fields or disciplines, that, on the contrary, can be captured by a measure of global centrality (i.e., “the betweenness”).

Table 7 shows that the highest local centrality (i.e., Freeman Degree), is related to pandemic-related keywords, including “covid-19” and “pandemics” as well as keywords indicating the various forms of working at a distance from offices, such as “remote work”, “work from home” and “teleworking”.

**Table 7. Network metrics for node centrality**

Node centrality: Freeman degree

<b>Keyword</b>	<b>Degr</b>
covid-19	47
remote work	43
telework	41
pandemic	39
work from home	35
working from home	33
remote working	32
teleworking	30
well-being	30
productivity	30

Node centrality: betweenness

<b>Keyword</b>	<b>Betw</b>
trust	56.96408
teleworking	56.27813
performance	51.01749
pandemic	47.33412
telecommuting	39.70336
remote working	38.17707
covid-19 pandemic	37.90004
innovation	33.18865
work from home	32.93486
remote work	31.12015

Node centrality: closeness

<b>Keyword</b>	<b>Clos</b>
teleworking	0.01234568
performance	0.01219512
pandemic	0.01190476
remote working	0.01190476
covid-19 pandemic	0.01176471
work from home	0.01162791
stress	0.01162791
well-being	0.01162791
Human resource management	0.01162791
employment	0.01162791

Interestingly, we found two relevant keywords, i.e. “well-being” and “productivity” with high values of network degree. By considering all keywords together, it can be desumed a relevant research focus on the impact of pandemic-induced remote working on specific workers’ conditions, with well-being and productivity playing a primary role and being studied both separately and together in the recent remote work literature (Juchnowicz & Kinowska, 2021; Park et al., 2021; Straus et al., 2023; George et al., 2022). As designing work for employee well-being and productivity is among the key priorities of organizations worldwide, the Covid-19 pandemic justified a focus on the challenges put by remote work on maintaining adequate levels of workers’ productivity and quality of life and employment; indeed, both issues are expected to surge their importance in the post-covid era for both employees and their organizations (e.g., Wheatley et al., 2021; Saridakis et al., 2023).

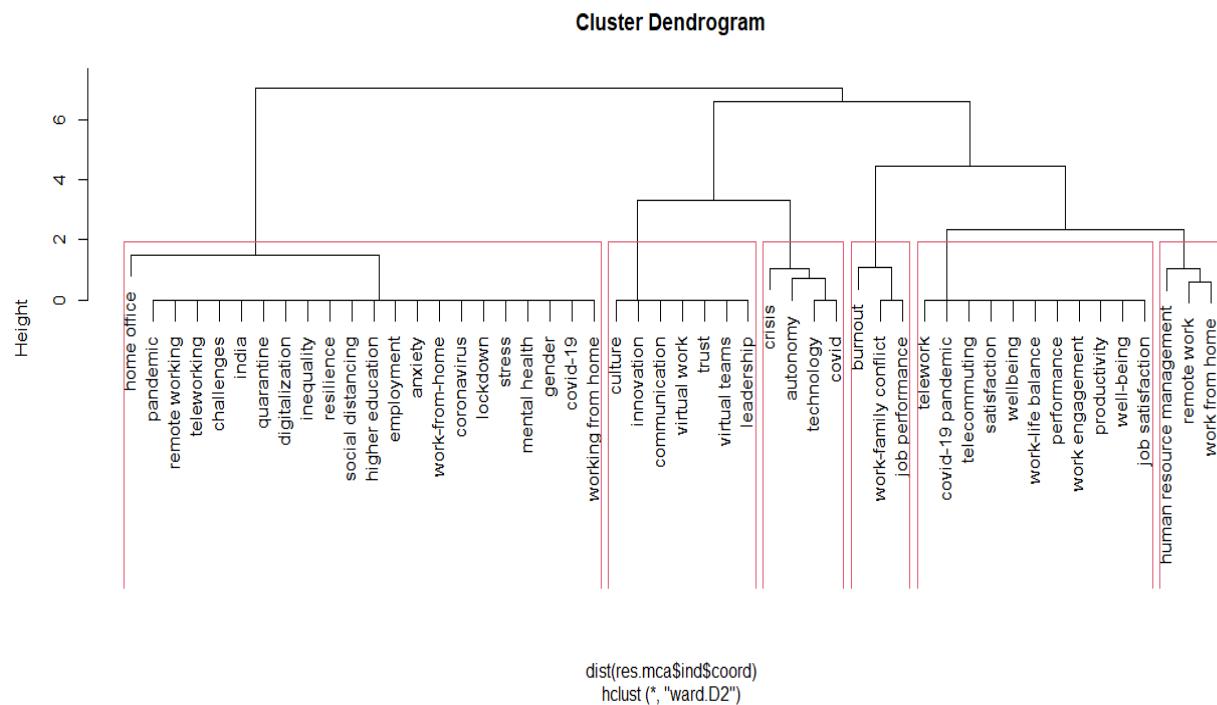
In the case of the betweenness, our analysis indicated the most central concepts on the network globally, including “trust”, “teleworking”, “performance” and “pandemic”. “Trust” was the keyword with the higher centrality in terms of betweenness. This result seems to suggest the relevance of understanding e.g. trust-based relationships between employees and their supervisors in the context of remote working, since remoteness and the lack of physical presence might create new challenges, such as reducing the effectiveness of traditional control mechanisms (Pianese et al., 2023; Cunha et al., 2024). The effects of pandemic-induced remote work on trust in organizations could be analyzed from different perspectives and through an interdisciplinary lens. For instance, they could be investigated in relation to individual workers (i.e., teleworkers) as well as to employees working together remotely (i.e., virtual teams); in addition, trusting relationships are a relevant topic for scholars from many disciplines, including organization studies, information systems, human resource management and psychology (e.g., Guthrie, 1997; Dambrin, 2004; Sewell & Taskin, 2015; Stavrova et al., 2023). The focus on “performance” and “innovation” is also important and allows us to observe a specific interest in the literature on issues such as how companies could benefit from pandemic-induced remote work for enhancing employee and organizational performance (Chatterjee et al., 2022; Kifor et al., 2022) or change the future workplace by enhancing a culture of innovation (Dash, 2022).

