
21. Embracing the digital workplace: a SMART work design approach to supporting virtual work

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If we can telework or shift our hours in a disaster, why can't we always? (Yost, 2012)

Although advanced information and communication technologies (ICTs) have long enabled people to work and collaborate remotely with fewer time and space constraints (Wang et al., 2020), only a small proportion of people before Covid-19 worked virtually on a regular basis (e.g., teleworking and virtual team). The current large-scale working from home “experiment” during the outbreak of Covid-19 suggests that working virtually can be as productive as working in the office. For example, according to the recent research conducted in the UK (CIPD, 2021), 33 percent of employers reported that virtual work has increased productivity. Increasingly, an expectation is emerging amongst both employees and employers that at least some degree of virtual work will be the “new normal” for many workers after the pandemic.

However, there can be limitations and challenges of virtual work, including poor communication, social isolation, work-home interference, work intensification, and procrastination, bringing negative impacts on employee work performance and well-being (Wang, et al., 2021b). If people continue working virtually without managers and other stakeholders recognizing and addressing these challenges, the effectiveness of virtual work will be limited. Therefore, it is theoretically and practically important to systematically consider how to optimize the benefits of virtual work and minimize its potential risks.

We propose that a re-orientation of research approach is needed to achieve such a systematic analysis of virtual work. Prior to the pandemic, scholars predominantly focused on the question “how effective is virtual work?” (e.g., Allen et al., 2015; Gajendran & Harrison, 2007; Raghuram et al., 2019). In other words, researchers devoted considerable attention to identifying the individual and team outcomes of working virtually, as well as the set of boundary conditions that mitigate these relationships (Shin, 2004). Overall, this mainstream research identified optimistic conclusions about virtual work arrangements (Allen et al., 2015). However, the outbreak of Covid-19 has required many employees to change their ways of working. Millions of workers have made the shift to working remotely, irrespective of their tasks, preferences, and abilities. Well-documented benefits of virtual work have been questioned, while various challenges have emerged and/or become more pronounced in the virtual work context (e.g., Chong et al., 2020; Kniffin et al., 2021; Wang et al., 2021b). Accordingly, we believe that the time is ripe for scholars and practitioners to shift the locus of understanding from evaluating the effectiveness of virtual work to asking “how can we better design virtual work to boost individual work effectiveness and well-being?” (e.g., Klonek & Parker, 2021; Wang et al., 2021b; Xie et al., 2019).

In this chapter, we introduce a work design perspective to the topic, which expands theory on virtual work, and generates useful guidance for managers and organizations to support their

virtual workers. To lay the foundation for this perspective, we review the literature to identify major challenges that employees struggle with in virtual work settings. We then discuss how some of these challenges can be addressed through a sociotechnically oriented work design approach involving both altering the social subsystem (i.e., changing work characteristics) and the technical subsystem (i.e., technology re-design). We conclude with important directions for future research.

KEY CHALLENGES OF VIRTUAL WORK

“Virtuality” refers to “the extent to which individuals use technology to interact with others, share ideas and information, and execute work” (Makarius & Larson, 2017: 160). Virtual work arrangements change how people perform their work tasks and interact with others. To identify the challenges arising from such change, we briefly review three streams of virtual work research: telework, virtual team, and computer-mediated communication (CMC) (Raghuram et al., 2019). Although we build on influential reviews on virtual work (e.g., Allen et al., 2015; Makarius & Larson, 2017; Raghuram et al., 2019; Wang et al., 2020), we particularly focus on research conducted during the outbreak of Covid-19. That is, because virtual work was primarily a “privilege” and was not widely adopted before the pandemic, previous research findings might have limited implications for future virtual work practices. For example, most studies prior to the pandemic identified the benefits of virtual work (e.g., Bloom et al., 2015), but these findings have been criticized for selection bias, focusing mostly on workers who possess sufficient resources, appropriate sorts of tasks, and/or have the required abilities to handle challenges accompanied with virtual work arrangements (Lapierre et al., 2016; Wang, et al., 2021b). Such a focus might underestimate pitfalls in virtual work settings when it is engaged in more broadly.

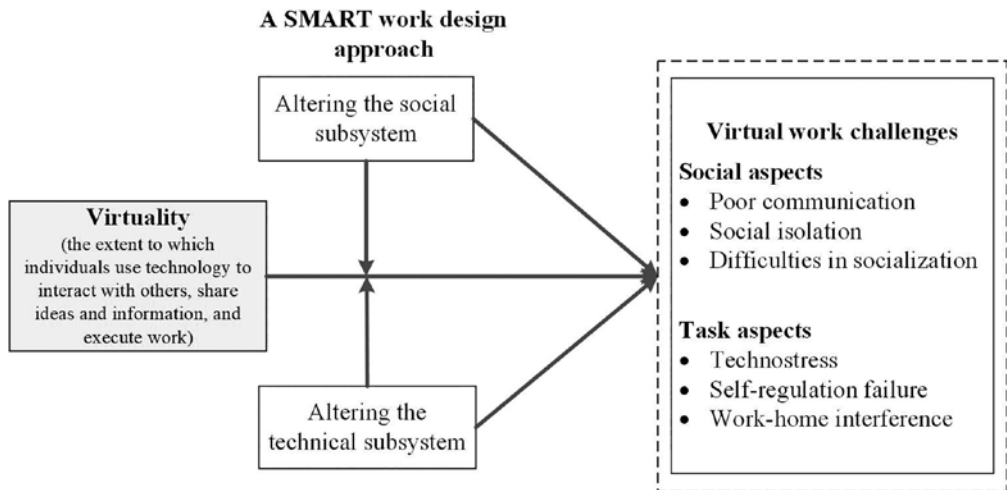
The unprecedented scale of working from home work practices during the pandemic provides a unique context to investigate the challenges that individuals may struggle with in the digital/virtual workplace (e.g., Chong et al., 2020; Darouei & Pluut, 2021; Wang, et al., 2021a). Consistent with Wang et al.’s (2020) findings, we show that many virtual work challenges emerged in the processes of utilizing ICTs to communicate or collaborate with others (i.e., social aspects) and to execute work (i.e., task aspects). In the remainder of this section, we discuss how virtual work can lead to important challenges, first, with regard to social aspects of work and second with regard to technical aspects (summarized in Figure 21.1).

