School of Management

Thrive in a Digital Age: Understanding ICT-enabled Work Experiences through the Lens of Work Design

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THESIS DECLARATION

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ABSTRACT

As information communication technology (ICT) becomes ever more embedded in today's increasingly digital organizations, the nature of employees' jobs and work experiences are being strongly affected by the use of ICT at work. In this thesis, based on the perspective of work design, I conducted three studies to understand the intertwined relationships among technology, human beings, and work. In the study presented in Chapter 2 and published as Article 1, I conducted an interdisciplinary review of ICT use at work and found that ICT use affects employees through shaping three key aspects of work design: job demands, job autonomy, and the relational aspects of work. In the study presented in Chapter 3 and listed as Article 2, I focused on a newly emerged form of ICT, social media use at work, and found that the day-to-day use of social media at work was positively associated with perceptions of social connectedness, which was further positively associated with life satisfaction and task performance. I also found that the relationship between daily social media use at work and perceived social connectedness was stronger for employees with higher, rather than lower, workloads. In the study presented in Chapter 4 and listed as Article 3, I investigated the major challenges that people are struggling with in ICT-enabled work, and how work design could help workers thrive in a digital age. This study was conducted during the COVID-19 outbreak, in which people were required to work from home in an intensive and involuntary manner. Based on semi-structured interviews, I identified four key challenges in working remotely during the pandemic (i.e., procrastination, work-home interference, loneliness, and ineffective communication) and four work design factors (i.e., social support, job autonomy, monitoring, and workload) that affected individuals via shaping these experienced challenges. I then tested the associations among these factors using self-reported survey data from 522 employees who were working at home during the pandemic. Results demonstrated the powerful role of work design in boosting workers' performance and well-being. In sum, this

thesis helps to deepen our understanding on ICT-enabled work experiences, to stimulate the development of work design theories in the current digital era, and guide contemporary managerial practices.

Keywords: work design, ICT use, social media, remote work

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ACKNOWLEDGEMENTS

"Success is advancing from failure to failure without losing enthusiasm."

—*Winston Churchill*

It is not always easy to define the success of a PhD student. Along the journey to gain deeper and novel insights in a particular research area, most PhD students go from one "failure" to another. I am fortunate enough to have taken my PhD journey with many virtuous, supportive, and intelligent people to whom I am grateful.

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he always went through it meticulously and provided thoughtful comments on research design, data analysis, writing, framing, etc. His high quality mentoring helped me greatly in making my research more solid and rigorous. Besides, I benefited a lot from the countless conversations with Yukun, often involving discussions on various issues including research and career development, during our lunch and coffee breaks in the past few years, which further helped me to develop myself as a professional scholar. Beyond research, Yukun and I also built a strong friendship, largely through our shared interests of hiking and photography, which also helped me achieve a good work-life balance. In short, I deeply appreciate Yukun as my co-supervisor.

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AUTHORSHIP DECLARATION: CO-AUTHORED PUBLICATIONS

This thesis contains published work and/or work prepared for publication, some of which has been co-authored. The bibliographical details of the work published from this thesis are outlined below.

Publications and Submissions Derived from This Thesis

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Other Research Outputs

I have made several research outputs beyond the current thesis, which also are important and meaningful parts of my PhD journey.

1. Journal Publications (*Note. * = Equal contribution)

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Xia, A.*, **Wang, B.***, Song, B., Zhang, W., & Qian, J. 2019. How and when workplace ostracism influences task performance: Through the lens of conservation of resource theory. *Human Resource Management Journal*, 29(3): 353–370.

Wang, W., Yang, C., **Wang, B.**, Chen, X., Wang, B.Q., et al. 2019. When error learning orientation leads to learning from project failure: The moderating role of fear of face loss. *Frontiers in Psychology*, 10(June): 1–9.

Qian, J., Song, B., Jin, Z., **Wang, B.**, & Chen, H. 2018. Linking empowering leadership to task performance, taking charge, and voice: The mediating role of feedback-seeking. *Frontiers in Psychology*, 9(October): 1–11.

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3. Conferences Papers

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Song, B., **Wang, B.**, Qian, J. 2020. Procrastination at work, sleep badly at night: The moderating role of job autonomy. *80th Annual Meeting of the Academy of Management*, Vancouver, Canada, 7-11 August.

Zhang, X. **Wang, B**., Wang, W. 2019. Individual trait and failure learning: Error management culture as the double-edged sword. *34th Annual Conference of the Society for Industrial and Organizational Psychology*, Washington, USA, 4-6 April.

Zhang, X., Qian, J., **Wang, B**. 2018. Empowering leadership and employee outcomes: Moderation and mediation effects. *33rd Annual Conference of the Society for Industrial and Organizational Psychology*. Chicago, USA, 19-21 April.

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4. Manuscript in Progress

Liu, Y., Tims, M., **Wang, B.**, Qian, J., Parker, S.K. (Under review in *Academy of Management Journal*). Reflecting on work design for improving quality of work: An experiential learning-based field experiment.

Song, B.*, **Wang, B.***, Qian, J. (Under review in *Journal of Organizational Behavior*). Procrastination at work, sleep badly at night: The moderating role of job autonomy.

Zhang, F.*, **Wang, B.*,** Qian, J., Parker, S.K. (Under review in *Journal of Organizational Behavior*). How and when overqualifaction results in positive outcomes? A job crafting perspective.

Wang, B., Liu, Y., Qian, J., Parker, S.K. (Preparing manuscript for submission). Emotional energy as an incentive to help others: Social support effects through the lens of interaction ritual chain theory.

Details of the work: **How does the use of information communication technology affect individuals? A work design perspective**

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Location in thesis: Chapter 2

Student contribution to work:

Bin Wang developed the research idea, conducted literature review, and did the majority of the writing.

Sharon Parker and Yukun Liu provided constructive comments, elaborated this review paper in terms of framing and writing, and helped Bin to address questions raised by editors and reviewers during the peer review process.

	Conception and design	Acquisition of data and method	Data conditioning and manipulation	Analysis and statistical method	Interpretation and discussion	Final approval	Total % contribution
Bin Wang	60	100	N/A	100	60	60	76
Co-Author Yukun Liu	20	0	N/A	0	20	20	12
I acknowledge that these represent my contribution to the above research output Signed:							
Co-Author Sharon K. Parker	20	0	N/A	0	20	20	12
I acknowledge that these represent my contribution to the above research output Signed:							
Total %	100	100	N/A	100	100	100	100

Details of the work: **How can people benefit, and who benefits most, from using social media at work? An affordance perspective**

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Location in thesis: Chapter 3

Student contribution to work:

Bin Wang proposed the research idea, collected data with the help of Jing Qian, did the analysis with the help of Yukun Liu, and did the majority of the writing,

Sharon Parker and Yukun Liu provided constructive comments on research design and interpretations of results, and also contributes to improving writing and theorizing.

Jing Qian provided the funding for data collection.

	Conception and design	Acquisition of data and method	Data conditioning and manipulation	Analysis and statistical method	Interpretation and discussion	Final approval	Total % contribution
Bin Wang	80	75	N/A	80	70	70	75
Co-Author: Yukun Liu	10	0	N/A	20	10	10	10
I acknowledge that these represent my contribution to the above research output Signed:							
Co-author: Jing Qian	0	25	N/A	0	0	0	5
I acknowledge that these represent my contribution to the above research output Signed:							
Co-Author: Sharon K. Parker	10	0	N/A	0	20	20	10
I acknowledge that these represent my contribution to the above research output Signed:							
Total %	100	100	N/A	100	100	100	100

	Conception and design	Acquisition of data and method	Data conditioning and manipulation	Analysis and statistical method	Interpretation and discussion	Final approval	Total % contribution

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Bin Wang developed the research idea based on discussion with Sharon Parker and Yukun Liu, collected data with the help of Jing Qian, did the analysis with the help of Yukun Liu, and did the majority of the writing.

Sharon Parker and Yukun Liu provided constructive comments on research design and discussion of results, and also contributes to improving general quality.

Sharon Parker and Jing Qian provided funding for the data collection.

	Conception and design	Acquisition of data and method	Data conditioning and manipulation	Analysis and statistical method	Interpretation and discussion	Final approval	Total % contribution
Bin Wang	90	80	N/A	90	50	70	76
Co-Author: Yukun Liu	5	0	N/A	10	25	10	10
I acknowledge that these represent my contribution to the above research output Signed:							
Co-author: Jing Qian	0	20	N/A	0	0	0	4
I acknowledge that these represent my contribution to the above research output Signed:							
Co-Author: Sharon K. Parker	5	0	N/A	0	25	20	10
I acknowledge that these represent my contribution to the above research output Signed:							
Total %	100	100	N/A	100	100	100	100

Name: Bin Wang

Signature: ████████   Date: 21/08/2020

I, **Professor Sharon K. Parker** certify that the student statements regarding their

contribution to each of the works listed above are correct.

Signature: ████████   Date: 21/08/2020

Chapter 1: General Introduction

"Am I bossed around? No, I don't need to be. The machine I'm on goes at such a terrific speed that I can't help stepping on it in order to keep up with the machine. It's my boss."

—A 1920s machine worker at a Ford plant (Meyer, 2016: 16)

"On the whole, it [the BlackBerry] makes my life a little less stressful. I know that most people can reach out to me even though I'm not here. So, in that sense it is less stressful. On the other hand, it is harder to be disengaged. But, I wasn't very good at being disengaged anyway."

—A 2000s lawyer (Mazmanian, 2013: 1236)

"I can work at my own convenience… when I want to sleep, I can sleep. Oh, another thing I just remembered, most of the jobs you can get are like from overseas… In [the] USA… it's time you want to sleep so you have to sacrifice… [by] working in the middle of the night."

—A 2010s gig worker (Wood et al., 2019: 68)

Background

Over the last century and a half, multiple waves of technological revolutions have fundamentally influenced the way we live and work. From steam engines to electric power, from computers to state-of-the-art information and communication technologies (ICT), the debate on the benefits and disadvantages of technologies has never stopped. On one hand, human beings reap the rewards from technological innovations. For example, they can rescue themselves from monotonous and tedious job routines through automated equipment such as robots (Bautista, Rosenthal, Lin, & Theng, 2018), keep connected with others without many temporal and spatial constraints through social media (Grieve, Indian, Witteveen, Anne Tolan, & Marrington, 2013), and even make a living through internet-enabled gig work (Wood et al., 2019). On the other hand, human beings are also concerned about or even resist new technologies. For example, they fear robots or artificial intelligence taking over their

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jobs (Granulo, Fuchs, & Puntoni, 2019), worry about virtual communications removing intimacy from interpersonal relationships (Sbarra, Briskin, & Slatcher, 2019), and are concerned about being distracted by a wide range of stimuli in cyberspace (Osiurak, Navarro, & Reynaud, 2018).

These arguments all made sense. Technologies are not inherently good or evil; instead, they may either promote or hinder people's welfare, depending on how they are used and who uses them. Taking work-related ICT use after regular working hours as an example, workers might benefit from the greater flexibility it affords as they can deal with work-related issues at home while at the same time fulfilling their family obligations. However, this flexibility offered by ICT, which enables workers to work remotely unrestricted by time and locations, can also force them to be "always online" and therefore exhaust them, also diminishing their well-being and work effectiveness (Mazmanian, Orlikowski, & Yates, 2013). Scholars have found that whether people can utilize ICT to achieve a better work-life balance and avoid the trap of constant connectivity depends on workplace norms (e.g., organizational segmentation norms: Derks, van Mierlo, & Schmitz, 2014) and personal preferences (e.g., segmentation preferences: Derks, Bakker, Peters, & van Wingerden, 2015).

Departing from the plethora of superficial debates on whether technology is good or bad, what has been omitted, yet is more important, is a comprehensive understanding on how technology influences workers, how it interacts with other factors in influencing workers, and what workers can do to thrive in the current and future digital eras. In other words, humans are not just passive recipients of technological changes. We, therefore, need move to a more proactive and less deterministic stance (Parker & Grote, 2020) which allows humans and technologies work in harmony.

Compared with other research areas (e.g., sociology, communication, information systems, etc.), despite the fact that management theories indeed co-evolved with

technological innovations (Bodrožić & Adler, 2018), technology usage is a relatively peripheral topic in the management literature. As Orlikowski and Scott (2008) pointed out, technology usually fades into the background, and is taken for granted in the organizational experience. However, the inadequacy of research on workplace technology cannot obscure the fact that both people and the work they do are being fundamentally shaped by technology. As Cordery and Parker (2012) stated, "rapid advances in digital technology continue to result in the emergence of whole new forms and patterns of work (and the disappearance of others), transforming the characteristic content of tasks, jobs, and roles performed by workers in all industries."

To provide a contemporary and fresh understanding of the intertwined relationships among technologies, human beings, and work, the current thesis adopts a work design perspective. The construct of work design or job design, developed over a century ago (Parker, Morgeson, & Johns, 2017), focuses on "the content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014: 662). Since the construct was developed, generations of scholars have developed various work design theories to absorb the emergent work characteristics or new challenges at work caused by technological innovations (which is discussed in detail in the following section, Bodrožić & Adler, 2018; Koontz, 1980). Regardless of how intelligent technology is, work design theorists focus on human work and advocate altering work and technologies to meet human needs (Parker & Grote, 2020). That is, technology and its associated effects are malleable; employers can proactively design or re-design work and technology, making employees thrive at work.

Building upon work design theories, I specifically focus on a set of research questions around ICT-enabled work in this thesis: *How does ICT use at work affect individuals and what are the boundary conditions? What does ICT-enabled work look like? What are the major challenges that employees are struggling with in ICT-enabled work?*

In the following section, I briefly recap on the co-evolution of technology and work design theories, thereby providing a rationale for the work design perspective, and why it can should be a necessary and useful theoretical angle to understand the influences of ICT-enabled work on workers.

Technology and Work Design Theories

Early Management Thoughts

The first industrial revolution (approximately 1790s-1890s) led to the radical transition from a craft form of organization to large-scale mechanized systems. This transition brought a series of managerial challenges. Before the industrial revolution, enterprises focused on how to control and monitor workers (Chandler, 1977). However, the unprecedented scale and complexity of organizations (e.g., the Erie Railroad Company) forced enterprises to consider work flexibility to accommodate coordination in the workplace. The "line-staff" organizational structure therefore was used to replace the traditional structure. A line-staff organizational structure consists of line groups and staff groups. Specifically, line groups always engage in organization's core tasks (e.g., production, sales, and service), while staff groups provide support for line groups with their specialization, such as human resource management, accounting, legal consulting, etc. However, autonomy was not directly provided for line workers within the line-staff structure at that time; rather, line managers had absolute control over line workers. In fact, only staff workers had their own advisory authority to influence line managers' decisions. In the current work design language, the line-staff structure provided considerable autonomy/authority for staff workers rather than the front-line employees who were directly responsible for core tasks.

This practice inevitably led to the criticism of "a growing gap between management and the worker" (Nelson, 1995). Some practitioners, such as Robert Owen, started to emphasize the human elements at work. As Owen stated (Wren & Bedeian, 2009: 64),

"[because] due care as to the state of your inanimate machines can produce such beneficial results, what may not be expected if you devote equal attention to your vital machines [the human resources], which are far more wonderfully constructed?" Managers at that time realized that workers' productivity also depended on their working and living conditions, which brought the emergence of "welfare work" (Brandes, 1976). "Welfare secretaries", therefore, were incorporated into the line-staff organizational structure to improve employees' working and living conditions (Brandes, 1976). As staff workers, welfare secretaries provided support for workers in physical (e.g., safety), cultural (e.g., education), personal (e.g., casework), and economic aspects (e.g., pensions) (Carter, 1977). However, welfare work eventually sparked workers' resentment, as it invaded into employees' personal lives. For example, workers were told "what they could or could not do on their own time and in their own homes" (Wren & Bedeian, 2009: 192).

The Scientific Management Era

The second industrial revolution, characterized by the advent of large-scale production of electricity, petroleum, and steel, gave birth to scientific management. To deal with the exploding demand for steel, managers sought to explore "more scientific planning of workstation operations, of workflows between workstations, and of machine and tool maintenance" (Bodrožić & Adler, 2018: 95). Frederick W. Taylor made a breakthrough contribution in this stage, describing management as "knowing exactly what you want men to do, and then seeing that they do it in the best and cheapest way." To discover how to do tasks in the best and cheapest way, Taylor and his disciples conducted a series of time-and-motion studies (e.g., Gilbreth, 1911; Taylor, 1911); they broke each job into its elementary fragments which were then described, recorded, and indexed. Based on their quantitative analyses, managers were then able to discard non-essential movements and identify the most productive way to accomplish a task. Besides, Taylor also advocated for reasonable

performance standards, appropriate price-incentives, rest pauses, and the fit between workers' abilities and job requirements (Locke, 1982; Wren & Bedeian, 2009). Though Taylor has always been criticized for omitting work motivations and overspecialization/oversimplification, scientific management effectively solved the "efficiency problem" in his era and his efforts retain their currency. As one researcher states, "most of his insights are still valid today" (Locke, 1982: 23).

Taylor's scientific management influenced subsequent technological innovation—Ford's assembly line or the so-called Fordism. Although also emphasizing standardization, assembly line production is fundamentally different from Taylor's idea, because Fordism overlooked human elements (or, as expressed in contemporary terms, ergonomics). According to Gilbreth's observation (Yost, 1949: 246), Fordism involved "…men at benches too low for them, men stretching farther than their normal reach, men in uncomfortable positions as they put on rear wheels, and much other evidence of making workers adjust to the line rather than making the line conform to the best needs of human beings."

In other words, Taylor's approach advocates that managers have responsibilities to find a better way of performing tasks to reduce fatigue and increase efficiency, based on quantitative analyses such as time spent on each movement and worker's motion (i.e., human-centred design). Fordism, in contrast, puts technology in the central role and asks workers to adjust to the technology (i.e., technology-centred design). The assembly line achieved great success in terms of efficiency, but at the cost of a series of side effects, in the form of higher levels of boredom, dissatisfaction, fatigue, absenteeism, and turnover (Walker & Guest, 1952).

The Social Person Era

To cope with the challenges posed by the narrow focus on the technical aspects of work in the scientific management era and the newly emerged problems in assembly line or

mass production, human relations theorists (Mayo, 1933; Roethlisberger & Dickson, 1939) sought to boost morale and satisfaction through meeting workers' social needs. The Hawthorne studies provided the initial evidence that workers are not motivated solely by money; social interactions (e.g., informal groups in the workplace and leader-member exchanges) as well as individual attitudes influence productivity (Wren & Bedeian, 2009).

"Whether or not a person is going to give his services whole-heartedly to a group depends, in good part, on the way he feels about his job, his fellow workers, and supervisors... [a person wants]... social recognition... tangible evidence of... social importance... the feeling of security that comes not so much from the amount of money we have in the bank as from being an accepted member of a group." (Roethlisberger, 1942: 15)

In Britain, technological innovations—e.g., the introduction of the longwall method of mining coal for mass production—failed to increase productivity, because of higher turnover and absenteeism after this method's implementation. Inspired by early research on human relations, scholars from the Tavistock Institute considered the misfit between technological and social subsystems as a critical cause of these problems (Trist & Bamforth, 1951). Under the traditional shortwall method of mining, multiskilled miners worked in a small group with considerable autonomy; however, the longwall method requires working in a large group with highly specialized working roles. In other words, the longwall method led to a loss of skill variety and job autonomy, which eventually decreased workers' commitment and caused a reduction in productivity. The lesson from Trist and Bamforth's (1951) classic study is that technological and social systems of organization should be "designed to fit the demands of each other and the environment" (Pasmore, Francis, Haldeman, & Shani, 1982: 1182), which is also the basic tenet of sociotechnical systems (STS) theory. As Trist articulated in his later

work, "economic performance and job satisfaction were outcomes, the level of which depended on the goodness of fit between the substantive factors" (Trist, 1981: 10).

STS researchers then proposed several principles to design these sociotechnical systems (e.g., Cherns, 1976, 1987); in parallel with this a series of interventions was conducted in the meantime to show that *joint optimization* could be achieved through re-designing social and technological systems (Pasmore et al., 1982). Based on a review of 134 sociotechnical interventions in North America, Pasmore et al. (1982) identified that most interventions at that time concentrated on re-designing the social system around existing technologies to achieve joint optimization (e.g., using autonomous work groups, skill development, feedback on performance, and minimal critical specifications), but management scholars largely overlooked the opportunity to re-design technologies to meet workers' physiological and psychological needs (i.e., only 16% of reviewed studies made technological changes to support the social system).

Another stream of work design research which developed from human relations devoted its attention to exploring what motivated individuals to work. Moving beyond early human relations theorists' research around social interactions at work, Herzberg, Mausner, and Snyderman (1959) systematically identified what made workers either happy and satisfied on their jobs or unhappy and dissatisfied. They developed the motivator-hygiene theory (or the Two Factor Theory), which argues that the absence of hygiene factors (job context variables), including supervision, interpersonal relations, physical working conditions, salaries, company policies and administrative practices, benefits, and job security, causes job dissatisfaction; the presence of motivational factors (job content variables), including achievement, recognition for accomplishment, challenging work, increased job responsibility, and opportunities for growth and development, leads to higher motivation and satisfaction. However, empirical evidence did not support Herzberg's Two Factor Theory that

the predictors of job satisfaction were not quantitatively different from the predictors of job dissatisfaction (Wall & Stephenson, 1970). One possible explanation is the way questions were asked in Herzberg's interviews. That is, participants in face-to-face interviews were driven by social desirability, so they tended to attribute dissatisfaction to the external job context, while they were more likely to attribute satisfaction to the job content that they could control (Vroom, 1964; Wall, 1973).

Although Herzberg's Two Factor Theory is controversial, it, in conjunction with early STS research, spawned the job characteristics model (JCM). Turner and Lawrence (1965) developed scales to capture six "requisite task attributes" that were positively associated with employee satisfaction and attendance. Based on Turner and Lawrence's (1965) work, Hackman and Lawler's (1971) study supported four of these attributes (i.e., autonomy, feedback, task identity, and task variety), which they named "core dimensions". They found that these four core dimensions positively related to job satisfaction, motivation, and work quality, and could reduce absenteeism. Hackman and Oldham (1975) added "task significance" to the earlier four-factor model and developed the influential job diagnostic survey (JDS) to measure these five core job characteristics. According to their following study (Hackman & Oldham, 1976), these five core job characteristics can lead to desirable employee outcomes (i.e., high internal work motivation, high quality work performance, high job satisfaction, and low absenteeism and turnover) through influencing three critical psychological states, that is, experienced meaningfulness of the work, experienced responsibilities for outcomes of the work, and knowledge of the actual results of the work activities.

JCM stimulated an ever-growing number of work design studies. Scholars elaborated and extended the original JCM by incorporating newly emerged job characteristics and identifying various antecedents, outcomes, and influencing mechanisms of work design (e.g.,

Grant & Parker, 2009; Morgeson & Humphrey, 2006; Parker, 2014; Parker, Van den Broeck, & Holman, 2017; Parker, Wall, & Cordery, 2001). Notably, the extended work design model incorporated interdisciplinary knowledge and inherited an earlier intellectual heritage (e.g., welfare work, scientific management, the human relations movement, and STS theory). Generally, Campion and colleagues identified four distinct approaches to work design—mechanistic, motivational, perceptual, and biological (Campion, 1988; Campion, Mumford, Morgeson, & Nahrgang, 2005; Campion & Thayer, 1985).

The mechanistic model developed from scientific management, which pursues increased efficiency by job specification and simplification with the sacrifice of job satisfaction and motivation (Taylor, 1911). The motivational model which arose from organizational psychology (Hackman & Lawler, 1971), on the contrary, focuses on increasing job satisfaction and motivation, but it also leads to higher training cost and errors. Two other approaches advocate designing or re-designing technological systems (e.g., technologies or equipment used at work) that can enhance efficiency and well-being. The first, the perceptual model, based on human factors research (Meister, 1971), aims to reduce the workers' information processing requirement through advanced technologies. The second, the biological model, borrowed from ergonomics and medical sciences research (Grandjean, 1980), sought to reduce physical requirements and environmental stressors. Work design elements from these four approaches have been covered in the widely used Work Design Questionnaire (WDQ; Morgeson & Humphrey, 2006), in which work characteristics were grouped into three major categories: motivational, social, and contextual characteristics.

The Modern Era: Digital Revolution and New Challenges

The third industrial revolution (or the digital revolution), marked by the introduction and development of information and communication technologies, enabled the emergence of more complex, flat, and dispersed organizations, and also changed the ways of

communication, coordination, control, and work (Cascio & Montealegre, 2016). Not surprisingly then, the digital revolution led scholars to reflect upon traditional work design theories (e.g., Oldham & Hackman, 2010; Parker & Grote, 2020).

"The nature of working has changed since these theories were developed. A job may no longer be a career, and many employment arrangements have been changed by outsourcing work, using temporary employees, dual-career couples, electronic commuting, postretirement careers, and individuals needing to retool their skills/abilities at different career stages. Working is central to living, and another generation of study is needed as jobs and careers change." (Wren & Bedeian, 2009: 450)

The first challenge we are facing today is to get a fresh understanding of the characteristics of the current ICT-enabled work. An early work design study conducted in a manufacturing setting found that job characteristics differed significantly across technologies (Rousseau, 1977), empirically demonstrating that technology use at work can influence work design. So, how is ICT changing our work in the digital era? On one hand, the mean levels of job characteristics might have been changed by ICT use. For example, Wegman et al.'s (2018) recent meta-analytic research with 102 studies examined changes in five core job dimensions from JCM theory since 1975. Their findings showed that the average levels of autonomy and skill variety increased since 1975 and workers perceived more interdependence since 1985. The authors speculated that advanced ICT usage may (at least partially) explain these changes.

On the other hand, ICT has brought in a range of new job characteristics, such as ICT demands (Day, Paquet, Scott, & Hambley, 2012), technostress (Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008), boundarylessness (Xie, Elangovan, Hu, & Hrabluik, 2019), and algorithmic control (Wood et al., 2019). As most work design theories were developed in the 20th century, current research on ICT-enabled work and pertinent issues are also highly

fragmented; scholars from different research disciplines (e.g., communication and management information systems) have different theoretical focuses, resulting in limited intellectual cross-fertilization. An interdisciplinary integration therefore is needed to develop a holistic picture of the relationship between technology and work design, thereby facilitating future research in this relatively nascent field.

Another challenge is that work design may function differently than it did before. First, enabled by advanced ICTs, bad work design will be more deleterious than previously. For example, ICT use is blurring the boundaries between work and non-work domains, which means that bad work design can easily exert negative spillover effects on employees and undesirable crossover effects on significant others. Carlson and colleagues (2018) found that individuals' mobile device use for work during family time negatively related to spouses' job performance and satisfaction via increased work-family conflicts. In fact, even when employees do not use ICT for work after hours, organizational expectations for constant availability (e.g., checking emails after regular working hours) can still increase employees' anxiety, which also hurts significant others' well-being (Becker, Belkin, Conroy, & Tuskey, 2019).

Besides, the new challenges which employees are struggling with in the ICT-enabled workplace bring some work designs to the fore. Taking virtual work as an example (Raghuram, Hill, Gibbs, & Maruping, 2019), most tasks, collaborations, and communications are mediated by ICT. Though organizations indeed can benefit from virtual teams in terms of lower overhead costs, a wider labour market, and lower absenteeism (Baruch, 2000), workers are struggling with loneliness, due to the relatively superficial or low-quality interpersonal relationships in virtual space (Golden, Veiga, & Dino, 2008). In this case, workplace social support becomes particularly important for remote workers to gain social satisfaction (Bentley et al., 2016).

In sum, accompanied by rapid technological advancement, organizations and work are undergoing profound changes. Since the inception of the scientific management era, generations of scholars have relentlessly pursued a better way of work—working "smarter", not harder—to cope with various challenges posed by technological innovations. Work design is still alive, in contemporary ICT-enabled organizations. What we need is a new approach, in other words "fresh thinking about the phenomenon and about the most productive ways to continue to learn about it [work design]", as Oldham and Hackman (2010: 476) claimed.

Overview of the Thesis

Based on this brief review on the co-evolution of technology and work design theories, I believe that work design theories can bear fruit in the current digital era from the seeds planted in the last one hundred years. In the research for this thesis, from the perspective of work design, I, conducted three studies to understand the intertwined relationships among technology, human beings, and work. Next each study is introduced and its contribution to the overarching research goal is described.

The primary goal of Article 1 (a systematic review) is to address how individual ICT usage influences employees' effectiveness and well-being through shaping the nature of work. We[1] conducted an interdisciplinary review, evaluating 83 empirical studies. Results show that ICT use affects employees through shaping three key work design aspects: job demands, job autonomy, and relational aspects of work. To reconcile previous mixed findings on the effects of ICT use on individual workers, we identified two categories of factors that moderate the effects of ICT use on work design: user-technology fit factors and social-technology fit factors. This finding is consistent with the sociotechnical systems theory in that

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[1] I use "we" rather than "I", because these three studies were all co-authored by my supervisors, external collaborators, and myself.

impacts of technology depend on the goodness of fit between technology and the user/social context (Trist, 1981). We consolidated the review findings into a comprehensive framework that delineates the work design processes, linking ICT use and employee outcomes with their moderating factors. The review fosters an intellectual conversation across different disciplines, including organizational behaviour, management information systems, and computer-mediated communication. The findings and proposed framework help to guide future research and to design high quality work in the digital era.

Article 2 particularly focuses on social media use at work, a newly emerged ICT. As identified in Article 1, impacts of ICT use at work on social outcomes have only been discussed recently and most existing research concentrates on social media's dark sides (e.g., distraction). In this study, we propose that the day-to-day use of social media at work is positively associated with perceptions of social connectedness, which is further positively associated with life satisfaction and task performance. Work design, in this process, will determine the relative value/utility of social media. We examined these hypotheses using an experience sampling study of 134 full-time employees across 10 consecutive workdays. The results of multilevel modelling showed that, as expected, daily social media use at work is related positively with employees' perceptions of social connectedness, which in turn predicted their daily life satisfaction and daily task performance. We also found that the relationship between daily social media use at work and perceived social connectedness was stronger for employees with higher, rather than lower, workloads. We suggest this moderating effect occurs because social media is an efficient medium, providing greater affordances, through which busy workers can meet their needs for belonging. Overall, our study sheds light on the previously less-studied positive effects of social media use at work.

Article 3 seeks to explore some major challenges with which people are struggling in ICT-enabled work, and how work design can help workers thrive in a digital age. This study

was conducted during the COVID-19 outbreak, in which people were required to work from home in an intensive and involuntary manner. In other words, the pandemic created a unique opportunity to examine and develop work design theory in a highly digitalized context. We first reviewed the literature that has included work design variables when investigating remote working. We concluded that work design has mostly been examined as a moderator of remote working effects, or a mediator linking remote working to outcomes, whereas we advocate the value in considering work design as an independent variable in the context of working remotely.

Adopting this perspective, we conducted a mixed-methods investigation. In Study 1, based on semi-structured interviews, we identified four key challenges in remote working during the pandemic (i.e., procrastination, work-home interference, loneliness, and ineffective communication); four work design factors (i.e., social support, job autonomy, monitoring, and workload) that affected individuals via shaping these experienced challenges; and one key individual difference factor (i.e., workers' self-discipline).

In Study 2, we tested the associations among these factors using surveys from 522 employees working at home during the pandemic. Results from Study 2 supported the powerful role of work design in boosting workers' performance and well-being. Importantly, some of our findings provided some initial evidence that work design might function differently in such a highly digitalized context. Social support appeared to be the most powerful work design factor in that it positively related to workers' self-reported performance and well-being through its association with all four challenges. Job autonomy particularly related to workers' well-being via its positive effect on loneliness. We also found that workload and monitoring were associated with remote workers' greater work-home interference which, in turn, related to lower well-being. Interestingly, workload was found to

be associated with lower procrastination. We then discuss the implications of our research for the pandemic and beyond.

In sum, these three articles contribute to understanding the intertwined relationships among technology, human beings, and work in a digital age: technology usage can influence people through shaping the nature of work (Chapter 2: Article 1); work design, as a boundary condition, can determine the impacts of technology usage on individuals (Chapter 3: Article 2); work design plays a powerful role in boosting employee work effectiveness and well-being in ICT-enabled work (Chapter 4: Article 3). To conclude, these studies are brought together and their implications are discussed in Chapter 5.

