

PERFORMANCE EVALUATION SYSTEMS AND METRICS IN TELEWORKING: A BIBLIOMETRIC ANALYSIS

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Abstract

Telework expanded during the coronavirus pandemic, as organizations adopted it as a strategic measure for survival and business continuity. Organizations that intend to adopt, or have already implemented, telework as a mode of operation must establish effective practices for performance measurement and management. This study aimed to conduct a comprehensive analysis of the scientific literature on performance evaluation in the context of telework. The ProKnow-C was used, with the scope limited to the Scopus and Web of Science databases. The results of the basic bibliometric analysis revealed that: (i) 79% of the publications are concentrated in the period from 2020 to 2023; (ii) the geographic regions with the highest publication rates on the topic are the United Kingdom and the United States of America; (iii) the most prolific author is Timothy D. Golden; and (iv) the journal with the highest number of publications in the field is the International Journal of Manpower (IJM). Regarding advanced variables, the research was found to be concentrated in the measurement subsystem of the Performance Evaluation Systems (PESs). Furthermore, among the literature fragments analyzed, 80% presented measurement instruments; however, these instruments do not meet the metric requirements proposed by Melnyk *et al.* (2014). It is concluded that there is a need to develop PESs that provide managers with a realistic understanding of both organizational performance and teleworker performance. To achieve this, it is essential to develop evaluation methods and metrics appropriate to the nature of this form of work.

Keywords: Telework, Performance Evaluation, *ProKnow-C*.

1 INTRODUCTION

Telework originated in the 1970s in response to the oil crisis in the United States (Jamal *et al.*, 2021; Garro-Abarca *et al.*, 2021). Although not a recent phenomenon, its adoption intensified during the COVID-19 pandemic, when organizations implemented it as a measure to ensure business continuity (Mutiganda *et al.*, 2022; Ngamkroeckjoti *et al.*, 2022). Lockdown measures and social distancing strategies adopted, in early 2020, compelled the transition from in-office work to remote work.

Since the early advances in telecommunications, telework had been regarded as a viable option; however, it had never been implemented on such a broad scale (Nilles, 1975; Ficapal-Cusi *et al.*, 2023; Pianese *et al.*, 2022). The pandemic impacted organizations, business processes and outcomes (Pradoto *et al.*, 2022), making the ability to adapt to telework a key indicator of organizational resilience. Employees faced challenges such as managing virtual relationships with colleagues and supervisors (Kuruzovich *et al.*, 2021;

Danilova *et al.*, 2022). Turkes *et al.* (2021) observed that managers encountered difficulties in identifying priorities, adapting work plans, and monitoring productivity, which required the swift adoption of new management strategies.

Remote work mediated by information and communication technologies reshapes how work is conducted (Vayre *et al.*, 2022), generating new job demands and resources (Jamal *et al.*, 2021). This shift significantly affects organizational dynamics, particularly interpersonal relations and people management (Aliushyna *et al.*, 2021; Cabral & Alperstedt, 2021), presenting a distinct set of challenges and opportunities.

In this context, telework has drawn attention from both practitioners and researchers (Danilova *et al.*, 2022). In academia, a key concern is how telework affects individual performance (Silva & Rosa, 2022; Tudu & Singh, 2022). Some studies report positive associations (Golden & Veiga, 2008), others negative ones (Kuruzovich *et al.*, 2021), while some find no significant differences between remote and on-site workers (Belanger, 1999; Nemteanu *et al.*, 2021). Research also highlights the impacts of professional isolation (Danilova *et al.*, 2022), work overload (Silva *et al.*, 2022), and productivity (Vilarinho *et al.*, 2021), all of which influence individual performance in telework contexts

The success of telework requires effective performance measurement (Park & Jae, 2022). Organizations adopting this model must establish performance management practices, emphasizing organizational justice (Kurland & Egan, 1999) and implementing fair evaluation systems with clear and measurable performance standards (Kim, 2022). Supervisors need to adjust task requirements, performance indicators and feedback strategies (Staples, 2001; Takahashi *et al.*, 2022).