Challenges in Social Aspects

ICTs help to mediate interpersonal communication and collaboration in virtual work settings. Building upon computer-mediated-communication theories, the virtual work literature has revealed a series of social challenges, including poor communication, social isolation, and difficulties in the socialization process.

Poor communication

Research has been demonstrated that computer-mediated communication in virtual work practices, in conjunction with geographic dispersion, often reduces communication quality and communication effectiveness. There are well-documented negative consequences of such



Source: Authors' own.

Figure 21.1 A work design approach to supporting virtual work

poor communication in virtual work, such as conflicts (Hinds & Bailey, 2003), and decreased work effectiveness and well-being (Day et al., 2012). First of all, compared with face-to-face interaction, computer-mediated communication delivers somewhat limited social information. For instance, it can be more difficult to understand facial expressions and body language with digital communication technologies. Thus, computer-mediated communication can lead to relatively lower intimacy in social interactions, and raise the chance of miscommunication or misunderstanding (Nesher Shoshan & Wehrt, 2021). Besides, high-quality communication at work also requires shared experience and cognition among individuals, which can provide useful additional information and make communication processes smoother. However, as Greer and Payne (2014) argued, virtual work arrangements build a new physical boundary between employees because they work in different places and different time zones, resulting in reduced frequency and amount of communication (especially informal communication) at work (Blanchard, 2021; Jarvenpaa & Välikangas, 2020). Yang et al. (2021), based on the data collected from 61,182 US Microsoft employees over the first six months of 2020, supported this argument. These authors found that the remote work during the pandemic made the collaboration network of workers more siloed and resulted in a decrease in synchronous communication and an increase in asynchronous communication. In other words, the firm-wide virtual work practices diminished the communication process at work (e.g., sharing information across departments). Finally, as identified in Wang, et al.'s (2021b) qualitative study conducted during the outbreak of Covid-19, technological issues (e.g., poor internet connections) also can hinder the communication process among virtual workers.

Social isolation

Limited social cues in computer-mediated communication and rare face-to-face interactions can cause virtual workers to feel socially isolated. We find surprising differences between research findings prior to the pandemic and those observed during the pandemic.

Pre-pandemic research findings of the relationship between virtual work on social isolation are inconsistent. Some empirical evidence supports the challenge of social isolation among virtual workers (e.g., Golden et al., 2008; Morganson et al., 2010). Taking Golden et al.'s study as an example, they found that isolation was negatively associated with job performance for employees who frequently worked away from the office. Another stream of research found that virtuality may not necessarily lead to isolation. Gajendran and Harrison's (2007) meta-analytical study revealed a positive association between telework intensity (i.e., time spent on working away from the office) and employee-supervisor relationships, and a non-significant association between telework intensity and coworker relationship quality. According to Cooper and Kurland's (2002) qualitative study, people can adjust their social behaviors to cope with isolation in virtual work settings, and virtual work arrangements therefore do not impair their social needs. It is also possible that individuals who prefer working alone might be those who choose to work away from the office, thus experiencing less isolation in virtual work settings.

However, during the Covid-19 pandemic, there was consistent evidence of social isolation and its deleterious effects in virtual work (e.g., Blanchard, 2021; Galanti et al., 2021; Tavares et al., 2021; Toscano & Zappalà, 2020; Wang, et al., 2021b). This phenomenon could be explained by the inflexibility of virtual work policies at this time. The involuntary nature of virtual work during the pandemic did not provide people sufficient autonomy to decide when, where, and how to work remotely, which means they could not adjust their virtual work intensity or frequency, return to the office, and/or engage in high-quality face-to-face interactions whenever they felt isolated (Cooper & Kurland, 2002). In addition, due to social gathering restrictions during the pandemic, people were less able to fulfill their social needs through their personal social networks, which likely exacerbated the feeling of isolation when working from home.

Difficulties in socialization

The frequent absence of face-to-face interactions and geographic dispersion have been suggested to undermine the process of socialization of newcomers into the workplace (Asatiani et al., 2021). In a highly virtual work environment, organization members are more likely to have diverse cultural backgrounds, resulting in an insufficient and weak base of shared value among workers (Watson-Manheim et al., 2002). Moreover, individuals usually focus on work-related topics in computer-mediated communication, spending limited time on informal interactions that are essential for socialization. Therefore, it will cost newcomers in the virtual work context more resources to seek information, build relationships at work, and adjust their behaviors, cognitions, and skills necessary to fulfill their roles in the organization. Employers likely need to invest more resources to support the relatively longer organizational socialization process and to establish the preferred organizational culture (Nyberg et al., 2021). Difficulties in socialization might be more pronounced in remote work during the Covid-19 pandemic. Xiao et al. (2021) found that, compared with pre-pandemic levels, employees' communication with coworkers was decreased. In other words, newcomers may have less opportunities to build connections with colleagues.