Chapter 2: How Does the Use of Information Communication Technology Affect

Individuals? A Work Design Perspective

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Abstract

People design and use technology for work. In return, technology shapes work and people. As information communication technology (ICT) becomes ever more embedded in today's increasingly digital organizations, the nature of our jobs, and employees' work experiences, are strongly affected by ICT use. This cross-disciplinary review focuses on work design as a central explanatory vehicle for exploring how individual ICT usage influences employees' effectiveness and well-being. We evaluated 83 empirical studies. Results show that ICT use affects employees through shaping three key work design aspects: job demands, job autonomy, and relational aspects. To reconcile previous mixed findings on the effects of ICT use on individual workers, we identify two categories of factors that moderate the effects of ICT use on work design: user-technology fit factors and social-technology fit factors. We consolidate the review findings into a comprehensive framework that delineates both the work design processes linking ICT use and employee outcomes and the moderating factors. The review fosters an intellectual conversation across different disciplines, including organizational behavior, management information systems, and computer-mediated communication. The findings and proposed framework help to guide future research and to design high quality work in the digital era.

An evolution so slow—it still occurs at the rhythm of "genetic drift"—that one can hardly imagine the human as its operator, that is, as its inventor; rather, one much more readily imagines the human as what is invented.

— Bernard Stiegler

Introduction

In the work context, technologies support the achievement of our tasks and, in turn, our tasks are sculpted by technologies (Cascio & Montealegre, 2016; Parker, Van den Broeck, & Holman, 2017). For example, assembly line technology was designed to improve productivity in manufacturing, but the nature of work tasks was also dramatically changed with this technology (Forman, King, & Lyytinen, 2014). The same applied when we moved from the industrial age to the current information age: ICT, defined as "any electronic device or technology that has the ability to gather, store, or send information" (Day, Paquet, Scott, & Hambley, 2012, p.473), has come to the forefront. Examples of ICT include mobile phones, email, Skype, and office automation systems. Just like earlier forms of production technology, ICT potentially enables productivity, but it also shapes how work is done in profound ways, therefore affecting the quality of people's work lives. In the book, *Technics and Time: The Fault of Epimetheus*, which we quote from above, Bernard Stiegler was keenly aware that humans are tremendously influenced by technology, and it is this core idea that we explore here.

Most scholars have tended to explore the direct relationship between ICT and individual behaviors and outcomes and have kept the effect on work per se out of the loop. Thus, in one stream of studies, scholars have focused on the "potential for actions that new technologies provide to users" (Leonardi & Vaast, 2017, p. 152), such as the idea that ICT gives people the opportunity to share knowledge online (Haas, Criscuolo, & George, 2015). Another stream of studies has focused on the direct psychological effects of ICT use on users,

such as psychological gratification (e.g., fulfilment of needs for autonomy, relatedness, and competence; Cascio & Montealegre, 2016) or the cognitive biases induced by ICT (e.g., Clark, Robert, & Hampton, 2016; Elsbach & Stigliani, 2019).

However, what is missing is a clarity as to how ICT affects the nature and quality of work, and in turn, employees' work effectiveness and well-being (Orlikowski & Scott, 2008). As Bandura (2001) pointed out, if we only focus on the direct psychological effects of ICT use, or the potential actions afforded by ICT, we will overlook the underlying processes embedded in its unique social context, in this case, the effects of technology on work. In the work context, ICT use not only affects user experiences directly, but also deeply changes individuals' connections to tasks and to colleagues, and the nature of their tasks. In essence, ICT can shape employees' work designs. Focusing on this process will help to explain the effect of ICT on individual outcomes.

The goal of this review is to understand how ICT use affects individuals' work effectiveness and well-being through changing the nature and organization of their work tasks, activities, and employee relationships (in sum, their work design). To achieve this goal, we collated and reviewed a diverse set of studies from the disciplines of organizational behavior, industrial and organizational psychology, management information systems, and computer-mediated communication studies. Importantly, to obtain a coherent understanding of this broad-ranging literature, we used the perspective of work design because, as we elaborate shortly, we see this as the most relevant for understanding how work is affected by ICT.

Considerable evidence shows that technology defined more broadly shapes work design (e.g., Bala & Venkatesh, 2013; Rousseau, 1977; Wall, Corbett, Clegg, Jackson, & Martin, 1990). At the same time, well-established literature exists that theorizes and demonstrates the effects of work design on individual outcomes (Demerouti, Bakker,

Nachreiner, & Schaufeli, 2001; Grant & Parker, 2009; Hackman & Oldham, 1975; Karasek, 1979; Parker, 2014; Parker, Morgeson, & Johns, 2017). Therefore, we have organized the literature in such a way as to understand what, how, and when work design elements of one's job or role are influenced by ICT use, to provide insight into the underlying work processes linking ICT use and individual outcomes. Importantly, we recognize that, consistent with other perspectives on ICT (e.g., sociomateriality; Orlikowski & Scott, 2008), ICT use effects on work design and outcomes are likely to be conditioned by various individual and contextual factors. We therefore also note and synthesize moderating factors.

In sum, our review addresses the following theoretical questions: *What aspects of work design are changed by the adoption of ICTs at work, and what effects do these changes have on individual outcomes? What are the contextual or individual factors that can strengthen or weaken the effects of ICT use on work design and employee outcomes?*

In what follows, we articulate why we have adopted the perspective of work design to organize our review and describe our approach to the review. We then consider how ICT use has been, and should be, conceptualized at the individual level, and review existing empirical studies to address how and when ICT use influences employees through the lens of work design. Finally, we present insights from the review, including an integrative framework (summarized in **Figure 2.1**), and suggest future directions.

Review Approach

We draw on the theoretical lens of work design to organize the literature on how ICT affects individuals. Work design is defined as "the content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014, p. 662). Well-designed work is typically conceptualized (e.g., Morgeson & Humphrey, 2006; Parker et al., 2017) as involving the presence of particular motivational task characteristics (e.g., job autonomy), stimulating knowledge characteristics (e.g., the chance to use one's skills), and beneficial

social characteristics (e.g., social support), as well as moderate levels of job demands (e.g., work load). At the individual level, high quality work design is a vehicle through which individuals achieve desirable outcomes, such as better job performance, positive work attitudes, and greater well-being (see, for example, the meta-analysis by Humphrey, Nahrgang, & Morgeson, 2007).

In the existing literature on work design, research attention has been given to its various antecedents, one of which is technology (see Parker et al., 2017 for a review). Research has also examined how changes in work design act as a mechanism that links technology use and employee outcomes (e.g., Bala & Venkatesh, 2013; Gibson, Gibbs, Stanko, Tesluk, & Cohen, 2011; Rousseau, 1977; Wall et al., 1990). For instance, building on work design theories, Wall et al. (1990) introduced a theoretical framework articulating how advanced manufacturing technology can affect key work characteristics, with subsequent effects on employee outcomes. We draw on such perspectives to examine which elements of one's job or role are influenced by ICT use so as to provide insight into the underlying processes linking ICT use and employee outcomes (Grant & Parker, 2009; Parker, 2014; Parker, Morgeson, & Johns, 2017).

We selected journals based on the 2018 UK Association of Business Schools (ABS) Academic Journal Guide. The ABS journal list identifies a range of high quality journals in which business and management academics publish their research. All journals rated as 4 and 4* (i.e., the top two tiers) in management[2] and information management categories were included in our search. In addition, however, compared with other academic journal guides (such as the *Financial Times* Top 50 and University of Texas at Dallas's list of 24 leading business journals), the ABS journal list goes beyond high quality journals in the management

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[2] Specifically, the management category includes four fields in the ABS Academic Journal List: General Management, Ethics, Gender and Social Responsibility; Human Resource Management and Employment Studies; Organizational Studies; and Psychology (organizational).

and organization area to include other journals from fields relevant to ICT, which we also included (these were: *New Technology*, *Work and Employment*, *Communication Research*, *Computers in Human Behavior*, and *Journal of Computer-Mediated Communication*).

For all journals, we searched the Web of Science for articles containing "information communication technology" or "ICT" in their titles, abstracts, or keywords. As most articles in information systems focused on ICT-related phenomena, we narrowed the search by including articles containing both "information communication technology" or "ICT" <u>and</u> work design terms, with the latter defined broadly (e.g., "work design", "job autonomy", "job demands", "task interdependence", "social support", etc.) In total, this research yielded 762 articles. After excluding literature reviews, meta-analyses, theory-building papers, organization- or team- level studies, studies that did not involve work design, and other irrelevant studies, we identified 47 articles relevant to the current research.

We then identified a further 36 relevant articles using the following approach. First, because management information system research tends to use very different terms to capture changes at work caused by ICT use, we conducted back-searching using terms identified in benchmark review articles (e.g., Cascio & Montealegre, 2016; Day, Scott, & Kevin Kelloway, 2010). For example, the term "technostress" is used to describe job demands created by technology use (Ragu-Nathan et al., 2008), whereas such technology-related stressors are usually theorized as job demands in organizational behavioral studies (Day et al., 2012). Second, some studies focused on specific ICT use behaviors such as work-related smartphone use (Derks et al., 2014) and so were not captured with general ICT terms. We therefore also searched for specific ICTs such as "email", "smartphone", "mobile ICT" and "mobile technology". Third, we added frequently cited articles that we had found in previous literature reviews or empirical studies that were not picked up in the journal-based literature

search. Altogether, these processes rendered 83 articles focusing on individual level ICT use and work design.

Conceptualizing ICT Use

Although there are diverse definitions of ICT use (Burton-Jones & Straub, 2006), to better understand this phenomenon at the individual level, we followed Burton-Jones and Straub's (2006, p 231) conceptualization of individual level ICT use as "*an individual user's employment of one or more features of an ICT to perform a task*". We chose this definition because it captures "ICT use in practice" (Leonardi, 2012; Orlikowski, 2007; Orlikowski & Scott, 2008). That is, according to Orlikowski and colleagues' theoretical work (Orlikowski, 2007; Orlikowski & Scott, 2008), technology use is not just "using something" but is a practice in which users, social goals, and technical characteristics are imbricated. We therefore consider that "ICT use" behaviors can be understood by the *extent to which the user employs ICT* (which we refer to as "ICT use intensity") as well as the *ways ICT is used to carry out tasks* (which we refer to as "functions of ICT use"). Next we elaborate on each of these elements of ICT use, and how they have typically been operationalized.

ICT use intensity. ICT use intensity reflects the depth of, or frequency of, ICT use at the individual level. In previous studies, both objective indicators (e.g., frequency of ICT use or time spent on ICT) and subjective perceptions have been used to measure ICT use intensity. Typical items include "For how many minutes did you use your BlackBerry/Smartphone for work after 9 PM last night?" (Lanaj, Johnson, & Barnes, 2014) or "Today, I checked my work-related emails until I went to sleep" (Derks, Bakker, et al., 2015). Some researchers have also used the depth of usage to assess ICT use intensity with more specific indicators. For example, to measure ICT-facilitated multi-communication intensity, Cameron and Webster (2013) measured the number of overlapping conversations, the pace of switching conversations, segmentation of social roles, diversity of topics, and

complexity of topics. Generally, and as we will elaborate in more depth in the review per se, the higher the intensity of ICT use, the stronger its effects on individuals. For example, in a diary study among 100 employees, it was found that the extent of daily smartphone use (ICT use intensity) was positively related to the degree of work-home interference experienced by individuals (Derks, van Duin, Tims, & Bakker, 2015).

Functions of ICT use. ICTs have various functions. Capturing ICT use functions is critical as the influences of ICT on work are likely to differ depending on the functions of the actual ICT use. At a broad level, two basic ICT functions have been identified: accomplishing information-related tasks (i.e., production/task function, or task focus) and communicating with others (i.e., social function, or communication focus) (Rice & Leonardi, 2013). This idea is consistent with Rice and Leonardi (2013, p. 429), who stated: "information and communication technologies… receive, distribute, process and store, retrieve and analyze digital information between people and machines (as information) or among people (as communication)".

Using different functions will further lead to different processes in which work elements are changed. First, when ICT is used as equipment to help accomplish tasks (production/ task function), ICT influences people through affecting the actual *work or tasks they engage in*. This process is referred to as *human-ICT interaction*. For instance, individuals can use a search engine (e.g., Google) to improve their work efficiency by reducing tedious processes. Second, when ICT is used as a *communication medium*, or has a social function, ICT influences people by affecting their interactions and social connections with others at work. This process is referred to as *ICT-mediated communication*. For example, people can use instant messaging platforms or social network services to connect with their colleagues.

As explained later, this distinction in purpose or function is important from the work design perspective because the task and/or technical aspects of work are more likely to be

changed in the human-ICT interaction process (the production/ task function of ICT), while social aspects of work are often changed in the ICT-mediated communication process (the social function of ICT).

Summary and synthesis. In sum, at least on a theoretical level, "ICT use" consists of both "ICT use intensity" and "functions of ICT use", with both types of use conveying unique information. For instance, we cannot predict the consequences of someone's ICT use behavior if we only know "Jack spends more than five hours on his smartphone every day" (intensity only) or "Jack uses his smartphone for social connections" (function only). Ideally, we need to know how much, or how intensely, Jack uses his smartphone for various purposes (intensity and function). Nevertheless, as discussed later, our review shows that empirical studies have mostly adopted indices to measure ICT use intensity alone (e.g., perceived intensity, frequency, and objective time spent on ICT), with ICT use function being captured only broadly and often implicitly. That is, only the basic function and/or purpose of production and/or task versus communication can be identified from these studies. In the rest of the review, we therefore use the term "ICT use" in a generic way when referring to the concept, and we spell out, as much as possible, how this concept has been operationalized within each particular study. We revisit this issue in the final section recommending directions for future research.

ICT Use, Work Characteristics, and Employee Outcomes

Based on our cross-disciplinary review (n = 83 articles), we identified three broad streams of research demonstrating how ICT affects work characteristics, as summarized in **Table 2.1** and **Table 2.2**. The first stream, primarily derived from the management information systems literature, focuses on job demands as the underlying mechanism to explain the relationships between ICT use and employee outcomes. The second stream, coming more from the management and organization literature, is centered on the impact of

ICT use on job autonomy, which is then theorized to influence work effectiveness and well-being. The third stream, obtained from multiple perspectives, hones in on changes in the social and relational aspects of work due to ICT use. Each of these streams is now discussed in more detail.

ICT Use and Job Demands

We identified 23 papers focusing on how ICT can affect job demands, which is 28% of the total set of studies. Job demands refer to "those physical, social, or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs (e.g., exhaustion)" (Demerouti et al., 2001, p. 501). Compared with technologies in the industrial age, which were primarily designed to save physical efforts, ICTs in the information age are mainly used to save cognitive and social efforts. However, as to the actual influence of ICT use on individuals' job demands, the effects are mixed. On one hand, as a type of equipment or tool that is used to do the work (i.e., the production/task function of ICT use), ICT has dramatically changed the cognitive aspects of work by helping individuals to accomplish tasks with a lower level of cognitive resource consumption. On the other hand, however, ICT use has also increased some job demands, or has brought in a range of new job demands, such as information overload, enhanced learning expectations, and ICT-related hassles (Ragu-Nathan et al., 2008). We elaborate these mixed effects next.

Reduced Job Demands

ICTs are designed to be labor-saving (Day et al., 2012). Without a doubt, acting as the "external brain", ICT use can support employees to achieve their work-related goals more easily. Especially with the advent of the internet, social media, and artificial intelligence, ICT use can help people effectively search, present, store, retrieve, and analyze digital information, thereby "rescuing" people from routine work (Chesley, 2010). As a result,

employees can spend less time and cognitive or mental resources on information-related tasks.

Consistent with this reasoning, two studies have emphasized the role that ICT plays in reducing people's job demands, especially cognitive demands. For example, a cross-sectional study conducted in England found that the use of ICT made preparing teaching materials, collating assessment data and generating reports easier. Thus, most teachers reported that using ICT for teaching helped to reduce their workload and enabled them to be more productive (Selwood & Pilkington, 2005). Using cross-sectional data from nurses, Bautista, Rosenthal, Lin, and Theng (2018) also found that the frequency of ICT use for work purposes was associated with lower job demands. Nurses who used smartphones for work also reported higher productivity and a better quality of patient care, which the authors speculated was because mobile phones helped them save time in communication, coordination, and the management of medical information.

However, recent research has also found that utilizing ICT to save cognitive resources can lead to unintended consequences, such as superficial processing (i.e., "lazier" brains). For example, Wilmer, Sherman, and Chein (2017) reviewed 43 studies on the cognitive outcomes of mobile technology use, finding most studies demonstrated the detrimental impacts of frequent mobile technology use on cognitive outcomes such as memory, attention, and cognitive functioning. In fact, scholars in the automation area have realized that labor-saving technology can lead to mental underload (i.e., employees invest less cognitive resources than the task requires). This, in turn, can increase safety risks and impair performance because employees cannot sustain their attention sufficiently in order to quickly and effectively respond when encountering automation malfunctions (Young & Stanton, 2002).

Similar effects have also been found for knowledge workers who use ICTs to do tasks. When processing ICT-mediated information (e.g., reading information on a screen),

individuals tend to skim and scan the information rather than processing it deeply (Singer & Alexander, 2017a, 2017b). For example, Singer and Alexander's (2017a) laboratory study found that individuals could remember more information when reading printed materials than they could when reading the same materials on a computer screen. In Mueller and Oppenheimer's (2014) experiments, people are more likely to transcribe information rather than reframing it in their own words when they use laptops for learning. Thus, individuals who took notes with laptops showed poorer learning performance than those who took notes longhand.

In addition to laboratory evidence, Jarvenpaa and Lang (2005) suggested a detrimental impact of ICT use on employees' cognitive abilities based on qualitative data from 33 focus group interviews. Participants in their study reported that the frequent use of ICT for processing information made them less competent. Some typical expressions from the interviewees included "I used to remember a lot of phone numbers from memory" and "SMS is impoverishing the language. It is a threat to language especially for young people" (Jarvenpaa & Lang, 2005, p. 14).

In general, as ICT is designed to reduce job demands, its bright side is usually taken for granted. Yet, only a few studies at the individual level have actually tested this assumption. The predominance of cross-sectional designs, rather than more rigorous research designs such as experimental or longitudinal designs, also limits the methodological rigor of the findings. For example, in both of the studies suggesting ICT reduces job demands, reverse causal processes might actually explain the cross-sectional associations (e.g., nurses and teachers who are more efficient make more use of ICT). Moreover, we observed that, while ICT has the potential to reduce job demands, it could also reduce demands excessively (Wilmer et al., 2017). Consistent with Wilmer et al.'s review on mobile technology, we also identified that ICT use at work could eliminate some necessary demands, which could bring about

unintended consequences for individuals' cognitive functioning, as well as for outcomes such as safety.

Increased Job Demands

Several studies have shown that ICT use can create new demands for users, such as information overload, learning demands, and ICT-related hassles.

Information overload. When the amount of information exceeds a human's capacity for processing it, this can be characterized in two broad ways (Farhoomand & Drury, 2002, p. 127). According to Farhoomand and Drury's (2002) qualitative study with a sample of 124 managers, the first is when employees are given more information than they can absorb. For instance, based on an online survey of working professionals, intensive social media use at work was found to expose them to more information than they can actually take in (Yu, Cao, Liu, & Wang, 2018). Results also showed that raising the information overload further led to exhaustion and impeded subsequent performance.

The second type of information overload occurs "when information processing demand on an individual's time and internal calculations exceeds the supply or capability of time available for such processing" (Farhoomand & Drury, 2002, p. 127). According to Farhoomand and Drury's (2002) results, this type of overload can occur when there is simultaneous information flow from multiple channels. With ICT enabling multiple streams of information coming towards individuals simultaneously, individuals are often expected to, or have to, engage in various tasks and meet different goals at the same time (i.e., multitasking; Ragu-Nathan et al., 2008), which results in information overload.

Nevertheless, research also suggests that the impact of ICT-enabled multitasking on information demands might vary as a function of individuals' preferences and age. Using a sample of 1004 employees, Saunders, Wiener, Klett, and Sprenger's (2017) cross-sectional study controlled the influence of ICT use intensity and showed that individuals who prefer

multitasking reported less information overload when dealing with a variety of information. Their study also found that, compared with younger users, older users reported more information overload, which the authors speculated to be because older users might find it hard to cope with multiple simultaneous information due to their declined cognitive capacities (Saunders et al., 2017).

König and Waller (2010) argued that using ICT for multitasking will enhance performance when the work environment required it. However, as humans really cannot carry out multiple tasks at one time because of their limited attention span (e.g., Pashler, 1994), multitasking actually means switching among multiple tasks quickly with short intervals. Several neuroscientific studies have demonstrated the detrimental effects of multitasking on cognitive outcomes such as attention, memory, and learning (e.g., Ophir, Nass, & Wagner, 2009). For instance, using functional neuroimaging methodology, Foerde, Knowlton, and Poldrack (2006) found that the medial temporal lobe system in the brain (which is responsible for declarative memory) was disrupted in dual task conditions, whereas the striatum part of the brain (which is responsible for habit learning) was not diminished. These findings demonstrated the differences in memory mechanisms for participants engaged in a single task compared with those engaged two tasks at once. They also found that, although multitasking did not hurt task performance, it was harder for participants in the dual task condition to apply their learned knowledge into a new context, suggesting learning was impaired. In a similar vein, Ophir et al. (2009) examined the consequences of chronic multitasking and found that heaver multitaskers demonstrated worse task-switching abilities due to their susceptibility to interference from irrelevant environmental stimuli and from irrelevant representations in memory. All these studies challenge the idea that using ICT for multitasking will enhance performance.

Nevertheless, most of these studies were conducted in laboratory settings. In contrast, in their field study, Aral, Brynjolfsson, and Van Alstyne (2012) relied on three data sets (i.e., five-year accounting records, a 10-month email history, and a self-reported survey) and found curvilinear relationships between multitasking and employee outcomes. Results indicated that with moderate levels of multitasking, employees can use information and knowledge from one task to help accomplish other tasks productively, and thus will not perceive themselves as experiencing too many demands. When multitasking exceeds a certain level, however, too many demands will reduce individuals' reaction time and increase error rates, which is detrimental for performance. Extrapolating from this study to the impact of ICT, it might be that – when ICT supports a moderate level of multitasking within an acceptable range – ICT use can be regarded as a job resource or a 'challenging demand'. However, when the ICT-induced information flow exceeds a certain level, it is likely to become a hindering job demand in the form of information overload. More research is needed to test this specific link between ICT use, multitasking, and information overload.

Learning-induced demands. The use of advanced ICTs usually leads to discrepancies between one's current skill sets or knowledge and those needed to meet future requirements, which raises employees' learning requirements (Parsons, Liden, O'Connor, & Nagao, 1991). Bala and Venkatesh (2013) conducted a longitudinal study to track the changes in work characteristics after ICT implementation and found that employees who used new electronic systems had to adapt to novel work routines to complete their tasks. At least in the early stage of ICT adoption, employees perceived that their work processes became more complex than before. In order to perform well, employees had to exert extra cognitive resources to get used to the new ICT (Lapointe & Rivard, 2005). Thus, employees perceived increased learning expectations were placed on them after the electronic system implementation (Bala & Venkatesh, 2013).

However, although demands increased during the shakedown period (the first two months after implementation), they then started to decrease afterwards. Venkatesh (2000) likewise found that individuals perceived more enjoyment, objective usability, and ease of use of an electronic system over time. Thus, it seems that, after an initial learning demand, if ICT stays in its initial state, and is not updated to a more advanced and sophisticated version after the adaptive phase, perceived learning demands tend to decrease with increased user familiarity. Of course, given the fast changing nature of ICT, updates are likely, which creates cyclical learning demands for employees (Day et al., 2010; Tsai, Compeau, & Haggerty, 2007). These new learning cycles might therefore raise learning demands again and again.

As well as time moderating the effects of ICT use on learning-induced demands, studies have also shown that individual differences and work experiences can play moderating roles. Research has indicated that older individuals are more resistant to technological change, and they usually show poorer performance in technological training due to the lack of confidence in their abilities to learn new technologies (e.g., Gist, Rosen, & Schwoerer, 1988; Tu, Wang, & Shu, 2005). Marler and Liang (2012) compared individuals' perceptions before and after the implementation of new electronic systems and found that employees in low-level clerical service jobs perceived more learning demands after using the new electronic systems, whereas technical workers and managers reported no overall change. This could be explained by the difference in prior experience with ICT between entry-level service employees and knowledge workers. That is, knowledge workers are more likely to have experience with using ICT, whereas entry-level service employees might have insufficient experience or knowledge with ICT, which required them to invest more cognitive resources to learn the new systems (Young & Stanton, 2006).

Consistent with work design theory, although empirical evidence has shown that learning-induced demands can bring about stress and hurt employees' well-being as well as their performance (e.g., Tarafdar et al., 2007; Wang, Shu, & Tu, 2008), these detrimental effects can also be alleviated for individuals with higher levels of technology self-efficacy (Tarafdar, Pullins, & Ragu-Nathan, 2015) and positive cognitive appraisals (i.e., those who view technical skill updating as enjoyable and pursue learning for its own sake; Tsai et al., 2007). In essence, individuals with high self-efficacy and positive appraisal patterns appear to experience learning demands more as demands which challenge them.

In theory, one might also expect that supportive organizational factors could also buffer the negative effects of learning-induced workloads on stress outcomes, yet the results have been far from conclusive. For example, in the relationships between ICT-related demands and employee outcomes (i.e., job satisfaction and satisfaction with the use of ICT), empirical evidence (Fuglseth & Sørebø, 2014; Ragu-Nathan et al., 2008) does not support the moderating roles of literacy facilitation (i.e., providing training and guidance), information technology (IT) technical support, and involvement facilitation (i.e., involving end-users during system planning and implementation phase). Some work design scholars have suggested that specific job resources (e.g., ICT-related support) help to buffer specific ICT-related demands (Bakker, Demerouti, & Euwema, 2005). Consistent with this, Day et al. (2012) proposed the moderating roles of personal assistance and technological resources support (e.g., technical training) and found that technological resources support indeed mitigated the negative effects of learning demands on burnout.

ICT hassle-induced demands and interruptions. Intensive ICT use can mean that individuals encounter more ICT-related hassles, which is a new type of job demand in the workplace (Day et al., 2012; O'Driscoll, Brough, Timms, & Sawang, 2010). Hassles are defined as "the irritating, frustrating, distressing demands that to some degree characterize

everyday transactions with the environment" (Kanner, Coyne, Schaefer, & Lazarus, 1981, p: 3). Examples of traditional hassles include traffic jams, losing things and bad weather.

ICT use brings new vexations into the workplace such as technological incompatibility, information security threats, and ICT malfunctions (Day et al., 2010; Ragu-Nathan et al., 2008). Given that ICT is so widely used in today's workplaces and employees have to grasp different technologies, it is more common for individuals to encounter incompatibilities between technologies (e.g., the incompatibility of software or documents between Macs and PCs; Al-Fudail & Mellar, 2008), which can disrupt task performance. The wide use of diverse ICTs also exposes employees to information insecurity risks. For example, a ransomware named "WannaCry" infected more than 200,000 machines all over the world recently, causing billions of dollars' loss to the economy and no doubt causing extensive hassles and impaired performance for individuals. Moreover, technology malfunction is another major type of ICT-related work hassle (Day et al., 2012), often caused by system errors, software malfunctioning, and the like (Bessière, Newhagen, Robinson, & Shneiderman, 2006; O'Driscoll et al., 2010).

Consistent with previous ICT studies on job demands, ICT hassle-induced demands can negatively affect users' emotions, well-being, and performance (Bessière et al., 2006; Day et al., 2012; Lazar, Jones, & Shneiderman, 2006; Zimmerman, Sambrook, & Gore, 2014). However, the presence and strength of these relationships vary across individuals and situations (Bessière et al., 2006). When faced with ICT hassle-induced demands, some individuals use adaptive coping strategies which can help them transform ICT-induced stress into energy that helps them better manage ICT-induced demands. In contrast, others tend to rely on maladaptive coping strategies and react with aggression or withdrawal, which makes things worse (Bessière et al., 2006; Shorkey & Crocker, 1981). In addition, organizational support matters (Day et al., 2012). For example, Day et al. (2012) found that personalized

technical assistance can attenuate the detrimental impacts of ICT hassles on individuals'

strain and cynicism, although technology resources support did not work in the same way.

Besides the aforementioned demands raised in human-ICT interactions (i.e., using

production and/or task functions of ICT for technical aspects of work), recent theoretical

work has also paid attention to demands derived from ICT-mediated interpersonal

communications such as ICT-related interruptions. Previous studies have shown that ICT-

related interruptions (e.g., frequent instant messages) increase job demands (e.g., time

pressure and workload) and harm performance and well-being (e.g., Addas & Pinsonneault,

2015, 2018a; Jett & George, 2003; Sonnentag, Reinecke, Mata, & Vorderer, 2018; Ter

Hoeven, van Zoonen, & Fonner, 2016). For example, based on a diary study, Sonnentag et al.

(2018) found that receiving ICT-related interruptions and intensively responding to online

messages can enhance employees' daily negative affect through increased time pressure.

However, Addas and Pinsonneault (2015) proposed a bright side for workplace

interruptions. Based on a cross-sectional study and a diary study, Addas and Pinsonneault

(2018b) showed that the frequency and duration of email interruptions that contain useful

information for the worker's primary tasks was positively associated with mindfulness and

performance, whereas the frequency and duration of receiving interruptions that did not

provide relevant information had a negative indirect effect on performance through increased

subjective workload.

Summary of Changes in Job Demands

In sum, a set of job demands affected by ICT use have been identified in the literature:

information overload, learning expectation, and ICT-related hassles and/or interruptions. We

found that ICT-induced demands not only emerge in human-ICT interactions (e.g., when

employees learn knowledge to master a new technology) but also emerge in ICT-mediated

communications (e.g., when they experience online interruptions by colleagues). The

research further shows that, although ICT-induced demands commonly exist in the workplace (Tarafdar et al., 2007), employees may not necessarily respond to them similarly (Tarafdar, Cooper, & Stich, 2019). For example, individuals who prefer multiple activities at the same time would perceive less information overload when multitasking (Saunders et al., 2017), and those who can get technical support from the organization can better handle these demands (Day et al., 2012).

In fact, these results about ICT and demands are consistent with wider work design research. Job demands can be appraised either as hindrances or challenges (LePine, LePine, & Jackson, 2004; Lepine, Podsakoff, & Lepine, 2005; Podsakoff, Lepine, & Lepine, 2007). According to this perspective, only demands which are hindrances are destructive, while some "good" (challenging) demands (e.g., the attention required by the job, learning demands) are constructive such that moderate levels of such demands can lead to desirable employee outcomes (e.g., Ohly & Fritz, 2009). Consistent with this reasoning, Humphrey, Nahrgang, and Morgeson's (2007) meta-analysis showed that information processing demands and job complexity are positively related to job satisfaction, suggesting these demands function as challenges. Therefore, although these three ICT-related stressors are labeled as demands in the current review, we recognize that they can, depending on the nature of the demand itself as well as other factors, also be appraised as challenging demands. Thus, they might not necessarily lead to detrimental outcomes. As we elaborate later, we advocate that future ICT evaluation studies include how demands are appraised.

Our review also suggests that certain ICT-induced demands, such as interruptions caused by ICT or demands to always be online for work (i.e., constant connectivity) may also influence another important work design element, job autonomy, which we expand on in the next section.

ICT Use and Autonomy

We identified 45 papers focusing on how ICT use relates to job autonomy, which comprised more than 50% of all reviewed articles. Job autonomy is defined as "the degree to which a job provides discretion over daily work decisions, such as when and how to do tasks" (Parker, 2014, p. 664), including work scheduling, decision-making, and work method autonomy (Morgeson & Humphrey, 2006). According to work design theory, work autonomy is a vehicle for desirable employee outcomes such as enhanced individual performance and work engagement (Hackman & Oldham, 1976). For instance, job autonomy can enhance job performance through increasing employees' role breadth (Morgeson, Delaney-Klinger, & Hemingway, 2005), through fostering intrinsic motivation (Gagne, Senecal, & Koestner, 1997) and prosocial motivation (Parker et al., 2007), and through enabling individuals to address problems effectively at their source (Cordery, Morrison, Wright, & Wall, 2010).

Similarly to the impact of ICT on job demands, the existing research sheds light on the paradoxical effects of ICT use on employees' perceptions of their job autonomy (e.g., Bader & Kaiser, 2017; Mazmanian, Orlikowski, & Yates, 2013), both with respect to human-ICT interaction and ICT-mediated communication processes.