Performance evaluation in the context of telework presents a multifaceted challenge (Groen *et al.*, 2018). The transition demands the development of methods and metrics suited to this work modality (Suresh & Gopakumar, 2021; Lopes & Daniel, 2022). Traditional evaluations, previously based on physical presence and direct supervision, must consider self-management, productivity in the home environment, and effective use of digital communication tools (Mihalca *et al.*, 2021; Baakeel, 2021; Susanto *et al.*, 2022). Emphasis shifts to results and work quality, rather than observable actions (Gajendran & Harrison, 2007), requiring clearly defined goals and performance indicators that can be assessed remotely (Kim, 2022). Consequently, telework performance evaluation remains a dynamic and evolving field, requiring continuous adaptation and innovation to ensure that remote workers are effectively supported and fairly recognized in their work environments.

Accordingly, it is important that the scientific community continues to conduct research in this area, as the trend is for the expansion of telework across organizations (Jamal *et al.*, 2021; Vayre *et al.*, 2022). In this context, the present study aims to conduct a comprehensive analysis of the scientific literature on performance evaluation in the context of telework. Thus, the objective is to investigate the main trends, methods, challenges, and contributions found in existing research, in order to provide a critical and up-to-date overview of this evolving field. Through this analysis, we seek to identify knowledge gaps and opportunities for future research that can enrich understanding of performance evaluation in telework environments. To this end, the Knowledge Development Process–Constructivist (ProKnow-C) intervention instrument was applied, with the scope limited to the Scopus and Web of Science databases.

2 METHODOLOGY

2.1 Data Collection Procedures

This study adopts a qualitative approach, using bibliographic research to conduct a systematic and critical analysis of the literature on (i) performance evaluation and (ii) teleworking. The selection of articles was followed by the analysis of basic variables—such as journals and prolific authors—and advanced variables, according to the framework proposed by Melnyk *et al.* (2014).

Data collection and bibliometric analysis were conducted using the Knowledge Development Process – Constructivist (ProKnow-C). The adoption of this intervention tool is justified by its ability to ensure the selection of a scientifically relevant Bibliographic Portfolio (BP), based on the criteria and boundaries defined by the researchers, with the objective of generating and deepening knowledge on the topic; and to promote a critical and reflective analysis of the selected portfolio, allowing for the identification, highlighting, and discussion of the main characteristics, evolution, gaps, and opportunities in the research area (Ensslin *et al.*, 2017; Matos *et al.*, 2019).

The operationalization of ProKnow-C comprises five stages: (i) selection of the BP; (ii) bibliometric analysis; (iii) construction of the literature map; (iv) systemic analysis; and (v) formulation of research questions and opportunities based on the accumulated knowledge.

In this article, the “selection of the BP” consists of three phases: i) selection of the raw article database; ii) filtering of the article database; and iii) representativeness testing of the articles in the portfolio. The selection of the raw article database begins with defining the research axes, keywords, and the databases in which the search would be conducted. Two research axes were adopted in this study: i) performance evaluation; and ii) teleworking. The combination of keywords resulted in the following search string: [(“Performance” OR “Management” OR “Measuring” OR “Measurement” OR “Measurements” OR “Measure” OR “Evaluation” OR “Evaluations” OR “Evaluate” OR “Appraisal” OR “Indicator” OR “Indicators” OR “Assessment” OR “Assess” OR “Metric” OR “Metrics”) AND (“Home Office” OR “Telework*” OR “E-Work” OR “Telecommut*” OR “Home Work*” OR “Remote Work*” OR “Flexible Work*” OR “Work* From Home” OR “WFH”)].

This search string was used in the Scopus and Web of Science databases. To verify the alignment of these databases with the research theme, a preliminary search using the predefined keywords was conducted. As a result, articles aligned with the research topic were retrieved from both databases. A total of 9,915 and 5,572 documents were found in Scopus and Web of Science, respectively, totaling 15,487 documents in the raw article database. Given the representativeness of both databases, they were retained. The database searches were conducted on March 15, 2023, with no time restriction applied.

