Coping with mobile technology overload in the workplace

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Abstract

Purpose – The overload effects associated with the use of mobile information and communication technologies (MICTs) in the workplace have become increasingly prevalent. The purpose of this paper is to examine the overload effects of using MICTs at work on employees' job satisfaction, and explore the corresponding coping strategies.

Design/methodology/approach – The study is grounded on the cognitive load theory and the coping model of user adaptation. The overload antecedents and coping strategies are integrated into one model. Theoretical hypotheses are tested with survey data collected from a sample of 178 employees at work in China.

Findings – The results indicate that information overload significantly reduces job satisfaction, while the influence of interruption overload on job satisfaction is not significant. Two coping strategies (information processing timeliness and job control assistant support) can significantly improve job satisfaction. Information processing timeliness significantly moderates the relationships between two types of overload effects and job satisfaction. Job control assistant support also significantly moderates the relationship between interruption overload and job satisfaction.

Practical implications – This study suggests that information overload and interruption overload could constitute an important index to indicate employees' overload level when using MICTs at work. The two coping strategies provide managers with effective ways to improve employees' job satisfaction. By taking advantage of the moderation effects of coping strategies, managers could lower employees' evaluation of overload to an appropriate level.

Originality/value – This study provides a comprehensive model to examine how the overload resulting from using MICTs in the workplace affects employees' work status, and how to cope with it. Two types of overload are conceptualized and corresponding coping strategies are identified. The measurements of principal constructs are developed and empirically validated. The results provide theoretical and practical insights on human resource management and human–computer interaction.

Keywords Information overload, Job satisfaction, Coping model of user adaptation, Coping theory, Interruption overload, Mobile information and communication technologies (MICTs)

Paper type Research paper

1. Introduction

Technology overload, including mobile application overload, information overload, communication and interruption overload, has become increasingly prevalent in the digital workplace. A recent survey conducted by RingCentral found that: more than 70 percent of employees say their communication volume is a challenge to the fulfillment of their work; 68 percent of employees toggle between mobile applications up to ten times per hour; 31 percent of employees indicate toggling causes them to lose their train of thought; and 56 percent of workers find searching for information from multiple sources disruptive

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(Brumberg, 2018). Workplace information and communication technologies are meant to help employees work more effectively and keep team members more focused in a collaborative way so that they can be more productive. However, employees are becoming more frustrated due to the extent to which they are overloaded by technology (Brumberg, 2018).

In particular, mobile information and communication technologies (MICTs) (e.g. smart phones, tablets and mobile application software) have been considered to help users overcome the physical strains associated with traditional business interactions (Cao *et al.*, 2016; Jeske and Axtell, 2014). On the one hand, the permanent connectivity of MICTs can increase the extent to which employees need to process multiple information demands (Jarvenpaa and Lang, 2005). On the other hand, the continuous connectivity of MICTs might induce individuals' feeling of cognitive overload, which is particularly significant in an era of information explosion (Hung *et al.*, 2011).

Since people make extensive use of MICTs, excessive engagement in interactions with MICTs has become commonplace. Considering the ubiquity of MICTs, it is reasonable to infer that the problematic mobile technology overload is one contributing factor to a reduction in employees' productivity and job satisfaction. Therefore, it is necessary to investigate the sources and the extent of technology overload caused by the use of MICTs in workplace, and examine its effects on employees' job satisfaction. Accordingly, we propose the following two research questions:

RQ1. Which technology overload factors exist and how will they affect employees' job satisfaction?

RQ2. Which coping strategies will decrease the overload effects of using mobile technologies in the workplace, and how?

In this study, through an extensive review of the literature, we identify two types of technology overload: information overload and interruption overload. Furthermore, based on coping theory and the characteristics of mobile technologies, we propose two specific mechanisms that may reduce individual perceived negative effects of MICTs usage in the workplace: information processing timeliness and job control assistant support. The coping model of user adaptation (CMUA) (Beaudry and Pinsonneault, 2005) is used as a framework to establish the research model.

The remainder of the paper is organized as follows. In Section 2, we review the literature about the technology overload phenomenon and associated coping strategies. Based on the literature review and theoretical foundations, we build our conceptual model and develop corresponding hypotheses in Section 3. In Section 4, we explain the survey research methods of this study followed by the data analysis. Then, we discuss the findings and suggest future research before concluding the paper with implications and contributions.

2. Literature review

2.1 Technology overload

In the era of the knowledge economy, the prevalently cooperative tasks undertaken by employees demand more effective and efficient information processing and communication in the organization (Mäntymäki and Riemer, 2016). Increasingly information systems, devices and applications for organizational or individual use are developed to support the requirements of human communication. The multiple sources of information and our communication requirements result in an increasing level of perceived overload by individuals. This phenomenon has been described as "technology overload" in the literature, and has been defined as "device proliferation and/or information overload that causes cognitive and physical burdens on human beings due to the use of multiple gadgets with multiple functions to accomplish multiple tasks in everyday activities" (Grandhi *et al.*, 2005).

Technology overload has been found to reduce individual productivity (Karr-Wisniewski and Lu, 2010), and increase the feeling of stress and decrease job satisfaction (Ragu-Nathan *et al.*, 2008; Tarafdar *et al.*, 2011). Typically, in the technostress literature, this phenomenon has been operationalized as one construct, i.e. techno-overload (Ragu-Nathan *et al.*, 2008). Hung *et al.* (2011) extended this stream of research to the ubiquitous technostress context and investigated the technology overload effects on job stress and individual productivity.

Scholars have recently investigated the technology overload phenomenon from two perspectives. The first is in the context of general organization IT environment, which focuses on organization supported technology (Karr-Wisniewski and Lu, 2010). The second examines the increasingly prevalent phenomenon of IT consumerization and Bring Your Own Device in the workplace (Yun *et al.*, 2012).