Increased Autonomy

Previous studies have shown that ICT use can directly increase *work scheduling autonomy*. As employees can obtain the necessary resources or information with portable ICT and engage in work digitally, they are able to work anytime and anywhere, such as working after hours, working in virtual teams, and teleworking (Raghuram et al., 2019). A recent meta-analysis (Wegman et al., 2018) revealed that mean levels of job autonomy perceptions have increased substantively since 1975, for which the authors speculated that ICT use at work might be a major driver. Consistent with work design theory, empirical evidence has shown that ICT-facilitated autonomy can lead to desirable employee outcomes such as higher

levels of work engagement (e.g., Fujimoto, Ferdous, Sekiguchi, & Sugianto, 2016; Ter Hoeven et al., 2016; van Zoonen & Rice, 2017) and performance (Gajendran, Harrison, & Delaney-Klinger, 2015).

Research in the field has emphasized the impact of ICT-facilitated autonomy on balancing demands across different roles or domains. In theory, smartphone use after work can reduce the negative impacts of competing expectations from different roles and help people handle different demands simultaneously. Employees are able to fulfil their family obligations at home while responding to clients and colleagues. Such employees can also leverage ICT to attend to urgent personal or family demands while at the workplace (König & Caner de la Guardia, 2014).

Nevertheless, empirically, the results are less positive than this reasoning implies. Piszczek's (2017) time-lagged study and Xie et al.'s (2018) two cross-sectional studies revealed the moderating impact of preferences for personal and work role partitioning (or combination). It was found that the intensity of ICT use for meeting work demands at home was positively associated with perceived control (i.e., boundary control, work schedule control, and location control) only for those who preferred role integration, but it was associated with lower perceived control for those who preferred role segmentation. Likewise, drawing on cross-sectional data from three organizations in telecommunication and consulting sectors, van Zoonen and Rice (2017) found that employees' responsiveness to colleagues moderated to weaken the relation between the frequency of ICT use for work-related communication and perceived autonomy. Fulfilling the expectation of continuous responsiveness reduces individuals' abilities to detach from work, resulting in lower levels of autonomy in their personal lives.

Recent work has also started to focus on the relationship between ICT use and decision-making autonomy. Given that ICTs have a range of functions (e.g., delivering

information or interpersonal communications) and can influence work in different ways, studies (e.g., Bloom, Garicano, Sadun, & Van Reenen, 2014; Lai & Dobrajska, 2015) have distinguished information technology (IT) from communication technology (CT), finding that they exert different effects on decision-making autonomy. In fact, this thinking (Bloom et al., 2014; Lai & Dobrajska, 2015) is similar to our approach of distinguishing human-ICT interactions (using the production and/or task function of ICT for technical aspects) and ICT-mediated communications (using the social function of ICT for social aspects). IT in their studies was mainly designed to help individuals accomplish information-related tasks, while CT was mainly designed to help individuals connect with others at work.

Bloom et al. (2014) argued that centralization requires the transmission of decisions from managers to workers, which comes at a communication cost, and managers therefore are more likely to delegate tasks to employees when the communication cost is higher than the information acquisition cost. Some IT (e.g., an enterprise resource planning system) can reduce employees' cost in acquiring organization- or production-related information. Therefore, using IT can increase decision-making autonomy. On the other hand, CT (e.g., email) can reduce the communication cost of transmitting information between managers and workers, which, in turn, enhances centralization and hence creates lower job autonomy (Lai & Dobrajska, 2015). However, ICT use in Bloom et al.'s (2014) study was measured at the firm level and Lai and Dobrajska (2015) measured ICT use with dummy variables (i.e., whether a particular ICT was used by employees).

According to our definition of ICT use, these measurements lack some important information, such as use intensity and the specific functions of ICT use. Besides, this classificatory approach is problematic because advanced ICTs have all the functions or features that both IT and CT have. For example, one can use a smartphone either to search for information or to communicate with colleagues. Thus, a more appropriate approach is to

understand ICT use by considering the use intensity and functions of use, as mentioned earlier, rather than distinguishing between types of ICTs.

To sum up, although a set of empirical studies supported the positive impact of ICT use on scheduling autonomy, we also observed that this varies in terms of individual differences. Recent theoretical work has started to distinguish IT and CT to disentangle their differential effects on decision-making autonomy (Lai & Dobrajska, 2015). However, due to limited information captured by the researchers' measurements of ICT use, we still need more empirical evidence with appropriately precise and conceptually defined measurement to examine their assumptions. This point is expanded in the last section of this paper.

Reduced Autonomy

ICT use in the workplace indeed offers the potential for greater autonomy, but on the other hand it also exposes employees to ubiquitous managerial control (e.g., electronic monitoring and standardized electronic systems). ICT use can also coerce employees to be "always online" in interpersonal collaborations and communications, which may actually reduce employees' scheduling, work methods, and decision-making autonomy (Bader & Kaiser, 2017).

Managerial control-induced decreases in autonomy. Bernstein's (2017) review on observation in management (i.e., "the act of careful watching and listening, or paying close attention to someone or something, in order to get information") found a shift from "people observing the technology" to "technology observing people", and another shift from observing organizational outcomes such as performance to observing specific individual activities (e.g., internet use behavior). In the industrial age, employees (operators) were required to monitor automated systems to maintain the machines' reliability (Wall et al., 1990). However, electronic monitoring, as an important managerial control tool in the digital

era, has been widely used to monitor employees' performance and other related behaviors at work.

More and more organizations are using electronic technologies to collect, store, analyze, and report the individual actions, group actions and/or performance (Nebeker & Tatum, 1993). Electronic monitoring can be used for the internet, telephone, and social media usage, visual observation, and detection of the person's physical location (e.g., via GPS; Alge & Hansen, 2014). A recent survey (Electronic Monitoring and Surveillance Survey, 2007) found that 66% of surveyed organizations used internet monitoring, 43% used email monitoring, 45% used telephone monitoring, and 48% used video surveillance.

Carayon (1993) first proposed a conceptual model linking electronic monitoring to worker stress through the work design perspective. She pointed out that exposure to monitoring reduces employees' autonomy to control work pace, work schedules, work methods, and decision-making. Consistent with this reasoning, using cross-sectional data from call centers, Sprigg and Jackson (2006) found that performance monitoring had negative indirect effects on job-related strain through reduced autonomy. However, this effect was not replicated in another study also conducted in call centers (Holman, Chissick, & Totterdell, 2002) – this study found job control did not mediate the relationship between monitoring and well-being but it weakened the detrimental impact of perceived monitoring intensity on well-being.

This mixed evidence indicates the importance of influencing conditions. Indeed, reviews suggest that electronic monitoring can be positive for managers and employees because it can provide valuable feedback (Alge & Hansen, 2014; Ball, 2010). In a qualitative study, Stanko and Beckman (2015) found that overuse of a monitoring system made people feel both disconnected to work and powerless, whereas underuse led to inefficiency. Only when monitoring is used astutely can people adjust their behaviors in time and keep focused

at work. Previous reviews (Alge & Hansen, 2014; Ball, 2010; Stanton, 2000) found several crucial contextual factors for artful monitoring, such as feedback integration, clarity of monitoring criteria, quality of work design (e.g., social support and job security), monitoring frequency, target task, and so forth. For example, Stanton and Barnes-Farrell (1996) found that participants who can control electronic monitoring (i.e., where individuals can choose when to use electronic monitoring) reported higher levels of perceived job control.

The reactions to electronic monitoring also vary as a function of individual differences (Stanton, 2000). Early studies captured the moderating role of employees' task ability and skill (Aiello & Kolb, 1995; Schleifer, Galinsky, & Pan, 1995). Schleifer et al. (1995) specifically studied workers who had difficulty maintaining their data entry performance. They found that low performing workers experienced more stress when monitored. Aiello and Kolb (1995) compared low and highly skilled workers. Their results revealed that when highly skilled participants were monitored they demonstrated better data entry performance than when their highly skilled counterparts were not, whereas an opposite pattern was found among low skilled participants.

Individuals' attitudes towards surveillance, organizational commitment, and organizational identification also matter as potential moderators (Spitzmüller & Stanton, 2006; Stanton, 2000). When employees hold a positive attitude towards monitoring and have a higher organizational commitment or identification, they are more likely to accept monitoring. Besides attitudes, Watson et al. (2013) identified employees' goal orientation as playing an important role. They found that individuals with higher performance prove goal orientations, compared with individuals with higher performance avoidance goal orientations, showed greater evaluation apprehension, or "distress and unease due to concerns about negative appraisal of others in an evaluative situation" (Watson et al., 2013, p. 643), resulting in poorer performance.

Finally, concerns over other managerial controls being enhanced by ICT, such as standardized work procedures and routines, are increasing. In human-ICT interactions, both scholars and engineers focus on ICT's advanced features such as automation, whereas humans (users) are gradually "out of the loop" (i.e., less attention to individuals' autonomy in use; Grote, Weyer, & Stanton, 2014). Consequently, working with these standardized ICTs, employees perceive themselves to have less decision-making and work method autonomy. Eriksson-Zetterquist, Lindberg, and Styhre's (2009) qualitative study found that employees have to strictly obey the automated workflow, with limited decision-making and work method autonomy, when they use an e-business system for purchasing. In an extreme case, Charlie Chaplin's masterpiece *Modern Times*, humans become parts of a machine and they have no autonomy at all to decide how to accomplish their work.

Although using such technologies could save cognitive resources and reduce uncertainty at work, Eriksson-Zetterquist et al. (2009) found that employees perceive less skill utilization and less autonomy, resulting in lower levels of professional identity after the adoption of e-business system. Bala and Venkatesh's (2013) longitudinal study also found similar negative effects after electronic system implementation. Their study revealed that the lower levels of reconfigurability and customization of adopted ICT can enhance perceived work process rigidity and radicalness, which, in turn, reduce employees' perceived job control.

Constant connectivity-induced decreases in autonomy. As mentioned above, the flexibility enabled with ICT use can increase scheduling autonomy (e.g., working without restrictions of time and space), but this is just part of the picture. ICT use can also create expectations of constant connectivity—individuals are expected to always keep online and respond to requests, imprisoning them in a "digital cage" (e.g., Cavazotte, Heloisa Lemos, & Villadsen, 2014; Mazmanian et al., 2013). Taking emails as an example, senders can direct

emails to recipients anytime and anywhere without any concern about disturbing them. Recipients are then expected to handle emails in a timely manner, if not, they will violate social norms (Barley et al., 2011). The experience of email-mediated communications is different from face-to-face communications. Perceived obligations will disappear after face-to-face chatting, whereas the reminder of pending tasks will only disappear when the tasks are handled (Barley et al., 2011). Thus, individuals might perceive less autonomy in managing their work/life balance as a result of ICT use.

More specifically, due to the constant availability of ICT, work issues can gradually invade into staff's personal lives through ICT usage, blurring boundaries between the work and non-work domains. Employees are expected to continue working outside regular working hours and therefore have limited autonomy in their personal lives (Fenner & Renn, 2004, 2010). In Mazmanian's (2013, p. 1242) case study, one participant from a legal team described his/her experience after two to three years' email use: "To me it's this passive/aggressive way that people get access to you... I think they will sometimes email you knowing that if you see it [the message], you'll feel obligated to do something about it."

In terms of quantitative evidence, Dettmers et al. (2016) traced 132 individual for four working days and found that perceived control (autonomy) in off-the-job activities mediated the relationship between after work ICT use and well-being. They found that the intensity of work-related ICT use after hours has indirect negative effects on start-of-the-day mood via reduced perceived control in off-the-job activities. A large body of research has shown the negative consequences of intensive work-related ICT use after hours such as work-family conflict, diminished well-being (e.g., emotional exhaustion and poor sleep quality) and reduced performance (e.g., Boswell & Olson-Buchanan, 2007; Butts, Becker, & Boswell, 2015; Chen & Karahanna, 2018; Ferguson et al., 2016; Piszczek, 2017).

As mentioned in the previous section, a preference for work/life segmentation (or the opposite) can mitigate the impacts of work-related ICT use after hours. Individuals who have a preference for integration of work and the family may regard ICT as a useful tool to increase autonomy in balancing different roles. In contrast, those who prefer segmentation are more likely to perceive after work ICT use as a stressor. In addition, employees with better time management skills (e.g., goal setting and periodization) may be able to cope with constant connectivity better (Fenner & Renn, 2010; Huang & Lin, 2014).

Besides these individual factors, we also identified the moderating roles of the social context. According to Derks, van Mierlo, and Schmitz's (2014) 4-day diary study, intensive work-related smartphone use after work impairs psychological detachment more seriously when employees perceive strong workplace segmentation norms, because these behaviors are inconsistent with their common practice. At the national level, employees are prone to give work a higher priority than their personal life in eastern countries (Chandra, 2012; Chen & Karahanna, 2014). Thus, it might be possible that work-related ICT use after work would be more tolerable in eastern countries.

Summary of Changes in Job Autonomy

To sum up, our review identified some paradoxical effects of employees' ICT use on job autonomy. ICT use can enhance employees' autonomy, especially their scheduling autonomy, via supporting teleworking or online collaboration. However, such impacts on job autonomy can be negative for individuals with a work/home segmentation preference and/or poor time management skills. In addition, individuals can suffer from excessive managerial control due to electronic monitoring or the use of standardized electronic systems if ICTs are not designed or implemented artfully, resulting in lower levels of autonomy. Finally, raised expectations for constant connectivity in ICT-mediated communications not only increase job demands as discussed in the previous section, but can trap people into "always being online",

which can be perceived as eroding job autonomy, especially when there are strong social norms for segmentation.

ICT Use and Relational Aspects of Work

In the digital era, with the prevalence of social network services such as Facebook and WhatsApp, more and more interpersonal interactions are mediated through ICTs (i.e., ICT-mediated communication). Meanwhile, scholars have emphasized the crucial role of ICT use in shaping social and relational aspects in daily life (e.g., Domahidi, 2018; Turkle, 2012; Waytz & Gray, 2018). For example, a meta-analysis showed that levels of dispositional empathy among college students in the U.S. decreased from 1979 to 2009 (Konrath, O'Brien, & Hsing, 2011). The authors speculated that ICT use might be one of the antecedents that has made the young less empathetic.

However, attention to the social consequences of ICT use is still inadequate in the management and organization literature. With the rise of the service and knowledge economies, jobs, roles, and tasks are becoming more and more socially embedded (Grant & Parker, 2009). As Grant and Parker (2009) articulated, interpersonal interactions and relationships are as important as task characteristics in the current workplace and are playing a crucial role in influencing employees' work effectiveness and well-being (Humphrey et al., 2007). Thus, in this section, we specifically focus on 23 papers that considered the impact of ICT use on relational work design.

Increased Instrumental Support

One way of conceptualizing social relations is to consider two types of social ties: *instrumental* and *expressive* (Balkundi & Harrison, 2006; Lincoln & Miller, 1979). Instrumental social ties are closely related to the task or work roles, which usually emerge from formal work relations (e.g., leader-subordinate and agent-customer relationships). High quality instrumental ties are important to achieve task performance because one can gain

valuable information and knowledge from such ties (i.e., instrumental social support; Ibarra, 1993). Expressive social ties, in contrast, usually reflect friendships or informal social relations in the workplace. Individuals with strongly positive expressive social ties (e.g., friendship) are more likely to receive emotional support from peers or supervisors (e.g., care and empathy), whereas those with negatively expressive social ties (e.g., antipathy) are more likely to receive social undermining. Briefly, "expressive ties are normative and affect based, whereas instrumental ties are information and cognition based" (Umphress, Labianca, Brass, Kass, & Scholten, 2003, p. 742).

Compared with face-to-face interactions, most ICT-mediated communications convey a limited number of social cues (e.g., nonverbal cues such as body language). Thus, it is relatively hard for individuals to comprehend others' moods or emotions, which may inevitably hinder the formation of expressive ties. They, however, are more likely to rely on easily accessible task-related information to reduce uncertainty. As a result, ICT-mediated communications are more likely to foster the development of instrumental rather than expressive ties (Monzani, Ripoll, Peiró, & Van Dick, 2014).

In fact, previous studies have revealed the advantages of ICT-mediated communication in building instrumental ties, such as fewer temporal or spatial constraints, the possibility of parallel communication, and the high speed of retrieving or documenting information (Dennis, Fuller, & Valacich, 2008; Zhang & Venkatesh, 2013). Especially with the development of social media, ICT-mediated communications largely reduce the cost of acquiring or delivering information in interpersonal interactions, which helps to build and extend information-based social networks. Specifically, employees can utilize ICT to learn more about others within or outside their work groups and build instrumental ties.

For example, Leonardi (2018) conducted a quasi-natural field experiment to examine the impacts of enterprise social media use on shared cognition. Leonardi found that ICT use

can overcome temporal and spatial constraints and promote shared experience across groups. As a result, employees have a better understanding of their colleagues' knowledge and social network. In other words, social media use promoted information sharing and the formation of cognition based instrumental ties. According to the literature on social networks, increased instrumental social ties positively relate to the amount and diversity of instrumental social support (e.g., advice, training, and professional development support; Robertson, O'Reilly, & Hannah, 2019), which means employees will own more resources (e.g., information and knowledge) to accomplish core tasks. Thus, they can achieve better performance (Ali-Hassan, Nevo, & Wade, 2015).

Reduced Emotional Support and Increased Social Undermining

On the other hand, ICT use can be detrimental to expressive social ties because of the limited number of social cues in ICT-mediated communications (Walther, 2011). For example, neither individuals' social contextual cues (e.g., body language; Daft & Lengel, 1986) nor communicators' background information (e.g., demographic information; Siegel, Dubrovsky, Kiesler, & McGuire, 1986) is presented in ICT-mediated communications. Video conference platforms such as Skype may make it possible to see more of others' vivid reactions, but they still cannot deliver as much information as face-to-face interactions (Lee, Leung, Lo, Xiong, & Wu, 2011). As one participant in Barnes's (2012, p.128) study expressed: "Technology has speeded work processes up but taken away some personal elements and interactions [...] some personnel have felt isolated from their colleagues by the introduction of email etc." Such a limited amount of social cueing in ICT-mediated communication will lead to deindividuation (Reicher, Spears, & Postmes, 1995).

Hence, employees usually focus on task-related content rather than building informal social relations as they would normally do in face-to-face interactions (Zornoza, Ripoll, & Peiró, 2002). Siampou, Komis, and Tselios's (2014) laboratory study showed that compared

with participants collaborating face-to-face, those in ICT-mediated communications demonstrated more task-focused actions, paid more attention to analysis and synthesis, yet engaged in fewer social interactions. Therefore, employees may benefit instrumentally from ICT use by achieving better task performance whereas it might be hard for them to establish expressive ties and get emotional support in ICT-mediated communications.

However, our review also found some evidence for the bright side of using ICT's effect on social ties. For instance, Ali-Hassan et al. (2015) found that using social media to build and maintain workplace social relations can enhance both instrumental and expressive ties. Hislop et al. (2015) and Lal and Dwivedi (2009) found that homeworkers can utilize ICT to meet their social needs or cope with social isolation by communicating with friends or colleagues. Thus, it is necessary to consider the potential influencing conditions in this process.

In their review, Waytz and Gray (2018) suggested the crucial roles of individuals' offline relationships and argued that ICT use could be beneficial when deep offline relationships are difficult to attain. Homeworkers, for example cannot engage in offline work relations as deeply as employees in face-to-face work conditions. Consequently, they will rely on ICT to build and maintain relationships. Furthermore, ICT use will be positive when individuals use it to complement deep offline relationships, whereas it will be detrimental when used to supplant offline relationships (Waytz & Gray, 2018). Cummings et al.'s (2003) study showed that using the internet is associated with declines in loneliness for individuals who already had many social resources. Using a sample of adolescents, Lee (2009) also found the rich-get-richer effect—people who already had strong social relationships are more likely to build high quality friendships via ICT-mediated communications.

Moreover, individuals may indeed build expressive ties and receive emotional support in ICT-mediated communications, but the emotional support delivered through ICT may be

less effective than the social support provided in person. Holtzman et al. (2017) conducted two randomized controlled experiments in which participants were asked to finish a stressful task. Results of both experiments showed that in person support was associated with a higher positive affect than ICT-mediated emotional support. Thus, under most circumstances, offline social interactions might be more effective in building expressive ties. ICT use might only be beneficial when it is used to maintain the already deep offline relationships or when offline interactions are not available.

In addition to decreased positive expressive social ties, we also found an increase in negative expressive social ties in ICT-mediated interpersonal communications, which, in turn, leads to more social undermining in the workplace. Limited social cues in ICT-mediated communication encourage new types of social undermining in organizations, such as cyberbullying, cyber incivility, and cyberaggression (e.g., Farley, Coyne, Axtell, & Sprigg, 2016; Park, Fritz, & Jex, 2018).

This behavior has three main origins, according to the literature. First, individuals usually hold the view that social norms that apply to face-to-face communications may not equally apply to ICT-mediated communications, which is termed the online disinhibition effect (i.e., "people say and do things in cyberspace that they wouldn't ordinarily say and do in the face-to-face world"; Suler, 2004, p. 321). Thus, they may perceive less guilt if they hurt others in ICT-mediated communications and exert fewer resources to control their behavior in cyberspace (Bauman & Yoon, 2014). Second, the poor quality of communication caused by limited nonverbal information will lead to more misunderstandings and misinformation in ICT-mediated communications, thereby leading to interpersonal conflicts (Friedman & Currall, 2003). Driven by these conflicts, people are more likely to show aggressive behaviors towards others (Camacho, Hassanein, & Head, 2018). Third, as people usually cannot see victims' reactions in time, it is hard for perpetrators to realize the harm of their

behaviors to victims. Besides, anonymity in the ICT-mediated environment also inhibits perpetrators' motivation to be mindful of their behaviors.

Consistent with studies on offline social undermining, ICT-mediated social undermining has been found to be associated with a series of negative outcomes, such as emotional exhaustion, distress, reduced job satisfaction, and workplace deviance (e.g., Farley et al., 2016; Giumetti et al., 2013; Lim & Teo, 2009; Park et al., 2018). ICT-mediated social undermining can even exert stronger negative impacts than offline social undermining because ICT can break the restrictions of time and space, reach a large audience, and make messages accessible for a long term or permanently (Camacho et al., 2018; Farley et al., 2016).

Decreased emotional support and increased social undermining due to ICT-mediated communications likely hinders employees' fulfilment of their social needs at work, which, in turn, may lead to loneliness. For instance, in Sacco and Ismail's (2014) laboratory study, participants in a face-to-face interaction condition showed higher levels of social needs satisfaction and positive mood compared to participants in an ICT-mediated interaction condition and participants in a no-interaction condition. In the work context, worries about workplace loneliness have surfaced with the widespread usage of ICT in virtual teams or in teleworking contexts.

Various scholars have realized that collaborating via "screens" (i.e., ICT-mediated communications) and having less or no face-to-face interactions may contribute to workplace loneliness (Cooper & Kurland, 2002; Golden et al., 2008; Hislop et al., 2015), which is defined as "employees' subjective affective evaluations of, and feelings about, whether their affiliation needs are being met by the people they work with and the organizations they work for" (Ozcelik & Barsade, 2018, p. 2345). According to Ozcelik and Barsade's study, workplace loneliness is negatively associated with employees' approachability and affective

organizational commitment, which, in turn, will impede job performance. Besides, loneliness also exerts a series of negative impacts on employees' well-being such as an increased risk of mortality (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015).

Summary of Changes in Relational Aspects of Work

To recap, ICT use is gradually changing the social and relational aspects of today's work. We found that ICT use is conducive for building instrumental social ties that can help employees gain instrumental social support. Nevertheless, ICT use reduces positive expressive social ties and increases negative expressive social ties, which, in turn, reduces emotional support and increases social undermining at work.

Research into the social consequences of ICT use at work is relatively scarce. Most existing studies were conducted in laboratory settings and simply compared the differences between ICT-mediated communications and face-to-face communications. In fact, social interactions in the workplace usually involve both face-to-face and ICT-mediated communications. Thus, offline relations and/or interactions and online relations and/or interactions are likely to influence social outcomes in a joint manner. Waytz and Gray (2018) proposed the moderating role of offline relationships on the effects of ICT-mediated communications—ICT-mediated communications are only beneficial for those who cannot attain enough offline relations or those who just employ ICT to complement their offline relations. However, less is known about this proposition in the work context.

<center>Insights and Integration</center>

This research presents a state-of-the-art summary and a holistic critique of existing knowledge about individual ICT use and its effects on work. By employing the work design perspective as our lens, we have identified solid evidence for fundamental changes in work characteristics that can transmit the effects of ICT to employees. We also identified some

powerful moderating roles of individual and social factors in this process. In what follows, we outline the key insights arising from our review.

Beyond Technocentric vs Humancentric Approaches to Technology Use in Practice

At the broadest level, our review moves beyond previous reviews on workplace technology by focusing on individuals' ICT use in practice, thereby showing the intertwined relationships among humans, technology, and work (or social systems).

Orlikowski and Scott (2008) observed that previous reviews either treat technology as having a deterministic role in predicting changes in organizations (i.e., technocentric perspective; Dewett & Jones, 2001; Huber, 1990) or regard technology use and its effects to be a product of social construction (i.e., humancentric perspective; Barley, 1988; Zammuto et al., 2007). However, these one-sided approaches may restrict our understanding of the whole picture (Orlikowski & Scott, 2008). Technocentric perspectives widely exist in management literature (Rice & Leonardi, 2013) and indeed can help us understand the significance of technology in organizational life; however, they ignore the influences of contextual factors and human agency in shaping ICT use (Orlikowski, 2007). Humancentric perspectives, on the other hand, tend to minimize the role of technology in shaping our work, because they assume that the properties of a technology depend on individuals' interpretations and agency (Leonardi, 2012). Instead, what is needed, and what we sought to do in this review, is the consideration of technology use in practice, including human agency in the process, to go beyond the technological deterministic approach (e.g., Dewett & Jones, 2001), but at the same time, recognizing it is not all about human agency but also about influencing the work.

To achieve this goal, we captured how ICT is used in practice by focusing on individual level ICT use and defining it by "ICT use intensity" (indicating the relationship between the human and technology) and "functions of ICT use" (indicating the relationship between technology and work). Our approach was not to prioritize either technology or

human aspects, but to emphasize how ICT is enacted in practice and how ICT use is embedded in the social context, with often profound implications for work. Thus, we showed how ICT use, individual differences, and contextual factors interact together in complex ways to affect work design and employee outcomes.

Key Role of Work Design for Understanding the Effects of ICT Use on Individuals

Positing work design as a central mechanism for interpreting the impact of ICT use on individuals provides an important theoretical perspective to guide future studies.

Although scholars have acknowledged the role ICT plays in shaping our work, as is the case for technologies in previous industrial revolutions (e.g., Cascio & Montealegre, 2016; Forman et al., 2014; Zammuto et al., 2007), there has been limited scholarly attention devoted to synthesizing - across multiple disciplinary perspectives - what aspects of work are changed by the adoption of ICTs at work, and how these work changes explain the effects of ICT use on employees' work effectiveness and well-being.

Specifically, most previous research on ICT use has adopted an affordance perspective (Gaver, 1991; Leonardi & Vaast, 2017) to explain newly emerging actions in the workplace afforded by ICTs (e.g., new forms of knowledge creation and sharing in the digital context), or it has employed a 'user experience' approach to understand the direct psychological effects of ICT use (e.g., psychological gratifications; Cascio & Montealegre, 2016; Coovert & Thompson, 2014; Peters, Calvo, & Ryan, 2018; Zhang, 2008). These two approaches can only partially interpret the impacts of ICT use on employees due to an omission of the work context.

As our review showed, for instance, previous studies reported mixed effects of ICT use on work-family conflict (e.g., Derks, Bakker, et al., 2015; Ferguson et al., 2016). Without deep insight into the changes in the nature of work, we cannot comprehensively understand such mixed results. Here, in contrast, we have focused on and captured the role ICT plays in

transforming the nature of work (Bandura, 2001). The work design perspective reveals that such mixed effects are caused by the paradoxical impact of ICT use on job autonomy, as we discussed above.

Thus, our review contributes to understanding ICT usage and its consequences by providing a unique explanation from the lens of work design, which also helps to reconcile previous mixed empirical findings and integrate interdisciplinary knowledge into a single framework.

Three Key Work Design Effects Identified Across Multiple Literatures

By bringing together research from different disciplines, our review has identified the key work design aspects affected by ICT use. Traditionally, researchers in the management information system field have studied stressors (job demands) affected by ICT use, such as ICT-related hassles and information overload (e.g., Ragu-Nathan et al., 2008). Scholars in organizational behavior have paid considerable attention to the role of ICT use in blurring work and non-work boundaries and studied issues such as ICT use and work-family conflict (e.g., Mazmanian, 2013). Researchers in computer-mediated communication have examined the differences between ICT-mediated communications and face-to-face interactions (e.g., Dennis et al., 2008). However, because of disciplinary barriers and a lack of knowledge integration, many of these findings have been disparate and disconnected, which inevitably hinders researchers' systematic and complete understanding of ICT's influences on work and individual outcomes.

Building upon the work design perspective, we have synthesized these diverse findings from different disciplines by categorizing them into ICT-induced changes in *job demands*, *job autonomy,* and *relational aspects of work.* As McGuire (1983, p. 33) articulated, reducing complex realities to a set of dimensions based on their characteristics is particularly important for phenomenon oriented studies, because scholars can treat sub-

dimensions as a checklist to decide which dimension needs a narrower and deeper look or which aspect still needs further exploration.

More importantly, this categorization helps to build a bridge between ICT-related studies and the well-established work design framework. That is, our review covers the three key work design elements: demand, control and resources. Scholars have developed powerful theories to interpret the multiple outcomes of work design (e.g., the job characteristics model, role theory, job demand-control model, and relational work design). Once we know which work design elements are being shaped by ICT use, we can link changes in work characteristics to employee outcomes. Therefore we are better able to understand and predict the effects of newly emerged phenomena in the workplace. Ultimately, we can hopefully use this knowledge, combined with our growing understanding of moderators, to proactively create more positive effects of ICT use on fundamental aspects of work.

The Three Work Design Effects Are Contingent

A crucial conclusion from our review is that there are non-deterministic effects of ICT use on work design and hence outcomes, with factors that moderate the link between ICT use and work design. Specifically, our review has showed that different boundary conditions can be observed according to the discipline of the study and the key work design variable being considered.

Building upon the well-established technology acceptance model, scholars who focused on ICT-related demands have argued that the antecedents of technology acceptance (e.g., demographic factors and ICT experience) also influence the relationships between ICT use and individual outcomes (Valkenburg & Peter, 2013). Thus, most moderators in these studies were derived from the technology acceptance model, which sometimes hindered further explorations. In contrast, work design theory posits that the outcomes of job demands are dependent upon employees' appraisal of the job demands (i.e., employees may appraise

job demands either as challenge or hindrance demands; Ohly & Fritz, 2009), a point which has been neglected in the reviewed literature (Tarafdar et al., 2019).

Studies on changes in autonomy entailed by ICT use are influenced by industrial and organizational psychology traditions. Scholars in these disciplines have recognized the essential impact of context on organizational behaviors (e.g., Johns, 2006). Therefore, these researchers not only captured individual differences (e.g., attitudes, time management skill, and segmentation preference), but also paid most attention to contextual factors such as organizational policy and social norms. However, with respect to relational aspects of work design, due to the lack of research on the relationships between ICT use and social consequences, little is known about the boundary conditions. Although recent theoretical work proposed the role of offline relationships as a possible factor (Waytz & Gray, 2018), empirical evidence is still inadequate.

In sum, our review shows that the influence of ICT use on work and individuals can be mitigated by various individual and contextual factors. In fact, task-technology fit is the dominant paradigm used to explain boundary conditions in the relationship between ICT usage and its outcomes (Maruping & Agarwal, 2004). However, the task-technology fit perspective has been criticized due to its limited attention to individual differences (e.g., employees' knowledge, abilities, and skills) and other contextual factors (e.g., social norms) (Devaraj, Easley, & Michael Crant, 2008; Kock, 2009). For example, the task-technology fit perspective cannot explain why consequences of ICT usage vary with employees operating within the same work context. Results from our review therefore shift the locus of understanding boundary conditions from merely considering technical aspects to considering the work characteristics of *job demands*, *job autonomy,* and *relational aspects of work*, which helps to sketch a holistic picture as to how and when ICT matters in the current digital era.

An Integrative Model

To summarize the above points, and to guide support both theoretical development and practice, we propose a comprehensive framework to help understand the work design mechanisms linking ICT use and employee outcomes (see **Figure 2.1**).

First, the framework shows that ICT use affects employee work effectiveness and well-being via the three work characteristics of mentioned above (note the model also depicts additional work design variables and outcomes which we discuss in the section on future directions).

