

MOBILE, REMOTE AND BLUE-COLLAR: USING INFORMATION AND COMMUNICATION TECHNOLOGY TO ELEVATE WORKPLACE WELL-BEING

Research-in-Progress

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Abstract

Remote and mobile workers (RMWs) are typically blue-collar workers such as repair/installation engineers, delivery drivers and construction workers, who constitute a significant share of the workforce. They work away from a home or office work-base, and are highly dependent on ICT for completing their work tasks. Low workplace well-being has been a key concern regarding RMWs. The objective of this research is to understand how RMWs can use ICT use to elevate workplace well-being. Drawing from the Demand-Control theory, we first theorize that distinctive work characteristics faced by RMWs can be viewed in the conceptual framing of information-processing 'demands'. We then conceptualize RMWs' practices of ICT use as possible means of 'control' to counter these demands. In this research-in-progress paper we report on an interpretive and interview-based study of twenty-eight RMWs employed in two firms in the UK, across fourteen remote work sites. Initial findings reveal that while RMWs faced high levels of information-processing demands due to their work conditions, they also were able to develop practices of ICT use that enabled them to meaningfully address these demands. Further, we see indications that existence of these practices was associated with higher workplace well-being. Expected theoretical contributions and ongoing analysis are discussed.

Keywords: *IT enabled work, remote and mobile work, workplace well-being, ICT use practices, information processing demands, uncertainty, equivocality*

1. Introduction and Motivation¹

Remote and mobile workers (RMWs), described as nomadic, mobile and multi-locational workers, work away from both a home and an office work-base (e.g. Crawford et al., 2011, Huuhtanen, 2005, Kurland and Bailey, 1999). They are typically blue-collar workers who work from their cars/vans, at client's sites, or other sites that are remote from their employers' offices (e.g. Hislop and Axtell, 2007). Examples of RMWs include repair engineers, installation engineers, delivery drivers and construction workers. RMWs constitute an important and interesting segment of study because sustained increase in the growth of the service sector (e.g. telecom, construction, transport) over the last three decades has led to a significant increase in the number of employees whose work requires them to be spatially mobile (Felstead et al., 2005). Further, use of Information and Communication Technologies (ICTs) is a primary enabler of remote and mobile work. RMWs are almost completely dependent on ICT for completing their work tasks because in absence of physical connectivity to the workplace, ICT form the means through which they access all organizational information.

RMWs have low psychological, social and physical workplace well-being (Vartiainen and Hyrkkänen, 2010, Felstead et al., 2005, Crawford et al., 2011), with outcomes such as reduced productivity and poor task performance (e.g. Leung et al., 2014). However, even though use of ICT is an essential and ubiquitous aspect of RMW's work, much research focuses on its negative impacts on them. At the same time, RMWs use ICT in flexible and improvised ways in order to execute their work tasks (Felstead et al., 2005), which generates the possibility of orienting their ICT use toward *positive* effects. Our research objective is thus to understand how RMWs use ICT use to elevate workplace well-being.

Drawing from the Demand – Control theory in occupational psychology (e.g. Karasek, 1979), we first theorize that the distinctive work characteristics faced by RMWs can be viewed in the conceptual framing of the *information processing demands* of uncertainty (e.g. Galbraith, 1973) and equivocality (e.g. Daft and Mackintosh, 1981). We next conceptualize RMWs' practices of ICT use as possible means of *control over their information processing to counter these demands*. We then suggest that the demand and control can together shape work place well-being. We thus address our research objective through the following research questions - (1) ***What information processing demands are faced by RMWs?***; (2) ***What practices of ICT use do RMWs engage in?***; and (3) ***How do information processing demands and practices of ICT use shape the RMWs' perception of workplace well-being?***

In this Research-in-Progress paper, we report findings on the first two questions based on an interpretive study of 28 RMWs employed in 2 private sector firms (in the telecom service provision and construction industries) in the UK, across 14 remote work sites. Our analysis is based on about 25 hours of data from interviews conducted with the RMWs. At the time of the conference, if selected, we hope to present in addition, based on ongoing data analysis, insights on the third question. We speak to, among others, the 'ICT as an enabler of meaningful work' topic of this Track.

