Determinants of teleworkers’ job performance in the pre-COVID-19 period: Testing the mediation effect of the organizational impact of telework

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Abstract
Although pre-COVID-19 research on telework is well established, most research has compared teleworkers against nonteleworkers to assess the adoption of telework. Thus, the investigation of the determinants of teleworker performance is limited. The current study seeks to identify the determinants of teleworker job performance in the pre-COVID-19 period. Using U.S. federal government employee telework data, the current study tests the effects of work, technology, and management factors on telework performance mediated by the organizational impact of telework. The findings revealed that work similarity, telework frequency, accessibility of technologies, and quality of performance management positively affected the organizational impact of telework. Telework frequency, quality of performance management, and quality of supervision showed a positive association with job performance. However, in contrast to expectations, evidence of a mediation effect was not found as the organizational impact of telework was negatively associated with teleworker performance. Implications for telework implementation and research in the post-COVID-19 period are offered.

Keywords
telework, teleworker performance, telework implementation, telework management

Introduction
Telework initially emerged as a technological innovation but quickly became an important tool in contemporary information communication technology (ICT)-based human resource management (HRM) practice (Bentley et al., 2016; Pérez et al., 2002, 2004). Today, business organizations often use telework to transcend geographic limitations, have instant access to employees outside traditional office settings, attract a high-quality workforce, increase flexibility in HRM, and improve organizational performance (Baruch, 2000; Greer and Payne, 2014). More recently, the SARS-CoV-2 (COVID-19) outbreak has triggered the need for the rapid expansion of telework because telework is considered a necessary alternative to in-person work to prevent the spread of COVID-19 (Centers for Disease Control and Prevention (CDC), 2020). A recent OECD (2021a) report states that in all countries where comparable data exist, the rates of telework usage increased during 2020. For instance, Eurofound (2020) estimated that nearly 40% of employees in the European Union (EU) worked full time via telework in April 2020 (Fana et al., 2020).

This rapid expansion of telework on a global scale is a result of the response to COVID-19 rather than an adoption based on a thorough review of the pros and cons of telework. Despite the recent expansion, the determinants of teleworker performance in both the pre- and post-COVID-19 periods have been studied on a limited scale. Therefore, the current study analyzes the determinants of telework performance in the pre-COVID-19 period and seeks to provide implications for the continuance of telework use in the post-COVID-19 era.

The current study focused on the U.S. federal government to investigate the effects of factors related to telework and organization management on teleworker performance. Although pre-COVID-19 research on telework is well established, most of this research has compared teleworkers against nonteleworkers to assess the adoption of telework technologies and programs by examining whether using telework is better than not using it (Vega et al., 2015). Such an approach creates a gap in the literature by limiting the opportunity to evaluate the factors that affect teleworker performance. Thus, this study begins by briefly reviewing the pre-COVID-19 adoption of telework by the U.S. federal government...
government. Then, this study conducts a review of the extant determinants of teleworker performance and investigates the work, technology, and management factors that are hypothesized to significantly influence teleworkers’ performance. During this process, the mediation effect of the organizational impact of telework between the determinants and teleworker performance is also tested. Last, this study offers implications for telework research, as well as for the management of teleworkers in organizations, in the post-COVID-19 period.

Pre-COVID-19 adoption of telework in the U.S. Federal government

Telework was first introduced in the federal government in 1990 by the President’s Council on Management Improvement, which commissioned the first government-wide telework pilot (Weisberg and Porell, 2011). Since then, the recently adopted Telework Enhancement Act of 2010 (TEA) has had the most extensive impact in expanding telework in the federal government by establishing a framework of requirements for federal agencies and assigning the Office of Personnel Management (OPM) the leadership of telework duties (Cook et al., 2013).

Amid these changes in telework policies, both positive and negative perspectives on teleworking have appeared in the literature. The organizational advantages of telework are mostly related to improving efficiency and saving costs (Caillier, 2013; Day and Burbach, 2015; Office of Personnel Management (OPM), 2012; Overmyer, 2011). For employees, advantages include improved work–life balance, lower absentee rates, and higher employee satisfaction (Caillier, 2012, 2013; Denison et al., 2014; Major et al., 2008; Maruyama and Tietze, 2012; Snyder, 2012). In contrast, problems also exist in implementing telework. These problems include dissatisfaction among non-teleworkers, increased turnover intention among employees who are not allowed to telework, and undermined teamwork due to decreased physical presence at the office (Caillier, 2013; Mahler, 2012; Pérez et al., 2004). Moreover, the managerial challenges of controlling, coordinating, training, and evaluating employees who work remotely from traditional offices and determining telework eligibility are daunting (Cook et al., 2013; Denison et al., 2014; Lee and Kim, 2018; Maruyama and Tietze, 2012; Weisberg and Porell, 2011).