Interestingly, we noticed that more keywords explicitly indicating remote working (e.g., “teleworking”, “work from home”) and the pandemic (e.g., “pandemic”, “covid-19”) which were central at local level, continue to be pivotal for remote work research also at global level. Since the keywords “covid-19”, “remote work”, “telework”, “pandemic”, and “work from home” showed the highest centrality indexes across all three measures, this suggests that they had a substantial impact on facilitating the interconnectivity within the research network within this particular area. The substantial usage of terms such as “covid-19” and “pandemic” suggests a considerable focus on the emergence of teleworking and remote work practices during the Covid-19 crisis, as businesses worldwide were compelled to adjust to novel working circumstances. The closeness index also shows that as companies sought to maintain or improve their performance in a remote work environment, employees’ well-being and productivity were significant focus areas and, into this direction, human resource management practices had to be adapted to the new circumstances and needs of a remote or hybrid workforce (Errichiello & Pianese, 2021; Hamouche, 2023). In summary, the centrality indexes of the co-occurring terms indicated how the global economic crisis had accelerated the transition toward remote work and brought new challenges and opportunities to the forefront, thereby driving research and discussion in this area.

#### 4.3 Ensemble Community Detection (community detection & ensemble analysis)

By using and combining different techniques we could identify different communities and apply an ensemble approach to obtain a single solution and detect the final communities. From the ensemble community detection performed, we could extract the relevant concepts from each community. All these concepts indicate some relevant topics in the analyzed corpus of research and can be interpreted as “semantic cores” that are helpful to represent and synthesize the entire literature (Drago et al. 2023). This means that each community was valuable to identify some meanings and contents that were crucial for understanding the intellectual structure of the pandemic-induced remote work research field. The outcomes of the ensemble community detection were visualized on a dendrogram, illustrating the distinct clusters of analyzed keywords (figure 2).

**Figure 2.** Hierarchical clustering from the communities’ memberships



We observed the main 6 clusters and cut the dendrogram in that way. The different communities represented maximally related topics and main concepts investigated in the literature. These clusters were summarized in table 8, capturing each community's label, a list of related keywords and illustrative works in the literature.

**Table 8: Pandemic-induced remote work research: an overview of communities, related keywords and illustrative publications**

Community	Keywords	Illustrative publication
1. Human Resource Management and Remote Work	human resource management, remote work, work from home	<ul style="list-style-type: none"> <li>“Impact of HRM practices on employee productivity in times of COVID-19 pandemic” (Aggarwal et al., 2023);</li> <li>“Implementation of human resource management in the adaptation period for new habits” (AM et al., 2020).</li> </ul>
2. Individual work-related outcomes of the remote work experience	covid-19 pandemic, telework, telecommuting, satisfaction, job satisfaction, performance, productivity, work engagement, well-being, wellbeing, work-life balance.	<ul style="list-style-type: none"> <li>“Work from home: Measuring satisfaction between work-life balance and work stress during the COVID-19 pandemic in Indonesia” (Irawanto et al., 2021).</li> <li>“The potential impact of the COVID-19 pandemic on work from home and employee productivity” (Farooq &amp; Sultana, 2022).</li> </ul>
3. Remote work, work-life stress and performance	burnout, work-family conflict, job performance.	<ul style="list-style-type: none"> <li>“Telework and work-family conflict during COVID-19 lockdown in Portugal: The influence of job-related factors” (Andrade &amp; Petiz Lousã, 2021).</li> </ul>
4. Technology-driven remote work practices in times of crisis	covid, crisis, autonomy, technology.	<ul style="list-style-type: none"> <li>“Responsible autonomy: The interplay of autonomy, control and trust for knowledge professionals working remotely during COVID-19” (Abgeller et al., 2022)</li> </ul>
5. Leadership and virtual team dynamics	virtual work, virtual teams, leadership, communication, trust, culture, innovation.	<ul style="list-style-type: none"> <li>“Reimagining e-leadership for reconfigured virtual teams due to Covid-19” (Chamakiotis et al., 2021)</li> <li>“Contrasting traditional and virtual teams within the context of COVID-19 pandemic: from team culture towards objectives achievement” (Stratone et al., 2022).</li> </ul>
6. Responses and Impacts of Covid-19 induced Remote Work for Economy, Society, and People	home-office, remote working, teleworking, work-from-home, working from home, pandemic, covid-19, coronavirus, lockdown, social distancing, quarantine, challenges, digitalization, resilience, employment, mental health, stress, anxiety, inequality, gender, higher education, India.	<ul style="list-style-type: none"> <li>“Resilience through digitalisation: How individual and organisational resources affect public employees working from home during the COVID-19 pandemic” (Fischer et al., 2023)</li> <li>“COVID-19 and remote work inequality: Evidence from South Korea” (Ha, 2022).</li> </ul>

## 5. Discussion and implications for future research on remote work

### 5.1 The intellectual structure of pandemic-induced remote work research

*Community 1: Human Resource Management and Remote Work*

In this cluster the keywords that co-occurred frequently were: “human resource management”, “remote work” and “work from home”. These keywords indicate that a certain amount of research explored a latent theme that can be labelled “remote workforce human resource management”. It captures one of the major challenge for managers and Human Resource Management (HRM) professionals brought about by the Covid-19 pandemic: coping with drastically altered work conditions deriving to the abrupt shift to remote working. HRM is a field of management focused on how to attract, hire, retain, train, motivate and maintain employees (DeCenzo et al., 2016:1). The abrupt shift to remote working made urgent re-design organizational systems, policies and procedures and created serious challenges for managers and HRM practitioners called to develop new skills and expertise to properly support employees working from home (Aitken-Fox et al., 2020; Hamouche, 2023). The majority of studies in this clusters looked at how HRM was challenged by the transition to remote working during the pandemic and examined those specific HRM areas requiring new policies, practices and expertise, including communication, supervision, productivity, performance management, support, health and well-being (e.g., Aggarwal et al., 2023; Carnevale & Hatak, 2020; Przytuła et al., 2020). In this context, research within this community underscores the importance for managers and HRM practitioners to recognize that remote working necessitates:

- i. provision of employees with technological resources to facilitate communication with their managers and peers, along with ensuring adequate infrastructures and other resources for working from home (Hamouche, 2023).
- ii. to identify specific training needs for employees, notably in terms of digital skills (Adekoya et al., 2020). Training was also crucial to help managers to cope with a remote workforce (Gong et al., 2023) so that they were able to foster collaboration and communication and support team members, addressing challenges associated with teamwork, coordination, and cooperation in a virtual work environment.
- iii. to develop new strategies to maintain and improve productivity, including establishing clear expectations, objectives, and performance metrics, and revise performance management practices aligning them to the new reality, e.g., through switching to a results- based system and cultivating trust-based relations (e.g., AM et al., 2020; Saurombe et al., 2022).
- iv. supporting employees in working remotely involves preventing or mitigating various potential side effects that can negatively impact work-life balance, mental health, and well-being. These may include social and professional isolation, communication difficulties with managers and peers, family conflicts due to blurred boundaries between work and personal life, and various forms of stress, including that stemming from the use of information and communication technologies (ICTs), i.e. “technostress” (Kraus et al., 2023).

- v. fostering the development of a new organizational culture able to sustain the shift to flexible and hybrid work arrangements while maintaining cohesion and engagement (AM et al., 2020; Raghuram, 2021).

*Community 2: Individual work-related outcomes of the remote work experience*

The second group is mainly composed of terms associated with specific individual work-related outcomes (i.e., satisfaction, productivity, performance, work engagement, work-life balance and well-being) affected by the new workplace arrangement and the experience of remote work and specifically of work from home during the Covid-19 pandemic. Indeed, this community consists of the co-occurring keywords “Covid-19 pandemic”, “telework”, “telecommuting”, “satisfaction”, “job satisfaction”, “productivity”, “performance”, “work engagement”, “work-life balance” and “well-being”.

Researchers in this cluster focused on evaluating the experience of working from home and its influence on one or more of the above individual-level outcomes (e.g., Orešković et al., 2023). Some studies were interested in identifying specific predicting factors in remote work environments compared to traditional ones (e.g., Yu & Wu, 2021a; Kakkar et al., 2023).

The association of a specific working model (i.e., work from home or work remotely) with finding satisfaction in work is of crucial importance since this job attitude is a key aspect of individual life and organizational effectiveness and it is directly linked to individual wellbeing (Judge & Church, 2000). As pointed out by Dogra & Priyashantha (2023), significant evidence exists about the positive effects of Covid-19 induced telework and related conditions - such as job characteristics - on job satisfaction (e.g., Irawanto et al., 2021).

The unexpected shift to remote work caused by the Covid-19 disease put on the foreground the importance to understand how new working conditions often associated to this new working model, including increased distractions, work-home interferences, isolation and inadequate communication, would affect individual productivity (e.g., Farooq & Sultana, 2022), performance (e.g., Kumar et al., 2021), engagement (e.g., Galanti et al., 2021) and well-being (e.g., Prasad et al., 2020) and to identify potential mitigating factors (e.g., Wang et al., 2021; Straus et al., 2023). Anakpo et al. (2023) showed that most research reported that work from home during the pandemic had a positive impact on employee productivity and performance while very few studies reported no influence or a negative influence, depending on several factors, including the nature of work and tasks, the employee's gender, position, expertise and IT knowledge, the sector and the home environment.

Although most quantitative studies found that work from home during the pandemic positively impact work engagement (Dogra & Priyashantha, 2023), recent qualitative research documents the

detrimental effects of remote work for employee engagement during the pandemic due to stress factors and the depletion of social and personal resources (Adisa et al., 2023). In addition, it seems that rather than differences in terms of the intensity of work engagement, remote workers and on-site workers differed in terms of the most influential determinants (Wontorczyk & Rożnowski, 2022).

The sudden shift to remote work put scholars for shedding light on the paradoxes, tensions and challenges put by the Covid-19 disease to the equilibrium between work demands and personal life (e.g., Donoso et al., 2021; Palumbo, 2020). Indeed, many factors and new work conditions, including the blurring boundaries between work and personal life, work intensification and the difficulty to switch off from work along with the need to juggle work responsibilities with caregiving duties, contributed to challenge the traditional image of remote working as a desirable flexible work arrangement (Shirmohammadi & Beigi, 2022b). Inconsistent findings emerged about the effect of telework on work-life balance (Elbaz et al., 2023). These heterogeneous results pointed at the need of a systematic investigation of the role of antecedents as or “stressors”, e.g., work intensity, technostress and professional isolation, or “resources”, e.g., supervisor and family members’ support and job autonomy (Shirmohammadi & Beigi, 2022a) to identify interventions can help improve it.

Finally, extant literature demonstrated that the relationship between teleworking and well-being was variable and dependent on a number of factors, notably job characteristics (e.g., autonomy, social support) but also the extent of telework, ICT usage, personality traits and organizational support (Beckel & Fisher, 2022). As a result, research also looked at potential solutions to improve employee well-being and mitigating the potential detrimental effects of a variety of individual, social and work-related conditions (Aleem et al., 2023).

### *Community 3: Remote work, work-life stress and performance*

Keywords on this cluster include the terms “burnout”, “work-family conflict”, and “job performance”. This community has been named “Remote work, work-life stress and performance” since the keywords co-occurrence highlights the intricate connections between the domains of work-family interface, occupational health and professional effectiveness of teleworkers. The accrued interaction between family life and work responsibilities induced by the pandemic contributed to generate workers’ difficulties in balancing work demands with family responsibilities with potential conflicts on both directions, i.e., work-to-family conflict (WFC) and family-to-work conflict (FWC) (Vitoria et al., 2022; Xu et al., 2022). Moreover, since several factors related to working at home intensified prolonged exposure to work-related stressors faced by individuals, Covid-19 induced telework contributed to burnout, i.e., a chronic state of physical and emotional exhaustion that is often

associated to cynism, detachment ad reduced feelings of efficacy that may negatively affect job performance (Hayes et al., 2021). Studies in this cluster looked at the complex relationship between telework, work-family conflict and burnout by investigating how work-family conflict affected burnout in remote work environments (e.g., Barriga Medina et al., 2021) and specific factors including individual preferences, job characteristics, family responsibilities and work conditions, contributed to enhance or mitigate work-family conflict and work-related burnout (e.g., Andrade & Petiz Lousã, 2021; Allgood et al., 2022). This community also includes occupational health scholars interested in the relationships between work-related stressors, work-family conflict, and job performance with the goal of developing intervention strategies balancing employee well-being and organizational effectiveness (e.g., Wang et al., 2021).