Second, we depict in the framework that ICT use should be considered as an interaction between intensity and function. More specifically, with regard to function, we illustrate that ICT use is more likely to influence job demands and decision-making or work method autonomy when it is applied to the technical or task aspects of work (i.e., in the human-ICT interaction process), but influences relational work design and scheduling autonomy when applied to the social aspects of work (i.e., in the ICT-mediated communication process). As Lai and Dobrajska (2015) pointed out, ICT's different functions (e.g., social and production and/or task functions) can affect work and employees in various ways. The differentiation of ICT use functions helps to disentangle ICT's discrete impacts on work.

Third, to reconcile the previous mixed effects of ICT use, the framework shows boundary conditions of the key relationships based on a *fit* perspective. As Trist explained, "economic performance and job satisfaction were outcomes, the level of which depended on the goodness of fit between the substantive factors" (Trist, 1981, p. 10). We categorize the influencing conditions identified in the review into *user-technology fit conditions* (i.e., individual level factors) and *social-technology fit conditions* (i.e., organizational/team level factors). That is, we propose that using ICT will likely be associated with desirable outcomes

when the ICT being used fits with the user's characteristics (e.g., demographic factors, personality, and previous experience) or the social context (e.g., task requirement, social norms, and culture).

Theoretically, this framework, and the review on which it is based, will help to foster a theoretical conversation between different disciplines, thereby creating more opportunities for understanding. Due to the consistent lack of a well-established integrative framework, there has been little cross-fertilization of ICT-related knowledge in the existing literature (Rice & Leonardi, 2013). A complete comprehension of workplace ICT use will be enhanced with greater interdisciplinary integration. For example, research into management information systems and computer-mediated communication both emphasize the technical characteristics of ICT (e.g., limited social cues in ICT-mediated communications exert negative impacts on social outcomes; Dennis et al., 2008), which, however, have been largely neglected in the organizational behavior literature. Though some conceptual work has recognized the importance of technical characteristics in organizational behavior (e.g., Maruping & Agarwal, 2004; McFarland & Ployhart, 2015), empirical studies addressing these are lacking.

Practically, the framework also has value. It provides guidance for managers who currently tend to focus on organizational-level ICT use from a strategic perspective, yet overlook ICT's impacts on employees. For example, managers should be aware that although mobile ICTs apparently increase workers' autonomy, such ICT use might actually reduce employees' perceived autonomy under certain circumstances (Mazmanian et al., 2013). Consequently, managers should attend closely to how ICTs affect employees' work and employee outcomes. Learning from such evaluations, they can re-design or update ICTs. Alternatively they may introduce managerial interventions such as providing extra technical training (Day et al., 2012) to alleviate detrimental outcomes. For example, given that the

limited social cues in ICT-mediated communications can hinder social satisfaction, managers

can add more social elements in communication technologies (e.g., chatting channels

unrelated to work) and encourage face-to-face interactions (Zhang, 2008). Thus, managers

are not only responsible for utilizing technology to promote work effectiveness, they also

play a crucial role in helping organizations and employees to benefit from this technology

(Major et al., 2007).

Our review also suggests the importance of designing and developing ICTs to achieve

high quality work in the current digital era. Our framework has shown that technology per se

is neither good nor bad; whether it is helpful or harmful depends on how it is designed and

implemented, as well as the fit between technology and individuals or the social context. On

one hand, more attention should be given to designing technology in a way that will improve

the quality of work. For example, Parker and Grote (2020) recommend that human-centered

design would be useful to achieve high quality work. On the other hand, more effort needs to

be given to designing the supporting organizational context, or the fit. For example, managers

can provide end user training systems and technical support to mitigate the potential demands

induced by ICT use (Ragu-Nathan et al., 2008).

Finally, employees can draw on findings from our review to improve how they cope

with ICT-related stressors, such as via job crafting. Previous studies have shown that

individuals often overlook the dark side of ICT (or they are not aware of it), and therefore

they are less likely to control their use behaviors (Singer & Alexander, 2017a). To better

adapt to the digital era, employees will need to exert more self-regulation to cope with the

challenges or difficulties entailed by ICT.

Altogether, therefore, a work design framework helps to highlight the potential

proactive role of employers and managers in seeking to design technology and organizations

so as to preserve and enhance work quality in the face of growing ICT use (Grant & Parker, 2009; Parker et al., 2017).

<div align="center">**Future Directions**</div>

Building upon our framework, and our analysis of the existing literature, we have identified four promising theoretical directions for future exploration (see the points with asterisks in **Figure 2.1**) and also propose two suggestions to improve research quality.

What additional work characteristics might be changed by ICT use?

We recommend more attention to theorizing and testing the work design mechanisms (i.e., changes in work characteristics) between ICT usage and employee outcomes, which are often not modeled explicitly. For example, besides job demands, job autonomy, and relational work design, we argue for more attention to task significance. Task significance reflects "the degree to which a job influences the lives or work of others, whether inside or outside the organization" (Morgeson & Humphrey, 2006, p. 1323). As Baumeister and Wilson (1996) suggested, purpose, efficacy, value and positive self-worth are tied to meaningfulness. However, advanced technologies such as AI or automation are gradually leading to a shift from "machines assisting human" to "human assisting machines", which might diminish the value and worth of human beings, and hence impair task significance.

It might be possible in the future that technology determines business success, while employees might move to a more marginal position in the value chain (Nelson & Irwin, 2014). For example, purchasers perceived that their practice of "being with suppliers, the internal construction process, or interactions and relationships with other groups" was less valuable after the introduction of an e-business system (Eriksson-Zetterquist et al., 2009, p. 1163). Especially with the rapid growth of AI, most employees will be required to train algorithms or to ensure the AI system is functioning properly and safely (Wilson & Daugherty, 2018). To some extent, they become assistants for machines rather than the

reverse. Therefore, how ICT will influence work's significance or meaningfulness in the future will be an important research question.

Does ICT usage influence other individual outcomes beyond work effectiveness and well-being?

Scholars should pay more attention to the other individual consequences of workplace ICT use. Considering social outcomes, for example, the increased frequency of engaging in ICT-mediated communication may shape users' fear of missing out (FoMO) (Buglass, Binder, Betts, & Underwood, 2017). FoMO is defined as "a pervasive apprehension that others might be having rewarding experiences from which one is absent" (Przybylski, Murayama, Dehaan, & Gladwell, 2013, p. 1841). Individuals high in FoMO have a strong desire to stay informed on what others are doing. In organizational studies, research into FoMO related phenomena is still inadequate. One pertinent research question is whether constant connectivity will lead to FoMO and how FoMO influences employees' performance and well-being.

Other social consequences of workplace ICT use should also be examined. Previous studies have usually been concerned with the differences between face-to-face interactions and ICT-mediated communications and have focused on the risks of ICT use for interpersonal interactions, which has resulting in incomplete understandings. In fact, impersonal interactions in ICT can reach a large audience (e.g., helping colleagues in an internal online knowledge community), which can magnify the social impacts of individuals' online behavior. Thus, there is a strong motivation for employees to show prosocial behavior in the virtual world. For example, individuals will create user-generated content (e.g., sharing knowledge) on social media because such behaviors can make them feel important, confident, and valued (Ansari & Munir, 2010; Daugherty, Eastin, & Bright, 2008). In addition to the intrinsic motivation, prosocial behaviors in ICT-mediated communications could also be

driven by external motivations such as image management (Ollier-Malaterre, Rothbard, & Berg, 2013). Accordingly, exploring the bright aspects of ICT-mediated communication for prosocial interaction will provide a more holistic understanding of workplace ICT use and help managers to leverage its benefits.

How might the impact of ICT use on work and individuals change over time?

We recommend more attention to the moderating role of temporal factors. Scholars have argued that the impacts of ICT use will likely change over time (Carlson & Zmud, 1999; Dennis et al., 2008; Kock, 2004, 2009; Walther, 1992). Specifically, Walther (1992) suggested that, although ICT-mediated communication may initially lead to negative relational effects (e.g., less expressive ties), individuals can adjust their behaviors to adapt to changes over time. Kock (2004, 2009) and Dennis et al., (2008) further explained that the negative effects of ICT use would disappear with an increased familiarity that individuals have with each other, with the task, and with the ICT they use.

However, our review found that not all negative impacts which ICT use entailed can disappear over time. For task-related outcomes such as task performance and efficiency, familiarity with an ICT-supported environment will help employees achieve the baseline level of performance or even better outcomes (e.g., Carlson & Zmud, 1999; Dennis et al., 2008; Kock, 2004, 2009; Walther, 1992). Even so, detrimental impacts on social outcomes may not necessarily change over time. For example, Cummings, Butler, and Kraut's (2002) empirical results suggested that ICT-mediated communication is less valuable for building and developing close relationships than face-to-face interaction.

Thus, individuals may not adapt to the limited social cues in ICT-mediated communications and will still feel lonely in the long run. Future research should systematically examine the role of temporal factors and differentiate their impacts in the

relationships between ICT use and task-related outcomes from their impacts in relationships between ICT use and social outcomes.

How does leaders' ICT usage (or ICT experience) influence work design?

Our review shows that most studies focused on employees' ICT usage. Although previous reviews have also emphasized the importance of incorporating technology into leadership research (Banks, Dionne, Sayama, & Mast, 2019; Gardner, Lowe, Moss, Mahoney, & Cogliser, 2010; Potosky & Lomax, 2014), empirical studies for this stream are absent. However, our framework allows scholars to gain theoretical insights on how and why leaders' ICT usage matters differently.

Given that leadership behaviors and managerial practices are also usually mediated by ICTs (Leonardi, Neeley, & Gerber, 2012; Rosen et al., 2019), we recommend regarding a leader as a special kind of end user and call for more attention to leaders' ICT usage. Specifically, according to Parker et al.'s (2017) model of the antecedents of work design, ICT-related experience influences leaders' knowledge, ability, skills, motivations and perceived opportunities. Thus, apart from the outcomes that were identified in our framework, leaders' ICT use might also motivate them to adapt work design to the new digital environment, and/or to adapt ICTs to current work systems. In addition to the potential influence of leaders' usage on formal decision make of work design, ICT also mediates leader-member communications (Potosky & Lomax, 2014; Rosen et al., 2019), which may further influence followers' ICT use, work effectiveness, and well-being in a "top-down" manner. Such processes warrant further investigation.

How can ICT use be measured appropriately?

As mentioned above, "ICT use" should capture the intertwined relationship between human, technology, and work (Burton-Jones & Straub, 2006). To precisely operationalize this variable in quantitative research, scholars therefore should capture both *ICT use intensity*

(i.e., the relationship between humans and technology) and *functions of ICT use* (i.e., the relationship between technology and work).

Our review identified the functions or purpose of ICT use were sometimes missing in measurements (e.g., Derks, Bakker, et al., 2015; Dettmers et al., 2016; Rosen et al., 2019; Yu et al., 2018). As an example, although Yu et al., (2018) defined excessive social media use at work as "the degree to which an individual feels that she or he spends too much time and energy on social media for information seeking, communicating, and socializing in the workplace", they measured social media use simply with use intensity (i.e., the amount of time spent on social media). However, as ICT mediates most activities in the workplace, individuals can use it for various purposes, both work-related and personal. Thus, the omission of the functions of ICT use could be theoretically problematic, and we recommend in future studies the clear measurement or capturing of "the intensity of ICT use (e.g., use frequency and depth) for a particular purpose (e.g., accomplishing information-related tasks, building social connections, or even searching for hedonic experiences)".

How can the quality of evidence be improved?

We found that most studies simply asked individuals to recall the changes of various kinds after using specific ICT. Such retrospective cross-sectional designs (38 of the 79 articles reviewed) muddy the waters as to the real impact of ICT use. We also found nine studies on ICT-mediated communications conducted in laboratory settings. Although experimental designs have high internal validity and help establish causality, the lack of ecological validity may make it hard to generalize their findings to real world settings.

Overall, a particular lack of rigorous field studies was noted, albeit with some exceptional studies that provide examples of good practice, three of which we mention here. One such example is a longitudinal research design, measuring variables repeatedly over a long time frame, used to examine the changes entailed in ICT use (Bala & Venkatesh, 2013).

As a further example, Leonardi (2018) conducted a quasi-natural field experiment to examine the changes after using social media, which is a design with good internal and external validity. A diary study, as another type of longitudinal design, has occasionally been used to examine within-individual daily ICT use (e.g., Derks et al., 2014), which we believe offers unique theoretical contributions because it assesses when individuals behave differently from their usual states (Dimotakis, Ilies, & Judge, 2013). In sum, although the topic as a whole is hampered by methodological challenges, there are pockets of good practice that can be built upon to provide more solid evidence and novel insights.

Table 2.1 Descriptive Information of Reviewed Articles

	Job demands	Autonomy	Relational aspects of work	Total
Management areas	6	35	10	41
Information management areas	13	6	9	28
Total (four articles addressed all three aspects and they were not included in this table)	19	41	19	79

Notes: Those marked with an asterisk (†) were not rated as 4 or 4* in 2018 UK Association of Business Schools Academic Journal Guide but publish studies on individual level ICT use.

Management: *Academy of Management Annals, Academy of Management Journal, Academy of Management Review, British Journal of Management, British Journal of Industrial Relations, Business Ethics Quarterly, Human Relations, Human Resource Management, Human Resource Management Journal, Human Resource Management Review, Journal of Applied Psychology, Journal of Management, Journal of Managerial Psychology, Journal of Management Studies, Journal of Occupational and Organizational Psychology, Journal of Occupational Health Psychology, Journal of Organizational Behavior, Journal of Vocational Behavior, Leadership Quarterly, New Technology, Work and Employment[†], Organization Science, Organization Studies, Organizational Behavior and Human Decision Processes, Personnel Psychology, and Work, Employment and Society.*

Information management: *Communication Research[†], Computers in Human Behavior[†], Information Systems Journal, Information Systems Research, MIS Quarterly, Journal of the Association of Information Systems, Journal of Computer-Mediated Communication[†], Journal of Management Information Systems.*

Table 2.2 Work Characteristics Affected by ICT Use with Examples and Boundary Conditions

Changes in Work Characteristics	Typical examples	Boundary conditions [we listed all boundary variables from reviewed papers]
Job Demands		
Decreasing job demands	Nurses who frequently used smartphone for work purposes perceived more productivity and higher quality of care (Bautista et al., 2018).	
Increasing job demands 1) Information overload - induced demands 2) Learning-induced demands 3) ICT hassles-induced demands	Excessive social media at work increased exhaustion via inducing information overload (Yu et al., 2018). Employees in clerical jobs, experienced a significant increase in work complexity and need for analytical skills after implementing an enterprise resource planning system, whereas those in technical and managerial service jobs did not (Marler & Liang, 2012). ICT hassles were positively related to burnout, and personal technical assistance weakened the negative impacts of ICT hassles on employees (Day et al., 2012).	**Individual factors:** Age, polychronicity, ICT experience, knowledge, coping orientation, technology self-efficacy. **Contextual factors:** Organizational IT technical support
Autonomy		
Increasing autonomy	The intensity of ICT use for work after hours was associated with higher boundary control for those who prefer role integration and lower boundary control for those who prefer role segmentation (Piszczek, 2017).	**Individual factors:** Segmentation preference, employee's responsiveness, time management, task skill, attitudes (e.g., surveillance attitude and organizational commit), performance goal orientation. **Contextual factors:** Organizational monitoring policy (e.g., monitoring frequency and range), organizational monitoring context (e.g.,
Decreasing autonomy	Exposure to electronic monitoring had negative indirect effects on well-being through changes in work design	

1) Managerial control-induced decreases in autonomy	(e.g., job control, workload, meaningfulness, etc.) (Smith, Carayon, Sanders, Lim, & LeGrande, 1992). Using e-business system for purchasing limited employees' own autonomy to decide how to finish their work. As a result, they perceived deskilling and showed lower levels of professional identity (Eriksson-Zetterquist et al., 2009).	social support and feedback integration), organizational segmentation norm
2) Constant connectivity-induced decreases in autonomy	The intensity of ICT use after hours for work was negatively associated with perceived control over off-job activities, which, in turn, hurt employees' daily well-being (Dettmers et al., 2016).	
Relational Aspects of Work		
Increasing instrumental social support	Using social media for acquiring information and building social connections had a positive indirect effect on job performance through increasing social capital (Ali-Hassan et al., 2015).	**Individual factors:** Offline interpersonal relationships (this variable has not been empirically examined in the work context)
Reducing emotional support and increasing social undermining	Compared with participants collaborating face-to-face, participants in ICT-mediated communication demonstrated more task-focused actions, paid more attention to analysis and synthesis, yet engaged in fewer social interactions (Siampou et al., 2014).	

Figure 2.1 Integrative Framework of Workplace ICT Use and its Influences through the Lens of Work Design
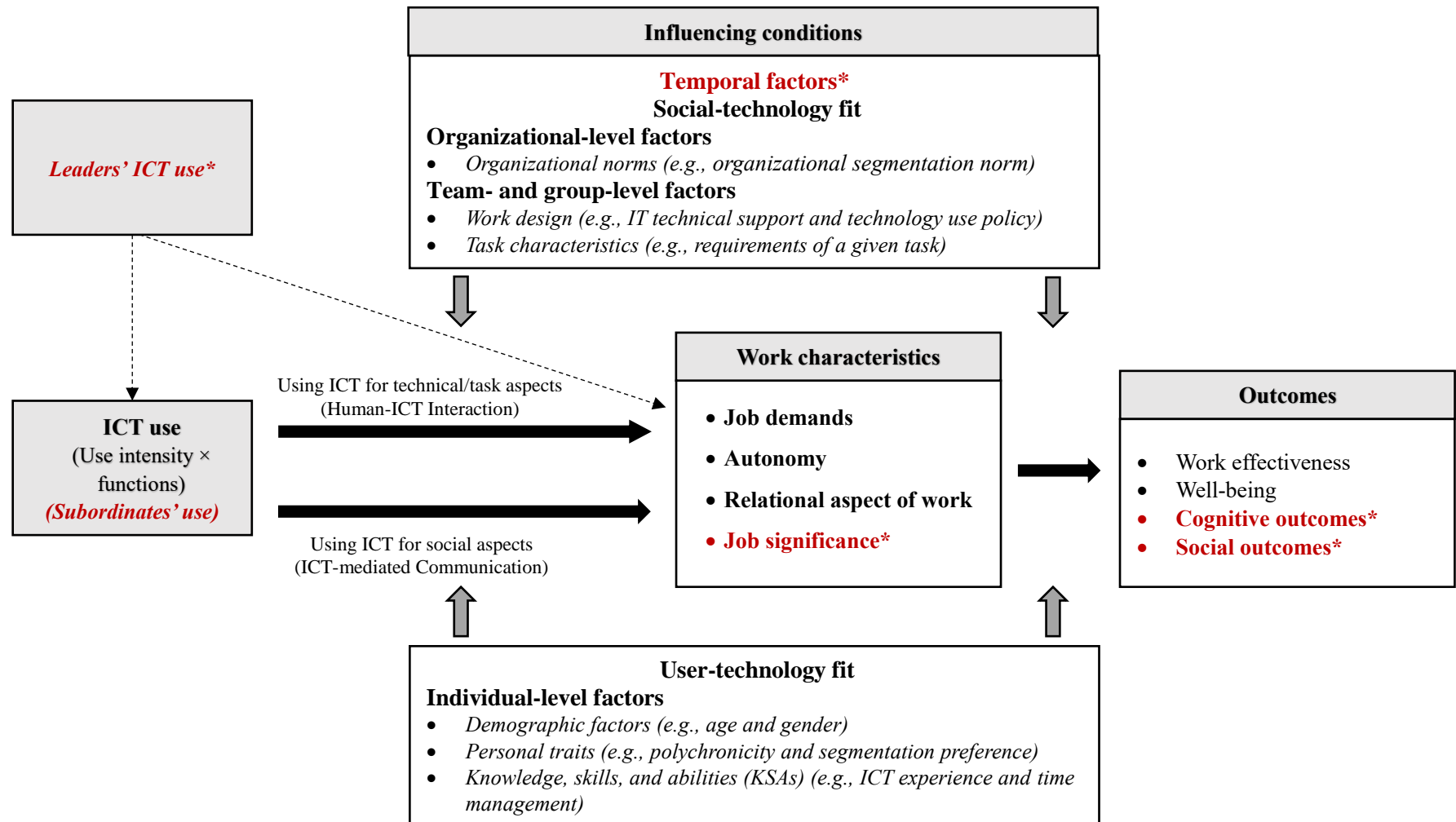
Notes: Those variables marked with an asterisk (*) and dotted arrows represent issues to be investigated by future research.

Chapter 3: How Can People Benefit, and Who Benefits Most, from Using Social Media at Work? An Affordance Perspective

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Note: Chapter 3 is a manuscript that is under review in *Human Relations*.

Abstract

Past research has predominantly regarded social media use at work as a counterproductive behavior and has thus focused more on its dark side. However, given the prevalence of social media in today's work life and the various affordances this technology can have, social media might have important bright sides. In this research, drawing on the affordance perspective, we propose that the day-to-day use of social media at work is positively associated with perceptions of social connectedness, which is further positively associated with life satisfaction and task performance. We examined these hypotheses using an experience sampling study of 134 full-time employees across 10 consecutive workdays. The results of multilevel modeling showed that, as expected, daily social media use at work related positively with employees' perceptions of social connectedness, which in turn predicted their daily life satisfaction and daily task performance. We also found that the relationship between daily social media use at work and perceived social connectedness was stronger for employees with higher, rather than lower, workloads. We suggest this moderating effect occurs because social media is an efficient medium, providing greater affordances, through which busy workers can meet their belongingness needs. Overall, our study sheds light on the previously less-studied positive effects of social media use at work.

Keywords: social media, social connectedness, workload, affordance

Introduction

In the past few decades, social media use, such as the use of Facebook, Twitter, and WhatsApp, in the workplace has attracted considerable attention from management scholars (e.g., Karahanna, Xu, Xu, & Zhang, 2018; Leonardi & Vaast, 2017; McFarland & Ployhart, 2015). Most of the existing research presents a negative view of the use of social media in the workplace. For example, many of the previous studies have focused on the dark side of social media use, such as interruptions to core task performance (Chen & Karahanna, 2018), the prevalence of cyberbullying (Kowalski, Giumetti, Schroeder, & Lattanner, 2014), and increased opportunities for cyberloafing (Lim & Chen, 2012); all largely regarded as having detrimental effects on worker effectiveness and well-being. Consistent with such findings, many employers are worried about employees using social media at work. For example, a recent national survey conducted by CareerBuilder reported that 37% of American employers cited social media as the worst 'productivity killer' in the workplace (CareerBuilder, 2014).

However, people today are relying more on social media to achieve various purposes and to fulfil diverse needs in their lives, such as building social connections, entertainment, self-development, and self-actualization (Kietzmann, Hermkens, McCarthy, & Silvestre, 2011; Leonardi & Vaast, 2017; McFarland & Ployhart, 2015). The use of social media has become an indispensable part of people's professional and personal lives. As a result, the previous predominantly negative view of social media use at work in research might be too simplistic. A more complete picture is required. In addition, although there are some recent efforts to explore the possible bright sides of social media, existing studies have only considered the main effects of social media, and have not paid enough attention to either mediators (why the effects occur) or moderators of these effects (e.g., Luo, Guo, Lu, & Chen, 2018; Robertson & Kee, 2017; Schmidt, Lelchook, & Martin, 2016). The omission of deeper

insights into the underlying mechanisms and possible boundary conditions hinders a nuanced understanding of this relatively new phenomenon.

Aiming to move beyond the dominant negative approach (e.g., Lim, 2002) and provide a less biased insight, we introduce the *affordance perspective* (Leonardi & Vaast, 2017) to investigate the following questions: *How* and *for whom* is social media use at work beneficial?

The affordance perspective, derived from Gibson's (1986) work on ecological psychology, has been widely used in research on management information systems (e.g., Karahanna et al., 2018; Norman, 1999) and communication (e.g., Evans, Pearce, Vitak, & Treem, 2017). It has more recently been introduced into the organization and management literature (e.g., Leonardi & Vaast, 2017; Zammuto, Griffith, Majchrzak, Dougherty, & Faraj, 2007). In the context of technology, an "affordance" of technology refers to the possibilities for performing certain actions based on particular technical features (Evans et al., 2017; Leonardi & Vaast, 2017). Karahanna et al. (2018) briefly defined affordances as "what a user can potentially do through using the technology" (p. 739). For example, recordability, the ability to capture images or video, is one of smartphones' affordances. The affordance perspective can foster a more comprehensive understanding of social media at work because it does not assume that technology is inherently good or evil; instead, it focuses on the potential actions made possible by technology (Evans et al., 2017).

In the case of workplace social media, a key affordance of social media is the potential to support highly interactive interactions and communications (McFarland & Ployhart, 2015). Karahanna et al. (2018), therefore, argued that using social media can help individuals fulfill their need for social connections; which has been theorized to be a fundamental and universal human need (Baumeister & Leary, 1995). Similarly, Deci, Olafsen, and Ryan's (2017) theoretical work also pointed out the role of advanced

technologies in meeting people's belongingness needs and called for more attention in the work context. Consequently, in the current study, we contend that using social media at work will be beneficial for employees' social well-being. Specifically, we propose that social media use at work will result in higher perceived social connectedness.

Fulfillment of belongingness (or social connections) can exert positive effects on individuals' well-being and performance (e.g., Cerasoli, Nicklin, & Nassrelgrgawi, 2016; Van den Broeck, Ferris, Chang, & Rosen, 2016), because high quality social relationships can provide valuable information or instrumental support to achieve personal goals as well as help individuals to cope with negative emotions (e.g., anxiety and distress; Baumeister & Leary, 1995). To extend the distal outcomes of using social media at work, we further propose that daily social media use is positively related to users' perceived social connectedness, which in turn, will enhance their daily life satisfaction and daily task performance.

We go further to investigate moderators in the relationship between social media use and employee outcomes. Scholars have argued that the affordance of a particular technology is relative (Evans et al., 2017; Norman, 1999). For example, "a small hole that affords concealment to a mouse does not afford the same thing, and will not be perceived in exactly the same way, to a human adult" (Fayard & Weeks, 2007, p. 609). Thus, the affordances offered by technology are likely to vary depending on who is using it. The current study specifically focuses on the users' workloads. According to affordance perspective, affordances of social media for keeping socially connected will be more significant and valuable for people with higher workloads, because these employees have limited time and resources to engage in face-to-face social interactions (e.g., Ilies et al., 2007; Repetti, 1989) and they might rely much more on social media to fulfill their belongingness needs through

online social activities. In other words, the positive relationship between social media use and perceived social connectedness will be stronger for employees with higher workloads.

However, we can also deduce the opposite effect based on affordance perspective. The affordance of social media for building and maintaining social connections needs to be enacted in daily practice, but high workload individuals might be too busy to fully utilize such affordances and they can only build superficial connections (Henle & Blanchard, 2008). On the contrary, these with lower workloads have more time and psychological resources to build deeper or higher quality online relationships and to achieve a good balance between online and offline social networks, resulting in more benefits from using social media at work. Thus, it is also reasonable to expect a stronger relationship between social media use and perceived social connectedness for these with lower workloads. Noting these competing predictions derived from affordance perspective, we propose competing hypotheses to explore whether this effect of social media use on perceived social connectedness is stronger for people with higher workloads or for people with lower workloads.

In summary, as depicted by our theoretical model in **Figure 3.1**, this research investigates how social media use at work can positively affect life satisfaction and task performance via perceived social connectedness. In addition, we investigate how the effect of social media use varies across different levels of workload to identify who can benefit the most from social media use at work. We develop these ideas further in the next section.

<center>**Theory and Hypotheses Development**</center>

Affordances of Social Media for Social Connections

The development of technology provides greater opportunities to satisfy individuals' belongingness needs beyond the limitations of space and time (Kietzmann et al., 2011; Peters et al., 2018). Karahanna et al. (2018) identified a set of concrete social media affordances that help users to form or maintain social connections, such as self-presentation, communication,

browsing others' content, and relationship formation. In other words, individuals can stay

connected with others not only through face-to-face communications but also through social

media afforded virtual/online interactions (McFarland & Ployhart, 2015). We propose that

social media use can therefore help employees meet their belongingness needs in the

workplace. We elaborate on this proposition next.

First, social media affords the chance to establish and develop formal professional

and collegial work relationships, which acts as a complementary vehicle to face-to-face social

interactions (Ollier-Malaterre et al., 2013). Social media affordances, including chatting,

commenting, giving a "like", retweeting, and so forth, help to extend and facilitate online

relational communications, thereby strengthening professional relationships directly. There

has been ample empirical evidence showing that individuals can keep socially connected

from online interactions (e.g., Indian & Grieve, 2014; Karahanna et al., 2018; Song et al.,

2014). Importantly, social media can also act as an alternative to face-to-face interactions at

work. For instance, Bernstein and Turban (2018) found that face-to-face communications in

an open office space can impinge on privacy or affect one's social image because such

interactions are exposed and visible to other colleagues. In contrast, social interactions

afforded by social media exist in a relatively private virtual space and employees are able to

connect with coworkers in a nonintrusive manner (Bernstein & Turban, 2018).

Second, social media affords self-disclosure in cyber space, which can indirectly

enhance workplace professional and collegial relationships (Gibson, 2018). In the past, when

social media was not so frequently used in the workplace, people could only learn colleagues'

personal information through face-to-face communication or gossip. Today, more individuals

voluntarily disclose their private lives on various social media platforms, such as LinkedIn,

Twitter, or Facebook. Thus, employees are now able to get more information about their

colleagues (e.g., personalities, identities, hobbies, and family) by following them on social

media and catching up with their outside work activities and updates and therefore learn more about each other, which likely facilitates connection. For example, previous studies have shown that employees' social media use can support the development of shared cognitions at work (i.e., similar perceptions of what and whom coworkers know) via learning self-disclosed information online (Leonardi, 2018; Lu, Guo, Luo, & Chen, 2015), which could in turn make them feel included as part of the group.

Finally, social media affords cross-domain social interactions. That is, the use of social media at work breaks the boundary between employees' work and non-work domains and provides employees easier access to connect with their personal social network. Thus, family members and friends outside of work can help them to gain more fulfilment of belongingness needs while at work. For example, by checking friends' or family members' Twitter or Facebook updates, or even chatting with them during office hours, individuals can feel more connected with their important ones (Bizzi, 2020; Bosque, 2013; König & Caner de la Guardia, 2014). Employees can also show concern for their family members or friends via social media (e.g., showing empathy; Brownlie & Shaw, 2018) and can obtain social support from their important ones (e.g., Ellison, Steinfield, & Lampe, 2007).

Taken together, given that a set of social media affordances can allow individuals to engage in interactions with their colleagues, family, and friends in a highly convenient manner, it is likely that individuals will feel more socially connected on days when they use, to a greater extent, social media at work. Therefore, we propose that:

Hypothesis 1: Daily social media use at work is positively associated with daily perceived social connectedness.

Consequences of Fulfillment of Need for Belongingness

The desire for forming and maintaining interpersonal social connections is a fundamental human need (Baumeister & Leary, 1995). From an evolutionary perspective,

maintaining social connections is crucial for survival because humans, for example, need to rely on them to gain valuable information and emotional support (Robinson, O'Reilly, & Wang, 2013). In the workplace, these valuable information and emotional support derived from high quality social relationships are conducive to employees' well-being and performance, which has been supported by several meta-analytic studies (e.g., Cerasoli, Nicklin, & Nassrelgrgawi, 2016; Van den Broeck et al., 2016). In the current study, we specifically focus on the impacts of social connections (or fulfillment of belongingness needs) on life satisfaction and task performance.

Defined as "a global assessment of a person's quality of life according to his chosen criteria" (Shin & Johnson, 1978: 478), life satisfaction captures a cognitive aspect of subjective well-being (Diener, Emmons, Larsen, & Griffin, 1985). Though individuals assess quality of life according to their own standards, the fulfillment of basic psychological needs (e.g., belonginess) has been theorized as a universal and fundamental standard. Thus, perceived social connectedness plays a crucial role in influencing employees' life satisfaction (e.g., Van den Broeck, Ferris, Chang, & Rosen, 2016; Van den Broeck, Vansteenkiste, Witte, Soenens, & Lens, 2010). In fact, various empirical studies have provided evidence for this argument. For example, based on 99 empirical studies, Van den Broeck et al.'s (2016) meta-analysis supported the positive relationship between relatedness need fulfillment and life satisfaction in the workplace. Thus, we argue that perceived social connectedness could be a crucial mechanism through which daily social media use enhances life satisfaction. Therefore, consistent with prior research, we propose that:

Hypothesis 2a: Daily perceived social connectedness is positively associated with daily life satisfaction.