Despite the mixed views on its benefits and problems, telework has continued to be adopted by agencies of various governments, including the United States. Nonetheless, telework has received little attention in the field of public management. Only a handful of researchers (e.g., Caillier, 2012; Mahler, 2012) have sought to validate the claim that the implementation of telework increases the productivity and performance of both organizations and employees by comparing teleworking against nonteleworking situations. Moreover, human factors (Guest, 1997: 269), such as teleworkers’ characteristics (individual employee factors), have not been extensively examined simply because many previous studies have largely focused on the adoption of telework (Anderson et al., 2015). Thus, the current study aims to extend the literature by examining the factors that affect teleworker performance.

Determinants of teleworker performance in the pre-COVID-19 period

How does telework affect individual and organizational outcomes? It has been well documented how telework affects individual-level outcomes such as job satisfaction (Morgan, 2004; O’Neill et al., 2009), job commitment (Martin and MacDonnell, 2012), and job performance (Gajendran and Harrison, 2007). While the adoption and outcome of telework has been a popular research topic, comprehensive models or frameworks of telework have received less attention, and only a limited number of studies have sought to propose them. For example, Campbell and McDonald (2009: 818) presented a “systems-based framework for understanding telework adoption and use” composed of three factors: (1) telework drivers, (2) telework processes, and (3) telework impact. To Campbell and McDonald, telework drivers include organizational factors (e.g., availability of skilled staff and need for strategic intervention), industry work practices related to telework, and employee preferences for telework, and these drivers are in a reciprocal relationship with the telework process (e.g., management support and ICT environment for telework). Furthermore, the authors contend that the telework process and telework impacts (organizational, societal, and employee impact) also affect each other.

Bélanger et al. (2013: 1259) applied sociotechnical system (STS) theory to illustrate how telework-related factors affect teleworker work outcomes and proposed a multilevel STS telecommuting framework. Bélanger and colleagues categorized work systems into three subsystems: (1) the telecommunicating personnel subsystem, (2) the telecommuting technical subsystem, and (3) the organizational structure subsystem. The descriptions of each subsystem are as follows. First, the personnel subsystem depicts demographic characteristics, psychosocial aspects (e.g., attitude toward work environment and motivation), and the degree of professionalism in performing the work. Second, the technical subsystem refers to factors including technologies and practices such as ICT support for work, the types of ICT used for telework, individual tasks and work design when teleworking, and the reward or compensation systems of the organization. Third, the organizational structure subsystem relates to the centralization and formalization of structures. To Bélanger and colleagues, all three subsystems of the framework result in telework work outcomes such as individual performance.

Nakrošiene et al. (2019: 93) used job demand-resources theory to identify the factors of telework and possible outcomes. The authors explain that telework factors such as supervisor support, communication time with coworkers, work–life balance-related issues, and the telework environment (e.g., accessing organization documents from home) affect telework outcomes, including satisfaction with telework, the perceived advantages of telework, and self-reported productivity.

Despite these attempts to construct a comprehensive framework for telework research, there are some limitations.
First, while various positive outcomes of telework have been discussed, individual performance levels (ratings) have rarely been used as a dependent variable. Assuming that performance appraisal ratings or scores can be a proxy for directly measuring individual performance, the current study uses the performance ratings of employees as the outcome of telework-related variables. Second, research that proposes a framework for telework analysis often focuses on individual factors that affect telework outcomes rather than offering an integrated model of the telework environment in organizations. More specifically, the possibility exists that telework-related organizational-level variables such as the perceived impact of telework may affect individual performance. The current study tests the mediation effect of the organizational impact of telework to address this limitation. Last, previous conceptual frameworks have not been empirically tested. The current study integrates an extant conceptual framework for telework factors and outcomes and attempts to provide preliminary results for the development of an integrated model.

Thus, based on the previous literature, the current study proposes that work factors, technological factors, and management factors affect teleworker performance. Therefore, the current study posits a theoretical framework in which work factors, technology factors, and management factors jointly affect the organizational impact of telework (as a mediating variable), which eventually affects teleworkers’ individual performance. Figure 1 presents an exploratory theoretical framework that outlines how work factors (expected work similarity and telework frequency), technology factors (accessibility of technologies and device availability), and management factors (quality of performance management and supervision) affect the organizational impact of telework (mediating variable) and individual performance (dependent variable). Each factor will be discussed, along with related hypotheses.