#### *Community 4: Technology-driven remote work practices in times of crisis*

This fourth group of keywords composing this cluster includes the terms “crisis”, “technology”, “autonomy” and “Covid”.

This community's implicit concept can be called “Technology-driven remote work practices in times of crisis”. It emphasizes the adoption of Information and Communication Technologies (ICTs ) as a covid-19-induced crisis response strategy: the focus is on their role in facilitating the shift to remote work during the pandemic as well as on its implications for employee's autonomy.

The covid-19 pandemic highlighted the central role of Information Technology (IT) in various aspects, encompassing behavioral, temporal, societal, and organizational dimensions (Agerfalk et al., 2020). Particularly, IT played a crucial role in helping organizations adapt to the “new normal” and to set-up remote work practices (Dwivedi et al., 2020). Research in this community looked at the positive implications of using technology during the pandemic, documenting how emails, apps, video conferencing platforms and cloud-based applications allowed business interactions and digital communication, facilitated real-time collaboration in virtual environments and provided remote access to resources, data and applications (e.g., Mitchell, 2023). However, studies in this cluster also emphasized the exceptional circumstances that constrained organizations to abrupt shift to remote working without enough planning and preparation and the consequent stress for employees and employers challenges to adapt to them (Shao et al., 2021). Relevant technology-related issues for employers include, among others, expenditure on home technology and connectivity, investments in ICT training for employees in order to facilitate their work and digital communication, the re-design of supervision practices and ICT-mediated surveillance (Westbrook, 2023). Scholars in this community also looked at the interplay of technology and covid-induced remote working from the employee perspective. In this regard, although digital technologies allowed employees to maintain

virtual interaction, communicate and collaborate with their managers and peers, literature also investigated the dark sides of technology-enabled remote working during the pandemic putting, such as workaholism and techno-stress (Spagnoli et al., 2020). Notably, although most studies pointed at autonomy as a main advantage of covid-19 induced remote working (e.g., Dubey & Tripathi, 2020) some scholars also emphasized how the enforced work-from-home during the pandemic exacerbated pre-existing tensions inherent to the so-called “autonomy paradox” so that remote workers who experienced enhanced autonomy and discretion over their work also reported work intensification and lower work-life balance (Abgeller et al., 2022).

#### *Community 5: Leadership and virtual team dynamics*

In this cluster the keywords “virtual work”, “virtual teams”, “leadership”, “communication”, “trust”, “culture” and “innovation” co-occur frequently. These keywords indicate that there was an amount of literature during Covid-19 pandemic focused on the interactions occurring within virtual teams, i.e., groups of individuals interacting with each other and collaborating towards a common goal, and the challenges put to leaders to manage them. “Leadership and virtual team dynamics” is the underpinning concept of this research community, encompassing various aspects, also related to each other, of how team members interact and work together, ultimately affecting their performance.

Research in this community looked at antecedents, mechanisms and behavioural consequences of:

- i. *Communication*: the Covid-19 pandemic has forced many team members to abruptly shift to virtual interactions and communication. Research in this cluster tried to understand changes in the nature of both horizontal communication among team members (e.g., Wu et al., 2021) and vertical communication with their managers (e.g., Vătămănescu et al., 2022); identify organizational factors for mitigating the obstacles to interactions put by the spatio-temporal dispersion (e.g., Maurer et al., 2022); suggest new leadership communication practices and tools to better inform virtual workers (Newman & Ford, 2021);
- ii. *Trust*: research produced during the Covid-19 pandemic on this issue can be considered as a part of a large corpus of existing literature traditionally focused on the nature and dynamics of trust in virtual teams, where it emerged as more important in comparison to traditional face-to-face teams (Breuer et al., 2016). Pre-covid research on trust largely focused on trust formation and maintenance although it emerged as crucial for team cohesion, conflict resolutions, open communication and collaboration (Hacker et al., 2019). In the new context, however, the focus would be on establishing trust rather than maintaining it (Feitosa & Salas, 2021). Moreover, within this community, trust in virtual teams has been largely examined in

- relation to digital leadership, i.e., e-leader's characteristics and behaviour, as a key antecedent (e.g., Chamakiotis et al., 2021).
- iii. *Leadership*: pandemic-induced work has contributed to what is considered as one of the most crucial themes in research on virtual teams and where many questions were still waiting for an answer (Liao, 2017). Scholars have pointed out that since virtual teams in the Covid-19 context were characterized by distinct features, like their enforced and more hybrid, home-based more local nature, they put new challenges to traditional leaders in their new role as e-leaders (Chamakiotis et al., 2021; Contreras et al., 2020). While some issues, that already played a dominant role in the pre-Covid-19 literature on virtual teams, notably the role of e-leadership for effective communication, trust and innovation, required to be specifically addressed in the new context, new themes that were previously neglected become prominent for Covid-19 virtual team e-leaders, including well-being and work-life boundaries (Chamakiotis et al., 2021; Chai & Park, 2022; Chaudhary et al., 2022).
  - iv. *Culture*: this dimension has been largely addressed in this cluster in relation to the role of “organizational culture” (e.g, Mitchell, 2023) or “team culture” (e.g, Stratone et al., 2022) in the rapid adjustments to virtual work associated with the pandemic. The concept of the “new normal” has significant implications for company values and organizational culture, which have been profoundly impacted by the pandemic and the sudden transition to remote work (Raghuram, 2021). Indeed, workplace culture has to be rebuilt to facilitate the transition to virtual work environments and leverage technologies to sustain social interactions and communication among employees working remotely (Mitchell, 2023). Moreover, team culture and leader-team communication in the context of the COVID-19 pandemic revealed crucial for virtual team performance and satisfaction with teamwork (Stratone et al., 2022; Vătămănescu et al., 2022).