Challenges in Task Aspects

We also identified a set of challenges that virtual workers struggle with to accomplish their work tasks, including technostress, self-regulation failure, and work–home interference.

Technostress

Technostress, developed by management information system scholars, indicates the “stress experienced by end-users in organizations as a result of their use of ICTs” (Ragu-Nathan et al., 2008: 417). Considerable research has revealed various negative impacts of technostress on employees such as psychological strains and reduced work performance (e.g., Ayyagari et al., 2011; Wang et al., 2020). In the virtual work context, people frequently interact with ICTs to communicate with others and execute tasks, increasing the chance of experiencing technostress. Research has shown that intensive usage of ICTs at work can lead to stress in at least three ways (Wang et al., 2020). First, employees may suffer from information overload. ICTs indeed can help users process information-related tasks with less cognitive resources; in the meantime, the usage of ICTs brings large amounts of data/information, which in turn, can make users exhausted (e.g., Yu et al., 2018). Second, employees may experience high levels of learning requirements because of the fast pace of technology change and increased ICT complexity (Suh & Lee, 2017). Third, virtual workers can encounter various ICT-related hassles and interruptions, including technological incompatibility, information security threats, and ICT malfunctions (Wang et al., 2020). The abrupt shift to working from home during the pandemic has made employees more vulnerable to technostress. That is because there was little or no time for organizations to prepare sufficient IT infrastructure, safety procedures, and instructions for employees (Urbaniec et al., 2022).

Self-regulation failure

Nyberg et al. (2021) raised concerns about the lack of monitoring and motivation in virtual work. Because of the absence of supervisors and colleagues, some employees fail to resist temptations and do not appropriately regulate their behaviors and cognitive resources to accomplish work-related goals. In other words, they experience self-regulation failure. This can be accentuated because ICTs not only serve work-related goals, but also enable employees to handle personal issues (e.g., connecting with friends, online shopping, and playing online games). Less disciplined virtual workers may procrastinate engagement in primary tasks by cyberslacking (O’Neill et al., 2014). In addition to using ICTs in a counterproductive manner, virtual workers may also be easily distracted by interruptions from the personal domain and fail to concentrate on work tasks (Wang, et al., 2021a). As one participant in Wang, et al.’s qualitative study stated, “without the kind of pressure in the workplace, I was a little slack. I did more private things [during working time]” (Wang, et al., 2021b: 26). Wang, et al.’s (2021b) survey-based study further revealed that the challenge of self-regulation failure (e.g., procrastination) can greatly hurt virtual work effectiveness. Similarly, Troll et al.’s (2021) mixed-methods research on working from home during the Covid-19 crisis found that effective virtual work requires employees demonstrate self-control and appropriate self-control strategies.

Work–home interference

Before the pandemic, virtual work arrangements, especially teleworking, were considered as a desirable employee benefit because working from home can enable individuals to better balance work and private life. Gajendran and Harrison's (2007) meta-analysis of 46 studies revealed that teleworking is associated with lower work-to-family conflict, and this beneficial relationship is greater for employees who engage in teleworking more frequently and for those with more teleworking experience. Similarly, Allen et al.'s (2013) meta-analysis of 58 studies also found a negative association between teleworking and work-to-family conflict. However, Allen et al. (2015) criticized that it is not appropriate to conclude that virtual work arrangements can reduce work-to-family conflict because of methodological limitations in the existing literature (e.g., absence of controlled field experiments). It is possible, for instance, that employees low on family responsibilities (e.g., living without children) are more likely to work virtually, not vice versa.

Recent studies, probing deeper into the virtual work context, suggest that the desirable effects of virtual work on reducing work-to-home interference are questionable, at least during the pandemic. For instance, in two qualitative studies conducted during Covid-19, participants cited work-to-home interference as a major challenge encountered in virtual work (Tavares et al., 2021; Wang, et al., 2021b). One potential explanation for increased work-to-home interference is the involuntary nature of working from home during the outbreak of Covid-19, that is, people were forced to work remotely irrespective of their preferences and abilities. Another explanation is that many children were not able to be cared for outside of the home, and home schooling was commonly required. Leaving aside the uniqueness of the pandemic context, Delanoëje et al.'s (2019) daily diary study found that working outside of standard work hours plays a crucial role in predicting work-to-home interference. ICTs usage blurs the boundary between work and non-work domains, which can keep users constantly connected (Fonner & Roloff, 2012; Leonardi et al., 2010). Virtual workers can be reached by advanced ICTs outside regular working hours and they are expected to work longer hours (Kelliher & Anderson, 2010). Therefore, virtual workers will have fewer resources to participate in their home activities. Considerable research has revealed deleterious impacts of employing ICTs to perform work tasks after hours on work-to-home conflict (Boswell & Olson-Buchanan, 2007; Butts et al., 2015; Derks et al., 2015; Ferguson et al., 2016; Golden, 2012).