Work factors

The technical and work subsystem described in STS theory stresses that individual satisfaction with task design is an antecedent to individual task performance (Belanger et al., 2013: 1272). In regard to the aspect of performance management, it is essential that in implementing telework, performance standards should be the same for both teleworkers and nonteleworkers (Office of Personnel Management (OPM), 2011, 2021). Moreover, it is well documented that a fair workload between teleworkers and nonteleworkers is one of the key antecedents of successful telework implementation (Park and Cho, 2022). Past research has indicated that the intensity of telework, which is often represented by the proportion of teleworkers among the workforce, is positively associated with organizational impact and job performance (Baruch, 2000; Martínez-Sánchez et al., 2008). A review by Allen et al. (2015) focused on the relationship between the extent of telework and work outcomes. The authors proposed that employees who telework more often tend to demonstrate a lower-level job performance because of professional isolation compared to those who spend less time teleworking. More recent studies have proposed that while increasing telework intensity can improve the efficiency, satisfaction, and productivity of workers, too much telework can result in negative results, thereby forming an inverted U-shaped relationship between the amount of telework and worker efficiency (Lodovici, 2021; OECD, 2020). Despite these interests in the work assignments of teleworkers and their telework amount, few studies have sought to directly test the effect of these variables on employee job performance measured by performance ratings. Therefore, the current study tests the following research hypotheses:

**Hypothesis 1a.** The perceived similarity of work between teleworkers and nonteleworkers is positively associated with the organizational impact of telework and the job performance of teleworkers.

**Hypothesis 1b.** The frequency of telework is positively associated with the organizational impact of telework and the job performance of teleworkers.

Technology factors

Technological determinism (Smith and Marx, 1994) emphasizes technologies, particularly information and communication technologies (ICTs), as a main driver of organizational and social changes, which eventually affect not only individual behaviors but also social interactions and organizational outcomes. Office of Personnel Management (OPM) (2011) reports that telework programs are functional when teleworkers are allowed to resolve any technology, equipment, and workflow issues during their telework. Kowalski and Swanson (2005) contend that organizations need to provide technology and sufficient equipment to improve teleworking management. Technological factors such as technological accessibility or device availability are also important to the nature and outcomes of telework simply because telework is essentially conducted via ICTs in remote locations from regular offices. Unless teleworkers are fully equipped with appropriate technologies, the intended outcomes are difficult to achieve. This situation leads to the following hypotheses regarding the effects of accessibility of technologies and availability of work devices on the organizational impact of telework and job performance of teleworkers:

**Hypothesis 2a.** The accessibility of technologies is positively associated with the perception of the organizational impact of telework and teleworkers’ job performance.
Hypothesis 2b. The availability of technological devices is positively associated with the perception of the organizational impact of telework and teleworkers’ job performance.

Management factors

Performance management is “a broad set of activities aimed at improving employee performance” (DeNisi and Pritchard, 2006: 255). Therefore, an organization with a good performance management system is likely to exhibit high employee performance. The success of telework requires organizations to develop a sound performance measurement, designs tasks fit for an independent working environment, and establishes reward systems that can motivate employees (Wicks, 2002).

Organizations that aim to implement telework should pursue effective performance management practices such as maintaining fairness in performance evaluation, work assignment, and setting performance standards to make a telework program work well (OPM, 2011). To monitor and enhance teleworker performance, supervisors must adjust job requirements, performance measures, and approaches to providing feedback (Lautsch et al., 2009). Moreover, positive effects of perceived fairness on employee performance appraisal, which is a task conducted mostly by supervisors, have been found in past research (e.g., DeNisi and Pritchard, 2006). In the telework context, supervisors often contend that monitoring, mentoring, and performance monitoring with fewer face-to-face interactions are difficulties faced while managing teleworkers and that the failure to address these challenges can negatively impact the effectiveness of telework practices (Greer and Payne, 2014; Kurkland and Bailey, 2000).

In summary, an organization needs a sound performance management system and high-quality supervision for the successful management of teleworking. Thus, the current study assumes that if the quality of performance management and supervision is high, employees will perceive that telework is working well and positively affecting their organization.

Therefore, the following hypotheses are proposed:

Hypothesis 3a. The quality of performance management is positively associated with the organizational impact of telework and the job performance of teleworkers.

Hypothesis 3b. The quality of supervision is positively associated with the organizational impact of telework and the job performance of teleworkers.