Subsequently, a keyword adherence test was conducted to validate the search string. By reading the titles of documents in the raw database, five articles aligned with the topic were selected, and all keywords from each of these were identified. It was verified that the keywords of the selected journals addressed both research axes. The documents were then exported from Scopus and Web of Science to the EndNote® X9 reference management software.

Filtering began with the exclusion of: a) duplicates automatically identified by the software (2,427 documents); b) documents not classified as “article” or “review” (2,201 documents); and c) duplicates manually identified (2,801 documents). At the end of this process, the non-duplicate article database totaled 8,058 documents. These were screened by title for alignment with the research topic. At this stage, 6,991 documents were excluded due to misalignment, resulting in 1,067 non-duplicate articles with aligned titles.

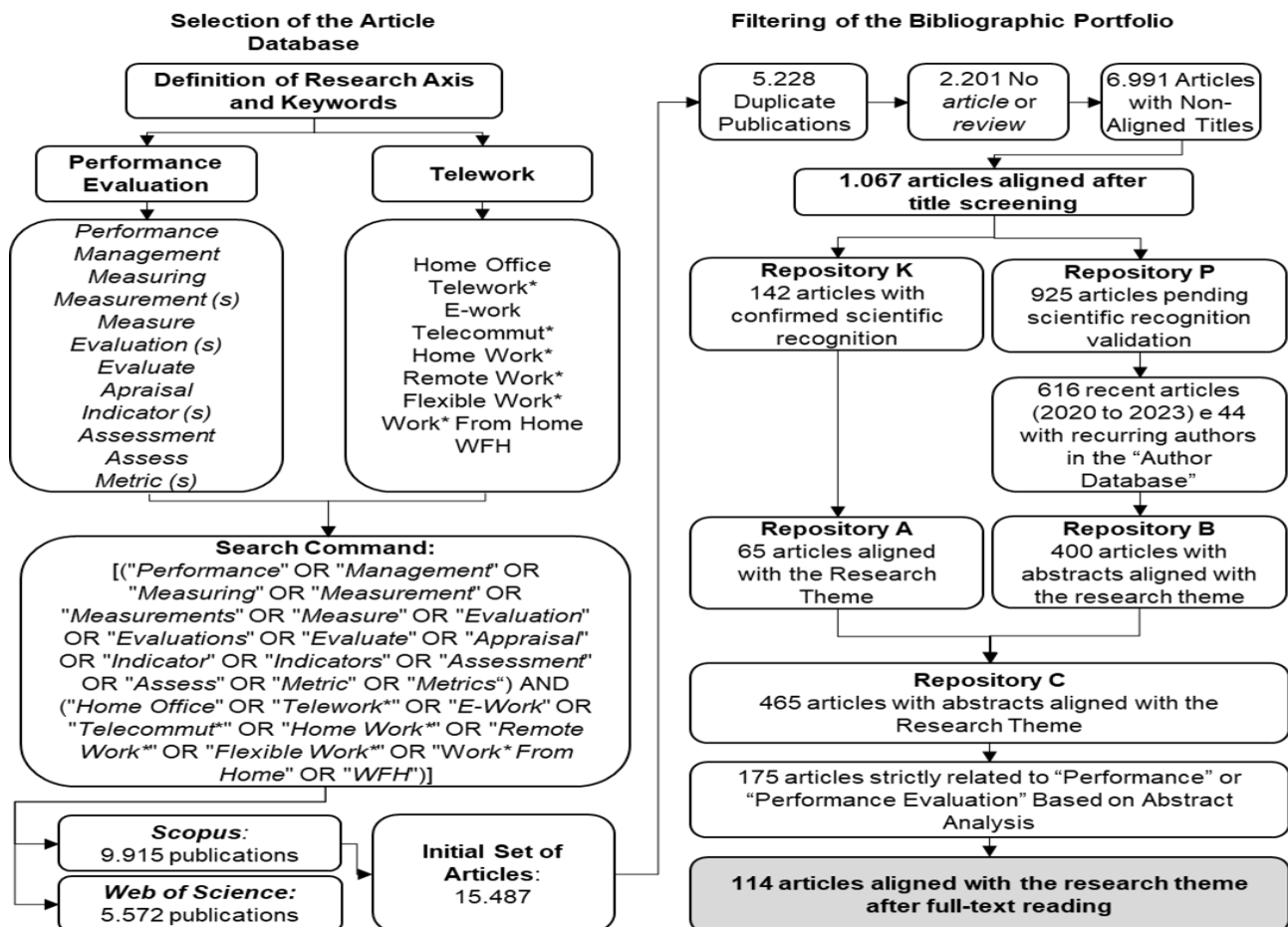
As a filtering criterion based on scientific recognition, each of these 1,067 articles had its citation count in Google Scholar identified. Articles accounting for 70.03% of total citations were considered representative, resulting in 142 articles (Repository K) with 147 or more citations. Among these 142, abstracts were analyzed for thematic alignment, and only 65 articles remained (Repository A). Authors of these 65 articles were added to the “Author Database,” totaling 312 authors.