Social connections are also crucial for completing tasks, because having more social connections means owning more opportunities or accesses to information, functional support,

and task-related resources (Robinson et al., 2013). Socially connected employees are more likely to utilize multiple types of resources derived from social connections, empowering them to engage in their work in a more efficient and effective manner and thus helping them to improve both the quantity and quality of their work output. Social connections also can boost task performance in a direct manner. For instance, individuals who feel socially connected usually report higher levels of vigor and less burnout, resulting in more psychological resources that are required for accomplishing tasks (e.g., Trépanier, Fernet, & Austin, 2013; Van den Broeck et al., 2010). Studies have also shown that socially connected people report more intrinsic motivation (Deci et al., 2017; Van den Broeck et al., 2010) and, therefore, they will work hard to achieve task-related goals. Thus, we propose that:

Hypothesis 2b: Daily perceived social connectedness is positively associated with daily task performance.

The widespread use of social media is currently changing the nature of social relationships (Turkle, 2012). In the digital era, many interpersonal connections are built, maintained, and enhanced through online social interactions; yielding an unprecedented role of communication technology in our social lives. Given the set of affordances provided by social media, we argue that social media is an important tool for employees to keep socially connected, which in turn is not merely conducive for well-being (i.e., life satisfaction), but also critical for their task performance:

Hypothesis 3: Daily perceived social connectedness mediates the effect of daily social media use at work on (a) daily life satisfaction and (b) daily task performance.

The Contextual Role of Workload: Two Competing Hypotheses

People with higher workloads benefit more. Individuals have a common desire to be socially connected to others (Baumeister & Leary, 1995). From the evolutionary perspective, humans are adapted to form and maintain social connections through in person

interactions that can deliver rich social information in virtue of body language, eye contact, facial expressions, and so forth (Sbarra et al., 2019). Alternative communication mediums, such as social media, may provide more benefits for employees who have limited opportunities to meet their social needs through face-to-face social interactions (Waytz & Gray, 2018). Putting social media use in the work context, we therefore, argue that—as employees with higher workloads have limited opportunities and resources to engage in face-to-face interactions—social media affordances should be more valuable and beneficial for these workers to fulfil their belongingness needs relative to those individuals with lower workloads.

Being busy with work can potentially reduce the number of socially oriented face-to-face interactions an employee can have in the workplace. Under the pressure of high workloads, employees must spend most of their time on task-related issues, restricting their opportunities for informal social activities at work. In addition, high workloads may also consume and exhaust individuals' emotional and cognitive resources, and such deficits in resources may hinder their desires and capacities to participate in interpersonal interactions (Baumeister, Vohs, & Tice, 2007). For example, Repetti (1989) tracked 33 air traffic controllers for three consecutive workdays and showed that employees with higher workloads were more likely to increase their social withdrawal to help themselves recover from physical and emotional exhaustion. Likewise, Ilies et al. (2007) found that perceived workload could induce work-family conflict and negative affect at home, which could further reduce employee's social interactions with their family members. Altogether, it is likely that employees with high workloads will struggle to gain enough social satisfaction from offline interactions that require time and emotional resources. Driven by the desire to be socially connected, they might choose an alternative communication medium that comes with lower costs, such as social media.

Compared with face-to-face social interactions, social media-mediated communications likely requires fewer resources. For one, social media affords users can engage in multitasking (i.e., working while chatting online) or multi-communications (i.e., having multiple conversations at the same time). That is, they can both work and participate in online social activities at the same time (Reinsch, Turner, & Tinsley, 2008). In addition, individuals do not need to exert as much effort to manage their social image or impressions in a social media-mediated environment as they usually do in face-to-face interactions. Thus, social media might be relatively more useful and valuable of a communication medium for employees with higher workloads. By contrast, employees with lower workloads might have more options to communicate with others and hence may not necessarily rely on social media to meet their belongingness needs. Thus, we propose that:

Hypothesis 4a: Employees' general workloads moderate the positive within-individual relationship between daily social media use at work and daily perceived social connectedness such that the relationship is stronger for individuals with higher workloads than for individuals with lower workloads.

People with lower workloads benefit more. On the other hand, though advanced social media provides several affordances to form or maintain social connections, only if individuals utilize social media artfully (e.g., balance online and offline relationships), can they attain social benefits from usage (Liu, Baumeister, Yang, & Hu, 2019; Waytz & Gray, 2018). That is because activities on social media typically happen within a social network of weaker interpersonal ties (Sbarra et al., 2019); purely depending on such superficial online relationships to keep socially connected may replace individuals' connections to high quality or close offline social relationships, which ultimately impairs their well-being (Liu et al., 2019; Sbarra et al., 2019). Besides, online social interactions cannot deliver rich information like face-to-face interactions (Daft & Lengel, 1986). Hence, the desirable influence of social

media use on meeting belongingness needs might be especially true when individuals utilize it to complement close offline relationships (Liu et al., 2019; Waytz & Gray, 2018).

As mentioned above, people with lower workloads usually have more time and psychological resources. Thus, they are able to utilize social media to complement offline relationships. That is, they will engage in both face-to-face and online social interactions and, as a result, their social connections might be enhanced due to increased amount of time spent with important others through social media (Kraut et al., 1998). In contrast, purely relying on online social activities (or using online relationships to supplant offline close relationships) might make user feel connected but its benefits are relatively limited (Sbarra et al., 2019). Thus, we propose that:

Hypothesis 4b: Employees' general workloads moderate the positive within-individual relationship between daily media use at work and perceived social connectedness such that the relationship is stronger for individuals with lower workloads than for individuals with higher workloads.

In addition to the moderating effect of general workloads in the relationship between daily social media use and perceived social connectedness, we further extend Hypotheses 4a and 4b by examining whether workloads influence the indirect effects of social media use on life satisfaction and task performance via perceived social connectedness. That is, we examine whether the first-stage moderating effects translate into moderated mediation effects on the end outcomes to address the question of whether the strength of the daily social media use-perceived social connectedness-life satisfaction/task performance relations depend on employees' general workloads.

Sample and Procedure

This research was approved by the research ethics committee of one author's

affiliated university. The data for this study were collected from two manufacturing

companies in China[3]. With the help of each company's human resource department, we

briefed our research project to all staff members attending a weekly meeting, inviting their

voluntary participation in this study. Respecting participants' concerns for privacy and

confidentiality, we made clear that all data collected would be anonymized and would only

be used for research purposes. In addition, to encourage employees to participate in this

research, and as a non-monetary incentive, we offered customized feedback reports to all

participants of our study.

At the beginning of the study, participants were first asked to complete a baseline

survey measuring their demographics. Participants were then asked to complete two online

surveys a day (i.e., an afternoon survey and an evening survey) for ten consecutive working

days. Two research assistants were employed to help with the distribution and collection of

the daily surveys. Specifically, before the end of each workday (i.e., approximately 4:30

p.m.), research assistants sent the afternoon survey to participants in which daily social media

use at work, perceived social connectedness, daily task performance, and daily workload

were measured. After the participants were off from work and were supposed to be at home

(i.e., approximately 8:30 p.m.), research assistants sent the evening survey to participants to

measure their daily life satisfaction.

The final sample consisted of 134 participants. We received 2286 daily observations

out of 2680 possible daily observations (134 individuals $\times$ 10 days $\times$ 2 surveys), resulting in a

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[3] The data for the current study were collected as part of a larger research project. As a statement for data collection transparency, we acknowledge that none of the variables reported in the current study have been used in any other studies, appeared in any existing publications, or been considered in any potential publications in the future.

response rate of 85.3%. Ten participants did not complete the baseline survey, but participated in the subsequent daily surveys. Thus, they were still included in the final analyses. Of the 124 participants who provided their demographics, 51.6% were women, the average age was 35.52 years ($SD = 9.26$), and the average organizational tenure was 4.96 years ($SD = 4.94$). Participants were employed in a wide range of positions such as engineer, customer service manager, and accountant.

Measures

In the survey instructions, we provided several typical examples of social media in China to help participants better understand our items, such as WeChat (similar to WhatsApp or Line), Weibo (similar to Facebook or Twitter), and QQ (similar to WhatsApp or Line). For all measures, we used a 5-point Likert scale with the anchors ranging from "1 = *strongly disagree*" to "5 = *strongly agree*". **Table 3.1** shows the descriptive statistics for the variables at the between-person and within-person levels.

Daily social media use. Daily social media use was measured using a two-item scale adapted from a scale developed by Derks et al. (2015). The two items were "Today, I used social media intensively" and "Today, I checked my social media account whenever I had time." Cronbach's alpha of this scale, averaged over the 10 days of observation, was .81.

Daily perceived social connectedness. We measured perceived social connectedness with three items from Lee et al.'s (2001) social connectedness scale, which had been validated in the online interaction context (e.g., Kushlev, Proulx, & Dunn, 2017). Items were "Today, I felt close to people," "Today, I was in tune with the world," and "Today, I saw people as friendly and approachable." Cronbach's alpha of this scale, averaged over the 10 days of the study, was .83.

Daily task performance. Daily task performance was measured using a four-item scale developed by Williams and Anderson (1991). Sample items were "Today, I adequately

completed my assigned duties" and "Today, I met the formal performance requirements of the job." Cronbach's alpha of this scale, averaged over the 10 days of the study, was .93.

Daily life satisfaction. Daily life satisfaction was measured using a five-item scale adapted from a scale developed by Diener et al. (1985). Sample items were "Today, my life is close to ideal" and "Today, I am satisfied with my life." Cronbach's alpha of this scale, averaged over the 10 days of the study, was .88.

General workload. To increase the validity of the measurement, we measured workload at the daily level and aggregated the daily responses to the between-individual level to create an index for general workload (ICC (1) = .69, ICC (2) = .96, mean of $R_{wg\,(5)}$ was .93). We measured daily workload with a five-item scale adapted from Janssen (2001). Sample items were "Today I had to work fast" and "I had to work under time pressure today." Cronbach's alpha of this scale, averaged over the 10 days of the study, was .87.

Control variables. We considered two factors when selecting control variables for our analyses. First, given the possible effects of time (e.g., day of the study) on the day level outcomes, such as accumulative or circadian effects, we followed exemplary practices in daily diary studies (e.g., Lanaj, Johnson, & Wang, 2016; Trougakos et al., 2014) and controlled for day of study (ranging from 1 to 10) in our analyses. Second, to rule out possible autoregressive effects and demonstrate the unique influences of social media use on outcomes beyond the possible autoregressive effects carried over from the previous day, we also controlled for the previous scores for respective endogenous variables (i.e., regressing current day's social connectedness/life satisfaction on previous day's social connectedness/life satisfaction). However, controlling for the autoregressive effects in the model did not change the patterns of our results in any substantial way. To give us a larger sample size and higher statistical power, we did not include previous day's reports as controls, as this time-lagged analysis would reduce the sample size by 20%.

Analytic Strategy

Given the nested nature of our data (i.e., day level responses were nested within individuals), we conducted multilevel path analysis with Mplus 8.3. The within-person variables were person-mean centered to rule out between-person variances (Hofmann & Gavin, 1998), while between-person variables were grand-mean centered to alleviate multicollinearity.

To examine Hypotheses 1 to 3, which proposed the relationships among social media use, perceived social connectedness, task performance, and life satisfaction at the day level, we estimated a random coefficient model in which perceived social connectedness was regressed on social media use, while life satisfaction and task performance were regressed on social media use and social connectedness. Following Bauer, Preacher, and Gil's (2006) recommendation, the indirect effect was computed as the product of the "daily social media use → social connectedness" random slope (a path) and the "social connectedness → life satisfaction/task performance" random slope (b path), plus the covariance between them (i.e., indirect effect = $a \times b + cov\ (a,\ b)$).

Finally, to test the cross-level moderating effect of the general workload (Hypothesis 4), we estimated an intercepts-and-slopes-as-outcome model (Raudenbush & Bryk, 2002) in which both the level-1 slope (i.e., the social media use → social connectedness random slope) and intercept were regressed on the level-2 moderator, general workload.

Results

Given that the current study specifically focused on within-individual phenomena, it is necessary to examine whether level-1 variables (i.e., social media use, perceived social connectedness, life satisfaction, and task performance) have sufficient within-individual variability. We first ran four null models to decompose the within- and between-individual variances of level-1 study variables. As shown in **Table 3.2**, the percentage of within-

individual variance among total variance ranged from 32.56% to 35.14%, indicating that all

variables had substantial within-individual variability. Thus, it is appropriate to examine the

effects of daily social media use behavior through multilevel modeling.

To test Hypotheses 1 and 2, which proposed the effect of daily social media use on

perceived social connectedness and the effects of social connectedness on end outcomes,

respectively, we ran a random coefficient model and present the model estimates in **Table

3.3**. As shown in **Table 3.3**, daily social media use was positively related to perceived social

connectedness ($B = .10$, $SE = .04$, $p = .019$), providing support for Hypothesis 1. In turn,

perceived social connectedness was positively associated with daily life satisfaction ($B = .12$,

$SE = .05$, $p = .019$) and daily task performance ($B = .18$, $SE = .05$, $p = .000$), and therefore,

Hypotheses 2a and 2b were also supported.

Hypothesis 3a proposed the indirect effect of daily social media use on life

satisfaction through social connectedness. As mentioned earlier, the indirect effect was

calculated as the product of the social media use → social connectedness random slope and

the social connectedness → life satisfaction random slope, plus the covariance between them

at level 2. Our results showed that the indirect effect was 0.048 ($p = .002$; 95% CI =

[.023, .074]), providing support for Hypothesis 3a. We used the same approach to examine

Hypothesis 3b, which proposed the indirect effect of daily social media use on daily task

performance through social connectedness. Our results showed that the indirect effect was

0.047 ($p = .020$; 95% CI = [.014, .080]). Thus, Hypothesis 3b was supported.

We proposed competing hypotheses (i.e., Hypotheses 4a and 4b) to explore the

moderating effect of general workloads (at the between-individual level) on the relationship

between daily social media use and perceived social connectedness.

To examine the cross-level moderating role of general workload, the level-1

relationship (i.e., random slope) between daily social media use and social connectedness was

regressed on level-2 workload. As shown in **Table 3.4**, general workload was a significant predictor of this within-individual random slope ($B = .15$, $SE = .07$, $p = .027$), providing support for Hypothesis 4a rather than Hypothesis 4b. Further, based on the interaction plot as shown in **Figure 3.2**, employees with higher general workloads benefited more from social media use (*simple slope estimate* $= .18$, $p = .001$). However, this relationship was not significant for employees with lower workloads (*simple slope estimate* $= .01$, $p = .929$). Thus, Hypothesis 4a was supported.

To extend Hypotheses 4a, we further examined whether workload can moderate the indirect effects of daily social media use on life satisfaction and task performance via social connectedness (i.e., moderated mediation effects). Following Edwards and Lambert (2007), we estimated the indirect effect of social media use on life satisfaction and task performance via social connectedness at higher ($+1$ SD) and lower (-1 SD) levels of general workloads. Our results showed that, as shown in **Table 3.5**, the indirect effect of daily social media use on life satisfaction via social connectedness was stronger for employees with high workloads (indirect effect $= .054$, 95% CI $= [.027, .082]$), while the indirect effect was weaker for the low workload counterpart (indirect effect $= .035$, 95% CI $= [.010, .060]$). Similarly, the indirect effect of daily social media use on task performance via social connectedness was stronger for employees with high workloads (indirect effect $= .058$, 95% CI $= [.014, .101]$), while the indirect effect was not significant for these with lower workloads (indirect effect $= .027$, 95% CI $= [-.021, .075]$). This analysis therefore showed that general workload moderated the indirect effects of daily social media use on life satisfaction and task performance through perceived social connectedness.

Discussion

Using a sample of 134 employees across 10 consecutive workdays, our daily diary study examined *how* and *for whom* social media use at work would be beneficial.

Specifically, our results revealed that daily social media use at work has a positive indirect effect on daily life satisfaction and daily task performance through perceived social connectedness. In addition, we also found general workload (at the between-individual level) mitigated the impact of daily social media use on perceived social connectedness, such that the relationship was stronger for employees who experienced higher (vs. lower) general workloads.

Theoretical Implications

The current study contributes to the literature on workplace social media use in several ways. First, we employed the affordance perspective to shed light on the potential bright side of social media use at work. Though scholars who build on research traditions of information systems and communication have identified several benefits of social media use at work for individuals and organizations (e.g., Leonardi & Vaast, 2017), organizational behavior research has predominantly treated it as a type of counterproductive behavior (e.g., Klotz & Buckley, 2013). The affordance perspective in the current paper, however, provides an opportunity to supplement the literature on social media use because it does not assume potential actions afforded by technology are inherently good or bad. Based on affordance perspective, using social media to socialize online might really distract individuals' attention from task, but it is theoretically important to have a balanced understanding of its consequences. The current study captured the fundamental affordance of social media—facilitating large-scale interpersonal interactions—and linked social media use at work to daily life satisfaction and task performance through increased social connectedness.

Consistent with findings outside the workplace (e.g., Ellison et al., 2007; Lin, 2019; Valenzuela, Park, & Kee, 2009), our study found that social media use at work can lead to benefits at least in social aspects for the working population. We also found increased social connectedness can further enhance users' task performance and well-being, as distal

consequences of social media use at work. These findings are critical because using social media is not merely self-serving behavior, but also likely to be conducive for organizations. Thus, based on affordance perspective, the current study provides a more balanced and comprehensive understanding of workplace social media use, going beyond the previous narrow focus on unintended consequences of social media use at work.

Second, we also found the affordance of social media use at work was dependent on individuals' workloads. As existing research on affordance of technology has suggested, the affordance of technology is relative (Evans et al., 2017). However, the boundary conditions, though critical, are largely neglected in previous work. Following previous debate on *who* can benefit more from using social media (e.g., Cheng, Wang, Sigerson, & Chau, 2019), we proposed and examined two competing hypotheses for the moderating role of workload on the relationship between daily social media use at work and perceived social connectedness. In fact, previous scholars have recognized that the affordances of social media might change with workloads. For example, Black, Light, Black, and Thompson (2013) speculated that social media would be more valuable for relaxing in high workload contexts. Pindek, Krajcevska, and Spector (2018), in contrast, argued social media is an effective tool for employee with lower workloads because it can help to cope with boredom. However, their opinions are far from conclusive and they did not empirically test these arguments. The current study directly addressed *who* can benefit more from using social media at work and our empirical results revealed that social media is more valuable in meeting belongingness for employees with higher workloads.

In addition, examining the moderating role of workload also addresses calls for research to capture the intertwined relationships between technology use behaviors and work systems (e.g., Forman, King, & Lyytinen, 2014; Orlikowski & Scott, 2008; Wang, Liu, & Parker, 2020). Though technology use behaviors are embedded in work, research on social

media use and research on organizations have different theoretical foci, resulting in emphasizing either technological factors (e.g., social media use) or organizational factors (e.g., work design) in predicting the influences of technology use (Orlikowski & Barley, 2001; Orlikowski & Scott, 2008). This study captures the joint effect of both factors, thereby providing a more comprehensive approach to explore social media in the workplace.

Finally, we probed deeper into the social media use phenomena on a day-to-day basis, making a methodological contribution to this research area. Existing research on social media use at work has predominantly studied this phenomenon through a between-individual approach, assuming that individuals have relatively stable patterns (e.g., intensity and habits) of using social media (Leonardi & Vaast, 2017). The between-individual approach shows advantages in examining the long term effects of social media use (e.g., accumulated social capital; Ali-Hassan, Nevo, & Wade, 2015), while daily diary design or within-individual design used in the current study is more appropriate for capturing the nuanced short-term effects such as need fulfillment. Thus, introducing the within-individual design into a workplace social media use study will create more opportunities for creating new insights.

Further, theoretical relationships at the within-individual level are different from the counterparts at the between-individual level. Taking our proposed model as an example, the positive relationship between daily social media use and daily perceived social connectedness at the within-individual level indicates that employees feel more socially connected on days when they engage in more social media use; this positive relationship at the between-individual level, however, can only suggest that employees who generally use social media more would feel more socially connected than those who use less. The affordance perspective actually encompasses both within-individual and between-individual elements: the effects of technology require users to enact affordances in daily practice (within-individual proposition) and the affordances of a particular technology depend on who is using it (between-individual

proposition). Therefore, our within-individual design also provides a rigorous approach to test the hypotheses derived from the affordance perspective.

Practical Implications

Our study suggests that social media use serves a valuable social purpose for workers in organizations, especially for those who are very busy. Nevertheless, we are not advocating that employees can use social media at work without any attention to downsides. Given the well-documented risks of cyberloafing, such as lower levels of work engagement and performance, managers should design internet use policies or workplace information and communication technology (ICT) artfully, in a way that help employees utilize social media for benefit while reducing potential risks. For example, Zhang (2008) recommended adding more social elements to enterprises' ICTs. By doing so, employees are more likely to conduct online social interactions within the organization. According to Bizzi's (2020) cross-sectional study, blogging with coworkers was positively associated with employees' intrinsic motivation and proactive behaviors, whereas blogging with outsiders was negatively related to intrinsic motivation. Huang, Singh, and Ghose (2015) also found that leisure blogging on enterprise social media had a positive influence on work posts, which in turn, can facilitate online knowledge sharing. Therefore, online social interactions within an organization are conducive for the organization and employees. Appropriate ICT design and internet use policies can encourage employees to utilize social media to build connections with colleagues, which will help them to meet their social needs and lead to desirable employee outcomes such as enhanced performance and well-being.

Limitations and Future Directions

First, we only employed use intensity to capture social media use behaviors and did not distinguish work-related and non-work-related social media use in the current study. In fact, individuals use social media for different purposes, such as hedonic uses (e.g., watching

funny videos), cognitive uses (e.g., learning useful information), and social uses (e.g., keeping connected with friends, Ali-Hassan et al., 2015). Use intensity indicates the relationship between humans and technology, whereas use purpose indicates the relationship between humans and concrete tasks (i.e., the used function). As suggested in Wang et al. (2020), an appropriate measure of technology use should capture the complex relationships among technology, humans, and tasks. More importantly, taking both use intensity and use purpose into consideration can provide more nuanced understandings of the consequences of social media use. For example, Karahanna et al. (2018) suggested that social media use for social purposes may lead to relatedness need fulfillment, while cognitive social media use may lead to competence need fulfillment. Thus, we recommend future research to capture how social media is used at work in a more nuanced way, rather than merely measuring use intensity.

Second, we did not control for individuals' face-to-face social interactions in our analyses. Compared with online social interactions, offline interactions still play a crucial role in predicting individuals' well-being in the current digital era (Liu et al., 2019; Sbarra et al., 2019). The current study assumes that employees with higher workloads may not have enough time and resources to engage in offline social interactions and, as a result, social media will be more significant a channel for them to form or maintain social connections. However, we were unable to test this assumption due to our not measuring individuals' offline interactions. Thus, future research should capture offline social interactions (e.g., time spent on face-to-face interactions and quality of experienced interactions) when examining the effects of social media use on individuals, especially in social aspects.

Third, all variables in the current study were reported by individuals themselves, which may lead to common method bias (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Although it is more appropriate to ask participants themselves to rate their own psychological

experiences (e.g., perceived social connectedness, daily life satisfaction, and perceived workload), we recommend future researchers to measure individuals' task performance through alternative sources, such as ratings from supervisors or objective indicators. Social media use could also be captured in an objective way, such as measuring the amount of time spent on social media via smart phone apps.

Table 3.1 Descriptive Statistics and Correlations among Study Variables

		Mean	*SDw*	*SDb*	1	2	3	4	5
Within-person level									
1	Social media use	2.80	.48	.76	(.81)	.38**	.47**	.32**	.38**
2	Social connectedness	3.55	.35	.54	.15**	(.83)	.51**	.60**	.30**
3	Life satisfaction	3.34	.36	.57	.08**	.15**	(.88)	.74**	.36**
4	Task performance	3.78	.32	.52	.08*	.28**	.13**	(93)	.39**
Between-person level									
5	General workload	3.15	—	.59	—	—	—	—	(.87)

Note: Correlations below the diagonal represent within-person correlations ($N = 1143$). Correlations above the diagonal represent between-person correlations ($N = 134$). *SDw* and *SDb* are standard deviations computed within and between individuals, respectively. Coefficient alpha estimates of the reliability are in parentheses on the diagonal. For the within-person variables, their reliabilities were the mean alphas across 10 days of observation.

*$p < .05$
**$p < .01$

Table 3.2 Variance Decomposition of Daily Variables

Daily variables	Within-individual variance	Between-individual variance	% of within-individual variance
Daily social media use	.26	.52	33.33%
Daily perceived social connectedness	.13	.24	35.14%
Daily task performance	.11	.24	31.43%
Daily life satisfaction	.14	.29	32.56%

Table 3.3 Results of Multilevel Path Analysis for Testing Hypotheses 1-3

	Social connectedness		Life satisfaction		Task performance	
	B	*SE*	*B*	*SE*	*B*	*SE*
Day of the study	.00	.01	.00	.01	-.01	.00
Social media use	.10*	.04	.00	.03	.03	.04
Social connectedness			.12*	.05	.18**	.05
Residual variances at level 1	.11**	.01	.13**	.01	.09**	.01

Note: N at level 1 = 1143, N at level 2 = 134; *B*s represent unstandardized regression coefficients from path-analytical modelling.
* $p < .05$
** $p < .01$

Table 3.4 Testing the Cross-Level Moderating Effect of General Workload

	Social connectedness	
	B	*SE*
Level 1		
Day of the study	.00	.01
Social media use	.10*	.04
Residual variances at level 1	.12**	.01
Level 2: Moderating effect of general workload		
On the intercept	.28**	.08
On the random slope (social media use → social connectedness)	.15*	.07

Note: N at level 1 = 1143, N at level 2 = 134; *B*s represent unstandardized regression coefficients.
**p* < *.05*
***p* < *.01*

Table 3.5 Estimates of Moderated Mediation Effects

Mediation Effect	Moderator (Workload)	Indirect Effect	*SE*	95% CI
Social media use → social connectedness → life satisfaction	High	.054	.02	[.027, .082]
	Low	.035	.02	[.010, .060]
Social media use → social connectedness → task performance	High	.058	.03	[.014, .101]
	Low	.027	.03	[-.021, .075]

Figure 3.1 Conceptual Model
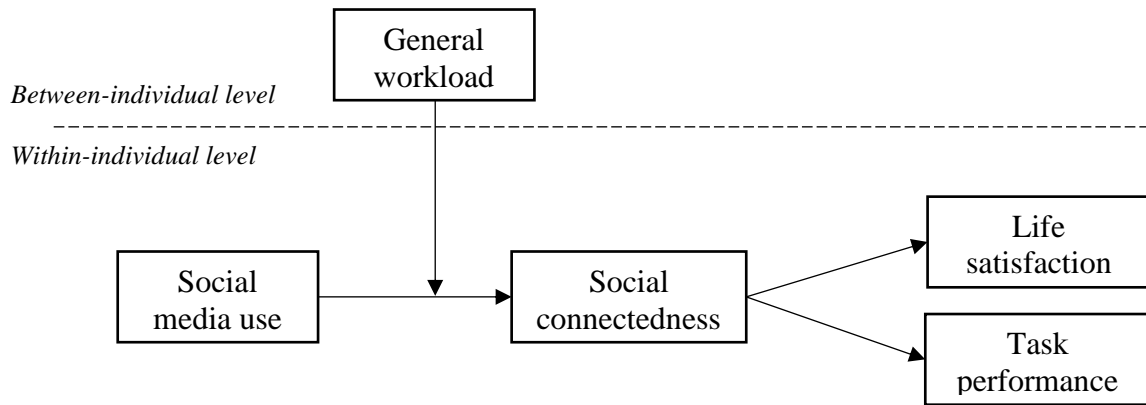
Figure 3.2 The Cross-Level Moderating Effect of General Workload
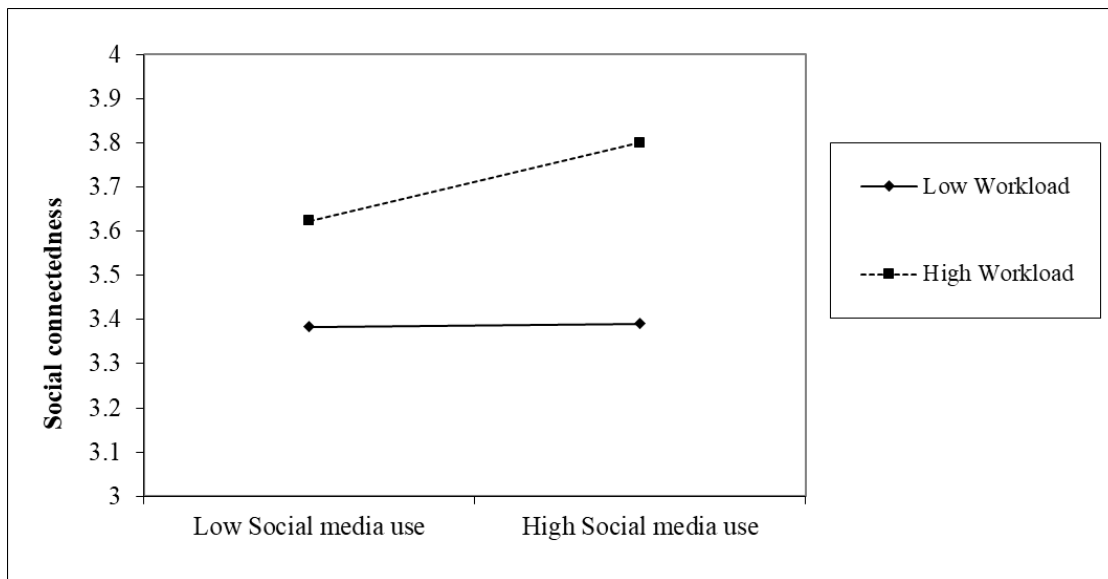
Chapter 4: Achieving Effective Remote Working During the COVID-19 Pandemic: A Work Design Perspective

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Abstract

With intensive involuntary remote working as the backdrop, and with a work design perspective, in this study our aim was to understand remote workers' working experiences during the pandemic. We first reviewed the literature that has included work design variables when investigating remote working. We concluded that work design has mostly been examined as a moderator of remote working effects, or a mediator linking remote working to outcomes, whereas we advocate the value in considering work design as an independent variable in a context of remote working. Adopting this perspective, we conducted a mixed-methods investigation. In Study 1, based on semi-structured interviews, we identified four key challenges in remote working during the pandemic (i.e., procrastination, work-home interference, loneliness, and ineffective communication); four work design factors (i.e., social support, job autonomy, monitoring, and workload) that affected individuals via shaping these experienced challenges; and one key individual difference factor (i.e., workers' self-discipline). In Study 2, we tested the associations among these factors using surveys from 522 employees working at home during the pandemic. Results from Study 2 supported the powerful role of work design in boosting worker's performance and well-being. We discuss the implications of our research for the pandemic and beyond.

Keywords: remote working, work design, COVID-19, pandemic

Introduction

Remote working is defined as "a flexible work arrangement whereby workers work in locations, remote from their central offices or production facilities, the worker has no personal contact with coworkers there, but is able to communicate with them using technology" (Di Martino & Wirth, 1990, p.530). As information and communication technologies (ICTs) have advanced in their capabilities, and especially with the greater availability of high speed internet, remote working (also referred to as teleworking, telecommuting, distributed work, or flexible work arrangements; Allen, Golden, & Shockley, 2015) has grown in its use as a new mode of work in the past several decades.

However, prior to the pandemic, remote working had never become a widely accepted practice (Kossek & Lautsch, 2018). Though the recent American Community Survey (2017) showed that the number of U.S. employees who worked from home at least half of the time has grown from 1.8 million in 2005 to 3.9 million in 2017, teleworking at that time was just 2.9 percent of the total U.S. workforce. Even in Europe, only around 2% of employees teleworked mainly from home in 2015 (Eurofound, 2017). Remote working has, in fact, been a "luxury for the relatively affluent" (Desilver, 2020), such as higher-income earners (e.g., over 75% of employees who work from home have an annual earning above $65,000) and white collar workers (e.g., over 40% of teleworkers are executives, managers, or professionals). Because of this situation, prior to COVID-19, most workers have little teleworking experience; nor were they or their organizations prepared for supporting this practice. Now, the unprecedented outbreak of the COVID-19 pandemic in 2020 has required millions of people across the world into being teleworkers, inadvertently leading to a de facto global experiment of remote working. Remote working has become the 'new normal', almost overnight.