Mediating effect of Telework’s organizational impact

Several meta-analyses have sought to comprehensively examine the effects of teleworking on individual and organizational outcomes. Gajendran and Harrison (2007) performed a meta-analysis of 46 telework studies and confirmed the existence of psychological mediators (e.g., perceived autonomy, work–family conflict, and relationship quality) that basically mediate teleworking and individual outcomes (e.g., job satisfaction, performance, turnover intention, role stress, and perceived career prospects). Moreover, Martin and MacDonnell (2012) used data from 22 studies to conduct a meta-analysis and validated the positive relationship between teleworking and organizational outcomes (e.g., productivity, retention, organizational commitment, and performance). Nevertheless, these comprehensive studies overlooked the potential linkage between the impact of telework on organization and individual performance.

Although few such studies exist, previous studies have explored the relationship between organizational-level variables as measured by individual perception and organizational performance in the ICT research context. For instance, Bayo-Moriones et al. (2013) collected data via face-to-face interviews with 267 Spanish manufacturing SME executive managers (small- and medium-sized enterprises) and examined the direct and indirect effects of ICT resources on firm performance. The authors revealed that the use of ICT leads to improved internal communication and coordination, which positively affects firm performance.

Other studies have investigated the relationship between individuals’ perception of the telework environment and their performance. For instance, Wicks (2002) analyzed survey data from a Canadian financial services company’s employees and suggested that employees may view increased individual performance from telework as a result of an improved work environment, such as less distraction and more control over the environment compared to the traditional office work environment.

Following Bayo-Moriones et al. (2013), Gajendran and Harrison (2007), and Wicks (2002), the current study assumes the existence of direct and indirect effects of telework-related variables on individual performance for several reasons. First, Gajendran and Harrison (2007) performed a meta-analysis and found that psychological mediators exist between teleworking and individual performance. Thus, the current study assumes that mediating variables exist between telework-related variables and teleworker performance. Second, following Bayo-Moriones et al. (2013), who used individual perceptions to measure organizational-level variables to depict the overall effect of telework on organizations, the current study integrates the individual perceptions of teleworkers. Third, extant studies have shown that the benefits of telework at the individual level can be aggregated into organizational-level benefits (Martin and MacDonnell, 2012; Verbeke et al., 2008). Therefore, teleworkers’ individual perception of the organizational impact of telework can be aggregated to represent the organizational-level benefits. In addition, via the same logic, the dependent variable investigated in Bayo-Moriones et al.’s (2013) study was firm performance, which can be disaggregated into individual-level performance to test the effect of organizational-level benefits on individual-level performance. Finally, as the successful implementation of telework is commonly assumed to increase employee productivity (Caillier, 2013; Day and Burbach, 2015; Office of Personnel Management (OPM), 2012; Overmyer, 2011), it is hypothesized that teleworkers’ positive perceptions of the organizational impact of telework, which can be attained by successful implementation, are positively associated with individual-level performance. These conditions lead to the following hypothesis:

Hypothesis 4. The positive effects of work factors, technology factors, and management factors on job performance are mediated by the organizational impact of telework.
Research design

The empirical analysis in this study involves three steps. First, data were collected from the U.S. Merit Systems Protection Board (MSPB) telework survey. Next, measures were defined, and principal factor analysis (PFA) was conducted to develop measures for variables that included multiple items. Finally, as the current study includes a mediating variable (organizational impact of telework), a path analysis was used to test the direct and indirect effects of the independent variables (expected work similarity, telework frequency, accessibility of technologies, device availability, quality of performance management, and quality of supervision) on the dependent variable (job performance of teleworkers).

Data collection

According to both the literature and federal government archives, the MSPB telework survey is the only study conducted for the sole purpose of studying telework in the federal government and includes the performance rating of employees. For that reason, the present study uses data from the 2011 U.S. MSPB Telework Study, which contains the most recent available federal-level data concerning telework. The data were collected from federal employees and released by the MSPB (see MSPB, 2011 for reference). The data were obtained by contacting the MSPB and relating the current research purpose. Despite the limitation that the period of data collection was restricted to 2009, the MSPB data is the only publicly available, large-scale, telework-related data with individual performance ratings. Using these data allows for the inclusion of the telework-related perceptions of more than 9000 employees to identify the determinants of teleworker performance in the pre-COVID-19 period.