In terms of home-to-work interference, meta-analytical studies before the pandemic reported a negative or a nonsignificant impact of virtual work arrangements on home-to-work interference (Allen et al., 2013; Gajendran & Harrison, 2007). In other words, virtual work arrangements sometimes help to reduce home-to-work interference (that is, family responsibilities interfere less with working roles), but sometimes they do not. However, studies during the outbreak of Covid-19 raised concern about interruptions from family domains; likely in part because of the uniqueness of the Covid-19 context in which employees had to work with children and didn't necessarily possess a dedicated workspace at home (e.g., Allen et al., 2021; Wang, et al., 2021b).

A SMART WORK DESIGN APPROACH TO SUPPORTING VIRTUAL WORK

The challenges described above are not an inevitable outcome of virtual work practices. Taking the challenge of poor communication as an example, Fonner and Roloff (2010) found that telework intensity was not significantly related to information quality; scholars even reported a desirable effect of computer-mediated communication on communication effectiveness (Chidambaram & Jones, 1993). These findings are consistent with the well-established fit perspective in the computer-mediated communication literature (Dennis et al., 2008; Maruping & Agarwal, 2004), that is, workplace communication effectiveness depends on the fit between the communication technology and the work tasks being performed. We therefore propose that several of the above challenges can be addressed, at least in part, through a work design approach.

The topic of work design or job design, developed over a century ago, focuses on “the content and organization of one’s work tasks, activities, relationships, and responsibilities” (Parker, 2014: 662). Often work design research has proceeded by investigating the impact and re-design of key work characteristics, or attributes of work such as job autonomy, that have psychological significance for workers. Work design researchers also recognize that the content and organization of work is strongly influenced by technology, and that this technology can be adjusted to create better work and meet human needs (Cherns, 1987; Parker & Grote, 2022; Trist & Bamforth, 1951). In particular, the socio-technical systems (STS) approach to work design, developed in the 1950s, remains powerful guiding research in the current digital workplace (e.g., Baxter & Sommerville, 2011; Bélanger et al., 2013). From the STS perspective, virtual work can be viewed as a system comprising interdependent social and technical subsystems (Cherns, 1987; Emery & Trist, 1965; Trist & Bamforth, 1951). The social subsystem encompasses “all that is human that members of an organization bring with them to work”, while the technical subsystem consists of “the tools, techniques, procedures, skills, knowledge, and devices used by members of the social system to accomplish the tasks of the organization” (Pasmore et al., 1982: 1184). STS theory states that system effectiveness largely relies on the joint optimization of social and technical subsystems, which implies people can achieve greater system effectiveness by adjusting both the social and technical subsystems simultaneously.

Nevertheless, despite the plea for joint optimization, research and practice has tended to focus on one subsystem more than the other. For instance, early researchers guided by STS principles advocated for autonomous work groups to improve the social subsystem (e.g., increasing job autonomy, job identity, and social contact at work) in order to deal with the demands induced by the technical subsystem (Pasmore et al., 1982). On the other hand, another stream of research largely applies STS principles to technology design, with an emphasis on the technical subsystem (e.g., Baxter & Sommerville, 2011; Clegg, 2000). Management and organization scholars usually adopt the former perspective, taking the technology as a given and, therefore, narrowly viewing the social subsystem as the target for change. In contrast, scholars from the management information system and engineering research traditions tend to focus on the adjustment of the technical subsystem (Orlikowski & Barley, 2001). Based on STS principles, we argue that successful virtual work requires an integrated approach in which both social and technical subsystems are jointly considered and optimized.

Table 21.1 *How can managers and organizations support virtual work?*

Virtual work challenges	Target subsystem	Tips for supporting virtual work
Challenges in social aspects Poor communication Social isolation Difficulties in socialization	Social subsystem	Achieving SMART work socially Stimulating: enhancing task/skill variety and complexity. Mastery: (1) providing timely feedback; (2) enhancing role clarity; (3) technical support and professional development. Agency: (1) providing scheduling-autonomy; (2) using electronic monitoring artfully; (3) improving the flexibility of virtual work policies. Relational: (1) providing social support; (2) creating opportunities for informal social interactions and collaboration; (3) increasing task interdependence at the early stages of virtual work. Tolerable demands: keeping workload manageable.
Challenges in task aspects Technostress Self-regulation failure Home–work interference	Technical subsystem	Achieving SMART work technically Stimulating: technical features/functions that meet one’s needs to challenge (e.g., learn new knowledge, abilities, and skills). Mastery: technical features/functions that provide timely performance feedback. Agency: technical features/functions that support autonomy (e.g., allow users to custom the technology). Relational: technical features/functions that (1) facilitate social interactions (e.g., offer chatting channels); (2) facilitate one’s desire to influence others as well as one’s desire to be influenced by others (e.g., online knowledge community). Tolerable demands: technical features/functions that allow users to provide feedback (e.g., feedback hub).

Source: Authors’ own.

In what follows, we describe the SMART work design model (Parker & Knight, 2020) that can be drawn on to improve both the social and technical subsystem within a virtual work system (summarized in Table 21.1).

SMART Work Design Model and Improvements to the Social Subsystem

Virtual work arrangements, as a new way of working, have changed the nature of work (Demerouti et al., 2014). As Wang et al. (2020) identified, adoption of ICTs for accomplishing work and interacting with others exert mixed effects on work characteristics including job demands, job autonomy, and relational aspects of work, which in turn influences individual work effectiveness and well-being. For instance, evidence suggests that, overall, when ICT is implemented, information overload, interruptions, learning requirements, and scheduling autonomy tend to increase, whereas social support, decision-making autonomy, and emotional labor often seem to decline (Sonnetag et al., 2012; Wang et al., 2020). To boost virtual work effectiveness, it is necessary to make a conscious effort to re-design virtual work by considering and, if necessary, changing the social subsystem.