2. Literature Review

2.2. Remote and Mobile Work

Remote and mobile workers (RMWs) are individuals who spend the majority of their working time away from *both* a home and an office work-base. They are variously described as nomadic, mobile, multi-locational or dispersed workers (Crawford et al., 2011, Huuhtanen, 2005, Huws and, O'Regan 2001, Jacobs 2004, Kurland and Bailey, 1999). They are typically blue-collar workers who do not work from home, very rarely go to the offices of their employer and instead typically work from their cars/vans, at client's sites or other sites that are remote from their employers' offices (Hislop and Axtell

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2007, 2009, Laurier, 2004, Lyons et al., 2007, Axtell et al., 2008)². Examples of RMWs include repair engineers, installation engineers, delivery drivers and construction workers (Crawford et al., 2011), whose organizational tasks require them to be away from either their office base or their home for most of their working time (Crawford et al., 2009). They are connected to their colleagues and employer's offices through various ICTs (e.g. smartphones, laptops, tablets and associated communication links), using them for work related communication and information processing from multiple locations (Vartiainen and Hyrkkänen, 2010, Bailey and Kurland, 2002, Sullivan, 2003, Kleinrock, 1996).

The work of RMWs has a number of distinct characteristics. First, they need to be mobile with respect to two aspects – physically and interactionally (Vartiainen and Hyrkkänen, 2010, Kakiyama and Sørensen, 2004). The first implies physical movement from location to location, either to execute tasks at different sites or meet clients, colleagues or project team members. The second implies the need for communication and collaboration with non co-located supervisors, colleagues and project team members (Lipnack and Stamps, 2000). Second, their work tasks are dependent on their colleagues' work tasks. For example, executing a technical fault repair at a particular site may require tracking the fault, getting repair equipment and/or spare parts from different locations into a central place, and when necessary, liaising with colleague, clients or third party suppliers (Cattell et al., 2016). Third, they face time constraints because tasks have to be executed within strict deadlines (Cattell et al., 2016, Brown and O'Hara, 2003). Fourth, they face unpredictable circumstances. For example, in the case of technical fault repair, there is lack of predictability regarding what is to be done, where, and what equipment and spares would be needed. Therefore, even though RMWs may know their work situations broadly and approximately, they find it difficult to anticipate, on a given day for instance, specifically what they would need to do and what resources they might require (Brown and OHara, 2003).

2.3. Workplace Well-being

Low workplace well-being along the psychological, social and physical aspects (Robertson and Cooper, 2011) has been a consistent factor associated with RMW (e.g. Leung et al., 2014). In terms of the first, RMWs experience high levels of psychological distress at work (Crawford et al., 2009)³. Specifically they experience high levels of anxiety, role ambiguity, workload and work intensification (Quinlan et al., 2001, Vartiainen and Hyrkkänen, 2010, Felstead et al., 2003, 2005.). Such conditions are primarily attributed to low decision authority, constant time pressures and the dynamic nature of their work (e.g. Bowen et al., 2014, Pocock et al., 2007, Asquin et al., 2010, Mohr and Wolfram, 2010, Turner et al., 2008). In terms of the second, RMWs work individually from remote sites, without communal and face-to-face interaction with colleagues and supervisors. They face potentially high levels of social isolation and even social dysfunction (Crawford et al., 2011, Felstead et al., 2005). Third, in terms of physical well-being, working from mobile and on-site spaces such as vans and equipment sheds, RMWs may face physically cramped and inconvenient conditions (Vartiainen and Hyrkkänen, 2010, Brown and O'Hara, 2003). Low workplace well-being for RMWs is associated with adverse work outcomes such as reduced productivity (Gatti et al., 2014), poor task performance (Leung et al., 2016), increased turnover (Cooper and Dewe, 2008), and even accidents (Leung et al., 2012). It is thus an important workplace concern.

2.4. Use of ICT by Remote and Mobile Workers

The use of various types of ICT – such as mobile phones, laptops, remote log in applications, communication applications - is an essential and ubiquitous aspect of the work of RMWs. They are often the means of accomplishing their work tasks. However, research shows that the use of ICT can

² In current work arrangements, individuals can typically work from three places - the employer's premises, the home, and all other locations beyond home and office. For the last one, blue-collar workers work at client sites or cars/vans or remote work sites (Crawford et al 2009, Hislop and Axtell 2007, 2009). White-collar workers such as consultants and sales professionals work at client sites, in hotels, or in trains, airport lounges and planes. The focus of our study is on the former.