In 2009, a web-based survey was administered to 18,406 federal employees, and 9773 employees responded, which resulted in a 53.1% response rate (Merit Systems Protection Board [MSPB], 2011). A total of 9686 participants responded to the question “Was your request for routine telework granted?” Excluding the skipped responses (67.5%, 6541) and responses still in progress (1.2%, 120), 27.5% (2664) participants responded that their request was granted, and 3.7% (361) stated that their request was denied. As teleworkers are the main interest of this study, only those who responded that their request to telework was granted were included in the current study. After observations with missing data or nonresponses were excluded, data from a total of 2125 teleworkers were used for analysis.

Although federal telework reports existed before the MSPB survey was conducted, reports issued before the Telework Enhancement Act of 2010 use different measures and methodology in analysis, thereby making their data less relevant to the purposes of the current study (Office of Personnel Management [OPM], 2015). Factors related to organization management and telework implementation aspects in the MSPB study are relevant to the hypotheses of the current study and were therefore used.

As the current study uses MSPB telework survey data for both independent and dependent variables, the data are drawn from a single source, which possibly creates a common-source bias (CSB). All survey items were extracted from the MSPB telework survey (see MSPB, 2011 for items). Although using distinct sources of data for measuring teleworker behavior and teleworker performance is ideal, in practice, it is difficult to attain actual employee performance ratings and even more difficult to find the data that match the survey responses related to the independent variables. Thus, the MSPB telework survey data are the only viable data that include both telework-related variables and federal employee performance ratings.

Furthermore, as CSB is often a problem when both independent and dependent variables are drawn from survey data based on subjective self-reports (George and Pandey, 2017), the dependent variable of the current study is an objective measure, namely, employee performance rating. Thus, the issue of CSB is mitigated, and the reliability of the data depends on the honesty of the survey respondents in providing their actual performance rating. As the survey was administered by the federal government under the promise of anonymity, the current study assumes that the self-reported actual performance rating is reasonably accurate. Following the suggestion of numerous scholars who have emphasized transparency in data disclosure (e.g., George and Pandey, 2017; Lee et al., 2012), the current study offers a detailed explanation of the measurement procedures.

Measures

The current section discusses the operationalization of the proposed dependent, independent, and mediating variables. Tables 1 and 2 list the specific dimensions and items that compose the independent, mediating, and dependent variables. The dependent variable for this study is the job performance of teleworkers, which is measured by the self-reported actual performance rating received in the latest evaluation period (1 = unsuccessful, 2 = less than fully successful, 3 = fully successful, 4 = exceeds fully successful, and 5 = outstanding).

Work factors include expected work similarity and telework frequency. Expected work similarity is based on a single measure that asks the respondents to what extent they think that teleworkers have similar work assignments and work expectations compared to nonteleworkers. Telework frequency is measured by the frequency of teleworking.

Technology factors are composed of two separate measures. The first is the accessibility of technologies, which is measured by asking the respondents whether their agency provides hardware, software, and internet connections for teleworking. The second is device availability, which represents the number of devices provided among the presented equipment list. Respondents were asked whether their organization provides them with a laptop, cell phone, personal data assistant (PDA), and other mobile devices.

Management factors include the quality of performance management and supervision. The quality of performance management is measured based on seven items representing individual-level perception of performance management. The measure illustrates the degree to which the employee believes the organization provides clear job expectations, clearly defined individual performance goals, clear links between individual and organizational goals, appropriate
measures for individual performance goals, accountability for achieving individual expectations, recognition and reward based on the employee’s performance in the work unit, and satisfaction with received recognition and rewards. Principal factor analysis showed that seven items were loaded on a single factor (eigenvalue = 4.453), with a Cronbach’s alpha value of 0.897. Factor loadings ranged from 0.733 to 0.849.

Quality of supervision is based on five items that measure the employee’s satisfaction with the supervisor in his or her understanding of the employee’s job performance and accomplishments, supporting the balance of work and family issues, providing autonomy in accomplishing work, having a positive relationship with the employee, and the employee’s overall satisfaction with the supervisor. According to the results of principal factor analysis, a total of five items were loaded on a single factor (eigenvalue = 3.702), with Cronbach’s alpha value of 0.909. Factor loadings ranged from 0.733 to 0.914.