The remaining 925 articles (Repository P) with lower scientific recognition were divided into two groups: a) articles published between 2020 and 2023, totaling 616, which were selected for abstract review; and b) articles published before 2020 (309 articles). For the latter group, author names were cross-referenced with the “Author Database” from Repository K. If an author appeared in the database, the article was included for abstract review (44 articles); otherwise, it was excluded (265 articles). At the end of this process, 660 articles (616 + 44) remained for abstract screening.

Of these 660 articles in Repository P, 400 (Repository B) had abstracts aligned with the research topic. Thus, combining Repository A (65) and Repository B (400), a total of 465 articles (Repository C) were aligned with the topic. During abstract screening, a significant number of articles were found to be relevant to the research theme. The researchers decided to categorize them based on the content of the abstracts. This categorization considered concepts and elements related to performance evaluation and teleworking (e.g., engagement, autonomy, innovation, communication).

To proceed with the study, the authors opted to include only those articles specifically addressing the concept of “performance” or “performance evaluation.” Of the 465 articles in Repository C, 175 matched this focus. The next step was to verify full-text availability. Six articles were unavailable. After full-text reading of the remaining articles, 55 were excluded for misalignment.

As a result of the first stage of ProKnow-C, a BP composed of 114 fully available and thematically aligned articles was obtained and used for subsequent analyses. The article selection and filtering process is illustrated in Fig. 1.

Figure 1 - Selection Process of the Bibliographic Portfolio

2.2 Data Analysis Procedures

The bibliometric analysis stage aims to deepen existing knowledge within a specific context by exploring the characteristics of the BP and selecting the attributes to be analyzed (Thiel *et al.*, 2017). This research carried out (i) basic and (ii) advanced bibliometric analysis. The basic bibliometric analysis involves variables that can be collected straightforwardly, without requiring prior knowledge or critical reflection on the topic. In this article, basic bibliometrics included factors related to: (i) temporal concentration of the articles; (ii) most prolific authors; (iii) most cited articles; (iv) journals that publish most frequently on the topic; (v) geographic region of publication; (vi) theoretical foundations of the articles; (vii) telework modality (regular telework or telework during COVID-19); (viii) research approach (theoretical or empirical); (ix) research method (self-evaluation, manager evaluation); (x) sector of application (public or private); and (xi) methodological approach (quantitative or qualitative). These variables were processed through frequency counts.

For advanced bibliometric analysis, the researcher must possess prior knowledge of the variables under investigation. Advanced variables proposed by Melnyk *et al.* (2014) were analyzed: i) the classification of the PES - measurement subsystem and/or performance management subsystem; and ii) the elements of a metric (verifiability; qualitative or quantitative nature; reference standard; consequences of being above or below the standard). This analysis expands the understanding of which PES subsystem has been most explored by the scientific community and how metrics are being structured in the telework literature.