The vast bulk of research has demonstrated that “good” work design in which work has work characteristics such as autonomy, task variety, and social support, and has low to moderate levels of job demands (e.g., workload), promotes individual motivation, well-being, and performance (e.g., Humphrey et al., 2007; Parker, 2014; Parker et al., 2021). One way to understand what constitutes “good” work design is the SMART model developed by Parker

and Knight (2020). This model identifies five higher-order categories of work characteristics. The first four letters (S for Stimulating, M for Mastery, A for Agency, R for Relational) encompass a series of desirable job resources that are important in and of themselves and that can also mitigate the detrimental impacts of virtual work challenges. The last letter, T, stands for a moderate level of job demands. Tolerable demands can be achieved by reducing work demands, and/or by increasing job resources.

Stimulating

Stimulating jobs involve high levels of task variety, skill variety, skill use, and job complexity. In other words, individuals with highly stimulating jobs can complete tasks using a wide range of skills and abilities, engage in varied tasks, and solve challenging problems at work. Although challenging jobs can, in the extreme, lead to strain, they also improve employee performance via increased work motivation (Lepine et al., 2005). On the contrary, employees tend to be bored with less stimulating or routine tasks, and have relatively lower levels of morale and performance.

In the virtual context, embracing complex jobs is conducive to facilitating organizational socialization processes. As Cooper-Thomas and Anderson argued (2006), learning is a key factor in organizational socialization. Newcomers learn from their colleagues, supervisors, mentors, and organizational literature to reduce the uncertainty at work and better understand their roles in the organization (Cooper-Thomas & Anderson, 2006). Complex tasks often require a set of interpersonal collaborations that facilitate interactions between newcomers and other organizational members. Through this kind of teamwork, newcomers master organizational knowledge and build workplace relationships.

Moreover, when a job is highly stimulating, virtual workers likely show less self-regulation failure. Previous studies have shown workplace boredom is the main cause of counterproductive ICT use behaviors (e.g., cyberslacking) and procrastination (Metin et al., 2016; Pindek et al., 2018). Work design research suggests that boredom in the workplace is often derived from underload. Namely, people who have few challenging tasks to do will shift their attention to non-work-related issues (Metin et al., 2016). Therefore, managers should allow virtual workers to engage in a variety of tasks, utilize different skills at work, and work on challenging tasks. As a result, employees will likely better concentrate on their primary work tasks.

Mastery

Mastery emphasizes designing work so that workers know what they are expected to do (e.g., via enhancing role clarity) and know how well they are doing (e.g., by providing job feedback). In the virtual context, poor or ineffective communication in computer-mediated modes can result in role ambiguity, namely, there is uncertainty over the expectations of one's role at work. The asynchronous nature of most interpersonal communication in virtual work can also reduce the effectiveness of performance feedback. Thus, managers need to clearly define virtual workers' roles, manage performance effectively, and provide feedback regularly to keep employees in the loop (Kirkman et al., 2002). Mastery also plays a significant role in the organizational socialization process. Given reduced opportunities for informal social interactions in the virtual work context, it is challenging for newcomers to acquire enough information to fulfill their work roles (Fang et al., 2011). Managers need to clearly explicate their expectations and provide regular feedback, whether about outcomes or processes, to enhance virtual organizational socialization success (Cooper-Thomas & Anderson, 2006).

Providing feedback and role clarity also helps virtual workers to self-regulate. Goal setting plays a crucial role in self-regulation (Locke & Latham, 2002). Setting specific yet challenging goals can motivate people to increase their effort to make goal progress, while timely feedback provides information about how people are doing, which helps individuals adjust strategies and the level of effort to achieve the goal (Locke & Latham, 2002).

Finally, mastery can be supported amongst virtual workers by ensuring they have the necessary resources. Virtual workers during the pandemic struggled with a lack of ICT infrastructure (Bezzina et al., 2021). Employees need the appropriate tools to work away from the office and should have access to organizational resources/documents. As Day et al. (2012) found, personal technical assistance and ICT resource support alleviated the negative impacts of technostress (i.e., learning expectations and ICT hassles in their study) on individual well-being. We also recommend providing professional training in technology use to ensure workers have the knowledge, skills, and abilities required for virtual work (Tavares et al., 2021).

Agency

A well-designed job should support human agency by providing job autonomy; a key work characteristic. Jobs with higher levels of autonomy allow employees to take control of their work schedule, choose the most suitable work methods, make work decisions independently, and influence wider decision-making. The work design literature has shown that autonomy is positively associated with desirable individual outcomes such as enhanced job performance, job satisfaction, and well-being (Humphrey et al., 2007).

According to lessons learned from the current pandemic, virtual work policies should themselves have flexibility (Wang, et al., 2021b). For example, some employees may prefer online interactions, while others prefer face-to-face communication, so managers should aim to give employees as much autonomy as feasible to choose where and how they work. Taking the challenge of social isolation as an example, when employees can decide the ways of working virtually, they can adopt strategies to fulfill their social needs, such as adjusting virtual work intensity, working at a coworking space, or participating in projects that require interpersonal collaboration. Such strategies, of course, need to be balanced alongside organizational requirements such that there will be clear and reasonable boundaries around the autonomy (e.g., employees might be expected to be physically present at particular times, or for particular tasks).