#### *Community 6: Responses and Impacts of Covid-19 induced Remote Work for Economy, Society, and People*

The last community includes the highest number of co-occurring keywords. These can be conveniently grouped together to identify five sub-groups: 1) terms used to describe the pandemic disease and immediate institutional measures adopted worldwide to contrast the diffusion of the epidemic, i.e., “pandemic”, “coronavirus”, “covid-19”, “lockdown”, “social distancing” and “quarantine”; 2) terms indicating the rapid shift to remote work induced by the covid-19 crisis and the urgency to implement the above mentioned measures, i.e., “home office”, “remote working”, “work-from-home”, and “teleworking”; 3) terms referring to responses and effects of the covid-19-induced remote working at

socio-economic or organizational level, i.e., “challenges”, “resilience”, “digitalization”, “employment”, “inequality”; 4) terms indicating the effects of remote working on workers’ occupational health and specifically related to the psychological sphere, i.e., “mental health”, “stress”, “anxiety”; 5) specific contexts where the previous themes became particularly crucial and were highly investigated, i.e., “gender”, “higher education” and “India”. Coherently, this research community’s implicit notion is titled “Responses and Impacts of Covid-19 induced Remote Work for Economy, Society, and People”. Research in this cluster focused on understanding the challenges faced by organizations during the pandemic, particularly in relation to measures such as quarantine, social distancing, and lockdowns along with the resulting shift towards remote or home-based working (Arunprasad et al., 2022; Franken et al., 2021), as well as exploring resilience strategies employed at company level to cope with these challenges, such as digitalization (e.g., Fischer et al., 2023).

Digitalization, in particular, was highly investigated in relation to pandemic-induced remote working: literature looked at various aspects of virtual work, such as connectivity, cybersecurity and access to digital tools and platforms and at both bright and dark side of technology use during remote working amid the COVID-19 pandemic (e.g., Amankwah-Amoah et al., 2021; Singh et al., 2022). In addition, some scholars considered the implications of digitalization for the future of work, notably the transition to digital workplaces (e.g., Kraus et al., 2023) and the expected surge of hybrid work models (e.g., Yang et al., 2021).

Research in this broad community analyzed the effects of the pandemic on employment patterns, including shifts towards remote work and the extent to which it has been adopted by different sectors and occupations and related public policies (e.g., Brynjolfsson et al., 2020; Gallacher & Hossain, 2020).

Covid-19-induced remote work has accelerated digitalization, and together, they have raised new questions and additional challenges in relation to various forms of inequalities that have been exacerbated throughout the pandemic (Ha, 2022; Nwosu et al., 2022). First, disparities in the access to remote work opportunities across occupations, industries, employer policies and geographical areas (Robinson et al., 2020; Irlacher & Koch, 2021; Nwosu et al., 2022). Extant research documented that women have been disproportionately affected by the shift to remote work, especially when charged of caregiving responsibilities and this, in turn, has exacerbated the gender gap in terms of labour participation, income and career development opportunities (Arntz et al., 2020; Bolade-Ogunfodun et al., 2022). Broadly speaking, some categories of workers, including those with lower levels of education and digital skills, in lower-wage, employed in service in manual labour activities, living in rural or peripheral areas or belonging to marginalized communities, showed higher levels of

vulnerability since they faced more obstacles to access to the technology and remote work options (Irlacher & Koch, 2021; Codagnone & Savona, 2023).

A group of studies focused on the implications of home-based working on occupational health, and in particular on the risks induced by this new mode of working on the psychological conditions of workers and related mental health supportive initiatives to mitigate the negative effects induced by working remotely, notably stress and anxiety (Bouchard & Meunier, 2023).

Gender issues have gained since the Covid-19 pandemic and have been investigated in relation to many topics, such as accrued challenges to achieve work-life balance, impacts on caregiving responsibilities and long-term implications for gender equality (e.g., Arntz et al., 2020; Feng & Savani, 2020). In addition, with the closure of schools and universities to curb the spread of the virus, higher education institutions quickly transitioned to remote learning. This transition underscored the crucial role of technology in education and prompted numerous inquiries regarding the efficacy of online teaching approaches and their impact on the experiences, performance, health, and well-being of students, faculty, and staff (Arora & Chauhan, 2021; Selvanathan et al., 2023). Finally, some geographical areas become privileged contexts of investigation since the Covid-19 induced work from home, notably the Global South and developing countries. India, in particular, was relevant especially due to its population density in urban areas, high pressures to healthcare infrastructure, and significant economic challenges it witnessed due to the pandemic. As a result, researchers investigated various issues related to remote work and home-based working in this context, including changes in work practices (Mukherjee & Narang, 2023), higher education (Mishra et al., 2020) and gender disparities (Islam, 2021).

## **5.2 Future research avenues – an integrated approach**

In this section, we proposed an integrated framework for future research on remote work through a critical evaluation and discussion of key findings based on:

- i. the bibliometric analysis carried on in this study, that allows to identify potential conceptual linkages among emerging weakly connected or disjointed nodes, i.e., keywords belonging to different communities;
- ii. recently published influential articles, including literature reviews, on remote work or specific remote work-related issues, that can be also particularly valuable to enrich our understanding about specific topic or issues within the six detected communities. We develop the research agenda starting from the six core communities identified in this study along with evaluating potential areas of overlap.

### *5.2.1 Future research about Human Resource Management and Remote Work (community 1)*

The abrupt Covid-19-induced shift to remote work generated a compelling need for HR managers and professionals to rapidly adapt their practices to the new organizational reality. As a result, most research in this community has a prescriptive nature and only provides preliminary evidence about how organizations actually responded to the crisis through strategic and operational changes to HR practices (e.g., Azizi et al., 2021). Future studies should systematically document the responses adopted by organizations, and especially HR managers, to sustain the effective implementation of remote work since the Covid-19 outbreak, how they actually modified existing practices to the new scenario and the extent they resulted effective from an employee perspective (e.g., Misra et al., 2023). We propose that future scholars delve deeper into the shifts occurring within both strategic HRM practices and specific HRM functions (Hamouche, 2023). This body of knowledge needs a greater understanding of significant differences between organizations that already adopted remote work arrangements and those with no previous experience and how the new strategic changes actually altered organizational routines in leading to a new stable order embedded in a digital culture that was retained after the pandemic.