3 THEORETICAL FRAMEWORK

3.1 Telework in the Context of Performance Evaluation

The concept of telework is based on two main premises: work is performed remotely, away from a central office, and it relies on information and communication technology (ICT) (Gajendran & Harrison, 2007; Allen *et al.*, 2015). Its adoption has increased in recent decades due to advances in ICT (Pianese, 2022) and was accelerated by the COVID-19 as organizations sought to avoid disruptions (Ngamkroekjoti *et al.*, 2022).

In this context, organizations' dynamic capabilities to adapt, innovate, and continuously learn from changes in both external and internal environments were tested. The rapid shift from on-site work meant that the implementation of telework skipped essential steps for establishing an effective remote work program, which typically includes, for instance, the development of new procedures for monitoring and supervising employees (Zappalà *et al.*, 2021). Telework brings about changes in organizational structure, culture, strategies, and the business environment (Caraianni *et al.*, 2022). Such changes directly affect PESs and underscore the need to adapt performance measures and metrics (Grant *et al.*, 2019).

The development of a fair PES with clear and measurable performance objectives is essential (Kim, 2022). Telework is generally linked to key metrics that impact organizational outcomes, such as employee performance and productivity, as well as turnover rates (Xu & Pan, 2021). The employee evaluation process should be properly designed and conducted, with predefined and widely communicated metrics. Employees should be informed in advance about how to improve their performance, in order to avoid the punitive perception of evaluations.

The literature identifies different methods for measuring performance. Some studies use self-reported performance measures (Belanger, 1999; Grant *et al.*, 2019; Nemțeanu *et al.*, 2021; Silva & Rosa, 2022), while others consider the quantity and quality of service delivered (Hunton & Norman, 2010), in addition to the use of actual data, such as the percentage of salary increase earned by employees based on their performance evaluation scores (Golden & Veiga, 2008).

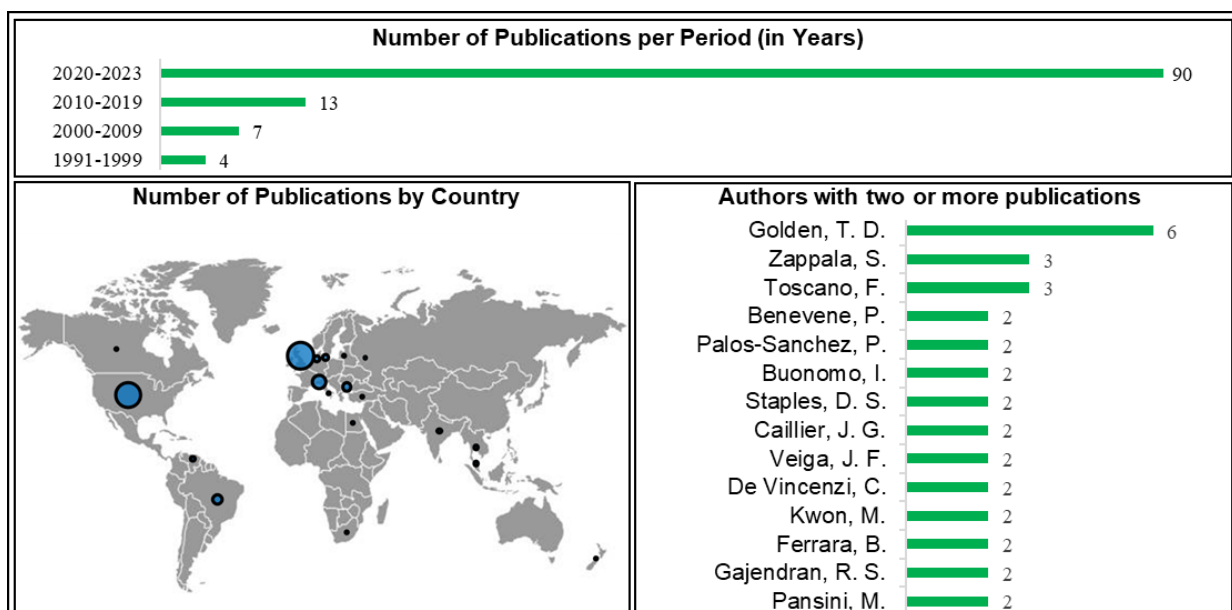
Telework presents challenges for performance monitoring, as managers are no longer able to directly observe their subordinates (Zappalà *et al.*, 2021). Therefore, a PES is required that keeps supervisors informed about the activities of their subordinates (Hartman *et al.*, 1991). Research has progressed in this direction, presenting performance evaluation models related to telework, such as those proposed by Marques and Backes (2021) and Zappalà *et al.* (2021). Telework remains an emerging area of research, particularly in identifying the critical factors for fair, objective, and unambiguous individual performance measurement, which in turn influences organizational performance more broadly.