Agency also plays a crucial role in mitigating demands from different domains. Virtual work arrangements blur the work–home boundary, which means that employees are expected to deal with work or family demands at the same time. Managers commonly believe that virtual workers have more autonomy in comparison to their counterparts in the office, and therefore, don't provide additional autonomy. For instance, managers sometimes monitor virtual workers in the same way they monitor office staff. As Lautsch et al. (2009) identified, virtual workers supervised with a close monitoring approach reported higher work–family conflict, which is also supported by Parker et al.'s (2020) study conducted during the pandemic. Thus, managers should trust and empower their subordinates, focusing on managing by outputs (e.g., achieving goals) rather than inputs (e.g., physical presence). Golden et al.'s (2006) study provides empirical evidence for the importance of autonomy in virtual work practices. They found that the negative relationship between telework intensity and work–family conflict was moderated by scheduling autonomy, such that work–family conflict decreased at a faster rate

for employees with higher levels of scheduling autonomy. In other words, when autonomy is available, virtual work arrangements can have a more positive effect on work–life balance.

Relational

Relational aspects are crucial for successful virtual work. First, social support can help virtual workers fulfill their psychological needs. Bentley et al. (2016) found that, in the remote work context, social support is negatively related to social isolation, which in turn, reduced psychological strain and increased job satisfaction. Based on data collected from virtual workers who worked from home during the pandemic, Wang, et al. (2021b) reported that social support can lead to greater life satisfaction via reduced loneliness. To facilitate social support, managers can encourage non-work-related communications through enterprise social media (e.g., Slack), organize informal online and offline social activities, and encourage employees to ask for, and provide, help.

Task interdependence, or the extent to which one's tasks are connected with other tasks (Grant & Parker, 2009), is an important relational element in virtual work. Previous studies have revealed detrimental impacts of task interdependence in virtual work settings, such as more work exhaustion (Windeler et al., 2017) and a higher level of experienced workload (Suh & Lee, 2017). A recent daily diary study conducted during the pandemic also revealed that the impact of daily Covid-19 task setbacks on end-of-day exhaustion was stronger for employees with higher levels of task interdependence (Chong et al., 2020). This might be because highly interdependent jobs usually require synchronous interpersonal communication (Golden & Gajendran, 2019), creating an extra level of demand.

However, if we take virtual work arrangements as a given, task interdependence can also facilitate interpersonal communication and coordination (Klonek & Parker, 2021). Enhancing task interdependence is particularly necessary at the beginning of virtual work (e.g., for newcomers). The channel expansion theory (Carlson & Zmud, 1999) suggests that people can proactively adapt to the virtual environment and can develop their abilities and skills to clearly and correctly send and interpret information with richer experiences. In other words, negative consequences caused by computer-mediated communication will be diminished over time. Thus, managers should facilitate interpersonal communication and coordination at the early stages of virtual work and support newcomers, thereby promoting the process of socialization (Hertel et al., 2005).

Tolerable demands

As identified in the last section, there are various types of demands in virtual work, including work–family conflict, ICT-related demands, workload, and so on. Sometimes, for example, virtual workers are expected to work under time pressure, work longer hours, or be “always online” even outside regular working hours, which explains why some studies show that virtual work arrangements may increase work intensification (e.g., Chesley, 2014; Kelliher & Anderson, 2008, 2010). Work intensification has a series of detrimental effects, including impairing worker mental health and well-being. For example, higher levels of workload will lead to work–home interference (Wang, et al., 2021b) and exacerbate the negative influence of work–home interference on employees (Golden, 2012). Therefore, managers must thoroughly consider the intensity of work. Klonek and Parker (2021) offered some recommendations to effectively manage workload. For instance, managers can use an evidence-based approach

to set work-related goals, make work–life balance part of the organizational culture, and hire additional support teams (e.g., outsourcing).

Under certain circumstances, it is not realistic to reduce workload; instead managers and organizations must offer job resources to buffer the deleterious effects of overload on employees. The first four elements of the SMART work design model (i.e., Stimulating, Mastery, Agency, and Relational) emphasize job resources that can help individuals cope with demands.

SMART Work Design Model and Improvements to the Technical Subsystem

In the current digital workplace, most work elements such as routines and roles nowadays are embedded in technology or the technical subsystem. According to STS theories, the technical subsystem influences employee working experiences through either supporting or limiting particular behaviors. As Cooper and Foster (1971: 469) articulated, “any environment can be analyzed in terms of those features which make particular behaviors possible (supports) and those which preclude or limit particular behaviors (constraints).” Considerable attention has been devoted to eliminating deleterious constraints or to solving problems raised by constraints. For example, machines in mass production limit operators from utilizing their skills. Managers usually re-design the social subsystem to alleviate the negative impact of this constraint, such as by increasing job rotation.

However, we can also achieve the SMART work and make desirable employee outcomes possible through the design of appropriate technology, which has received limited attention in previous literature. For instance, users may perceive more autonomy when the technology allows customization. We therefore see re-designing technology, especially the technology *affordance*, as an avenue for improving job quality and work system effectiveness.