Various benefits of remote working, such as higher employee commitment, productivity, performance, and retention, have been well-documented in existing research (see Martin & MacDonnell, 2012 for a meta-analytic review). Though the overall impact of remote working on individuals is positive, some unintended costs of remote working, manifested in the forms of psychological challenges or even risks for teleworkers, have also been identified in previous studies, such as exhaustion (Sardeshmukh, Sharma, & Golden, 2012), professional isolation (Cooper & Kurland, 2002), and work-family conflict (Delanoeije, Verbruggen, & Germeys, 2019). As management scholars, we might assume that we already have a sufficient evidence base to understand the psychological challenges or risks that teleworkers are facing with during the pandemic, given the large body of research on remote working. However, due to the fact that almost none of those studies was conducted at a time when remote working was practiced at such an unprecedented scale as it is at the current moment, coupled with some unique particular demands associated with the pandemic, some of the previously accumulated knowledge on remote working may more or less lack contextual relevance in the current COVID-19 crisis.

Specifically, existing knowledge on remote working was mostly generated from a context in which teleworking was only occasionally or infrequently practiced, and was only considered by some, but not all or most, of the workers within an organization. As criticized in Bailey and Kurland (2002), "(the) occasional, infrequent manner in which telework is practiced, likely has rendered mute many suspected individual level outcomes for the bulk of the teleworking population" (p. 396). In other words, there might be large differences in individual outcomes between those who do remote work extensively and those who do it infrequently, which likely affects the outcomes of this practice. In addition, because of the largely voluntary nature of prior remote working, in which teleworkers choose to work remotely at their own discretion, some of the previous findings on remote working have

suffered from a selection bias (Lapierre, van Steenbergen, Peeters, & Kluwer, 2016). As such, the previously identified benefits of remote working might only, or especially, be true for those who are interested in, or able to engage in, remote working (Kaduk, Genadek, Kelly, & Moen, 2019). In an unusual situation when teleworking is no longer a discretionary option but rather a compulsory requirement or a mandatory order, there is a need to shift the research focus from understanding *whether or not to implement remote working* to understanding *how to get the most out of remote working.*

Such a shift of research focus essentially requires a systematic understanding of the changing nature of work itself in such a different context. In that sense, we contend that the perspective of work design, which deals with the content and organization of teleworkers' work tasks, activities, relationships, and responsibilities (Parker, 2014), can work as a suitable medium to help us gain a thorough understanding of the essence of remote work. Recent reviews have recognized the theoretical and practical importance of work design in the current digital era (Parker & Grote, 2020; Wang et al., 2020). For example, successful ICT-enabled work requires appropriate work design (Bélanger, Watson-Manheim, & Swan, 2013). More broadly, high quality work designs (e.g., low job demands, sufficient autonomy and support, etc.) can contribute to a set of desirable employee outcomes (e.g., better performance and well-being, positive psychological states, job satisfaction, etc.; see Humphrey et al., 2007 for a meta-analytical review).

Applying the work design perspective to our investigation on the remote working practice during the pandemic, we expect to observe a powerful role of work design in shaping teleworkers' psychological and working experiences. However, because of the unprecedented large-scale working from home practice during the pandemic, exploratory research is required to incorporate the COVID-19 context, thereby identifying concrete and nuanced relationships between work design and remote worker outcomes. In the following sections,

we briefly review the existing research on work design in the remote working literature, and discuss the necessity to conduct research in the current context. We then present our mixed-methods research to explore how work design shapes working experiences in the unique context wrought by the pandemic. Finally, we discuss the theoretical and practical implications of our research beyond the context of the COVID-19 pandemic.

Work Design and Remote Working: An Overview of the Literature

To understand how work design is positioned in the existing remote working literature, we retrieved related studies through two steps. First, we searched the Web of Science for articles containing both remote work terms (i.e., "telework", "telecommute", "working from home", or "remote work") and work design terms (e.g., "job autonomy", "social support", "job demand", "task interdependence", "job complexity", etc.) in their titles, abstracts, or keywords, which yielded 174 articles. We then screened each article's abstract to confirm the relevance to the current research. Any articles that did not capture work design in qualitative or quantitative ways, and any studies that did not involve remote work, were excluded. We also excluded studies that only examined predictors of adopting remote working policy, because the current research focuses on individuals' experiences in remote working. This process finally yielded 42 articles.

As shown in **Figure 1**, we identified three different types of positioning of work design in the remote working literature, which we categorized as three approaches. Work design in the first approach is framed as a moderator in the relationship between remote working (i.e., remote working intensity and whether taking up this policy or not) and remote worker outcomes, which aims to assess which types of work are suitable for remote working. The second stream of literature regards work design as a mechanism to link remote working and employee outcomes, explaining how engaging in remote working affects individuals. The third approach moved beyond the other two approaches by theorizing teleworking as a

context or a setting, with scholars in this stream of literature being interested in how work design in remote working shapes working experiences (i.e., work design as an antecedent). We discuss each of the three approaches in more detail.

Approach 1: Work Design as a Moderator

As Golden and Veiga (2005) stated, "whether individuals can fully benefit from telecommuting is likely to be influenced by the way in which they must perform their work activities" (p. 303). Building upon the premise that remote working policy is only suitable for certain types of jobs (Pinsonneault & Boisvert, 2001), the first approach considers work design as a boundary condition to reconcile the mixed impacts of engaging in remote working.

Golden and colleagues have conducted several studies to support this argument. For example, using a sample of 273 telecommuters and their supervisors, Golden and Gajendran (2019) found that the positive relationship between the extent of remote working (i.e., the percentage of time spent on remote working per week) and supervisor-rated job performance was more pronounced for those working in complex jobs, those with lower task interdependence, and those receiving lower social support. In other words, more intense remote working predicted performance most positively when tasks were complex and independent and when social support at work was low.

The impact of remote working on well-being also depends on the nature of worker's job. Golden and Veiga's (2005) cross-sectional study with 321 teleworkers revealed that remote working can contribute to more job satisfaction for employees whose jobs are highly independent and/or those with higher job discretion. In addition, based on a sample of 454 remote workers, Golden, Veiga, and Simsek (2006) found that job autonomy and scheduling flexibility moderated the negative relationship between the extent of telecommuting and work-to-family conflict, such that teleworkers either with lower job autonomy or with higher

scheduling flexibility had lower levels of work-to-family conflict. Perry et al. (2018) further found a three-way interaction effect (remote working intensity, emotional stability, and decision autonomy) on workers' strain. Their two studies showed that, depending on a person's emotional stability, higher autonomy can make remote working either beneficial (i.e., reducing strain for emotionally stable remote workers) or harmful (i.e., increasing strain for emotionally unstable workers).

Taken together, work design factors in this stream of literature are positioned as boundary conditions for the effect of the extent of remote working (or participation vs. non-participation in remote working) on individual outcomes (e.g., performance and job satisfaction). The key implication from these studies is that managers should provide remote working policy for appropriate jobs and workers (Golden & Veiga, 2005).

Approach 2: Work Design as a Mechanism

Work designs have also been considered as mechanisms that link remote working extent and individual outcomes. The basic tenet is that - as most tasks, communications, and interpersonal collaborations are mediated by ICTs in remote working - the nature of worker's job is changed by taking up flexible working policy. Wang, Liu, and Parker (2020) provided a theoretical framework to understand changes in work design caused by ICT-enabled working practice and its impacts on employee outcomes. In the case of remote working, engaging in telework practices can significantly change job demands, autonomy, and relational aspects of work.

Specifically, remote working tends to exert paradoxical effects on job demands. For instance, Sardeshmukh et al. (2012) found a negative relationship between time spent remote working and time pressure, which the authors speculated is because telework can save time on commuting. In Kelliher and Anderson's (2010) qualitative study, on the other hand, most remote workers experienced work intensification. That is, because working remotely can

keep individuals away from interruptions in the office, this enables them to work more intensely, and some workers voluntarily choose to work hard to reciprocate their employer's trust in allowing them to work remotely (Kelliher & Anderson, 2010). A considerable number of studies have found positive impacts of remote working on autonomy (e,g., Gajendran, Harrison, & Delaney-Klinger, 2015; Sardeshmukh et al., 2012; Ter Hoeven & Van Zoonen, 2015). Gajendran and Harrison's (2007) meta-analysis of 46 studies also supported the beneficial effect of remote working on perceived autonomy, which in turn, was associated with desirable individual outcomes (i.e., task performance, job satisfaction, lower turnover intention, and less role stress). Finally, studies suggest that remote working is usually detrimental for the relational aspects of work. Morganson et al. (2010), based on cross-sectional online survey data, found that home-based workers reported less inclusion than main office workers. Based on 93 interviews, Cooper and Kurland's (2002) qualitative study also revealed that telecommuters experienced more professional isolation when they missed opportunities to engage in developmental activities at work (i.e., interpersonal networking, informal learning, and mentoring).

In sum, studies in this stream reveal that remote working practices change people's ways of working, communicating, and collaborating at work. Thus, work design serves as a crucial vehicle for understanding why remote working affects employee outcomes.

Approach 3: Work Design as an Antecedent

The third stream of literature derives from the sociotechnical systems perspective (Trist, 1981; Trist & Bamforth, 1951), which regards remote work as a context rather than an independent variable, arguing that work design in this context should fit the new way of working to achieve better performance and well-being (Bélanger et al., 2013). Although the second approach described above also models the link between work design and employee outcomes, those studies consider how telework intensity shapes one's whole work design

encompassing both remote and non-remote work. The third approach, however, specifically focuses on the work design characteristics of one's remote work (i.e., what does one's work look like during home office days). Unintended outcomes might arise when work designs in remote working fail to meet individual and/or task requirements. Work-to-family conflicts, for example, could occur where there are intolerable job demands and limited autonomy for remote workers during home days.

Existing research has mainly focused on impacts of work design in the remote work context on well-being. For example, in one study, workplace support for teleworkers was positively associated with job satisfaction (Baker, Avery, & Crawford, 2006). Bentley et al. (2016) also found indirect effects of social support from supervisors and organization on psychological strain and job satisfaction via reducing social isolation in telework practices. In addition to social support, research has shown that perceived control over the location, timing, and process of work was negatively related to teleworkers' work-family conflict and turnover intentions (Kossek, Lautsch, & Eaton, 2009), and task-related demands (e.g., time pressure and uncertainty) were positively associated with teleworkers' experienced stress (Turetken, Jain, Quesenberry, & Ngwenyama, 2011).

Overall, however, few studies have adopted this third approach. Thus, little is known about how work design in the telework context matters, and whether work design can affect workers beyond well-being. The advantage of this third perspective is that it explicitly focuses on how to make the experience of remote work better through work design.

Summary of Research on Work Design and Remote Working

The first two approaches, which dominate the literature, leverage work design theories to understand which types of jobs are suitable for remote working and how remote working practices influence individuals via shaping the nature of workers' jobs. Knowledge generated from these two streams of literature provide valuable evidence to evaluate and

design remote working policy prior to the pandemic. For example, managers are encouraged to provide such policy to appropriate people and appropriate jobs; employees, on the other hand, can adjust their frequency of teleworking to cope with the challenges in offsite work (e.g., Cooper & Kurland, 2002).

However, the COVID-19 outbreak has forced people to be working from home irrespective of their preferences, abilities, and the nature of their jobs. In other words, remote working has become during the pandemic a 'new normal', or a new context, rendering the third approach to be of high theoretical and practice importance. We adopt this approach in the current research to understand how remote working experiences can be improved through work design in the context of the pandemic, in which large numbers of people have been required to work intensively in their homes.

The Current Research

Specifically, we conducted mixed-methods research to explore *what major challenges remote workers are currently struggling with during the COVID-19 crisis, and how work designs shape remote working experiences and outcomes*. In Study 1, we, based on interview with 39 participants who worked from home during the pandemic, developed a theoretical framework to integrate the relationships among work design, remote working challenges, and individual outcomes. In Study 2, a cross-sectional online survey study, we collected data from 522 employees having remote working experiences during the COVID-19 to quantitatively examine the identified links, and we conducted supplementary analyses to further deepen our understanding of remote working.

Study 1

To build the theoretical foundation of the current research, we adopted a grounded theory approach to capture remote workers' first-hand accounts of their experiences and challenges while they were working from home during the COVID-19 outbreak.

Method and Procedure

In mid-February, 2020, a significant proportion of workers across the major cities in Mainland China had been forced to work from home. As soon as we obtained ethics approval for our research, we started recruiting remote workers for interviews through social media (e.g., WeChat, QQ, etc.). Within a few days, we recruited 39 full-time employees (15 of them were from Beijing) who were required by their organizations to work from home until further notice. The first author and two research assistants conducted semi-structured interviews with each of the participants using audio calls or video calls, which were all recorded and then transcribed. Data collection was completed when we reached theoretical saturation, that is, we were not able to identify a new category/theme from the interviews (Strauss & Corbin, 1998).

Participants were employed from a wide range of industries (e.g., education, IT, media, finance, etc.) and occupations (e.g., managers, teachers, designers, etc.). They had an average age of 32.62 years (SD = 9.43) and 23 of them were women; 15 of them were married and 18 of them had caring responsibilities. Participants worked 7.27 hours per day on average (SD = 2.39) and by the time they were interviewed they had worked from home for an average of 20.41 days (SD = 10.45). Notably, flexible work arrangements such as remote working are relatively new in China. In 2018, only 0.6 % of the workforce (4.9 million Chinese employees) had remote working experiences. Most Chinese workers in our sample worked away from the office for the first time during the COVID-19 situation. In our study, only one participant (#4) was an experienced remote worker.

Participants were initially asked to generally describe their working experiences (i.e., work performance and well-being) during the period of working from home. As participants might narrowly focus on specific aspects of remote working experiences, we generated a list of questions before we conducted the interviews (for these questions, see Appendix A),

which helped us to get a comprehensive understanding of this phenomenon. Participants were then asked to indicate potential factors that shaped their work performance and well-being during this period. On average, an interview lasted for 15.62 minutes (ranging from 10 to 42 minutes; SD = 7.11).

Data Analysis

Following previous recommendations for coding qualitative data (Creswell, 2003), it is necessary for researchers to deeply immerse themselves in the research context. The first author had worked remotely in his hometown located in southern China for three weeks during the COVID-19 outbreak. Thus, he was knowledgeable regarding remote working experiences in China and the COVID-19 context.

We followed a three-step approach in analyzing the qualitative data. The first author conducted open coding to analyze the raw interview data. With the first interview, he conducted open coding by going through the interview transcript line by line. He particularly focused on participants' narratives (i.e., words, sentences, or paragraphs) about factors that were influencing their work performance and well-being. *In vivo* codes (i.e., words, sentences, or paragraphs in participant's language) were identified in this step. Second, we considered the shared properties/dimensions among first-order *in vivo* codes and, then, grouped similar first-order codes into a more abstract second-order category. Codes and categories emerged from the first interview were used to analyze the next interview transcript; newly-identified codes in turn can help to refine, elaborate, and develop existing concepts and interrelationships. After coding all 39 interviews, we unified second-order categories around central phenomena based on existing literature on remote working. Throughout this process, co-authors assessed the categories and themes identified by the first author. Conflicts were resolved through discussion.

Findings

Table 1 provides representative first-order *in vivo* codes, second-order categories, and shows the three aggregated main themes that we identified from the categories.

Theme 1: Challenges in Remote Working

Theme 1 includes four key challenges of remote working, namely, procrastination, work-home interference, ineffective communication, and loneliness. These aspects reflect individuals' immediate psychological experiences in accomplishing tasks, interpersonal collaborations, and social interactions with family and friends.

Procrastination. Procrastination, defined as the irrational delay of behavior (Steel, 2007), is one of the biggest productivity killers at work. Procrastination is common in the office-based workplace (Kühnel, Bledow, & Feuerhahn, 2016) and it can become even worse when people work from home. Although most participants were committed to working productively as usual, they sometimes were struggling with self-regulation failure. Fourteen participants indicated procrastination as a challenge during working from home. We found that these participants delayed working on their core tasks via spending time on non-work-related activities during working hours, such as using social media and having long breaks. For example, one participant, a business analyst (#1), noted that: "I usually can't prevent myself from using smartphone and listening to music [in working hours]. I was less productive at home." As a result, he had to work after hours, which always made him stressed and tired.

Work-home interference. Most participants (26 out of 39) mentioned that remote working blurred the boundary between work and home, which increased both *home-to-work interference* (HWI) and *work-to-home interference* (WHI). First, working at home means more interruptions from family. As one participant (#24) stated: "While working from home, you might be disturbed by other things. For example, my family members sometimes ask me

to eat, and sometimes they ask me to do other things. Besides, I need to take care of my cats...work is interrupted by all these trivial matters, which will affect productivity a little bit." Notably, schools in China had been shut down during the COVID-19 outbreak, working parents, therefore, faced a bigger challenge in balancing work and family roles. A manager with a child (#15) mentioned that he had to take care of his child while working: "I think sometimes it may be easier to get distracted because I have a child at home, and sometimes I need to take care of him temporarily."

Second, individuals' work invaded their life domains during the period of working from home. A project manager (#23) shared her experience of being "always online": "I'm basically always online…during these days when I am working from home, my supervisors and colleagues may come to me whenever they need something from me, and you have to give immediate response."

Loneliness. Remote working means fewer face-to-face interactions with colleagues and supervisors. Given the restrictions on non-essential social gatherings during the pandemic, people also lost social opportunities to meet their friends or colleagues, which inevitably contributed to the feeling of loneliness. Ten participants indicated loneliness as a challenge. For instance, participant #4 suggested that though individuals can connect with colleagues via ICTs, conversations with colleagues were more task-focused, which cannot meet her psychological needs for belongingness or relatedness: "Now [while working from home], although we can still communicate with each other through online work-related meetings, we are just no longer able to talk a lot about gossips or other interesting stuff as we did before." Similarly, a teacher (#16) also stated: "Online communications cannot give people a sense of intimacy and closeness."

Ineffective communication. Remote workers rely heavily on ICTs to communicate and collaborate with colleagues, supervisors, and clients. Especially during the pandemic,

ICT-mediated communications almost become the only option because workers were not able to engage in face-to-face meetings. Twenty-one participants identified that they suffered from poor communications during this period. Participant 3 commented on the *synchronicity* in ICT-mediated communications: "I cannot get real-time feedback. What I can do is to wait." An attorney (#18) suggested that he was struggling with limited *symbol variety* (i.e., availability of multiple cues) in ICT-mediated communications: "…through online communications, only simple text and symbols can be used, and many times you cannot understand what your clients meant to say." A manager (#32) described experienced lower *efficiency* in ICT-mediated communications: "I feel that online communication is not as efficient as face-to-face communications in the office. [Online] communication has a time cost."

Theme 2: Work Design in Remote Working

Theme 2 reflects the nature or quality of worker's job during the period of working from home. We identified four crucial work design factors in remote working – social support, job autonomy, monitoring, and workload. Our analysis suggested that work design factors usually influence individuals' performance and well-being in an indirect manner, that is, via shaping their experienced challenges in remote working.

Social support. Seven participants mentioned social support in remote working, and they indicated social support as necessary resources to accomplish tasks. Participant #31, a customer representative, shared her negative experiences caused by limited access to *instrumental support* from colleagues: "when you work from home, it is difficult to seek help from colleagues or leaders while encountering problems at work." A manager (#36) emphasized the importance of *emotional support* in collaborations: "Our work requires collaborations. We need emotional bonds, mutual help, and learning from each other's strengths to achieve a perfect work result. Now it has become a lonely struggle."

More importantly, social support is conducive to overcome loneliness. Participants whose organization provided online platforms to boost social interactions among workers usually reported less loneliness. For instance, participant 2 stated: "We discussed about work on enterprise social media [DingTalk], and chatted in WeChat. I do not feel isolated." Participant 17 also described: "I can connect to my colleagues via the internet if I face any problems, so it's fine for me. I am not alone."

Job autonomy. Thirteen participants suggested the role of job autonomy in remote working. Job autonomy means employees can decide when and how to accomplish their tasks. Individuals' performance and well-being benefit from job autonomy, as those with higher job autonomy can balance work and rest, and choose the most productive ways to do their work. For example, a teacher (# 37) stated: "I was more productive with lesson preparation at home, because we can schedule time by ourselves." Similarly, participant #4 suggested that she felt more energized and productive when she had the autonomy to start working in the late morning.

Job autonomy was also identified as beneficial for work-family balance. For example, participant 14 stated: "I can control the rhythms of work and rest… As long as it's not during the meeting, I can have a short break, around ten to thirty minutes, and then continue to work. That also means more time to spend time with my family." Descriptions from participant #4 indicated the similar desirable impact of autonomy on work-family balance: "The culture of working overtime is common in China…without restricted schedules and a fixed location, things are getting much better now."

Monitoring. Ten participants reported that they experienced different forms of monitoring from their supervisors, including daily reports, clocking in/out via applications such as DingTalk, and being required to have a camera on while working. In the current sample, most comments about monitoring were positive. Some participants reported that

monitoring can help them to cope with procrastination and to concentrate on their core tasks. A business analyst (#1), for instance, described his experiences of extra morning meeting which was not a routine activity in previous office: "After this morning meeting, you will feel a sense of ritual and you will devote yourself to work." Another participant (#26) suggested the degree of monitoring was lower in remote working, which was experienced as positive. He recalled his working experiences in the office and noted that, in comparison, low-intensity monitoring in remote working made him more relaxed: "My previous workstation was very close to my leader's office. I feel more relaxed now, because I have escaped from my leader's monitoring."

Workload. Ten participants mentioned workload during remote working, but changes in workload varied with occupations and job positions. For example, teachers need to manage an increased workload because of the transition to teaching online. Participants indicated that workload influenced their work-home balance. Participant #39 complained about heavy workload during this period: "I'm getting so many phone and video calls. I feel that the workload is super high and my work is endless…I don't like working from home, unless under special circumstances. More importantly, I don't think remote working can give me more personal time; instead, I feel that remote work increases my working time."

Workload also relates to procrastination. Participant 3 noted that low workload means more opportunities to procrastinate: "While working from home, you can decide to work right now or procrastinate, which is associated with your workload. If the workload is not heavy, you can have a slow work pace." Also suggesting a link between work load and focus, a top-level manager (#36) who had to deal with lots of urgent business caused by COVID-19 stated: "I cannot stop even if I wanted to."

Theme 3: Self-discipline

Though we were primarily interested in how work design factors shape remote working experiences, one powerful individual factor emerged from the interview data—self-discipline. Twelve participants highlighted the importance of this aspect. Participants who indicated they were less disciplined reported experiencing more self-control failures, such as procrastination (#9), cyberloafing (#4), and absenteeism (#26), making them less productive in remote working. Those participants who identified themselves as more disciplined, in contrast, reported that they completed their work in a more efficient and timely manner (#2). Participant #36 also emphasized the benefit of self-discipline for work-family balance: "It totally depends [on self-discipline]. I don't think my family can interfere my work because I stick to my daily schedule."

Interestingly, disciplined and less disciplined people evaluated the impact of some aspects of work design differently. Notably, monitoring was mentioned as particularly useful for less disciplined workers. As participant #18 mentioned: "I'm not a self-disciplined person. If there is no external pressure [monitoring], I will be very indolent." Participant #28 suggested that job autonomy in the current context is a "curse" for less disciplined people: "Autonomy at the home office would be bad without self-discipline. You will never achieve goals and will become lazy."

Summary

We integrated the above findings identified from our interview data into a theoretical model suggesting that work design and self-discipline jointly shape the extent of experienced challenges in remote work, which in turn, affect employees' work effectiveness and well-being (see Figure 2). Some of the findings we identified differ from existing research. For example, one previous study reported a significant relationship between job resources and procrastination at work (Metin, Taris, & Peeters, 2016), but such a link was not identified in

our interview data. We also showed that that particular aspects of work design might not hold the same value for everyone, such as the idea that less disciplined people rely more on external forces (e.g., monitoring) to cope with procrastination. These findings suggest the value of a follow-up quantitative assessment that further tests the model, as well as its boundary conditions.

Study 2

Sample and Procedure

We recruited participants via www.wjx.cn, a Chinese online data collection platform that is similar to Amazon Mechanical Turk (MTurk) and Prolific Academic. It has been widely used in previous studies conducted in the Chinese context (e.g., Buchtel et al., 2015; Lu et al., 2020). WJX has a large participant pool with 2.6 million participants from China, which allowed us to recruit niche samples on-demand. We recruited participants who were working from home or had recently come back to the normal office-based workplace after a period of working from home during the COVID outbreak. Similar to the pricing policy of Prolific Academic, monetary compensation was calculated by WJX based on the sample size, the length of the survey, and screening conditions. Following the quote from WJX, each participant was compensated 15 Chinese yuan (equivalent to about 2.1 U.S. dollars).

Our final sample consisted of 522 participants, with 271 being female (51.9%). Participants were from a wide range of industries including IT (26.6%), education (15.5%), and manufacturing (12.5%). They were employed as managers, teachers, editors, engineers, and so forth. The average age of participants was 31.67 years old ($SD = 6.09$); 306 participants (58.6%) lived with their children; 161 participants (30.84%) held management positions; participants had worked from home for an average of 21.25 days ($SD = 17.25$); and they worked 7.02 hours per workday on average ($SD = 1.98$).

Measures

Work design in the context of remote working. We used the four-item scale adapted from Morgeson and Humphrey (2006) to measure social support while working at home. Job autonomy was measured using the three-item scale developed by Hackman and Oldham (1980), and the average number of their daily working hours during the period of working from home was used as a relatively objective indicator to operationalize workload.

Based on interviews in Study 1, we developed a four-item checklist to measure employees' received monitoring during the period of working from home. Our scale covered three frequently mentioned techniques, that is, "providing daily reports", "clocking in/out via apps such as DingTalk", and "keeping cameras switched on during working time"; the fourth item, "other methods to monitor my work performance during the period of working home", was used to capture other potential techniques. Participants were asked to indicate whether their organizations/managers adopted these techniques to monitor employees' work performance by checking "Yes" or "No". The intensity of monitoring was calculated by summing the number of techniques adopted by their organizations/managers.

Self-discipline. Self-discipline was measured by the three-item scale adapted from Lindner, Nagy, and Retelsdorf (2015).

Challenges in remote working. We used the three-item scale adapted from Tuckman's (1991) to measure procrastination. A six-item scale developed by Carlson, Kacmar, and Williams (2000) was used to measure work-to-home interference (WHI) and home-to-work interference (HWI). Loneliness during the period of working from home was captured by three items from the well-established UCLA loneliness scale (Russell, Peplau, & Cutrona, 1980). Participants were asked to recall their experiences in virtual communications during the period of working from home, and a three-item scale adapted from Lowry et al.'s (2009) was used to measure communication effectiveness.

Remote worker outcomes. We used a three-item scale adapted from Williams and Anderson (1991) to measure task performance in remote working. We also focused on two main well-being outcomes, that is, emotional exhaustion and life satisfaction. Emotional exhaustion was captured by a two-item scale adapted from Maslach and Jackson (1981), while life satisfaction was measured by a three-item scale adapted from Diener et al. (1985).

Controls[4]**.** Previous studies have shown that age, gender, caring responsibility, and remote working experience can influence remote workers' productivity and well-being (e.g., Gajendran & Harrison, 2007; Kossek, Lautsch, & Eaton, 2006; Martin & MacDonnell, 2012). Thus, we controlled for these variables while testing our proposed model. Specifically, gender was coded as a dummy variable (0 = male, 1= female). Following Kossek et al. (2006), caring responsibility was coded as a dummy variable (0 = no caring responsibility, 1 = living with children). To assess remote worker experience, we asked participants to report the frequency of working from home before the lockdown with a five-point rating scale ranging from *1* = never to *5* = always. Finally, as our study was conducted in the COVID-19 context, individuals' psychological experience (e.g., life satisfaction) might be influenced by the pandemic. Hence, *the severity of COVID-19* was controlled. We used the number of confirmed cases in each participant's city to indicate the severity of COVID-19. To reduce the skewness of the severity distribution, we conducted a natural logarithmic transformation of the number of confirmed cases.

Data Analysis

We estimated the relationships simultaneously in a path-analytical model through *Mplus* 7.4 (Muthén & Muthén, 1998-2015). Specifically, we regressed employee outcomes on all remote working challenges, work design factors, self-discipline, and control variables.

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[4] The job autonomy → WHI and job autonomy → HWI path coefficients changed to be significant when we estimated this model without any controls. Except for that, other relationships were not significantly influenced by removing control variables.

We also regressed remote working challenges (except for communication effectiveness) on all work design factors, self-discipline, and control variables. To examine the indirect effects of work design and self-discipline on employees via remote working challenges, we used the Model Constraint command in *Mplus* to calculate the product of path coefficients *a* and *b*. Path coefficient *a* indicates the effect of the predictor on the mediator, while path coefficient *b* indicates the effect of the mediator on the outcome.

We did not model the link between work design and communication effectiveness in the above model for two reasons. First, Study 1 did not suggest such a pathway. Second, even though prior research suggested some aspects of work design might be important for communication quality during remote working, these studies considered different work characteristics. For example, Marlow, Lacerenza, and Salas's (2017) theoretical framework suggested that interdependence and task complexity could influence communication in virtual teams; and Bélanger et al. (2013) found that technical support could shape teleworkers' communication experiences. Instead, in our study, we controlled for the effects of communication effectiveness on performance and well-being.

Results

Table 2 summarizes the means, standard deviations, reliabilities, and correlations among study variables.

Work design and remote working challenges. The analysis showed that social support was the most powerful work design factor in terms of its breadth of impact. As shown in Table 3, social support was negatively associated with procrastination ($B = -.17$, $SE = .04$, $p < .001$), WHI ($B = -.27$, $SE = .05$, $p < .001$), HWI ($B = -.16$, $SE = .05$, $p < .01$), and loneliness ($B = -.20$, $SE = .05$, $p < .001$). Job autonomy was negatively related to loneliness ($B = -.18$, $SE = .05$, $p < .001$). Monitoring was positively related to WHI ($B = .22$, $SE = .05$, $p < .001$), but the relation between monitoring and procrastination was not significant, contrary

to what we expected from the interviews. The effects of workload on remote work experiences were mixed. Workload was negatively related to procrastination (B = -.18, SE = .09, $p < .01$), but it was positively related to WHI (B = .38, SE = .12, $p < .01$).

Individual differences and remote working challenges. Self-discipline was negatively associated with procrastination (B = -.46, SE = .04, $p < .001$), WHI (B = -.16, SE = .05, $p < .01$), HWI (B = -.28, SE = .05, $p < .001$), and loneliness (B = -.32, SE = .04, $p < .001$).

Remote working challenges and employee outcomes. As shown in Table 3, worker's performance was significantly influenced by procrastination (B = -.22, SE = .03, $p < .001$) and HWI (B = -.14, SE = .03, $p < .001$). Emotional exhaustion was predicted by each remote working challenges, including procrastination (B = .20, SE = .05, $p < .001$), WHI (B = .16, SE = .04, $p < .001$), HWI (B = .11, SE = .04, $p < .05$), and loneliness (B = .20, SE = .05, $p < .001$). Finally, life satisfaction was negatively associated with WHI (B = -.09, SE = .04, $p < .05$) and loneliness (B = -.28, SE = .04, $p < .001$).

The mediating roles of remote working challenges. We further examined the indirect effects of work design factors and self-discipline on employee outcomes via remote working challenges using with Model Constraint command in *Mplus*. As shown in Table 4, social support had a positive effect on performance via lower procrastination and HWI; social support had a negative effect on emotional exhaustion via lower procrastination, WHI, and loneliness; and social support had a positive effect on life satisfaction via lower WHI and loneliness. Loneliness mediated the indirect effects of job autonomy on emotional exhaustion and life satisfaction, and WHI mediated the indirect effects of monitoring and workload on emotional exhaustion and life satisfaction. Self-discipline had a positive effect on performance via lower procrastination and HWI; self-discipline had a negative effect on

emotional exhaustion via lower procrastination, WHI, HWI, and loneliness; and self-discipline had a positive effect on life satisfaction via lower loneliness.

Supplementary analyses. As identified in Study 1, the impacts of work design on remote working challenges varied with workers' self-discipline. Thus, we conducted supplementary analyses to further explore the potential moderating effects of self-discipline. In addition, according to the job demand-control model (Karasek, 1979), job demands (i.e., workload in the current study) and job autonomy jointly influence individuals, and workers are expected to experience the highest levels of strain in the high demands-low control context. Thus, we then explored the interactive effects of workload and job autonomy on remote working challenges.

For the sake of parsimony, we only present significant results identified from these explorations (see Table 5). The interaction term of social support and self-discipline was positively associated with procrastination ($B = .11$, $SE = .05$, $p < .05$; see Table 5). As shown in Figure 3, social support was negatively associated with procrastination when self-discipline was low (simple slope = -.25, $p < .001$) but unrelated to procrastination when self-discipline was high (simple slope = -.07, *ns*).