4 RESULTS

4.1 Basic Bibliometric Analysis

Bibliometric Analysis is the second stage of ProKnow-C methodology. It begins after the selection of the literature fragment, which consists of articles aligned with "performance evaluation" and "telework." This section addresses the core bibliography of the research. Therefore, it explores aspects related to the articles, authors, geographic regions of publication, among others - as shown in Fig. 2.

Figure 2 - Basic Bibliometric Analysis of the Bibliographic Portfolio (Periods, Countries, and Authors)



The oldest study in the Bibliographic Portfolio (BP) dates back to 1991. A growth in publications is observed over time, with 79% concentrated between 2020 and 2023. Of these, 63% address telework during the pandemic, while 37% focus on regular telework. This highlights the need for research on the topic during the

health crisis, as on-site workers abruptly transitioned to telework (Danker *et al.*, 2022). According to Toscano and Zappalà (2022), this shift posed significant challenges, requiring adaptation to new work processes.

The BP includes publications from all continents, reflecting the global reach of telework, made possible by information technology that enables work to be performed anytime and anywhere (Metselaar *et al.*, 2022). Most articles (62) originate from Europe, with the United Kingdom standing out as the leading center of research, contributing 37 studies. The United States ranks second, with 33 publications, placing the Americas as the second most represented region. The UK and the US dominated telework publications, accounting for 23 of the 24 pre-pandemic articles. Asia, Africa, and Oceania together account for only 9% of the publications. Brazil, with six articles, ranks fourth overall and leads among emerging countries, highlighting the scarcity of research on telework in developing nations (Dávila *et al.*, 2022).

The most prolific author is Timothy D. Golden, with six publications—twice the number produced by Ferdinando Toscano and Salvatore Zappalà, each with three. A professor at the Lally School of Management (Rensselaer Polytechnic Institute, USA), Golden has a diverse academic background but focuses his research on topics such as remote work, telework, telecommuting, and virtual interactions (Rensselaer Polytechnic Institute, 2023). His BP articles range from 2008 to 2021. He is also the second author of the BP's second most cited article, with 1,604 citations: "How effective is telecommuting? Assessing the status of our scientific findings" (Allen *et al.*, 2015).

The most cited article in the BP is "The Good, the Bad, and the Unknown About Telecommuting" (Gajendran & Harrison, 2007), with 2,861 citations. Although most studies lack a specific theoretical foundation, 12 (10%) apply the Social Exchange Theory, which is regarded by Cropanzano and Mitchell (2005) as one of the most influential paradigms for understanding workplace behavior.

Empirical studies (89%) prevailed over theoretical ones. Self-reported instruments were used in 86% of the studies for data collection. However, this type of response may be subject to self-perception and social desirability bias (Mihalca *et al.*, 2021). Gajendran and Harrison (2007) point out that teleworkers, when self-assessing, may favor the work arrangement they prefer, compromising the accuracy of the evaluation.