Beyond exploiting specific themes within this research community, our suggestions related to future research directions also concern the potential linkages with other detected communities. In particular, evidence-based strategic and operational guidelines for HR managers and practitioners can be elaborated based on the huge amount of empirical employee-related remote work research carried on since the Covid-19 outbreak (notably research communities 2, 3, 4 and 6). For instance, based on the personal experience of remote workers during the pandemic, Shirmohammadi et al (2022) derived potential lessons for HR management in order to sustain work-life balance. Similar research goals were found for other individual-level effects, such as employee productivity, wellbeing and work engagement (e.g., Adisa et al., 2023; George et al., 2022). Future research could follow this line of empirical investigation through looking at other less investigated individual-level effects. In addition, further exploration is needed to document how specific HR interventions and new policies introduced throughout the Covid-19 pandemic produced positive outcomes at personal levels like work engagement or allowed to mitigate the detrimental factors of forced home-based work, such as isolation, work-family conflicts and technostress. Additional studies are also required at the crossroads of research communities 1 and 4. For instance, scholars could look at how the adaptation of HRM in the crisis context of Covid-19 fostered the development of new managerial capabilities and leadership skills for managing remote workers considering that they are valuable to deal with future potential crises (e.g., Dirani et al., 2020). Future research could also understand how those new areas of knowledge and competence would be leveraged in the post-covid era for managing hybrid working models and distributed teams (e.g., Verma et al., 2023).

### *5.2.2 Future research about employees' telework experience and individual outcomes in the work and family domains (community 2, 3 and 4)*

Our study exhibits that research included in the community 2 mainly adopted a quantitative survey-based research design and a variance-based approach to investigate the relationships between remote working during the Covid-19 pandemic and individual-level outcomes. However, in order to overcome heterogenous results and develop effective interventions, we suggest that future research should enrich the existing body of knowledge through more qualitative research and process lens: by shifting the focus from the outcomes to the dynamics of teleworking, we recommend to look at the multi-faced experience of workers' since they were abruptly forced to work from home, often on a full-time basis. Little research so far has explored the processes of employees' adjustment to high-intensity remote working during the pandemic, documenting the specific challenges they faced, the resources they exploited and the coping strategies they adopted to successfully manage the crisis and the Covid-19 induced transition to home-based working (e.g., Dhanpat et al., 2022). For instance, phenomena such as "the Great Resignation" , silent "quit quitting" from jobs and the rising expectations for flexibility expressed by employees, all underscore the importance of understanding whether returning to the office led to a decline in employee work engagement and satisfaction with work and life. In a similar vein, further studies are required to investigate the process of employees' re-adaptation to the post-covid stage, when full-time based remote work has been mostly replaced by hybrid work arrangements (e.g., Pandita et al., 2024). For instance, future research could look at how boundary management strategies have been changed and adapted to the different phases of the pandemic and the post-pandemic period to preserve high work-life balance and job satisfaction (e.g., Adisa et al., 2022). Moving towards an organizational level of analysis, longitudinal research design are recommended to better understand the long-term effects of remote working on businesses' productivity and performance rather than workers' ones, also considering variations across countries, industries or activities (e.g., Monteiro et al., 2021).

Potential directions for future research could be traced by considering interrelations with other research communities emerged through the bibliometric analysis. In particular, cluster 3 and 4 respectively pointed out at two key domains, i.e., work-family conflict and technology, that are pivotal for the individual-level effects investigated in cluster 2. In detail, work-family conflict has been often studied as a form of work-life balance characterized by negative effects flowing from the work domain to the family domain. Future research could examine how a variety of work and nonwork interactions generate both positive and negative effects, i.e., work family-conflict and work-family enrichment in both directions, and how, these differently affect the work-life balance and well being

of onsite and remote workers considering job characteristics, telework intensity, working and family conditions (Huyghebaert-Zouaghi et al., 2022). Future research should also consider focusing on how the adoption of digital technologies - through tecnostress - negatively affects employee job performance, work engagement and well-being, and identify mitigating factors (e.g., Wang et al., 2023). In a similar vein, it would be of interest to investigate how employees manage digital interactions to avoid intrusive control (e.g., Cunha et al., 2023), maintain work engagement and access valuable resource for securing productivity, performance and well-being (e.g., Abelsen et al. 2023). Valuable links for future investigations can be created at the intersection of one or more of community 2, 3 and 4 with community 5 or 6. Notably, positioning within the overlap of community 2, 3 and 5, future studies could examine how specific leadership styles, e.g., a work-life supportive leadership (Kossek et al., 2023), and managerial approaches (e.g., Buick et al., 2024) able to reduce work-family conflict contribute to producing positive effects at individual level for remote employees. Finally, several intersections across communities 2, 3 and 6 have been already found in available research on Covid-19 induced work. In their systematic literature review on remote work and the Covid-19 pandemic, Aleem et al (2023) exploited LDA topic modelling to identify a specific topic within the employee-related research focused on how Covid-19-induced remote work impacts the mental health (cluster 6) and well-being (cluster 1) of the employees and potential strategies that can be adopted to mitigate unwanted conditions of burnout (cluster 3), stress or anxiety (cluster 6). As emerged from Dogra & Priyashantha (2023) a large amount of studies conducted on specific employee work-related outcomes of telework (cluster 2), such as job productivity and job satisfaction (Feng & Savani, 2020) or work-life balance (González Ramos & García-de-Diego, 2022) have been examined in relation to gender. Similarly, most research focused on the work-life interface adopted a gender perspective (cluster 3), as evidenced by the emergent topic “family life and gender” identified by Aleem et al. (2023).