³ Studies have shown that as high 65% of RMWs may be subject to high psychological distress *Twenty-Sixth European Conference on Information Systems (ECIS2018), Portsmouth, UK, 2018*

actually have negative impacts on RMWs. For example, there are negative spill-overs between work and non-work activities. Service engineers have been known to use smartphones for social interactions during work hours, resulting in a blurred work/non-work boundary and leading to potential conflict, information overload and work overload (Hislop and Axtell., 2011). Or, RMWs could engage in dangerous ICT use such as multi-tasking between phone conversations and driving (Laurier 2004, Middleton and Cukier, 2006). Further, ICT mediated communication can be prone to potentially fatal misunderstanding, especially in work sites that involve the use of heavy machines or human security (Vartiainen and Hyrkkänen, 2010).

3. Research Problem and Research Question

Consideration of the literature reported above reveals the following salient observations. Firstly, RMWs experience low workplace well-being. However, the conditions that cause it are inextricably linked to the inherent nature of RMW and cannot perhaps be eliminated. Even further, RMWs coping efforts at tackling their low workplace well-being have not been known to be effective (Leung et al 2012, 2016, Peterson and Zwerling, 1998). Second, therefore, it is important to understand how this low well-being can be increased (Turner et al., 2008, Aitken et al., 2007). Third, even as the use of ICT enables RMW and is extensive and pervasive, research focuses largely on the *negative* effects of ICT use on RMWs. Finally, while the inherent nature of RMW cannot be substantially changed, RMWs' use of ICT is likely to be more amenable to flexibility and adaptability, and can hence be oriented towards *positive* effects. Thus, the research question we seek to address is: ***How can ICT use elevate workplace well-being in remote and mobile work?***

4. Theoretical Framework – Job Demands and Job Control

Although the literature recognizes that the characteristics of RMW can be associated with low workplace well-being of RMWs, it does not explain how that happens (Richter et al., 2006, Vartiainen and Hyrkkänen, 2010, Bowen et al., 2014). To conceptually frame our approach to the research question, it is possible to theorize two aspects of RMW work.

First, literature shows that RMWs face distinctive conditions at work because of their mobility and lack of physical accessibility to the workplace as well as due to the technical nature of their work. These characteristics can be viewed in the conceptual framing of information processing **demands**. Specifically, it is possible to suggest that these demands manifest in *uncertainty* (e.g. Galbraith, 1973) and *equivocality* (e.g. Daft and Mackintosh, 1981) of information processing. The first happens when there is lack of information necessary to execute a particular work task. The second happens when the information that is present to execute a particular work task is difficult to interpret because its meaning is ambiguous. The characteristic of, for example, 'mobility' creates uncertainty because, among other things, it leads to lack of knowledge regarding where colleagues are, at any given point of time. The characteristic of unpredictability may lead to equivocality because information available may be partial or not easily interpretable in a changeable work situation.

The second observation is that RMWs can exercise *autonomy* in their use of ICT. That is, they have **high control** over how they use ICT. Such control is manifest in how they often engage in improvisation to execute their work tasks, such as working in mobile vans if remote work sites do not provide appropriate physical spaces, and adapting on technical tasks if equipment is not readily available (Brown and O'Hara, 2003). Their practices of ICT use are also in support of this; they use ICT such as laptops, phones and applications in emergent, non-mandated and unplanned ways to execute their work (Brown and O'Hara, 2003, Felstead et al., 2005).

The Demands Control framework (e.g. Karasek, 1979), suggest that when job demands are effectively addressed by high job control, the individual's workplace well-being is high. 'Demands' refers to requirements perceived by the individual to undertake their work tasks (Demerouti et al., 2001, Cattell et al., 2016). In the case of RMWs, the job characteristics of mobility, unpredictability, time pressure and task dependency lead to **high information processing demands** manifest uncertainty and

equivocality. 'Control' refers to the extent to which an individual feels they can exert influence over their work tasks (Karasek, 1979, Cattell et al., 2016). Although, typically RMWs have low job control because their decision latitude and authority are limited, as we noted above, literature shows that they do exercise **high control regarding their practices of ICT use**.