The analysis showed that the International Journal of Manpower (IJM) leads in the number of publications in the field, with five articles published between 2022 and 2023. These studies are empirical, use a quantitative approach, and focus on telework during the pandemic. The IJM is interdisciplinary, with an emphasis on human resource management and labor market economics at corporate, local, national, and international levels. In addition to the basic variables, the BP presents the following characteristics: i) sector researched - private (33%), public (23%), public-private (21%), and not specified/not applicable (23%); and ii) methodological approach - quantitative (76%), qualitative (16%), and mixed (8%).

4.2 Advanced Bibliometric Analysis

To conduct an advanced bibliometric analysis, it is essential to have prior knowledge of the variable under investigation, enabling a critical evaluation of the articles. The variables were analyzed based on a full reading of the articles, from two perspectives: the classification of the PES (Melnik *et al.*, 2014) and the constituent elements of a metric (Melnik *et al.*, 2014). PESs consist of two subsystems: the measurement system and the performance management system. The former encompasses procedures for setting goals (creating a set of metrics) and collecting, analyzing, and interpreting performance data. The purpose of this process is to transform data into information and assess the effectiveness and efficiency of actions (Neely *et al.*, 1995). In the identified dataset, 86% of the articles focus on performance measurement related to telework. Furthermore, performance measurement is largely (98 articles) based on employee self-assessment, as identified in the basic variables of this study. To measure performance, information such as the following is collected: "I always perform all the tasks I am required to do" (Silva & Rosa, 2022); "My performance evaluation is a fair reflection of my performance"; "I feel unproductive in my work environment" (Belanger, 1999); "I created creative solutions to new problems" (Nemteanu *et al.*, 2021); and "The overall productivity of my work increased due to my ability to work remotely/from home" (Grant *et al.*, 2019).

According to Melnik *et al.* (2014), although performance measurement is fundamental, it is not sufficient by itself to manage an organization. The presence of a performance management system is essential. Management involves assessing disparities between actual and desired results, identifying and signaling critical discrepancies, ensuring managerial intervention, investigating the root causes of deficiencies, and, when necessary, implementing and monitoring corrective actions. Despite the importance of the management system, only three articles address both performance measurement and management within a single study.

Zappalà *et al.* (2021) conducted an empirical study based on interviews with employees and managers,

highlighting the need for corrective actions in the PES. Participants reported that the quantitative nature of monitoring forms made it difficult to describe less routine or more specific tasks. Suresh and Gopakumar (2021), in turn, proposed a conceptual model to assess the efficiency of telework in the IT sector of a private organization, classifying attributes into four categories (underperforming, well-performing, high-performing, and low-priority) and identifying, for instance, attributes requiring immediate managerial attention to enhance employee efficiency. Downes *et al.* (2023) analyzed the management subsystem of the PES, focusing on the organizational control of teleworkers, using semi-structured interviews and online diaries. Their findings highlight discrepancies between actual and expected outcomes, as well as managers' dissatisfaction with the current metrics and their difficulty in implementing improvements. No study focused exclusively on the management subsystem. Thirteen articles did not address either measurement or management as a research topic; most of these were theoretical in nature.

The second perspective examines how the articles in the Bibliographic Portfolio (BP) address the components of a metric, as defined by Melnyk *et al.* (2014). According to the authors, to be considered a true metric, a measure must not only be quantifiable and verifiable, but also incorporate three essential elements: (i) a performance measure that quantifies what is occurring; (ii) a performance standard or target that defines what constitutes acceptable or unacceptable performance and provides strategic direction; and (iii) consequences linked to performance levels—whether falling below, meeting, or exceeding the established target.

The analysis of metric components began with the identification of measures. Thus, the search focused on instruments that quantify the efficiency/effectiveness of an action. Measurement elements are present in 91 articles, representing 80% of the sample. Aspects measured include organizational commitment (Van Der Lippe & Lippenyi, 2020); engagement (Giauque *et al.*, 2022); task planning and difficulty (Caraianni *et al.*, 2022); performance (Garro-Abarca *et al.*, 2021); among others. Most of these measures were applied using the Likert scale (1932), which appears in 72 publications (63%). Among the remaining BP articles, 21 did not use measures, and in 2 cases, it was not possible to identify whether any were used.