### *5.2.3 Future research about leadership and management of remote working (community 5)*

Studies in community 5 mainly adopted a team perspective to study remote work, since it is the only cluster including the keywords “virtual teams”. In suggesting future research directions, it would be valuable to extend the boundaries of this community through a broader and comprehensive focus on the role of managers and they expectations, attitudes and behaviours towards remote and hybrid work models also considering the effects produced at individual level (i.e., a potential intersection with community 1). In fact, beyond looking at still underresearched aspects of leaders’ characteristics, behaviours and leadership styles, the we recommend to look at the various facets of their decision-making processes and remote work management practices. On the one hand, the Covid-19 pandemic

contributed to advance crisis leadership research (Balasubramanian & Fernandes, 2022) and put on the foreground the relevance of some leadership styles, such as transformational and charismatic, that are particularly valuable in crisis context (Wu et al., 2021b). On the other hand, the new work organization fostered a research interest in the role of inclusive leadership behaviours (e.g., Nguyen, & Tsang, 2023). Future research could delve into the intersection of crisis situations, such as the pandemic, and the imperative of effectively managing a remote workforce, which present unprecedented challenges to leaders. For instance, scholars should investigate how leaders responded to this unforeseen scenario by adjusting their inclusive behaviour (Beijer et al., 2024). Moreover, it would be valuable to understand how these exceptional circumstances facilitated the emergence of new leadership competencies and to what extent they continue to hold value even outside of crisis contexts (Cogliser et al., 2023; Torres & Orhan, 2023). Broadly speaking, it would be essential to advance existing body of knowledge about the role that managers must play in remote and hybrid work arrangements (Leonardi et al., 2024) by examining their strategies and practices to facilitate open communication, promote a culture of trust, secure psychological safety as well as sustain individual creativity and innovation at both individual and team level (e.g., Tønnessen, 2023). Finally, promising avenues for research at the intersection of community 5 and 6 related, among others, to the interplay of leadership and gender. In this respect, it would be interesting, for instance, to explore the role of leader gender in influencing the attitudes and responses of remote workers (Eichenauer et al., 2022). Future scholars could also look at differences in how men and women leaders are affected by emotions to understand if these influence virtual leadership efficacy (Shen et al., 2023). Finally, future studies could explore to what extend remote work contribute to reinforcing common stereotypes about women (Tremmel & Wahl, 2023) or, on the contrary, sustain the empowerment of female leaders (Mayer & Vanderheiden, 2023).

#### *5.2.4 Future research about organizational challenges and socioeconomic and psychological Impacts of Remote Work in the post-covid era (community 6)*

Pandemic-induced remote work has brought many challenges for organizations and extant research has contributed to significantly advancing the existing body of knowledge about key issues that were already relevant before the pandemic disease, including ensuring productivity and performance, managing work-life balance, overcoming technological barriers and providing employees with adequate support and resources. On the one hand, researchers should further scrutinize criticalities and challenges associated to the above issues by addressing related dilemmas, such as that related to performance (Ficapal-Cusí et al., 2023), or tensions and trade-offs, like those between autonomy and control (Cunha et al., 2024), or between high productivity and wellbeing (Straus et al., 2023), in a

changed scenario in which spatio-temporal flexibility has become the new normal. On the other hand, the Covid-19 pandemic has put on the foreground new under-researched challenges notably: ensuring that remote work arrangements comply with law and regulations (Smite et al., 2023); addressing cybersecurity and privacy concerns to protect organizational data and ensure compliance with privacy regulations (Suomi & Somerkoski, 2023); and, fostering a remote work culture (Müller et al., 2023). Indeed, these areas require the set up of new strategies and policies to effectively manage organizational change and adaptation and build organizational resilience and adaptability in the face of future disruptions.

In the post-COVID era, digitalization continues to play a critical role in facilitating remote work. However, next to security risks and legal and regulatory requirements, several challenges require further investigation, including: the digital divide and digital skills gap, since not all employees could have equal access to technology and infrastructures needed for remote work neither adequate proficiency in digital tools and technologies for remote communication and collaboration (Codagnone & Savona, 2023); the digital fatigue and digital overload, deriving from constant exposure to digital devices and platforms and the proliferation of digital tools and communication channels in remote work environments (Leonardi, 2021; Wang et al., 2023). However, it is worthwhile that future research carefully examines how new digital technologies, including AI-applications, automation technologies, virtual reality (VR) and augmented reality (AR) can be effectively integrated in remote work environments and help organizations to overcome barriers and challenges fostering greater efficiency, enabling workforce control and performance management, increasing spatio-temporal flexibility, enhancing collaboration and innovation (Baldwin & Okubo, 2023; Watanabe, 2023).

Scholars could deepen our understanding of the complex dynamics of inequality generated by remote work by looking at increasingly relevant but still under-explored categories of remote workers, i.e., “gig”, “crowd” and “platform” workers (Schulz et al., 2023). For instance, it would be valuable for future research to look at how remote gig work can exacerbate income wages disparities of gig workers compared to traditional employees or even create inequity among gig workers as a consequence of exploitative labour practices, such as unpaid overtime and unsafe working conditions (Fiers & Hargittai, 2023; Reynolds & Kincaid, 2023). The so-called “platform economy” and crowdwork has increased income insecurity, job instability and lacks those social protection mechanisms and benefits traditionally provided by firms, such as healthcare, paid time off and retirement savings. In turn, these conditions could create disparities in job satisfaction, work-life balance, mental health and wellbeing. In addition, remote gig work can expose specific categories of workers, including women, the older and individuals with disabilities to discrimination and bias,

leading to disparities in earnings and job opportunities (Anwar, 2022; Codagnone & Savona, 2023). Since scholars tend to focus on one form of inequality a potential direction for future research could be exploring how different forms of inequality, such as race, ethnicity, disability and sex, also combined together, shape individuals' experience and outcomes in remote work contexts. It would also worthwhile to evaluate the effectiveness of specific policy interventions and organizational practices such as the right to disconnect in reducing inequalities and supporting a more equitable and inclusive remote work ecosystems (Miernicka, 2023). Finally, we recommend to investigate how technologies can be leveraged to mitigate various forms of inequalities generated by remote work, for instance by ensuring equal access to online organizational resources among different groups of workers or by designing remote work platforms and digital collaboration tools with inclusive features so to address the needs of diverse classes of workers.