Research shows that both high demand and high control can be beneficial for work place well-being whereas high demand and low control can cause burnout and stress (Cooper et al., 2001, De Lange et al., 2004). Thus, because RMW's experience both high information processing demands and high control over their use of ICT, we draw from this framework to conceptually suggest that RMWs' lack of well-being is shaped by the high information processing demands that they face, which can be countered by their practices of use of ICT to effectively address these demands. Seen through this sensitizing theoretical framing, it becomes apparent that when RMW's appropriately exercise their autonomy and control, such that their practices of ICT use address their high information processing demands, their workplace well-being is favourably influenced.

Thus, it is possible to view our overall research question - *How can IT use elevate workplace well-being in remote and mobile work?* - as a set of three sub-questions. These are - (1) *What information processing demands are faced by RMWs?*; (2) *What practices of ICT use do RMWs engage in?*; and (3) *How do information processing demands and practices of ICT use shape the RMWs' perception of workplace well-being?*

We present below, empirical findings to address the first two questions. At the time of the conference, if selected, we hope to present based on ongoing data analysis, insights on the third question.

5. Research Methods

The empirical data to for this study was collected from 28 RMWs from two private sector firms in the UK. The firms belonged to two service industries - telecom service provision and construction. Every participant was a mobile worker who went from site to site to execute various tasks and/or worked on different sites simultaneously. Their tasks included site work/engineering/supervision, transport supervision, field maintenance, field service, repair engineering, site contract management. The study participants had the following organizational roles – field engineer/supervisor (9), equipment maintenance/repair engineer (5), site worker/supervisor/engineer (10), transport supervisor (2), and site contract manager (2), for a total of 28. Data was collected through interviews, conducted in person by the author with each participant at the respective RMWs' work sites, covering 14 remote work sites in the UK. Each interview lasted from 30 minutes to an hour.

We used the Demands Control framework as the sensitizing lens (Walsham, 2006) for conducting our interviews. We asked open-ended questions pertaining to (1) job conditions, work norms, and information processing; (2) how they used ICT at the workplace; (3) resources available to them; (4) situations in which they experienced high and low well-being. All the interviews were recorded and transcribed, yielding several pages of text. They were content analysed to understand the themes that the data contained. There were two groups of themes. The first group represented the broad concepts that emerged from the data, and the second group, specific sub-themes within each broad concept. The analysis utilized a combination of axial and open coding (Strauss and Corbin, 1998, pg. 101&123), wherein emerging data was compared against existing themes and sub-themes. Axial (open) coding was used to identify data that reflected existing (emergent) themes and sub-themes. This process combining axial and open coding allowed us to understand the concepts as they emerged and relate them to the literature elements that informed data collection.

6. Findings

The (ongoing) analysis so far has yielded two broad themes and their constituting sub-themes that address the first two sub-questions. They describe respectively - (1) information processing demands that RMWs face; and (2) their practices of ICT use. We next describe and illustrate these two themes and their sub-themes, as answers to the first two sub questions.

6.1.Sub-Question 1: What information processing demands are faced by RMWs?

RMWs faced a number of information processing demands relating to uncertainty and equivocality as we show below. All names of individuals and sites are anonymized.

Traceability: RMWs were required to be identifiable and traceable by location, even as they were mobile. Traceability was important in order to allocate jobs, and to work out who was going to take care of which job. This was associated with uncertainty because information needed to trace people was difficult to obtain given that people were on the move. A field engineer said, *'We need to know which other of our colleagues are where. Like today they rang me to say 'we've got an important fault in Leyland'. I said to them 'well give Gordon a ring, because he's near that site and can get there before I can', because I knew where he was.*

Responsiveness: RMWs needed to respond to situations quickly and in the heat of the moment. The situation usually related to a breakdown/fault that had to be quickly repaired or a task that needed to be quickly completed. This was associated with equivocality because it involved trade-offs among potential task situations. A field engineer said, *'A lot of the jobs have a time target that we've got to try and hit. So, it's a judgment call and the way I see it is if my boss asks 'Why didn't you do that job, because you went somewhere else and did another job, why did that one fail?' If I can say well that one's got a lot more customers potentially affected, or I know it's part of another problem.....'*