The relationship between social support and loneliness also depended on the extent of self-discipline. The interaction term of social support and self-discipline was negatively related to loneliness ($B = -.16$, $SE = .05$, $p < .001$). As shown in Figure 4, social support was negatively associated with loneliness when self-discipline was high (simple slope = -.34, $p < .001$) but unrelated to loneliness when self-discipline was low (simple slope = -.06, *ns*), indicating that the relationship between social support and loneliness was stronger for self-disciplined workers.

Finally, our results showed that workload moderated the relationship between job autonomy and loneliness. The interaction term of job autonomy and workload was negatively

associated with loneliness ($B = -.34$, $SE = .14$, $p < .05$). Based on the plot in Figure 5, the relation between job autonomy and loneliness was negative and significant when workload was high (simple slope = -.25, $p < .001$), while this relation was not significant when workload was low (simple slope = -.01, ns), indicating that the role of job autonomy in coping with loneliness was more significant for individuals with higher workload.

General Discussion

The COVID-19 outbreak created a unique context in which many employees were involuntarily required to work from home intensively. In this context, we argued that it makes sense for focus on work design as an antecedent, which our literature review suggested is a rare perspective in the remote working literature to date. Consequently, we set out to explore remote workers' work experiences in this unique context, especially the role of work design in shaping these experiences. We discuss key implications of our findings next.

Work Design as a Vehicle for Improving Remote Workers' Experiences

An overarching contribution of our research is our demonstration of the powerful role of work design in shaping people's experiences when working from home during the pandemic. Exploring and examining how work design matters in this unique context is theoretically necessary, because scholars have demonstrated that the impacts of work design vary with work locations (or contexts). Biron and Van Veldhoven (2016), for example, compared workers' experiences on office days with those on home days. Their findings revealed that employees with higher levels of job demands reported greater ability to concentrate and less need for recovery during home days than during office days. In other words, though there are several well-established work design theories, scholars should be cautious in applying them in the current context as most accumulated knowledge was generated from onsite work. Even in the traditional remote working research, researchers also

face a challenge of distinguishing work design in the normal office and work design in the home office if remote working is practiced infrequently (Bailey & Kurland, 2002).

The widespread and intensive practice of working from home during COVID-19 meant it was possible, sensible, and important to investigate variations in work design in remote working. Findings from our research thus avoid any 'contamination' of one's work design in onsite work. Generally, results from our mixed-methods research are consistent with work design theory (e.g., Demerouti, Bakker, Nachreiner, & Schaufeli, 2001). Our research showed that social support and job autonomy, acting as job resources, help employees to deal with challenges in remote working. Social support appears to be the most powerful work design factor because it had positive indirect impacts on performance and well-being via its associated beneficial effects on all the identified challenges. Job autonomy also correlated negatively with all the identified challenges, and appears to particularly contribute to remote workers' well-being through its alleviating effects on loneliness. We also found that workload and monitoring both functioned as demands, increasing remote workers' work-home interference, and thereby undermined employee well-being. Interestingly, workload was helpful in alleviating the challenge of procrastination, although monitoring was not.

We discuss these findings more deeply next. The broader point is that work design can be, and is, a powerful vehicle for improving remote workers' work effectiveness and well-being. Consequently, we suggest that future remote working research should more often adopt the perspective of work design as a key antecedent of worker outcomes.

Procrastination as a Challenge that can be Mitigated through Work Design

Although procrastination has been acknowledged as an issue for remote workers in a recent review on telecommuting (Allen et al., 2015), to our knowledge, only one empirical study has considered this topic, and this study considered procrastination as a personality

variable (O'Neill, Hambley, & Bercovich, 2014). In contrast, our qualitative and quantitative analyses led us to consider procrastination as a challenge as it can greatly hurt worker's performance and cause emotional exhaustion.

Most importantly, we found that procrastination can be shaped by work design. Our findings showed that remote workers who received more social support are less likely to procrastinate. There are several explanations that might explain this link. In fact, procrastination is a self-regulation failure that is usually caused by limited self-regulatory resources (Kühnel et al., 2016). Thus, the first explanation is that the social support that people receive—either instrumental or emotional—might offer opportunities to replenish resources. In addition, employee's resources deletion processes could also be buffered by workplace social support (Johnson & Hall, 1988). Thus, individuals with higher social support can have more self-regulatory resources to cope with procrastination at work. Another possible explanation is that social support might distract, or re-direct people's attention away, from the broader social challenges that workers experience when self-isolated. Individuals sometimes procrastinate for a relief from stress (e.g., Lavoie & Pychyl, 2001; Wan, Downey, & Stough, 2014). Social support is particularly important in this extraordinary context, because it can act as a "negativity buffer" (Bavik, Shaw, & Wang, in prress), helping workers cope with stress and focus on tasks.

We further found that—albeit with a caveat about the exploratory nature of the moderator analyses in mind—less disciplined workers benefit more from social support in terms of reducing procrastination. This finding might be because less disciplined people need external driving forces to "push" them (Steel, 2007). Social support might be especially valuable for people lacking discipline as it can provide the psychological resources for self-regulation (Pilcher & Bryant, 2016), and increase the extent to which individuals feel obligated to repay supervisors' care by concentrating more on work (Buunk, Doosje, Jans, &

Hopstaken, 1993). In contrast, disciplined individuals can more effectively control their own behaviors and may not necessarily rely on external forces.

Workload, as another work design factor, was negatively related to procrastination, perhaps because of the higher costs of procrastination for busy workers, and perhaps because work pressure increases flow and focus and thus reduces the propensity for procrastination (Steel, 2007). The effect of monitoring in remote working on reducing procrastination was frequently mentioned by participants in Study 1. However, results from Study 2 did not support this argument; instead, given the negative effects of monitoring on employee well-being, it appears an unhelpful and potentially costly managerial practice.

Altogether, given that procrastination in the home office is a challenge for many, yet it has not been considered adequately in the remote working literature, we suggest the need for research to investigate the experience of procrastination among teleworkers.

Re-Theorizing Home-Work Conflict during Remote Working

To date, in the remote working literature, flexible work arrangements are predominantly framed as a useful policy for balancing work and personal life. That is, compared with these who have no opportunities to engage in flexible work, some degree of teleworking helps to reduce work-family conflict (Gajendran & Harrison, 2007). These studies usually treat remote working as an interdependent variable, resulting in a natural confound because they focus on people who, largely, have chosen this form of working, perhaps because their potential for work-home conflict is lower in the first place (that is, lower conflict means they prefer flexible working) or because they have the resources to be better able to balance work-family conflict at home. However, when individuals do not choose remote working, as in our study, their lack of preference or resources to do so, might mean that working from home creates a significant challenge. In other words, it is possible that previous research says more about the people who choose flexible working than it does

about the real experience of working from home. However, the current research might question this conclusion. Framing remote working as a context, our qualitative analyses showed work-home interference is the most frequently mentioned challenge in the home office, and its negative effects were shown in Study 2.

Our research showed that job autonomy did not predict work-home interference as expected. Theoretically, we would expect job autonomy to be important for work-home interference because autonomy gives people latitude to manage the demands in a flexible way (Kahn & Byosiere, 1992; Bakker, Demerouti, & Euwema, 2005). Empirical research also supports the positive role of job autonomy in the remote worker context (e.g., Kossek et al., 2009). How to explain our finding? On the one hand, it might simply be that job autonomy is less important for managing home-work demands in a remote worker context in which everyone works from home, not just the elite few. On the other hand, it might also be due to the unique nature of home-work conflict in this study. If some of the home-work conflict is self-induced because people cannot maintain home/work boundaries, we would not expect autonomy to be especially helpful. One might even then theorise that, in the pandemic context, autonomy might positively help manage home-work stressors such as child care demands but might negatively affect home-work boundary self-management, with these countervailing forces explaining the weaker role of autonomy for home-work conflict in this study.

Finally, it is also possible our findings relate to the unusual context. We note that the mean for job autonomy in the sample was 4.03 (on a five-point scale), which is a very high for Chinese workers who tend to usually have relatively lower levels of job autonomy (e.g., Xie, 1996). The high job autonomy might, in turn, reflect the unusual remote work situation in which workers had to very rapidly set up to work at home. Managers might not have had sufficient time to fully set up their 'usual' controls. Thus it is possible that in this case the

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level of job autonomy was artificially high, leading to a ceiling effect suppressing its impact. Further research is needed on this issue.

Although the autonomy findings were unexpected, it is perhaps not a surprise that monitoring and workload, that are usually theorized as jobs demands at work, exerted negative impacts on employees' home-work conflicts in this remote work context. Our results showed that individuals with higher levels of monitoring and workload reported greater WHI. While the positive relation between workload and work-family conflict is consistent with the existing work-family interface research, the finding that monitoring is also positively associated with work-family conflict adds to the literature as a new form of work demands that leads to negative work-family spillover.

Loneliness and the Role of Job Autonomy

We identified the feeling of loneliness as an important challenge among remote workers during the pandemic. Earlier studies have identified a concern about professional isolation among remote workers because of the reduction in informal social interactions with colleagues in the home office (Cooper & Kurland, 2002). Advanced ICTs (e.g., WhatsApp) nowadays afford users the opportunity to engage in large-scale and real-time social interactions (McFarland & Ployhart, 2015), which potentially contributes to keeping people socially connected and overcoming isolation. However, our study shows that online social interactions are not necessarily sufficient for reducing loneliness; "a psychological pain of perceived relational deficiencies in the workplace" (Ozcelik & Barsade, 2018; Wright & Silard, 2020). As our participants indicated in Study 1, they were not satisfied with the quality of online social interactions due to restricted "intimacy" and "closeness", and such a feature might relate to loneliness.

Although our participants did not mention this, we also suspect that the need for proactivity in virtual communication plays a role. That is, in the work place, informal

interactions can simply 'happen'; the so-called 'water cooler' effect (Fayard & Weeks, 2007).

However, such interactions need to be more deliberately orchestrated when working from

home. Individuals need to actively participate in such interactions, either by initiating them,

or by consciously joining in to such an activity arranged by someone else. It is noteworthy

that self-discipline predicted loneliness in Study 2. Although we cannot be sure of causality,

it is possible that individuals low in self-discipline fail to consciously or proactively

orchestrate and engage in informal communication activities, and suffer greater loneliness as

a consequence. Also consistent with our speculation that addressing loneliness in a remote

context requires some degree of self-initiation, in the exploratory moderator analyses, we

found self-disciplined people better utilize social support to reduce loneliness.

The idea that virtual social interactions require some degree of self-initiation also

relates to the somewhat surprising link we observed between job autonomy and loneliness.

That is, previous theory and research argues that job autonomy is crucial for fueling proactive

behavior because autonomy enhances people's internalized motivation, builds their self-

confidence, and fosters activated positive affect; all of which can drive proactive behavior

(e.g., Parker, Bindl & Strauss, 2007). For example, being proactive involves some degree of

interpersonal risk because it means self-initiating a behavior that no one has instructed one to

do, which heightens the need for individual self-efficacy. Considerable research shows the

role of job autonomy for enhancing employees' self-efficacy, and thereby increasing their

proactive behaviors (e.g., Ohly & Fritz, 2009; Parker, Williams, & Turner, 2006). Although

the focus of the current study is on proactive behavior that is socially oriented, it is possible

that job autonomy is important for building individuals' proactive motivation to self-initiate

contact with others, and thereby reduce feelings of loneliness.

Autonomy might also simply provide individuals with more opportunities to engage

in social contact. Such opportunities might be especially important for those with high

workload. Existing research shows that workload usually depletes individuals' time and resources to engage in social activities (Ilies et al., 2007; Repetti, 1989). Consistent with this idea, our exploratory moderator analyses suggest that job autonomy is more beneficial for employees with higher workload to cope with loneliness. It might be that, for those high in work load and hence less time for engaging in social contact, having autonomy is especially essential for seizing opportunities for busy workers to balance work with social activities.

Communication Quality Beyond Its Remote Attributes

A fourth observation with regard to working from home challenges concerns the quality of communication, which was identified as a key challenge in the interview study. Although remote working literature has acknowledged the limitations of ICT-mediated communication and has assumed it is a hindrance relative to face-to-face interaction (Raghuram et al., 2019), poor communication experience in virtual collaboration has been empirically addressed mainly in virtual team and computer-mediated communication literature (e.g., Chang, Hung, & Hsieh, 2014) rather than the literature on remote working. This situation might be because ICT-related communication experience is logically related to the technical system at work (Bélanger et al., 2013; Dennis et al., 2008), which is not the primary research focus in remote working literature. However, our study suggests such an omission is problematic because many interpersonal processes are mediated by ICTs in the current digital workplace (Wang et al., 2020), and therefore communication quality is an important experience to consider for remote workers. Poor communication will not only hinder performance, as suggested in our research, but can also impair professional relationships (Camacho et al., 2018) and increase work stress (Day et al., 2012). Thus, our findings inspire scholars and practitioners to re-think how to facilitate high quality virtual communications for remote workers.

The Power of Self-Discipline

As an attribute that helps remote workers to mitigate the destructive effects of interruptions, self-discipline has been widely considered as an important and necessary skill for achieving remote working effectiveness (e.g., Haddon & Lewis, 1994; Kinsman, 1987). However, largely due to the fact that remote working has always been a luxury among a small proportion of workers, as we mentioned earlier, self-discipline as a desirable attribute was more used merely as a criterion to select the right people as remote workers (Baruch, 2000). This on the one hand might have rendered most remote workers to be those having relatively higher levels of self-discipline, possibly leading to people's limited understanding as to the broader influences of self-discipline; and on the other hand might have downplayed the role of self-discipline in remote working (i.e., it should not be merely used as a selection criterion).

In a context wherein remote working becomes the normal and everyone started working remotely, self-discipline is no longer just a selection criterion but becomes something that every remote worker strives to gain or improve on. By showing that self-discipline affecting work effectiveness and well-being both directly and indirectly (through its buffering effects on the identified remote working challenges), as well as its moderating effects, this research underscored the critical role of self-discipline among all individuals practicing remote working. We believe this finding is critical as it may greatly enhance remote working practitioners' awareness of the importance of self-discipline and may also motivate many remote workers to try to develop their self-discipline to achieve work effectiveness and well-being.

Practical Implications

Insights from working at home during COVID-19 can, beyond the immediate context of pandemic, guide flexible work practice after crisis. Here, we distill three lessons for managers and employees in future practice.

First, our findings can help organizations and managers to manage telework effectively. The predominantly positive view of remote working in the literature to date might make managers ignore the need to consider how flexible workers jobs are designed. Adopting flexible work arrangements is not the end; it is the beginning. As Baruch (2000) articulated, organizations and managers should "find news to manage…, develop innovative career paths, and put in place proper support mechanisms for teleworkers" (p. 46). The current research revealed the crucial role of work design. Although further research is needed, our study suggests managers can boost remote workers' productivity and well-being via designing high quality work. Managers can utilize work design theories to re-design the nature of work to cope with the challenges that arise with remote working, such as providing more social support for workers to overcome loneliness. Hence, the work design perspective can guide managers to design a better job for remote workers during the pandemic or even in future flexible working practices. For example, managers might put a lot cost into setting up monitoring systems (Groen, Triest, Coers, & Wtenweerde, 2018), but the desirable effect of monitoring on work effectiveness was not supported by our data. Managers should instead engage more supportive management practices especially in this extraordinary context, such as communicating with subordinates using motivating language (Madlock, 2013), building trust within distributed team (Grant, Wallace, & Spurgeon, 2013), and sharing information rather than close monitoring (Lautsch, Kossek, & Eaton, 2009).

Second, employees and managers should be aware of the challenges in practicing remote work. Remote working is attractive to organizations and individuals in the current

digital age, because of space savings, the opportunity to utilize a global labor market, less time spent on commuting, and so forth (Baruch, 2000). Many commentators are speculating that remote working will become even more attractive after COVID-19 (Hern, 2020). However, scholars and practitioners might overstate the bright side of remote working, especially if they rely on the established research. For example, our research indicated less disciplined people experienced more challenges during working from home and, therefore, teleworking may not be suitable for them. Given that such challenges will influence individuals' performance and well-being, employees and employers need to consider the fit between flexible work arrangements and the person (Golden, Veiga, & Simsek, 2006; Perry et al., 2018).

Finally, a work design perspective potentially helps individuals to cope with challenges in remote working. In addition to the top-down approach (i.e., re-designing work), individuals can proactively craft their jobs (Tims & Bakker, 2010; Wrzesniewski & Dutton, 2001; Zhang & Parker, 2019). For instance, engaging informal communication with colleagues in high-intensity telecommuting setting has been shown to be positively related to job satisfaction (Fay & Kline, 2011). Thus, teleworkers can proactively utilize current advanced enterprise social media (e.g. Slack) to socialize with others in an informal manner to overcome loneliness.

Limitations and Future Research

Our research inevitably has limitations. First, our qualitative and quantitative data were both collected in China, which may raise concerns about generalizability. As mentioned above, remote working in China and other developing countries is relatively new, which means we can capture individuals' unique experiences during the sudden transition from the onsite office to the home office. However, experience and acceptance of remote working can influence individuals' experiences during working from home (Gajendran & Harrison, 2007).

Thus, it will be interesting to compare remote working during the pandemic between developing countries and developed countries where flexible work arrangements are more widespread (e.g., exploring differences in coping strategies and perceived challenges).

Second, our research was conducted in an extraordinary context. On the positive side, the COVID-19 outbreak provides a unique opportunity to address theoretical gaps and expand theory. Yet this context indeed provides extra pressure for employees, such as worry about the pandemic, social isolation, financial pressure, greater family interferences, etc. We believe that the COVID-19 outbreak context influences the extent of experienced challenges in remote working, but it might not significantly change the theoretical relationships identified from our research. In other words, lessons from our discoveries will still be meaningful when business returns to normal after the pandemic.

Finally, the cross-sectional nature of Study 2 means it inevitably suffers from common method bias (CMB; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) and the possibility of reverse causality, which means that we were unable to establish causality in this study. In light of this limitation, we recommend the use of longitudinal or experimental research designs in future research. A longitudinal design will also contribute to tracking dynamic processes, such as how individuals adapt to flexible work arrangements. Given that working from home is becoming a day-to-day practice in many organizations, we also recommend future researchers to conduct daily diary studies to investigate the intraindividual processes of remote working. For example, it will be interesting to examine the antecedents and consequences of the remote working challenges identified in the current research on a daily basis. Future research also can benefit from collecting data from multiple sources. For example, although individuals themselves might be the more suitable raters for their own challenges, their work effectiveness and well-being can be assessed by their supervisors and spouses, respectively, which can help to alleviate issues of common method bias.

Table 1 Themes Identified from Study 1 Interviews

First-Order Codes (representative quotes with interviewee ID)	Second-Order Categories	Aggregated Themes
"The same thing can be solved immediately in the office, because there is no other thing involved. At home, when I was about to prepare for the task, the child came. At this time, I will certainly put the work at hand to deal with some home affairs, and the [work] efficiency is definitely not as high as in the office." (#21)	Work-home interferences	
"I'm basically always online. In the normal workplace, the maximum of working overtime is one or two hours. However, during these days when I am working from home, my supervisors and colleagues may come to me whenever they wanted something done, and you have to provide real-time feedback. Therefore, apart from sleeping, the rest of the time I am on standby." (#23)		
"If I want to communicate with others, I can only type or call. But sometimes, the information may not be conveyed in time." (#4)	Ineffective communication	Challenges in remote work
"If you work from home, the overall collaboration efficiency will decrease. Some information can only be expressed clearly in face-to-face communications. In a video conference, you can only hear the voice, but you cannot really see others' facial expressions. If you cannot see others' reactions, you cannot get your points across. Face-to-face communications are more straightforward!" (#2)		
"Without the kind of pressure in the workplace, I was a little slack. I did more private things [during working time]." (#18)	Procrastination	

"When I work in the office, the working hours are from 9:00 to 11:00 in the morning and from 1:30 to 5:00 in the afternoon. Therefore, I am very clear that I should work during this period. But when working from home, there is no restriction about when I should end my work. I might think that I can start to work after a short break; the task is not very urgent anyway. This definitely influenced my work." (#25)		
"In the office, we can chat with colleagues. Now [while working from home], we communicated only during meetings, but we did not talk about gossip or something interesting." (#4)	Loneliness	
"I think the more influential factor is the lack of social interactions, because I feel lonely working at home. There are no colleagues or leaders whom I can communicate face-to-face. While working from home, I can communicate through the internet. However, compared with face-to-face interactions, online communications cannot give people a sense of intimacy and closeness." (#16)		
"I think working in the office is better. That is because, when you work from home, it is difficult to seek help from colleagues or leaders while encountering problems at work." (#31)	Social support	
"Our work requires collaborations. We need emotional bonds, mutual help, and learning from each other's strengths to achieve a perfect work result. Now it has become a lonely struggle. This feeling is indescribable." (#36)		Work design in remote working
"I was more productive with lesson preparation at home, because we can schedule time by ourselves. In the past, we might have to prepare lessons until midnight, and then we got up early to work. But for now, we are more flexible. We can get up late in the morning, so working until midnight is fine for me now." (#37)	Job autonomy	

"I can control the rhythms of work and rest… As long as it's not during the meeting, I can have a short break, around ten to thirty minutes, and then continue to work. That also means more time to spend time with my family." (#14)		
"We have a meeting in the morning every day during this period…After this morning meeting, you will feel a sense of ritual and you will devote yourself to work. The morning meeting is actually very important." (#1)	Monitoring	
"Some leadership behaviors indeed affect my productivity. For instance, managers measured your performance in remote working to make sure you are doing a good job." (#29)		
"I'm getting so many phone and video calls. I feel that the workload is super high and my work is endless…I don't like working from home, unless under special circumstances. More importantly, I don't think remote working can give me more personal time; instead, I feel that remote work increases my working time." (#39)	Workload	
"While working from home, you can decide to work right now or procrastinate, which is associated with your workload. If the workload is not heavy, you can have a slow work pace." (#3)		
"I'm not a self-disciplined person. If there is no external pressure [monitoring], I will be very indolent." (#18)	Self-discipline	
"Autonomy at home office would be bad without self-discipline. You will never achieve goals and will become lazy." (#28)		Individual factors

Table 2 Correlations of Study Variables

		M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1.	Age	31.67	6.09	-																		
2.	Gender	0.52	0.50	-.15**	-																	
3.	With children	0.59	0.49	.38***	-.03	-																
4.	Management position	0.31	0.46	.12**	-.07	.15**	-															
5.	Experience	2.47	0.97	-.09*	.01	.02	.06	-														
6.	Severity of COVID-19	4.62	1.88	.02	-.08	.01	.02	.00	-													
7.	Self-discipline	3.48	0.86	.18**	-.03	.10*	.02	.13**	.02	(.79)												
8.	Social support	3.61	0.79	.01	.08	.07	-.02	.17***	-.02	.34***	(.74)											
9.	Job autonomy	4.03	0.68	.05	.03	.11*	-.03	-.00	-.08	.19**	.14**	(.63)										
10.	Monitoring	1.54	0.87	-.02	-.00	.07	.03	.16***	.08	.02	.06	-.09*	-									
11.	Workload	7.02	1.98	-.08	-.07	.01	.02	.03	.06	-.01	-.05	-.15***	.24**	-								
12.	Procrastination	2.22	0.87	-.14**	.09	-.09*	-.04	-.12**	-.09*	-.52***	-.31***	-.10*	.01	-.06	(.80)							
13.	WHI	2.99	0.98	-.07	.02	-.04	.01	-.06	-.01	-.23***	-.26***	-.17***	.21***	.20***	.24***	(.82)						
14.	HWI	2.49	0.88	-.03	.01	-.01	.03	-.13**	-.06	-.35**	-.24***	-.16***	.07	.07	.48***	.41**	(.75)					
15.	Loneliness	2.63	0.85	-.05	-.02	-.11	.07	-.13**	-.08	-.41***	-.33***	-.23***	.02	.05	.37***	.35***	.37**	(.76)				
16.	Communication effectiveness	3.64	0.78	.05	.04	.11*	-.03	.10*	-.01	.43***	.49***	.24***	.01	-.04	-.46***	-.33***	-.40***	-.50***	(.76)			
17.	Performance	4.14	0.61	.06	-.02	.04	-.03	.13**	.01	.42***	.37***	.22***	.04	-.02	-.54***	-.19***	-.44***	-30***	.47**	(.65)		
18.	Emotional exhaustion	2.33	1.01	-.16***	.01	-.15**	.01	-.17***	.01	-.33***	-.33***	-.36***	.12**	.18***	.44***	.41***	.42***	.46***	-.40***	-.29**	(.79)	
19.	Life satisfaction	3.49	0.87	.08	.05	.13**	-.01	.14**	-.04	.40***	.37***	.33***	.01	-.11	-.36***	-.34***	-.36***	-.50***	.49***	.42***	-.54***	(.74)

Note. N = 515-522; Gender was coded as a dummy variable (0 = male, 1=female); With children was coded a dummy variable (0 = not, 1 = live with children); Management position was coded as dummy variable (0 = not, 1 = manager); The severity of COVID-19 was measured by the natural logarithm of confirmed cases in participant's city; WHI = work-to-home interference; HWI = home-to-home interference.

*** $p < .001$
** $p < .01$
* $p < .05$

Table 3 Results from Path Analysis

	Challenges in remote working				Employee outcomes		
	Procrastination	WHI	HWI	Loneliness	Performance	Emotional exhaustion	Life satisfaction
Control variables							
Age	-.01 (.01)	-.00 (.01)	.00 (.01)	.01 (.01)	.00 (.00)	-.01 (.01)	.00 (.01)
Gender	.13 (.07)	.06 (.08)	.03 (.07)	-.01 (.07)	-.01 (.04)	.00 (.07)	.06 (.06)
With children	-.03 (.07)	-.01 (.09)	.04 (.08)	-.11 (.07)	-.06 (.05)	-.12 (.07)	.08 (.07)
Remote working experience	-.05 (.03)	-.04 (.04)	-.07 (.04)	-.05 (.04)	.01 (.02)	-.09* (.04)	.03 (.03)
Severity of COVID-19	-.04* (.02)	-.02 (.02)	-.04 (.02)	-.04* (.02)	-.01 (.01)	.01 (.02)	-.03 (.02)
Work design in remote working							
Social support	-.17*** (.04)	-.27*** (.05)	-.16** (.05)	-.20*** (.05)	.08** (.03)	-.10* (.05)	.09* (.05)
Job autonomy	.01 (.05)	-.11 (.06)	-.10 (.06)	-.18*** (.05)	.10** (.03)	-.32*** (.05)	.21*** (.05)
Monitoring	.06 (.04)	.22*** (.05)	.08 (.04)	.04 (.04)	.03 (.03)	.06 (.04)	.06 (.04)
Workload	-.18* (.09)	.38** (.12)	.10 (.10)	.04 (.10)	-.04 (.06)	.24* (.02)	-.15 (.09)
Individual differences							
Self-discipline	-.46*** (.04)	-.16** (.05)	-.28*** (.05)	-.32*** (.04)	.07* (.03)	-.14** (.05)	.10* (.05)
Challenges in remote working							
Procrastination					-.22*** (.03)	.20*** (.05)	-.06 (.05)
WHI					.04 (.02)	.16*** (.04)	-.08* (.04)
HWI					-.14*** (.03)	.11* (.04)	-.06 (.04)
Loneliness					.03 (.03)	.20*** (.05)	-.24*** (.04)
Communication effectiveness					.14*** (.03)	.01 (.06)	.18*** (.05)

Note. N = 515. WHI = work-to-home interference; HWI = home-to-home interference; Standard error is indicated in bracket; Calculations are based on logarithmic values for workload (i.e. working hours).
*** $p < .001$
** $p < .01$
* $p < .05$

Table 4 Indirect Effects of Work Design on Employee Outcomes via Remote Working Challenges

		Indirect effect	SE	95% confidence interval	
				Lower	Upper
1.	Social support → Procrastination → Performance	.04	.01	.015	.057
2.	Social support → Procrastination → Emotional exhaustion	-.03	.01	-.057	-.010
3.	Social support → WHI → Emotional exhaustion	-.04	.01	-.069	-.016
4.	Social support → WHI → Life satisfaction	.02	.01	.001	.042
5.	Social support → HWI → Performance	.02	.01	.005	.037
6.	**Social support → HWI → Emotional exhaustion**	-.02	.01	-.035	.000
7.	Social support → Loneliness → Emotional exhaustion	-.04	.01	-.067	-.015
8.	Social support → Loneliness →Life satisfaction	.05	.01	.020	.075
9.	Job autonomy → Loneliness → Emotional exhaustion	-.04	.01	-.063	-.010
10.	Job autonomy → Loneliness →Life satisfaction	.04	.01	.015	.070
11.	Monitoring → WHI → Emotional exhaustion	.03	.01	.012	.057
12.	**Monitoring → WHI → Life satisfaction**	-.02	.01	-.035	.000
13.	Workload → WHI → Emotional exhaustion	.06	.02	.013	.105
14.	**Workload → WHI → Life satisfaction**	-.03	.02	-.062	.002
15.	Self-discipline → Procrastination → Performance	.10	0.02	.069	.135
16.	Self-discipline→ Procrastination → Emotional exhaustion	-.09	0.03	-.143	-.046
17.	Self-discipline→ WHI → Emotional exhaustion	-.03	0.01	-.046	-.006
18.	**Self-discipline→ WHI → Life satisfaction**	.01	0.01	.000	.028
19.	Self-discipline→ HWI → Performance	.04	0.01	.018	.058
20.	Self-discipline→ HWI → Emotional exhaustion	-.03	0.01	-.059	-.004
21.	Self-discipline→ Loneliness → Emotional exhaustion	-.07	0.02	-.100	-.031
22.	Self-discipline→ Loneliness →Life satisfaction	.07	0.02	.039	.105

Note. WHI = work-to-home interference; HWI = home-to-home interference; Indirect effects in bold were not significant with 95% CI.

Table 5 Results of Supplementary Analyses

|	Challenges in remote working				Employee outcomes		
	Procrastination	WHI	HWI	Loneliness	Performance	Emotional exhaustion	Life satisfaction
Individual differences							
Age	-.01 (.01)	-.00 (.01)	.00 (.01)	.00 (.01)	.00 (.00)	-.01 (.01)	.00 (.01)
Gender	.14 (.06)	.05 (.08)	.02 (.07)	-.02 (.07)	-.01 (.04)	.01 (.07)	.06 (.06)
With children	-.04 (.07)	-.01 (.09)	.05 (.08)	-.11 (.07)	-.05 (.05)	-.12 (.07)	.08 (.07)
Remote working experience	-.05 (.03)	-.04 (.04)	-.07 (.04)	-.05 (.04)	.01 (.02)	-.09* (.04)	.03 (.03)
Severity of COVID-19	-.04* (.02)	-.02 (.02)	-.04 (.02)	-.04* (.02)	-.01 (.01)	.01 (.02)	-.03 (.02)
Work design in remote working							
Social support	-.16*** (.04)	-.28*** (.06)	-.16** (.05)	-.20*** (.05)	.08** (.03)	-.10* (.05)	.09* (.05)
Job autonomy	.00 (.05)	-.10 (.06)	-.09 (.06)	-.13* (.05)	.10** (.03)	-.32*** (.05)	.21*** (.05)
Monitoring	.06 (.04)	.22*** (.05)	.08 (.04)	.06 (.04)	.03 (.03)	.06 (.04)	.06 (.04)
Workload	-.19* (.09)	.39** (.12)	.12 (.10)	.04 (.10)	-.04 (.06)	.24* (.10)	-.15 (.09)
Individual differences							
Self-discipline	-.46*** (.04)	-.17** (.05)	-.29*** (.05)	-.34*** (.04)	.07* (.03)	-.14** (.05)	.10* (.04)
Challenges in remote working							
Procrastination					-.22*** (.03)	.20*** (.05)	-.06 (.05)
WHI					.04 (.02)	.16*** (.04)	-.08* (.04)
HWI					-.14*** (.03)	.11* (.04)	-.08 (.04)
Loneliness					.04 (.03)	.20*** (.05)	-.24*** (.04)
Communication effectiveness					.14** (.04)	.01 (.06)	.18*** (.05)
Interactive terms							
Social support × self-discipline	.11* (.05)	-.08 (.06)	-.10 (.05)	-.16*** (.05)			
Job autonomy × workload	-.04 (.14)	.04 (.17)	.06 (.16)	-.34* (.14)			

Note. N = 515. WHI = work-to-home interference; HWI = home-to-work interference; Standard error is indicated in bracket; Calculations are based on logarithmic values for workload (i.e. working hours).