Work factors

Expected work similarity
To what extent do you agree or disagree with the following statements about telework in your agency: Employees that telework have similar work assignments and work expectations as employees that do not telework (5 = strongly agree to 1 = strongly disagree)

Telework frequency
0 = never; 1 = on an ad hoc basis; 2 = 1 day per week; 3 = 2–3 days per week; 4 = 4–5 days per week

Technology factors

Accessibility of technologies
To what extent do you agree or disagree with the following statements about telework in your agency: I have access to (use my own or my agency provides) the hardware, software, internet connections, etc., I need for telework (5 = strongly agree to 1 = strongly disagree)

Device availability
My organization provides me with: Laptop, cell phone, personal data assistant PDA, all other mobile devices (number of devices 0–4)

Table 1. Independent variables.

| Variable          | Question                                                                 | Factor loading | Factor eigenvalue | Alpha |
|-------------------|--------------------------------------------------------------------------|----------------|-------------------|-------|
| Management factors | Quality of performance management (5 = strongly agree to 1 = strongly disagree) | 0.768 0.849    | 4.453 0.897       |       |
| Management factors | Quality of supervision (5 = strongly agree to 1 = strongly disagree) | 0.837 0.809    | 3.702 0.909       |       |
| Work factors      | Expected work similarity                                                                                   | 0.733 0.914    | 3.702 0.909       |       |
| Technology factors | Accessibility of technologies                                                                                     | 0.000 0.000    | 0.000 0.000       |       |
| Technology factors | Device availability                                                                                                               | 0.000 0.000    | 0.000 0.000       |       |

Results

In the current study, the analysis of the hypothesized model, which is presented in Figure 2, revealed that the model was just-identified with zero degrees of freedom. In such just-identified models, to calculate the chi-square goodness-of-fit, revising the model by excluding the nonsignificant paths is recommended (Scott and Bruce, 1994). Thus, the current study obtained additional degrees of freedom by excluding the nonsignificant paths. More specifically, work similarity, accessibility to technologies, and device availability had no impact on the job performance of teleworkers. Additionally, device availability and quality of supervision did not affect the organizational impact of telework. As the device
availability hypothesis was not supported within the scope of this study, the amount of equipment provided to teleworkers had no effect on either the organizational impact of telework or teleworker job performance. Therefore, Hypothesis 2b was not supported. The results of the final model are presented in Figure 3.

The fit statistics for the final model suggest that the data fit the model well. All the fit indices used in the current study showed good fit according to a chi-square test (chi-square = 1.105, df = 3, p = 0.776), the relative fit index (RFI) >0.95, the comparative fit index (CFI) >0.95, the normed-fit index (NFI) >0.95, the goodness-of-fit index (GFI) >0.95, and the root mean square error of approximation (RMSEA) <0.001. According to the squared multiple correlation values in the final model, the model accounted for 15% of the variance in the organizational impact of telework and 7.4% of the variance in the job performance of teleworkers. To confirm the mediation effect of the organizational impact of telework between the independent variables and teleworker job performance, bootstrapping with 500 samples and a 95% bias-corrected confidence level was applied.

The results of the hypothesis testing in the final model are as follows. The final model involved two sets of results: 1) the direct relationship between the independent and dependent variables, expected work similarity (b = 0.114, p < 0.001), telework frequency (b = 0.162, p < 0.001), accessibility of technologies (b = 0.106, p < 0.001), and quality of performance management (b = 0.218, p < 0.001) directly affected the organizational impact of telework. These findings suggest that teleworkers who expect that they have similar work assignments and expectations compared to those of nonteleworkers, telework more frequently, have more access to technologies used for teleworking, and perceive that their organization’s performance management is high quality tend to have positive perceptions about the organizational impact of telework.

Regarding the job performance of teleworkers, telework frequency (b = 0.079, p < 0.001), quality of performance management (b = 0.168, p < 0.001), quality of supervision (b = 0.125, p < 0.001), and organizational impact of telework (b = −0.055, p < 0.05) showed statistical significance. This result illustrates that teleworkers who carry out jobs more often through telework tend to perform better than employees who telework less often. The findings of this study also indicate that management matters and greatly influences teleworkers’ performance. Teleworkers who perceived that their organization was doing well in performance management practices and that their supervisors were doing well in supervising them showed higher performance outcomes compared to their counterparts. However, in contrast to the expectations of the current study, the relationship between the organizational impact of telework and the job performance of
teleworkers was negative, which suggests that teleworkers who believe that telework has positive impacts on their organization demonstrate a lower performance level than employees who do not. In other words, high-performing teleworkers evaluate the organizational impact of telework more negatively than do low-performing teleworkers. In sum, Hypotheses 1b and 3a were supported, while Hypotheses 1a, 2a, and 3b were partially supported. Among the two supported hypotheses, by comparing the standardized path estimates, as shown in Table 4, the current study revealed that the quality of performance management has a stronger effect on both the organizational impact of telework and the job performance of teleworkers than telework frequency.