Knowledge Work: RMW required tasks such as repair, trouble shooting, engineering and client solution development. These were associated with equivocality because solutions were not straightforward or the problem were not familiar, and there were ambiguity in how information, e.g. client requirements, equipment status, could be interpreted. A repair engineer said, *'When I'm changing a router or a switch or hub, we have a big array of different leads and cords and things. So, quite a few times I've got to something I've never done before and I say we'll just fire it in, log into it and do this...they don't tell you what to do, it's just up to you.*

Boundary Spanning: RMWs were often required to co-create and devise solutions with customers and third party contractors/vendors. This was associated with uncertainty because information from them was not always available. A site contract manager said, *'Yeah there's been the occasion where the client has had a deadline for information they wanted and left it very late to ask for that information and its meant quite a lot of work involved producing documentation for the meeting.'*

Emergence: RMWs faced unexpected conditions could not be predicted beforehand. This could be because, for instance, material did not arrive as expected or because a task itself was more complicated and difficult than anticipated. This created both uncertainty and equivocality. Uncertainty because the information to deal with the unexpected situation was not always available and equivocality because the unpredictable situation was often complicated to deal with, especially under time pressure. A site supervisor said, *'The plan at the weekly meeting will be we're doing A, B and C. A could be build a wall, B could be clad a wall, C could be doing some drainage. You turn up and obviously you've planned but then you find the pipes haven't arrived and you don't know where they are and someone has not turned up and you don't know why.'*

Coordination: RMWs needed to coordinate among different aspects to complete a task. These included materials, equipment, specifications, information about faults etc. All the associated elements of information needed to come together in order for the task to be completed, with a potential for uncertainty because they may not have been available. A traffic manager said, *'Now I've got all the materials, but the rubble and soil have to be shifted. My biggest hindrance is not having enough wagon time. I need a wagon constantly and unfortunately it is been split between jobs. So if I can't get the rubble off site then I've got people standing around doing nothing.'*

6.2. Sub-question 2: What practices of ICT use do RMWs engage in?

RMWs exercised control over how they used their workplace ICT. We describe and illustrate the following practices of ICT use that were not mandated or specified, but improvised and self-shaped.

Self-selection of tasks: RMWs used ICT to self-select their own jobs. This provided a means to tackle the emergent nature of tasks because the ability to self-select meant that they could exercise discretion over what they did. A repair engineer said, *'it's a judgement call every day, you decide which job you want to pick and pin them to yourself and then using the [application]. It's basically a list of jobs out there and we can go in and we can decide... we can pick any job we want and go and do it.'*

Self-prioritization: RMWs used ICT to prioritize their jobs. This enabled them to deal with unexpectedly long or short times to complete their jobs (for example, because of interdependent tasks and coordination needs) by adjusting their tasks lists. A field maintenance engineer said, *'I have too much work but the technology itself does help find out what is the most important issue at the time to be dealt with. Sometimes I have too many issues so you just have to prioritise.'*

Device demarcation: RMWs received task related information on different devices and applications. On an average, each RMW we interviewed carried at least two workplace ICT devices – a laptop and a smartphone. Some had two smartphones and a laptop. Each device had different applications that needed to be accessed for completing work tasks- such as remote equipment log in applications, communication applications (e.g. email, Skype and Slack), and task workflow management applications. The potential danger was not being able to access the devices and applications when required, which given the time pressure, could lead to delays. RMWs worked out device demarcation strategies such that they knew what device and application they would use for what task, depending on what information they wanted to access and how.

A site supervisor said, *'I always pick up my emails on my phone and then if it's a short email I'll just use my phone to write back but if it's a longer email or I need to sort of get information from the laptop, i.e. drawings or quotations and stuff I'll go onto my laptop and use that.'* A field engineer said, *'if you wanted something urgently, with Skype, you can actually see if people are online so you might instant message them to say, 'can you talk?' and then you would ring their mobile. Because with emails not everybody gets back straight away.'*

Technical support: Given that they faced complex technical tasks, RMWs used ICT to give and receive technical support to and from colleagues. This was critical for sharing experiential knowledge about specific equipment or technical tasks. They used a location tracker application to track their colleagues, a task tracker to understand if they were stationary or mobile, and ICT devices and applications as per their demarcation strategy to contact them. A field engineer said, *'If I have a piece of equipment and I'm not sure or want some advice from a colleague I take a photograph, email it to them, or do a Skype video call and say, 'have a look at this, what do you think' for a second opinion.'*