The number of BP studies using the Likert scale influences the findings regarding the remaining metric elements, as this scale is not verifiable, is expressed qualitatively (ordinal scale), lacks a reference standard (target), and has no associated consequences for being below, within, or above the standard. Of the 91 publications that presented measurement elements, none used measures expressed in quantitative terms. Regarding the final two metric components proposed by Melnyk *et al.* (2014), the analysis revealed that none of the BP articles explicitly included performance standards (targets) or the consequences of being below, within, or above those targets.

5 CONCLUSION AND RECOMMENDATIONS

The COVID-19 pandemic accelerated the adoption of telework, as institutions implemented it as a strategy to ensure survival and operational continuity. Organizations that employ telework as a work model must adopt effective practices for performance measurement and management. The objective of this study was to conduct a comprehensive analysis of the scientific literature on performance evaluation in the context of telework. A BP was developed based on the researchers' perception of the topic. Additionally, a bibliometric analysis of the BP was carried out to identify key characteristics of the selected literature. To this end, the ProKnow-C methodology was applied, limited to the Scopus and Web of Science databases. Through its application, researchers gained knowledge about the topic of interest. A careful selection of studies was conducted, focusing on those perceived as relevant and capable of contributing substantially to the literature review. The findings suggest that the use of ProKnow-C plays a significant role in supporting theoretical foundations in scientific research, as it provides structured guidance for researchers to develop a deep understanding of the subject. Furthermore, the bibliometric analysis stage validates the scientific recognition of the articles published by the academic community.

The basic bibliometric analysis revealed the following: i) the earliest article included in the BP was published in 1991; ii) most publications are concentrated between 2020 and 2023, a period that includes the global COVID-19 pandemic; iii) 63% of the studies address telework in the pandemic context; iv) although publications originate from all continents, the United Kingdom and the United States stand out as the leading contributors; v) Brazil is the leading emerging country, with six articles in the BP; vi) the most prolific author is Professor Timothy D. Golden; vii) the journal that publishes most frequently in the area is the *International Journal of Manpower* (IJM); viii) the most cited work (2,861 citations) is titled "The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences", published by Gajendran and Harrison (2007); ix) the most frequently referenced theoretical framework is the Social Exchange Theory; and x) most studies are empirical, relying on self-reported responses from participants for data collection. Regarding advanced variables, the analysis showed that research is primarily

focused on the measurement subsystem of the PES, rather than on performance management. Moreover, 80% of the selected literature includes measurement instruments; however, these instruments do not meet the metric requirements proposed by Melnyk *et al.* (2014). It is concluded, therefore, that it is necessary to develop PESs that provide managers with a clear view of both organizational and employee performance in the telework context. To achieve this, appropriate evaluation methods and metrics must be developed to suit the nature of this work arrangement.

This study was limited to the following stages of the ProKnow-C methodology: i) selection of the BP; ii) bibliometric analysis; and partially, v) formulation of research questions and opportunities based on the knowledge acquired. It is important to note that the third phase of the BP selection process—referred to as the “article representativeness test”—was not carried out, as a representative number of articles had already been obtained by the end of the second selection phase.

Future research may address the following ProKnow-C phases: iii) development of the literature map, and iv) systemic analysis, which were beyond the scope of this article. Furthermore, it is recommended that post-pandemic telework be explored. These studies were not included, as the end of the COVID-19 global emergency was declared by the World Health Organization on May 5, 2023, and the database searches were conducted on March 15, 2023. Therefore, there are still gaps concerning the impacts of COVID-19 on telework. Additionally, as observed, most studies in the selected literature relied on self-reported data, which may lead to responses that favor the work arrangement preferred by the respondent, rather than providing an accurate assessment of their performance. Thus, an opportunity for future research lies in the use of concrete, objective data, as well as external benchmarks to determine performance. The literature lacks longitudinal studies that track the effects of telework over time, with cross-sectional approaches prevailing.

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