Finally, since the gender dimension can be considered transversal to all clusters, a systematic literature review at the crossroads of Covid-19 induced remote work and gender is a promising avenue for guiding future developments and identifying potential linkages across communities (in this regard, see Errichiello & Drago, 2023).

## **6. Policy implications**

By adopting a holistic approach that transcends disciplinary confines and harnesses emerging perspectives, the research contributes to a more profound comprehension of remote work dynamics and guides the development of practices grounded in evidence to navigate the intricacies of remote work, particularly in the aftermath of the pandemic. Firstly, our analysis underscores the urgent need for HR managers and professionals to adapt their practices to the evolving remote work landscape. In navigating the landscape of remote work, organizations must prioritize the management of human resources to ensure the well-being and productivity of their employees. This begins with the implementation of adaptable work policies that not only accommodate remote work settings but also actively advocate for employee health and work-life balance. By providing flexibility in both work hours and location, organizations empower their employees to effectively manage their personal and professional obligations, consequently alleviating stress and enhancing overall job satisfaction. Moreover, companies ought to allocate resources towards holistic skill enhancement initiatives customized to meet the requirements of remote workers. Such programs are imperative for furnishing employees with the requisite technical proficiencies and resources to excel within a remote work context. Through continuous training and assistance, organizations can assist employees in overcoming the hurdles associated with remote work and optimize their prospects for achievement. In times of emergency, policymakers must prioritize investments in digital infrastructure and

accessible internet connectivity to support remote work initiatives. By ensuring reliable access to digital tools and platforms, organizations can facilitate seamless remote team collaboration and communication, even in emergency situations. Furthermore, providing employees with training and support to navigate and adopt new technologies is essential for maximizing productivity and efficiency in remote work environments.

Fostering collaborative and effective leadership in virtual work environments requires a multifaceted approach. Organizations should prioritize open communication and transparency to enhance employee satisfaction and foster a sense of belonging in remote work environments. By creating channels for regular communication, feedback, and collaboration, organizations can cultivate a culture of trust and teamwork among their remote workforce. Promoting diversity and inclusion initiatives in remote work environments is essential for fostering creativity, innovation, and collaboration across diverse teams. Furthermore, enhancing the leadership abilities of managers is paramount for proficiently guiding remote teams and nurturing their professional growth. Lastly, fostering cross-functional collaboration and knowledge sharing can bolster innovation and efficiency in virtual workspaces, leading to organizational triumph. Moreover, it is imperative for companies to institute regular performance assessments and feedback mechanisms for remote staff. These evaluations serve as pivotal checkpoints for gauging employee engagement, effectiveness, and welfare in the remote work environment. By actively seeking feedback and addressing any issues or obstacles encountered by remote workers, organizations can cultivate an atmosphere of openness and ongoing enhancement, ultimately elevating motivation and job contentment within their remote workforce.

As organizations navigate the shift to remote work, placing a premium on employee well-being and mental health is of utmost importance. Offering comprehensive support services and resources, such as access to counseling and mental health initiatives, can help alleviate the stress and feelings of isolation commonly associated with remote work. Furthermore, promoting a healthy work-life balance through flexible scheduling and remote work policies can further bolster employee well-being and overall job satisfaction.

Addressing work-life challenges is imperative for optimizing remote work performance and safeguarding employee well-being. Managers and policymakers should contemplate the implementation of labor regulations and policies that tackle work-life issues for remote employees, such as setting limits on working hours and ensuring adequate breaks to prevent burnout. Additionally, organizations can deploy strategies to mitigate work-family conflicts, such as providing flexible scheduling alternatives and offering childcare support services for employees with caregiving responsibilities.

As policymakers navigate the socioeconomic and psychological effects of remote work during the influenza pandemic, it is essential to consider the broader implications for income inequality, labor market dynamics, and employee well-being. Based on existing evidence, it clearly emerged that addressing the many forms of inequality generated by remote work during the covid-19 pandemic requires a multi-faceted approach that includes policies and initiatives aimed at promoting equitable access to remote work opportunities, digital infrastructure, education and training programs, childcare and eldercare support, and economic relief measures for vulnerable populations. This may include investments in broadband infrastructure, workforce development initiatives, childcare subsidies, and policies to support work-life balance and gender equality in the workforce. Providing remote employees with access to mental health initiatives and support services should be a top priority, given the heightened stress and uncertainty associated with the pandemic. Furthermore, promoting empathy and understanding within organizations is essential for supporting remote employees through these challenging times and fostering a culture of resilience and solidarity.

## **6. Conclusions**

The COVID-19 pandemic accelerated an unparalleled transformation in the work landscape, thrusting remote work into the forefront of organizational dynamics worldwide. This shift has not only necessitated rapid adaptation but also sparked a surge in scholarly interest to understand its multifaceted implications. This study makes several significant contributions to the international literature on pandemic-induced remote working by analyzing keyword communities and extracting key concepts. These findings offer valuable insights that can guide the formulation of impactful remote work policies and practices.

This work provides a comprehensive examination of the co-occurring keywords in the literature revealing significant patterns and relationships between diverse themes and topics. This holistic approach assists in identifying the most pertinent research areas and their interrelationships. By extracting and designating critical concepts from the keyword communities, the paper synthesizes the significant topics in the literature and provides a comprehensive understanding by integrating insights from multiple disciplines, including human resource management, organizational behavior, technology, and economics, thus providing a multidisciplinary perspective on the challenges and opportunities presented by remote work.

This work also provides a solid foundation for future research by identifying potential research lines and emphasizing the most pertinent findings in the literature. It identifies direction for researchers to investigate the dynamics of remote work further and develop effective strategies to improve remote work outcomes and employee experiences in the post-covid era.

Finally, based on the extracted concepts, this paper offers a series of policy implications that can guide organizations and policymakers in developing remote work policies and practices. These recommendations address diverse aspects of remote work, such as human resource management, technology adoption, collaboration, leadership, and the socioeconomic and psychological effects of remote work during the pandemic.

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