*** $p < .001$; ** $p < .01$; * $p < .05$

**Figure 1 Different Types of Positioning of Work Design in the Remote Working Literature**

Approach 1: Work design as a moderator
Key Implication: Remote working is suitable for certain types of jobs.
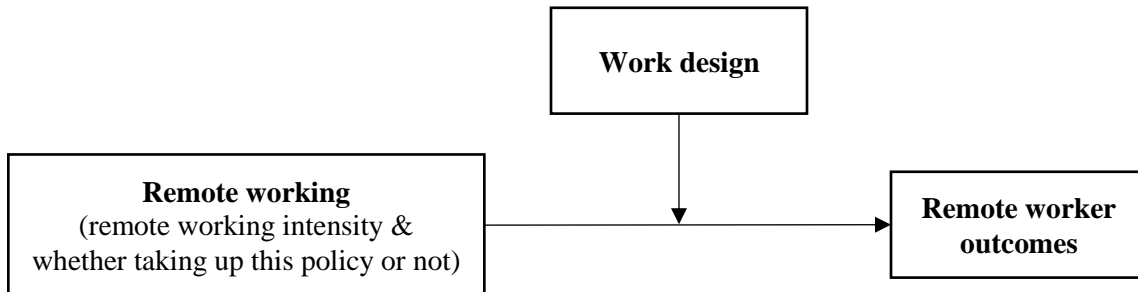
Approach 2: Work design as a mechanism explaining the impact of remote working
Key Implication: Remote working practices influence individuals through shaping the
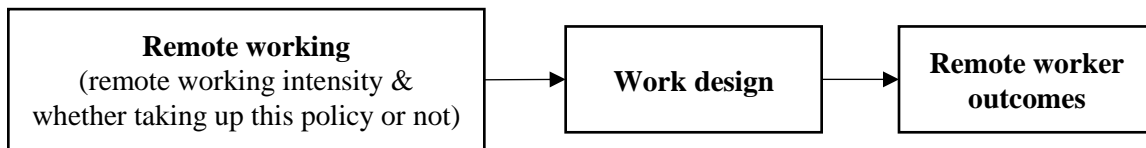
Approach 3: Work design as an antecedent
Key Implication: Work design in the remote working context can influence remote worker outcomes.
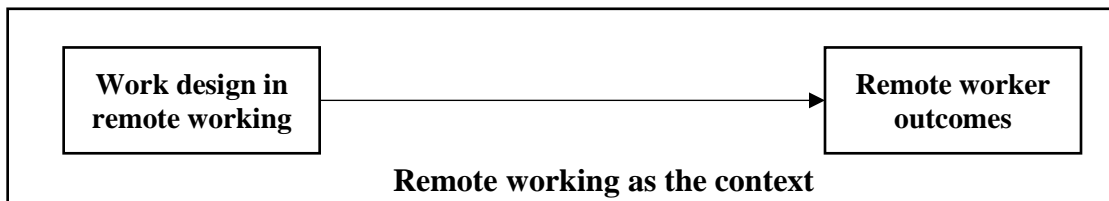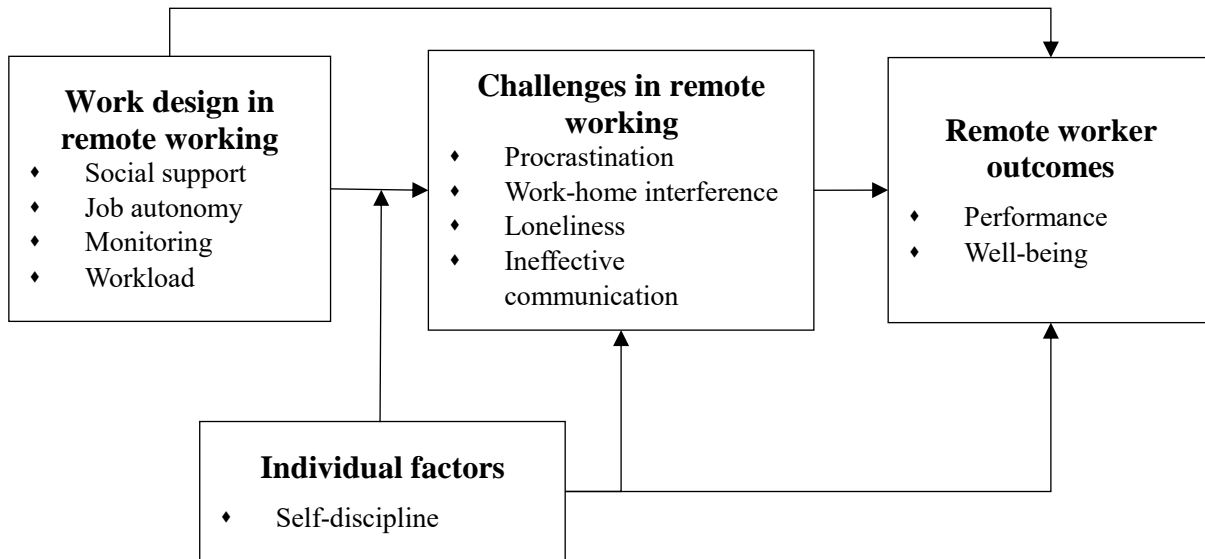
Figure 2 Theoretical Framework Developed in Study 1

Note. Though we did not identify the relationship between current four work design factors and the challenge of ineffective communication in Study 1, we still include it in our framework because it might be influenced by other work characteristics such as technical support, task interdependence, task complexity (e.g., Bélanger et al., 2013; Marlow et al., 2017).

Figure 3 The moderating role of self-discipline on the relationship between social support
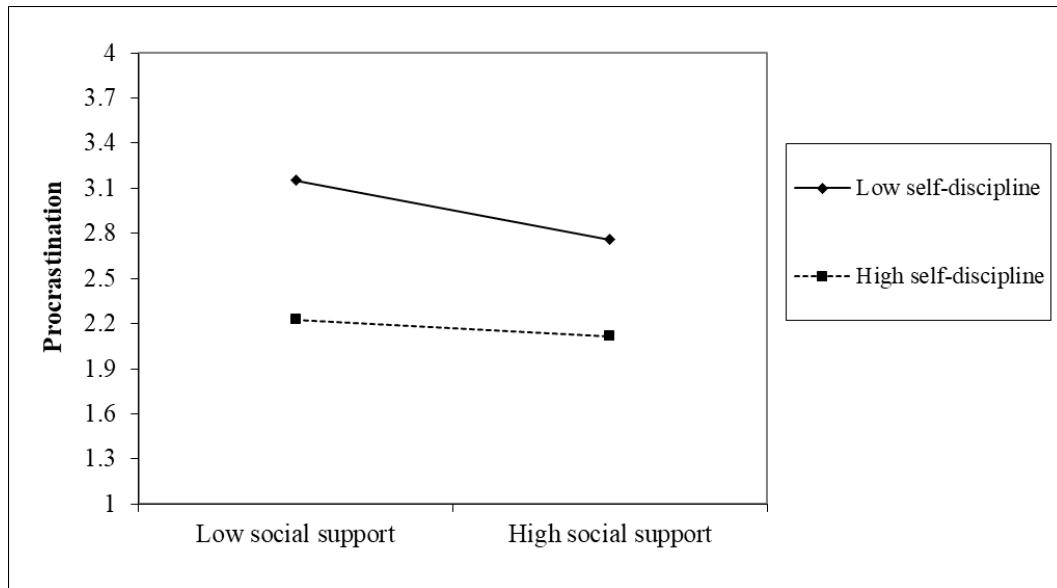
and procrastination

Figure 4 The moderating role of self-discipline on the relationship between social support and loneliness
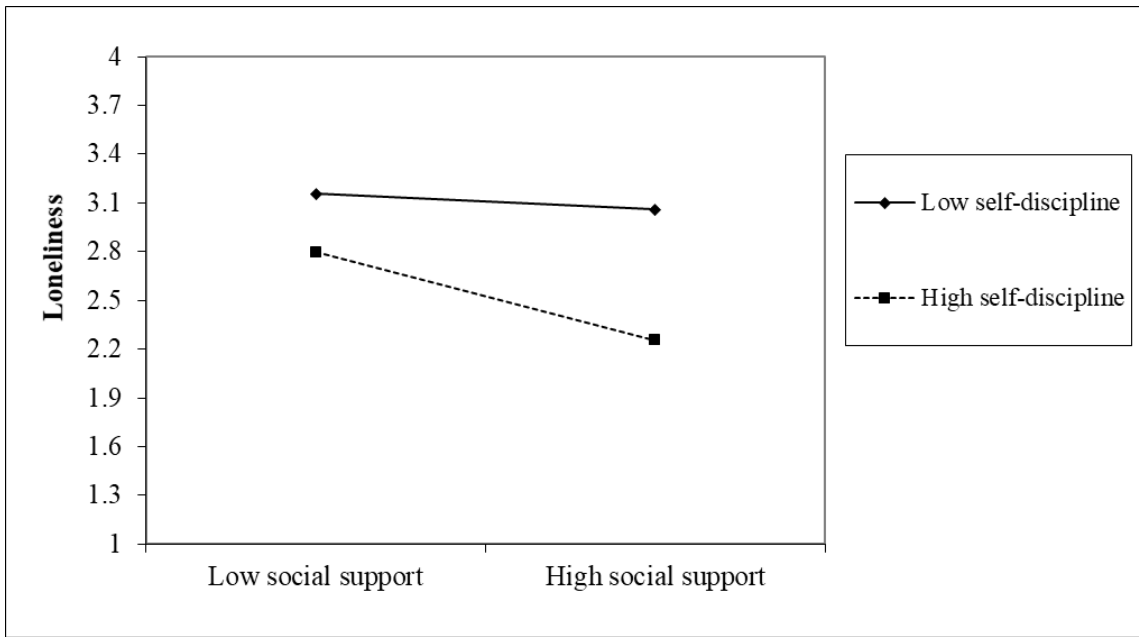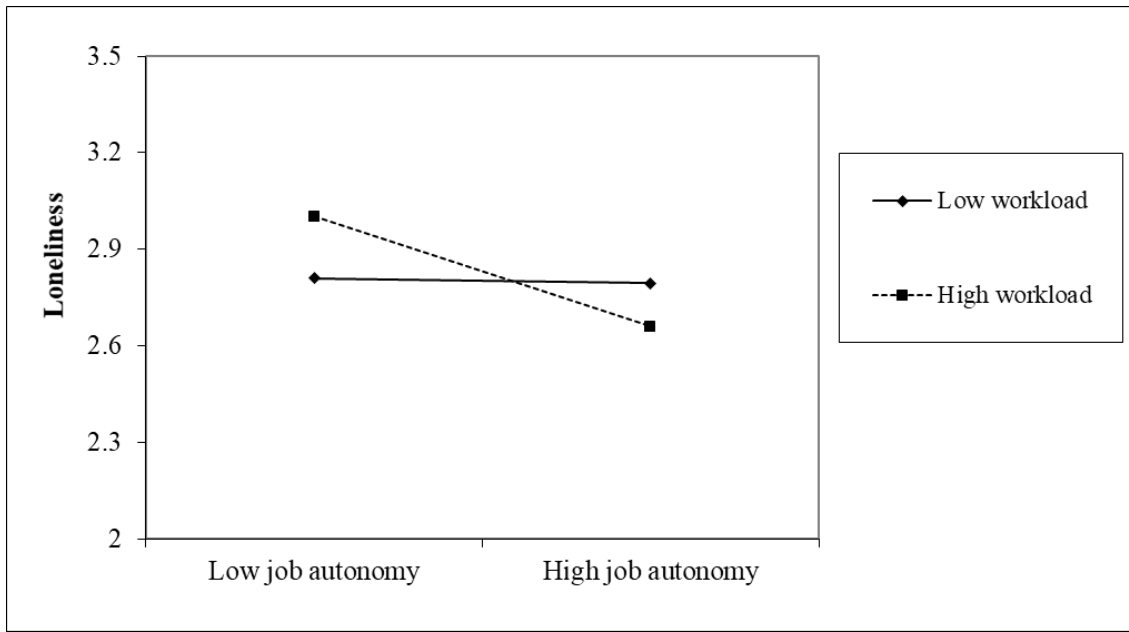
Figure 5 The moderating effect of workload on the relationship between job autonomy and

loneliness

Appendix A

Interview Protocol

Can you describe your work, life, or general psychological experiences during the period of

working from home?

- Positive aspects (e.g., collaborations, personal life, emotion, etc.)

- Negative aspects

Can you describe the potential factors that had influenced your work effectiveness and well-

being?

- Work-related factors (e.g., workload, colleagues, supervisors, etc.)

- Other factors (e.g., personal traits, caring responsibilities, family, etc.)

Do you think your work is suitable to work from home in the future?

- If yes, why?

- If no, why?

Chapter 5: General Discussion

The overarching goal of this thesis is to understand the intertwined relationships among technology, human beings, and work. In this chapter, I articulate how the research presented in this thesis can deepen our understandings on ICT-enabled working experiences, and how our findings can stimulate the development of work design theories. Finally, several directions are presented for future research.

Overall Implications

The current research addressed three research questions: *How does ICT use at work affect individuals and what are the boundary conditions? What does ICT-enabled work look like? What are the major challenges that employees are struggling with in ICT-enabled work?* In what follows, I will discuss a set of important theoretical and practical implications from our findings.

A New Way of Seeing ICT-enabled Work

ICT-enabled work encompasses three crucial factors—technology, humans, and work. As identified in the literature review (Chapter 2), organizational behavior (OB) scholars usually regard technologies as the organizational or work context, while work elements are largely overlooked in management information system (MIS) research. Merely focusing on two factors (i.e., either the relationship between work and humans r or the relationship between technology and humans) is theoretically problematic, as it may result in negatively biased appraisals of technology and inconsistent findings on technology's influences. The research in this thesis helps to overcome these limitations in the existing literature, moving towards a new way of seeing ICT-enabled work by integrating technology, humans, and work through the work design perspective.

First, taking account of *ICT usage* at work helps to avoid the negative stereotypes about ICT found in the OB literature. Given the unprecedented march of ICT into our work

and life, ICT and its associated effects are becoming crucial predictors of individuals' work effectiveness and well-being. Yet biased underlying beliefs about new technologies commonly exist in the workplace (Elsbach & Stigliani, 2019). Most studies from OB research have focused on the unintended consequences of ICT, as discussed in Chapters 2 and 3. For example, attention has been largely devoted to issues such as cyberloafing (e.g., Khansa et al., 2017), cyberbullying (e.g., Farley et al., 2016), and ICT-related demands (e.g., Rosen et al., 2019). However, even without the use of ICT in the workplace, individuals may still loaf on the job, bully others, or become exhausted with extra work demands after working hours. ICT, in these cases, is merely a tool that employees use to achieve their work-related goals or a medium through which employers/managers control their workers.

In the traditional manufacturing context, it is understandable that OB scholars focused mainly on the challenges or problems raised by machines (e.g., assembly lines) yet neglected how workers used these machines, which was studied more by researchers of ergonomics. With machines becoming more advanced in today's workplace, manifested through various forms of ICTs used at work, and affecting workers in different fundamental ways, it is timely and important for OB scholars to gain a more comprehensive and contemporary understanding of the role of technology in today's ICT-enabled work.

It might be hard to evaluate the nature of a particular ICT (i.e., whether it is inherently good or bad). The impacts of a technology, in fact, depend on how the technology is used (Orlikowski & Scott, 2008). For example, people can share positive news about their organizations on social media to promote their organizational reputation, but in the meantime they can also use social media in bullying others. In light of this, in Chapter 2, I advocate that we need deeper insights into *ICT usage*, including how technology is used in the workplace and how technology interacts with the work context and individual characteristics in influencing individuals, rather than discussing ICT in a generic way.

To have a more holistic picture of ICT usage at work, we conducted an interdisciplinary literature review, focusing on both positive and negative aspects of workplace ICT use as well as the boundary conditions. In other words, we provide a more proactive and less deterministic perspective on workplace ICT. Our findings show that ICT use can lead to desirable employee outcomes via work designs wherein the usage of ICT coincides with personal (e.g., gender, segmentation preference, time management ability) and social factors (e.g., organizational norms, IT technical support, internet use policy) but it will hurt individuals when the usage does not fit well with personal and social characteristics.

This argument received further support in Chapter 3, in which we stated that daily social media use positively related to perceived social connectedness for busier workers (i.e., those with higher workloads), which in turn, enhanced their daily task performance and life satisfaction. That is because employees with higher workloads can fulfill their needs for belongingness in a more convenient manner with social media, as the flexibility afforded by social media fits perfectly with their scarcity of time.

Through emphasizing individual ICT usage at work, this research helps to shift the locus of understanding from identifying the unintended consequences (e.g., technostress, constant availability) of advanced ICT to exploring *how*, *when* or *for whom* ICT use is beneficial or harmful. This shift in approach means that humans have agency over technology and they can proactively utilize ICT to thrive at work through using it in smarter ways (e.g., employees with high workloads can utilize social media to meet their needs to belong). OB scholars have responsibilities to help individuals to embrace the digital revolution, helping the right people to use ICT in the right place at the right time. To achieve this goal, the integrative framework (Figure 2.1) identified from our review serves as a theoretical foundation for future explorations, and our following research (Chapter 3) on the bright side of social media sets an example within this framework.

Second**,** incorporating "work" into the technology-human interaction helps to integrate accumulating knowledge in MIS with a novel theoretical angle (i.e., the work design perspective). Though ICT plays a central role in MIS research, scholars have shown limited attention to work elements while examining the influence of ICT use. As identified in our literature review, they focus on employees' immediate use experiences (e.g., frustration with computers) with the concrete work context faded into the background. The omission of "work" in the workplace technology-human interface will eventually hinder theoretical development. For example, scholars may lose opportunities to capture how ICT use shapes the nature of work and how ICT use interacts with the embedded work context (Forman et al., 2014).

In this research, I addressed this limitation by framing work characteristics either as underlying mechanisms or as boundary conditions in the relationship between workplace ICT usage and individual outcomes.

First, shedding light on the mechanisms between ICT use and employee outcomes (e.g., performance and engagement) can contribute to a better understanding of the ICT's paradoxical effects. ICT use provides employees with resources at the cost of raised demands. Using ICT may help to reduce exhaustion via reducing cognitive demands, but it may also increase exhaustion via increased learning expectations, multitasking or ICT-related hassles (Wang et al., 2020). Thus, I propose work design as a powerful mediator to interpret the influences of ICT use on individuals. As shown in our literature review (Chapter 2), individual outcomes are not only caused by human-technology interactions; instead, ICT use may change the work system in which individuals are embedded (i.e., changing a set of work characteristics), thereby influencing people in a more fundamental way. In other words, ICT use may exert paradoxical effects on employee outcomes.

Besides, the current research also proposed the constraining role of the work design in technology-human interactions. Study 2 supported this argument by showing that the affordance of a technology is influenced by work characteristics. That is, using a technology might be beneficial for certain types of work, but it might be harmful in other work contexts. This finding is consistent with the sociotechnical systems theory in that technology cannot function solely on its own merits and its impacts depend on the goodness of fit between the technological system and the social system.

Together with the last point, this research demonstrates that ICT and work mutually shape each other. ICT use can shape the nature of the work; on the other hand, work design can also influence the affordances of ICT. This research thus not only presents a theoretical perspective to integrate previous findings, but also bridges the gap between OB and MIS research by incorporating "work" into technology-human interactions.

New Thinking about Work Design in the Digital Age

This research contributes to the development of work design theories in the current digital age. As Oldham and Hackman (2010: 465) reflected, "for research and theory on job design… the very phenomena being studied are changing." I argue that changes brought by technological innovations serve as a driving force in theory development (Chapter 1). For example, to deal with the inefficiency problem in railway and steel industries, Frederick Taylor developed the scientific management theory; the widespread use of assembly lines led to the "low-morale" problem, and JCM was therefore developed to enhance motivation among workers. So, *what has been changed by contemporary ICTs*? The answer to that question might be the first step in developing work design theories in the digital era.

One of the most obvious and essential changes brought by ICT is that ICT creates an *electronic space* (Cascio & Montealegre, 2016). In the traditional manufacturing context, usually jobs and roles are separated by time and space (Cooper & Foster, 1971). However,

the electronic space afforded by advanced ICTs brings a unique context that we have never

seen before, in which people can work, collaborate, or communicate with others virtually

without temporal and spatial constraints (Cascio & Montealegre, 2016). The combination or

hybridization of physical space and electronic space in ICT-enabled work inevitably leads to

a new way of working and raises a series of problems for work design researchers to solve

(Xie et al., 2019). For the task aspects of work, our literature review (Chapter 2) and research

on remote working (Chapter 4) have identified the following challenges in ICT-enabled

work: information overload, multitasking, procrastination, interruptions, (ICT) learning

demands, ICT-related hassles, ubiquitous surveillance, ineffective online communication, and

work-home interference. For the relational aspects of work, we found that individuals suffer

from weak expressive social ties, cyberbullying, and loneliness in ICT-enabled work.

Our discoveries and findings raised more questions than answers. New problems and

challenges in ICT-enabled work require new thinking for work design theories. Though our

research cannot directly address these problems, it provides two approaches to enrich work

design theories and help individuals thrive in ICT-enabled work with contemporary

knowledge.

Work design in the electronic space. Limited research has explicitly explored the role

of work design in the electronic space (e.g., work design in the remote working context), as

discussed in Chapter 4. We need a fresh understanding of work design in the highly

digitalized context, as work design in the electronic space may function differently. For

example, email demands can directly blur work-life boundaries, and exert negative spillover

effects on individuals and crossover effects on their significant others (Becker et al., 2019),

whereas in the physical workspace the spillover or crossover effects of traditional demands

(e.g., the workload) are more indirect. Job autonomy/control in the electronic space can also

easily exert spillover and crossover effects. As mentioned in Chapter 4, electronic

monitoring, used as a technology in controlling remote workers, hurts life satisfaction through increasing remote workers' work-home interference.

In addition, as Gibson et al. (2011) identified when examining the classic JCM 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, they advocated that work design theories need to be developed or modified in the highly digitalized context.

Our research on remote working is a good example to demonstrate new thinking about work design in the electronic space (see Chapter 4). According to work design theories, job autonomy, reflected through practices such as flexible working arrangements, can help to alleviate work-family conflicts, as employees working from home can better attend to their family obligations without sacrificing their work effectiveness. However, this may not be the case if their remote work is badly designed. As identified in Chapter 4, work-home interference was identified as one of the most prevalent challenges in remote working. Participants in our study stated that monitoring and their workload were two main causes of work-home conflicts during the period of working from home. In other words, employees might face even greater work-family conflicts when working from home than when working in the office, especially when they receive strict monitoring and a heavy workload.

The most important implication from our research on remote work is that, successful teleworking requires re-designing work to adapt to the digital ways of working. Given that most work in the future will be more and more digitalized, it is timely for scholars and managers to devote more attention to work design in the electronic space so as to improve employees' digital experiences.

Job quality and technology affordances. The idea that improving job quality through re-designing technology is rooted in the sociotechnical systems theory (Trist & Bamforth, 1951). Work design researchers, however, tend to regard technology as stable and, therefore, re-design the "work" to solve the problems (e.g., low motivation) raised by new technologies (Pasmore et al., 1982). In the current age, we can re-design work in the electronic space (i.e., by changing the social subsystem) to improve working experiences, but this process should come with changes in the technological subsystem. This is because most work elements such as routines and roles are embedded in technologies in ICT-enabled work (Volkoff, Strong, & Elmes, 2007). Employees usually accomplish their work and fulfill their different role obligations with the help of a series of functions afforded by ICT. In other words, employees' working experiences are currently largely influenced by the technological subsystem at work.

Early sociotechnical systems theorists argued that the technological 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 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 used technology allows customization. I therefore see re-designing technology, especially the technology *affordance*, as an avenue for improving job quality.

As discussed in Chapter 3, *affordance* refers to "the potential for action that new technologies provide to users" (Leonardi & Vaast, 2017: 152). When users can utilize a technology's material features to achieve their goals, we can say this technology provides an "affordance". Based on a technology's material features, different users may utilize a particular affordance for different purposes. For example, the smartphone's camera function is a material feature, and it can provide an affordance of recording images or videos. Users can utilize such an affordance either to document work processes or to record natural sceneries.

In the workplace, designing the job in the electronic space will change the nature of the work in a "top-down" manner; technological affordances, however, cannot directly improve employees' job quality. Affordances offer the potential for a series of self-initiated actions. That is, technological 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, remote workers usually collaborate with colleagues via enterprise social networking platforms (e.g., Microsoft Teams). If this platform *affords* informal social interactions (e.g., channels that are provided for non-work related online chatting), individuals will have more opportunities to interact with colleagues and to be socially connected with them. In contrast, employees will have limited opportunities to initiate or engage in online social interactions with colleagues, if this platform does *not* afford informal social interactions.

This argument is supported by our third study (see Chapter 4). As one participant stated, informal social interactions on social media helped him overcome loneliness during the period of working from home. Zhang (2008) made a similar point. She advocated that it is crucial to build *motivational affordances* that refer to "the properties of an object that determine whether and how it can support one's motivational needs" (Zhang, 2008: 145). Users will benefit from motivational technological affordances by utilizing those affordances to meet their psychological needs.

In sum, given that more and more work activities and roles are embedded in ICTs, managers should explore how to re-design jobs to fit the new ways of working, i.e., "a top-down" approach (Parker et al., 2017). However, building fruitful technological affordances and making job crafting behaviors possible, i.e., "a bottom-up" approach (Parker et al., 2017), is equally important. Work design theorists, therefore, should not merely focus on motivational factors in social systems (e.g., skill variety), but also take account of technological affordances that contribute to job quality in a more fundamental manner.

Summary

Altogether, the use of advanced ICTs is changing our workplace into an entirely different system more than ever before and therefore this prompts a need for further understanding of the complex relationships among technology, human beings, and work. The implications from our three studies can be generally summarized as follows.

First of all, our research has demonstrated that the work design perspective could effectively integrate accumulating knowledge across disciplines and guide scholars to explore newly emerged phenomena in the digital age. One of the major tenets of work design theories is that the technological subsystem at work is in an equal position with the social subsystem and personnel subsystem (i.e., humans). That means we need to comprehensively consider

these three elements with systems thinking while investigating ICT-enabled work experiences.

Second, our findings reveal the necessity and importance of explicitly examining the role of work design in the electronic space because the effects of work characteristics on individuals vary with the level of virtuality (Gibson et al., 2011). Practitioners should not merely implement advanced ICTs to increase efficiency, but also re-design the job in the highly digitalized context to accommodate the new ways of working, thereby improving employees' digital working experiences.

Finally, scholars and managers should also devote more attention to the technological subsystem. Technological affordances, acting as a fundamental role in the current digital workplace, will make particular behaviors possible. Employees, therefore, can utilize technological affordances to achieve a better person-job fit through their own crafting behaviors.

Future Directions

Technological innovations are ongoing; the next generation of technologies will breed new challenges as well as research opportunities. In the final section of this thesis, I present several promising directions that merit further study.

How do managers utilize technologies to design work? Technology will reinforce the impacts of work design, as it provides managers a powerful tool with which to supervise their employees. One of the major challenges of our time has been frequently discussed during the development of work design theories—how to achieve a balance between *optimizing technology to pursue efficiency* and *alerting technology to meet human needs*? When managers seek to achieve better efficiency, they are likely to expect technology to play a central role. For example, they may monitor employees at work through advanced surveillance technologies to reduce counterproductive behaviors (e.g., cyberloafing); they

may also simplify or routinize jobs to accommodate the features of technologies. When managers emphasize human needs, they may add more motivational affordances into ICTs (Zhang, 2008). For instance, they can add chatting or blog functions to enterprise social media platforms to facilitate social interactions among coworkers.

Though Morgeson and Campion (2002) argued that the relationship between human needs and efficiency may not necessarily be a trade-off, a lot of questions still merit further investigation. For example, when non-work-related ICT use helps employees to meet social needs at the cost of work effectiveness (i.e., a trade-off between opportunities for social interactions and efficiency), is it appropriate to monitor or prohibit personal internet usage at work? When introducing robots, this deskills workers and makes them feel purposeless (i.e., a trade-off between skill variety and efficiency). In this case, how do managers provide effective support for them? When upgrading technology which requires constant learning (i.e., a trade-off between extra demands and efficiency), how do employers provide technical support?

Answers to these questions may vary from individual to individual, and different answers (or beliefs) will lead to different working experiences. To promote good work design in the workplace, it is necessary to understand why managers design work with technologies in the way they do. Parker et al. (2017) have provided a comprehensive theoretical model to understand the antecedents of work design at multiple levels. They proposed that managers' KSAs (i.e., knowledge, skills, and abilities), motivations, and opportunities will influence their formal decision-making process, which was supported by their later empirical studies (e.g., Parker, Andrei, & Van den Broeck, 2019). Applying their framework to the case of designing work with technology, research is needed to examine how managers' attitudes towards technology, their previous technological experiences, and the macro technological

and social environments (e.g., cultural factors) influence their work design decisions via the mechanisms of KSAs, motivations, and opportunities.

In the broader picture, this topic is associated with the "Tech for Good" movement, which advocates that technology should be designed and used to improve social, environmental, and economic outcomes. In the workplace, technology should also be designed and developed to improve both employee welfare and efficiency (Parker & Grote, 2020). However, sometimes technologies are developed and implemented to achieve power holders' goals rather than meeting end-users' needs. For instance, Bernstein's recent review identified "a shift from people observing the technology to technology observing people" in the workplace (Bernstein, 2017: 217). Understanding the reasons why power holders at work use technologies in the way they do will help to design effective interventions to prevent technologies being used in bad ways.

How do individuals thrive at ICT-enabled work? Our review has identified a number of changes in work design caused by technology use. However, only limited research has addressed how employees cope with these changes (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). A recent meta-analytic review (Rudolph, Katz, Lavigne, & Zacher, 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. Remote workers in this study reduced teleworking

frequency to obtain more face-to-face interaction opportunities, thereby overcoming social isolation. In addition to social isolation, future research can explore how individuals react to other job demands/resources in ICT-enabled work, including constant connectivity, ubiquitous surveillance, uncertainty, low skill variety in automation, and information overload.

Besides, it is also important to identify which abilities are important for individuals to thrive at ICT-enabled work. Ollier-Malaterre et al. (2019) suggested the importance of technology management abilities in their recent literature review. They argued that individuals who can effectively manage constant connectivity, privacy, and online self-presentation are more likely to thrive in the digital age. In addition, results from Study 3 show that self-disciplined employees behave better in terms of coping with remote working challenges (e.g., procrastination and work-home interferences). However, research on this topic is inadequate. New ways of working nowadays are imposing new requirements on employees. Thus, identifying key KSAs needed for future work is essential for the training and development of the labor force.

How to define "worker", "employer", and "employment" in the future? The definitions of "worker", "employer", and "employment" are being questioned in nontraditional industries (e.g., the gig economy; Stewart & Stanford, 2017). An independent contractor or freelancer nowadays can work for several different organizations/clients; project-based practices and on-demand employment are becoming the new normal, as companies can reduce costs of training and development, and benefit from a wider global labor market. Work design theory builds on the premise that employers and managers have responsibilities to improve workers' productivity and well-being. However, the new triangular relationship between the gig worker, end-users or clients, and the digital intermediary (Stewart & Stanford, 2017) has replaced the traditional employer-employee

relationship. Thus, it might be hard to answer who has the responsibility to design a high quality job for gig workers. But the reality is that a bad job can hurt all stakeholders: gig workers, end-users, and the digital intermediary. As Wood et al. (2019) identified in their qualitative study, gig workers who hold a bad job reported more exhaustion, sleep deprivation, social isolation, etc. Eventually, workers' negative working experiences will reduce service quality, which, in turn, leads to poor customer experiences and damages the intermediary's reputation. Hence, improving job quality is still important and necessary in the gig economy, but the first step is to update the definitions of "worker", "employer", and "employment". This topic may go beyond the boundary of our discipline, therefore more interdisciplinary efforts are required.

Conclusion

In sum, this thesis reveals the effectiveness of the work design perspective in integrating the relationships among technology, human beings, and work in the current digital era. Implications from this research contribute to building a harmonious relationship between human beings and technologies in ICT-enabled work. However, technology is ever advancing and rapidly, which means that findings from the current research may lose some contextual relevance and may need to be updated in the future.

Yet one basic tenet of work design theories will be unchanged. Humans should always be placed at the center of the technological and social systems at work, regardless of what and how technologies are used. In light of this, I am confident that future technologies will not prevent or limit us in any way from thriving in our digitalized work. Human beings will strive to obtain the needed knowledge, abilities, and skills to embrace any changes brought by new technologies or new ways of working, as we always do.

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