Subsequently, regarding the expected work similarity and accessibility of technologies, there was no statistical significance in the direct relationship with teleworker job performance, whereas the indirect relationship mediated by the organizational impact of telework showed statistical significance. This result may suggest perfect mediation; however, as shown in Table 5, because the relationship between the organizational impact of telework and job performance of teleworkers was negative, the sign of the indirect relationship was negative, which is in contrast with the expectations of the current study. Telework frequency and quality of performance management both directly and indirectly affected the job performance of teleworkers. Thus, a partial mediation effect seems to exist. However, because the signs of the direct (+) and indirect effects (−) were different, the existence of suppression effects was found, which resulted in an inconsistent mediation (Mackinnon and Fairchild, 2009; Shrout and Bolger, 2002). In such a case, Zhao et al. (2010) suggest the possibility that an omitted variable exists between the independent variables and dependent variables and recommend that the researchers look for alternative mediators. Therefore, in the current study, the mediation effect of telework impact was not found, and Hypothesis 4 was not supported.

**Discussion and conclusions**

This study simply aims to identify what factors determine teleworkers’ performance in public organizations in the pre-COVID-19 period. An exploratory analytical framework was posited to identify which factor is more critical to teleworkers’ performance among work factors, technology factors, and management factors. During this process, the mediating effect of the organizational impact of telework was also tested. The implications for future research and practice are as follows.

First, whether teleworkers perceive that they perform similar work assignments and experience the same work expectations as nonteleworkers does not affect teleworkers’ job performance. This result implies that in contrast to past research that argues the importance of improving teleworker performance by adjusting job requirements and performance measures (Bogdanski and Setliff, 2000; Lautsch et al., 2009), maintaining fairness in work assignments and expectations is not a determinant of the performance of teleworkers. However, a positive association was found between work similarity and organizational impact. Therefore, providing fair work expectations for telework may be important for employees to think positively of the impact of telework on their organization. Future studies may consider that providing similar work to teleworkers can lead to positive perceptions regarding telework, but it does not improve individual performance. To validate this finding, it may be possible to analyze the relationship between work similarity and job performance of nonteleworkers and examine whether similar results are found.

Second, the present findings also reveal that telework frequency positively affects teleworker performance. This result contradicts previous studies (e.g., Bailey and Kurland, 2002; OECD, 2020) that argue that frequent teleworking may lead to social isolation, missing out on information at the workplace, poor performance appraisals, and decreased work efficiency. Thus, this finding may imply that high-performing teleworkers may simply be high-level performers who happen to telework more frequently. Future studies may consider investigating how factors such as work efficiency and social isolation mediate the relationship between teleworking amount and teleworker performance. In addition, subsequent research can attempt to first identify the high-level performers and examine the level of telework-related variables to reveal if employee performance can act as an antecedent of telework.

Third, the accessibility of technologies and device availability were not associated with the job performance of teleworkers. One possible reason is that the accessibility of technologies and provided devices are simply not determinants of teleworker performance. Another possible explanation may be that when the quality of the accessibility and number of devices reaches a certain point, the positive effect of technological factors may be subject to the law of diminishing marginal utility. Subsequent research may focus on validating
the reasons underlying the insignificant relationship between technological factors and job performance. Thus, to save unnecessary investments in telework accessibility and devices, practitioners may consider identifying the proper level of investments in technological environments.

Fourth, all variables related to management factors were positively related to teleworker performance; thus, within the scope of the current study, management factors are more critical to teleworkers’ performance than technology factors. This result suggests caution among those who believe in technological determinism with an optimistic view of the prospects of a technology-mediated work environment. Future studies should consider that teleworkers are likely to feel detached from their supervisors and easily lost in an autonomous but unchecked working environment. Managers may worry about the “out of sight, out of mind” phenomenon being present among teleworkers (Weisberg and Porell, 2011). Thus, practitioners need to consider that the quality of performance management practices might be more important to organizational performance in the telework environment than in the traditional work environment simply because teleworkers tend to frequently be physically distant from their managers.

Fifth, regarding the mediating effect of telework impact, in contrast to the expectation of the current study, the organizational impact of telework was negatively associated with teleworker performance. This finding implies that high-performing teleworkers do not view telework as having a positive influence on their organization. High-performing teleworkers may even view telework as a deterrent to organizational management because the more teleworkers view the organizational impact of telework as negative, the higher their performance ratings are. Thus, determining the reasons why teleworkers with negative perceptions of the organizational impact of telework show high performance warrants more research. These findings offer implications for past research that argues that teleworkers are likely to exhibit more positive work attitudes than nonteleworkers (Caillier, 2012; Lee and Kim, 2018; Martin and MacDonnell, 2012). Future research and practitioners interested in telework implementation might consider re-examining whether the attitude of teleworkers is positive before merely comparing teleworkers against nonteleworkers.