Social support and constructive distraction: Given the potential for social isolation inherent in their jobs, RMWs used ICT to give and receive social support to and from their colleagues, maintaining social conversations and contact. A field engineer said, *'We tend to be quite close-knit. We talk to each other and if we have any problems we'll speak to each other ... it's never an email. It will maybe start off as an email but always ends up with a conversation over the phone.'* They also used ICT for distracting themselves from the isolation in a constructive way. A repair engineer said, *'Sometimes, I have a little five minutes just playing on the laptop, go on the internet, look at motorbikes or things like that [smiles]. [Given lack of people around] you just find things to amuse yourself while you are doing your work.'*

Visible communication trails: RMWs used ICT to create and record trails of communications, such that in spite of their mobility, task interdependence and task unpredictability, information that was key to a task was logged in. Engineers for example logged their workflow steps on an application, with notes about what went wrong or right. This was also done for boundary spanning communication with

external partners. A site engineer said, *'I very rarely text clients. I usually first have a phone conversation because I'd rather speak to someone on the phone and say this is the problem, how are we going to deal with it? We'll come up with a solution and then I'll put it in an email. That way if someone else comes out and says why are doing it like that, I'll say this is what the [client] said.'*

7. Discussion, Ongoing Analysis and Expected Theoretical Contribution

We found that all RMWs faced high levels of information processing demands. However, many were also able to develop practices of ICT use that enabled them to control key aspects of their job such as what tasks they undertook, how they prioritized those tasks, and making their task execution steps visible to their colleagues. Taken together these practices helped to reduce uncertainty and equivocality. Thus, they provided a means to meaningfully counter the information processing demands.

Further, we see indications that the existence of practices of ICT use was associated with higher levels of workplace well-being. For example, the practice of using ICT to seek social support elevated the RMWs social workplace well-being by helping cement a sense of togetherness and professional camaraderie. Similarly, the practice of using ICT to self-allocate jobs enabled the RMWs to minimize their travel, thus elevating physical well-being in a work situation that is already physically demanding to begin with because it involves high mobility. Additionally, the practices of device demarcation enabled RMWs to experience a sense of control over how and when they processed work related information, avoid problems such as information overload, and experience greater psychological wellbeing.

It is thus possible to make a preliminary suggestion that RMWs who engaged in one of more of the practices of ICT use experienced higher levels of workplace well-being. This points us to a potential way to understand how information processing demands and practices of ICT use together shape workplace well-being for RMWs - greater control over information processing through particular practices of ICT use enables RMWs to address the information processing demands of uncertainty and equivocality to a greater extent, resulting in higher workplace wellbeing.

For ongoing and future analysis, we aim to examine the above suggestion in greater detail. Specifically, we are examining three more themes in addition to the two we reported, namely - (3) ICT management policies of the organization; (4) different aspects of the RMWs' workplace well-being; and (5) occasions of intersection between information processing demands, practices of ICT use, and the ICT management policies of the organization. The ongoing data analysis is focused on understanding how the themes individually and together, shape the workplace wellbeing perceived by RMWs. This will be potentially presented at the conference if the paper is selected.

In terms of theoretical contributions, firstly, we develop a conceptual understanding of why RMWs face low workplace well-being due to high information processing demands and how they can effectively address the demands through particular practices of ICT use. In doing so, we contribute to understanding of workplace well-being in this highly prevalent type of work. Secondly, we extend understanding of the role of ICT for the well-being of RMWs, thus far seen as largely negative, to positive and elevating. Our findings are potentially transferable to other, related types of work. Increasingly now, organizational work is being carried out in different places other than fixed office spaces, and workers are required to be spatially mobile to carry out their work (Felstead et al., 2005; Hislop, 2008). At the same time, pervasive use of ICT forms the workflow backbone of such work. Prominent examples include working out of delivery vans (e.g. Deliveroo) and taxis (e.g. Lyft and Uber). While there are increasing practical instances that these new types of mobile work adversely affect the well-being of workers, studies that connect the *characteristics* of work to the worker's experiences of well-being are scarce (Richter et al., 2006, Vartiainen and Hyrkkänen 2010). Seen in this light, while our results arise from the context of RMW, they may well have implications for how control over ICT use can offset difficult demands from other types of mobile work.

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