The term *affordance* refers to “the actionable properties between an object and an actor” (Zhang, 2008: 145). In the context of technology, affordance can be simply understood as the possibilities for performing certain actions based on particular technical features (i.e., what a user can potentially do through using the technology). *Motivational affordances* specifically indicate technical features of a given technology that determine whether and how it can support one’s motivational needs (e.g., needs for autonomy, relatedness, and competence, Zhang, 2008). A technology with high motivational affordances should allow users to take actions to meet their psychological needs (Karahanna et al., 2018; Peters et al., 2018; Zhang, 2008). For example, enterprise social media with chatting channels will facilitate online interactions, which in turn, helps to meet individuals’ social needs.

The core tenet of the motivational affordances technology design approach is consistent with the SMART work design model, because those two approaches both aim to improve virtual working experiences. Notably, altering the social subsystem or re-designing work in a SMART manner tends to be “top-down” in so far as it requires the input of managers and other organizational stakeholders. Affordances, on the other hand, offer the potential for a series of self-initiated actions. That is, technical affordances can make job crafting behaviors possible, and employees can utilize these affordances to achieve a better person–job fit in a “bottom-up” manner (Wrzesniewski & Dutton, 2001). For example, virtual workers often collaborate with colleagues via enterprise social networking platforms (e.g., Microsoft Teams). If this platform *affords* informal social interactions (e.g., channels are provided for non-work-related online chatting), individuals will have more opportunities to interact with colleagues and to be socially connected with them.

We argue that, in the virtual context, managers and organizations should not take the technology as a given; it's equally important to improve the technical subsystem to support virtual workers (Parker & Grote, 2022). We believe the SMART work design model will also be effective when designing technology in the virtual work context. Specifically, incorporating Zhang's (2008) ideals on motivational affordances, the current chapter recommends adding necessary technical features/functions that afford employees to work in a SMART way.

Stimulating

Zhang (2008) recommended introducing gamification in technology design to encourage employee motivation. That is, applying game elements or principles to design workplace technologies, such as earning points, managing a challenge, levels, badges, leaderboards, and so on, might enhance workers' stimulating experiences. As Grünewald et al. (2019) argued, the game-like design "has the power to transform the activity of learning a new skill or onboarding new employees into an exciting challenge" (p. 557). For example, a complex training program could be divided into several challenges; people who hit a milestone will earn points and badges. Gamification is also conducive for the interpersonal process, thereby overcoming difficulties in social interactions among virtual workers. Taking group/team games as an example, these games require the corporation of team members, which would be a great opportunity for newcomers to acquire social information and establish networks (Colbert et al., 2016).

Mastery

In terms of coping with the challenges of virtual work in task aspects, technology should afford users to get immediate performance feedback, helping employees better master their jobs. Except for supervisors and colleagues, technology is the main source of feedback. Advanced ICTs used in virtual work have great abilities to fetch user data. Managers usually utilize ICTs to monitor their subordinates because of lower trust in virtual work settings. However, users might be able to adjust their strategies and improve if they can receive timely information about their work performance. Participants in Wang, et al.'s (2021b) study stated that electronic monitoring is acceptable and necessary when managers and organizations use it appropriately. Previous research has revealed that using electronic monitoring to control and punish employees is deleterious, but providing constructive feedback with the help of electronic monitoring contributes to employee growth and skill development (Ravid et al., 2020). Accordingly, we recommend organizations analyze the massive amounts of data generated during virtual work, but importantly, ensuring that virtual workers have access to relevant work-related data and real-time performance feedback. This technical feature also affords managers to create optimal challenges for employees (i.e., making work stimulating). By doing so, individuals will feel their jobs are stimulating but will not be exhausted by overload.

Agency

Managers need to pay attention to human autonomy in human-computer interaction and support human agency. Most existing research has focused on autonomous technology, while overlooking human agency. In fact, working with a standardized system often means limited employee decision-making and work method autonomy (Eriksson-Zetterquist et al., 2009). Scholars have recently called for more attention to support human autonomy (i.e., designing greater opportunities for workers to control and influence the technology) (Parent-Rocheleau

& Parker, 2022; Parker & Grote, 2022). It is a common practice to afford personalization (e.g., application toolbar customization). Another advanced approach, discussed by Peters et al. (2018), is to build technical features into the system that can help users achieve goals more fluently by reducing obstacles or strengthening their capabilities. For example, assistive functions (e.g., time management applications) can give users better control over their work.

Relational

Given that most challenges in virtual work are caused by the absence of face-to-face interactions, we encourage managers to add more technical features/functions that facilitate social interactions, thereby improving the “R” element of virtual work. Song et al.’s (2019) qualitative study found that work-oriented technology and socialization-oriented technology exert different effects on users. Specifically, participants perceived more instrumental value of work-oriented technology, while perceiving more expressive value of socialization-oriented technology; socialization-oriented technology (e.g., WeChat in their study) plays a more important role in facilitating social exchange and social support in comparison to work-oriented technology. We believe that virtual workers will benefit from functions that afford informal online social interactions. Managers are encouraged to add (non-work-related) chatting channels into the enterprise social media, which can strengthen the emotional bond between virtual workers and other organizational members. According to Huang et al.’s (2015) study, non-work-related online posts had a positive spillover effect on work-related online posts, which, in turn, increased employee performance. In other words, facilitating informal online social interactions can not only mitigate challenges in social aspects (e.g., social isolation), but also contribute to greater performance.