In summary, the analysis of the pre-COVID-19 period data shows that the perceived impact of telework negatively affected teleworker performance, while more frequent telework and management factors showed a positive association. Within the scope of the study, although telework frequency positively affected job performance, it had a weaker effect than that of management factors. Therefore, telework itself and positive perceptions regarding telework may not be major determinants of employee performance. Future research and practice can consider analyzing the perceptual differences in telework between high- and low-level performers independently rather than merely assuming that telework improves overall organizational performance.

The results of this study have implications for post-COVID-19 telework research. Since telework has been expanded as a response to the pandemic, assessing teleworker performance before the COVID-19 pandemic is necessary to identify the possible determinants of performance and apply the findings to post-COVID-19 teleworking. Furthermore, during the crisis, to prevent infection, organizations have

Table 4. Results of path analysis.

| Dependent variable | Path | Standardized path estimates | p |
|--------------------|------|----------------------------|----|
| Organizational impact of telework | Expected work similarity->Organizational impact of telework | 0.114*** | .000 |
| | Telework frequency-> organizational impact of telework | 0.162*** | .000 |
| | Accessibility of technologies-> organizational impact of telework | 0.106*** | .000 |
| | Quality of performance management-> organizational impact of telework | 0.218*** | .000 |
| Job performance of teleworkers | Organizational impact of telework-> job performance of teleworkers | -0.055* | .013 |
| | Telework frequency-> job performance of teleworkers | 0.079*** | .000 |
| | Quality of performance management-> | 0.168*** | .000 |
| | Quality of supervision-> job performance of teleworkers | 0.125*** | .000 |

Note: *p < .05, ***p < .001.

Table 5. Standardized effects on performance rating with bias-corrected percentile p values.

| Effect | Expected work similarity | Te lework frequency | Accessibility of technologies | Quality of performance management | Quality of supervision | Organizational impact of telework |
|--------|--------------------------|---------------------|----------------------------|-----------------------------------|------------------------|----------------------------------|
| Direct (p value) | — | 0.079*** (.005) | — | 0.168*** (.004) | 0.125*** (.003) | —-0.055* (.046) |
| Indirect (p value) | -0.006* (0.022) | -0.009* (0.033) | -0.006* (0.026) | -0.012* (0.041) | — | — |

Note: *p < .05, ***p < .01.
been encouraged to let employees telework (Centers for Disease Control and Prevention (CDC), 2020). The prolonged COVID-19 pandemic period has required organizations to develop the means by which to maintain performance using telework. Based on the findings of this study, researchers and practitioners can investigate how those determinants have affected performance during the crisis.

Recent studies have discussed telework in the post-COVID-19 period, during which organizations may or may not have offered telework to their employees (Belzunegui-Eraso and Erro-Garcés, 2020). Belzunegui-Eraso and Erro-Garcés proposed that future studies should analyze whether the COVID-19 virus was a driver for change or if it was simply a temporary alternative. Organizations’ decision about whether to continue using telework would depend on the effect of telework during the COVID-19 period, which remains unclear (OECD, 2021b). Some studies have claimed that business organizations need to adjust their work practices to solve challenges related to teleworking and that governments should implement relevant policies to sustain the benefits of telework (OECD, 2021a). Therefore, the determinants identified in the current study can be used to assess telework-related practices for the better implementation of telework in the post-COVID-19 era.

Despite the contributions of the current study, there are several limitations. First, the empirical analysis was conducted by using a data set produced by the U.S. federal government. As items listed on the survey were used in the analysis, it cannot be claimed that all the constructs were based on theoretical development. This limitation could not be solved within the scope of the current study because the Telework Study data represent the first and only federal government survey that exclusively investigated the perceptions of federal employees regarding telework in the pre-COVID-19 period. Future researchers can attempt to develop their own measurement model that can incorporate telework practices during the COVID-19 period and conduct a survey independent of federal government-led telework studies. Second, the empirical findings are strictly based on the U.S. federal government teleworking environment before the COVID-19 pandemic. Therefore, the generalization of the results of the current study to a broader population and time frame may be limited. Subsequent research can attempt to test the results of the current study in other regions or settings over multiple periods of time that include telework during the COVID-19 period.

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