Another approach to promote social interactions is to build an online knowledge community (or corporate Wiki). People usually have a need to influence others (Zhang, 2008). As prosocial behaviors in the online knowledge community are transparent to a large-scale audience, individuals tend to be motivated to contribute or to show organizational citizen behavior (e.g., sharing knowledge and providing support) (Leonardi & Vaast, 2017). As a member of the knowledge community, on the other hand, employees will have more opportunities to learn organizational knowledge, seek and receive help.

Tolerable demands

Tolerable ICT-related demands do not mean technologies automatically execute primary tasks, substituting for humans in the virtual work practices. In fact, manageable and challenge technostressors as a motivating factor can enhance employees’ skills, tasks, and work–life activities, while too less of challenge technostressors will make work less stimulating (Tarafdar et al., 2019). The idea of Tolerable demands underscores the importance of reducing threat technostressors, including techno-insecurity, techno-overload, techno-invasion, techno-uncertainty, techno-complexity, and so on. Based on the SMART work design approach, improving the first four elements of the SMART model (i.e., Stimulating, Mastery, Agency, and Relational) in technology design can provide necessary resources for individuals to cope with such threat technostressors, thereby helping to keep the demands tolerable. Taking the relational aspect as an example, Bennett et al.’s (2021) research on videoconference meetings during the Covid-19 pandemic found that videoconference fatigue could be reduced if meeting attendees had higher feelings of group belongingness. That means increasing relational elements in computer-mediated communications is conducive to buffer demands in

virtual work. Besides, technical features that support human agency are also useful. Managers and engineers need to add supportive functions to the technical subsystem which allow users to provide their feedback (e.g., Feedback hub), such that technologies will be upgraded improved user experiences.

CONCLUSION

The unprecedented large-scale virtual work experiment has challenged our understanding of work. Practitioners and scholars need to embrace the digital way of working in the coronavirus-forged world by considering how to support virtual work and improve virtual work experiences. Based on a work design perspective, the current chapter frames virtual work as a system comprised of social and technical subsystems. As summarized in Figure 21.1 and Table 21.1, we introduced the SMART work design model to achieve a joint optimization of social and technical subsystems. Overall, we identified that previous research has been disconnected. Organizational scholars focus on employees' experiences in a given technological context, while studies inspired by management informational system traditions are more interested in how to optimize the technical system. However, effective virtual work practices require interdisciplinary integration of accumulating knowledge. We hope this chapter can facilitate theoretical conversation across disciplines and spark greater interest in virtual work re-design.

To move research on virtual work, we offer three promising directions for future research. First, we encourage the investigation of how impacts of work designs vary with the degree of virtuality. As Gibson et al. (2011) identified when examining the classic job characteristic model in the virtual team context, the effects of job characteristics vary with the level of virtuality. Their results showed that the relationship between task significance and perceived meaningfulness was significant only when electronic dependence (i.e., degree of reliance on electronically mediated communication) was higher; the relationship between job autonomy and perceived responsibility was greater for employees with lower electronic dependence; the relationship between feedback and the knowledge of results was greater when electronic dependence was at lower levels. In other words, virtuality enhanced the effect of task significance on meaningfulness, whereas it weakened the influence of job autonomy on responsibility as well as the influence of feedback on the knowledge of results. Based on this evidence, we advocate that work design theories need to be developed or modified in the highly digitalized context.

Second, how individuals cope with virtual work challenges with motivational affordances is another promising research area. Only a few studies have addressed how employees cope with these changes in virtual work (e.g., Cooper & Kurland, 2002). In fact, employees are not passive recipients of changes in work design, but instead can proactively craft their jobs (Wrzesniewski & Dutton, 2001). According to Zhang and Parker's (2019) hierarchical model of job crafting, individuals engage in job crafting by exerting efforts to seek positive aspects of work (i.e., approach crafting) or to avoid and/or escape from negative aspects of work (i.e., avoidance crafting). Individuals could play an active role in job crafting through managing to discover positive aspects of work (i.e., approach crafting) or avoid and/or escape from negative aspects of work (i.e., avoidance crafting). A recent meta-analytic review (Rudolph et al., 2017) has revealed the positive effects of job crafting on performance and well-being,

which suggests that job crafting could be an effective strategy to help individuals thrive in ICT-enabled work. In fact, one early study (Cooper & Kurland, 2002) conducted in the remote working context found that employees crafted the relational aspects of work to achieve a person–job fit. Based upon Wrzesniewski and Dutton’s job crafting framework, current advanced technologies used in virtual work provide fruitful opportunities that are crucial for crafting. Therefore, future research can explore how individuals react to virtual work challenges with motivational affordances.

Finally, we encourage scholars and practitioners to understand the digital workplace by combining both the virtual and physical offices. The digitization of the workplace doesn’t mean the death of the physical office; the physical office still has social value (e.g., enabling social contact and collaborating on a project). The future of work might likely be for many a “hybrid,” a location-flexible working arrangement. Thus, it’s important to explore how workers in the virtual office and counterparts in the physical office interact with each other. For example, virtual work practices may influence onsite workers’ psychological experiences. Previous studies including the current chapter have dominantly focused on virtual workers’ perceptions of social isolation. According to Rockmann and Pratt’s (2015) qualitative study, onsite workers reported similar levels of isolation, because the relational nature of onsite work had been changed by virtual work practices. We recommend to break the boundaries between the virtual office and the physical office, thereby obtaining a more comprehensive understanding of work in the current digital era.

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