In the first stream of research, Karr-Wisniewski and Lu (2010) proposed three components of technology overload: information overload, interruption overload and system feature overload. The system feature overload "occurs when the addition of new features is out-weighed by the impact on technical resources and the complexity of use." That is, the system feature overload only happens in situations where the provided IT features, interfaces or functions exceed users' ability to cope with them or they are too complex to use.

In this study, we focus on the context of employees' proactive adoption of mobile technologies in workplace, where employees are "more aware of technology in the workplace and able to choose software and devices that are optimally suited to their work" (Niehaves *et al.*, 2013). Further, employees usually consider their own consumer devices and apps as easier and more intuitive to use (Harris *et al.*, 2012). Therefore, employees are more familiar with these kinds of devices due to work-life dual usage behavior (Niehaves *et al.*, 2013). The mobile technologies used for work purposes have been voluntarily and spontaneously selected by employees based on their own work practices and personal habits. The exploitation of privately gained competences enhanced their capability to cope with these mobile technologies at work (Niehaves *et al.*, 2013). As a result, the above-mentioned system feature overload is not considered an overload issue any more.

In addition, to the best of our knowledge, only one paper refers to the concept of "system redundancies" (Ortbach *et al.*, 2013). In their qualitative research work, four keywords are used to reflect the existence of system redundancies, which are "frequent changes of system, increased multi system usage, lack of comfort, redundancies of data" (Ortbach *et al.*, 2013). They claim that the main stressor in the system redundancies dimension is the "necessity to frequently switch contexts between multiple different channels." Therefore, this view is consistent with the research of Zhang and Rau (2016) who considered that the technology *per se* is the primary source of multitasking. Further, Aral *et al.* (2012) suggested that multitasking creates high cognitive switching costs. Therefore, the negative effect of system redundancy constitutes a cognitive overload due to the large amount of information that needs to be processed and the repeated interruption requests due to the frequent switching among multiple tasks through multiple technologies.

Thus, in this study, we focused on two primary negative effects of MICTs: information overload originating from multiple communication channels and interruption overload caused by requests enabled by MICTs.

Literally, the term "information overload" refers to a person receiving too much information (Eppler and Mengis, 2004). Researchers initially focused on investigating the inverted U-shaped relationship between individual performance and the received amount of information. When the received amount of information exceeds a certain point, individual performance will decline (Chewning and Harrell, 1990).

The definition of information overload also refers to a comparison between an individual's information processing capability and information processing requirements.

That is, the information overload will occur when the information processing requirements are greater than the information processing capabilities. The "capabilities" and "requirements" can be measured in terms of a certain time period. In addition, researchers have also claimed that the available processing time is an important element that causes information overload (Schick *et al.*, 1990; Owen, 1992; Iselin, 2010). In the information systems literature, information overload is treated as individuals' subjective experience. Scholars have indirectly investigated the level of information overload by empirically examining individuals' perceived levels of stress, anxiety or pressure (Haksever and Fisher, 1996).

Thus, in the current literature, the phenomenon of information overload involves two issues. First, it highlights the fact that individuals often receive a large amount of information. Second, it recognizes that individuals will experience information overload when their information processing capability is insufficient given the amount of information received. However, the adoption and widespread use of mobile technologies in the workplace means that the information overload phenomenon has become increasingly prevalent. The ubiquitous nature of mobile technologies provides users with multiple sources of information communication and the ability to be continuously connected. These functions cause users to be exposed to massive amounts of information, which enhances the perception of information overload.

In the current literature, there is no consistent definition of the concept of interruption overload. The term "interruption" refers to "any distraction that makes an individual stop his/her planned activity to respond to the interrupt's initiator" (Jackson *et al.*, 2001). The interruption overload construct is different from information overload because it highlights the frequent attention distractions in a given circumstance. In practice, individuals are required to process information from both internal and external sources in parallel, which results in high levels of interruption (Ragu-Nathan *et al.*, 2008). Therefore, in this study, we defined the interruption overload as the degree to which MICT users experience an overload of disturbance from unscheduled MICT interactions, or the discontinuity of current work activity because of MICT interactions that are not initiated by the focal employee.

It is worth noting that communication overload and interruption overload overlap in the literature. Frequently occurring communications are a major cause of interruptions (Ou and Davison, 2011). Thus, interruption overload occurs together with communication overload. Although these overloads may affect individuals in different ways, the two concepts are highly correlated. However, few studies have been conducted to distinguish the antecedents and impacts of these phenomena. In this study, we focus on the influence of interruption overload on individual job satisfaction.

The use of MICTs in the workplace causes interruption overload to increase; this is thus a topic that is worthy of more research attention. In the literature, researchers have investigated the influence of the synchronicity of IT on individual communication behavior. MICTs have been identified as highly synchronous technologies (Carlson and George, 2004). The existence of multiple communication channels supported by MICTs means that users may be frequently interrupted by unscheduled interactions, which require more cognitive resources to change among diverse mental models, and eventually result in high levels of perceived overload. On the other hand, the high synchronicity of MICTs means that users do not have enough time to effectively integrate information into a specific mental model. In this way, the frequent discontinuity of current tasks will also increase an individual's perceived interruption overload (Garrett and Danziger, 2008; Ou and Davison, 2011).

2.2 Coping strategy

Coping has been theorized as an effective way to reduce an individual's perceived stress level (Lazarus, 1993). From the perspective of coping theory, some researchers have also

investigated coping strategies when individuals experience overload that results in stress or other negative consequences (Lazarus, 1993; Weinert *et al.*, 2013). Coping theory incorporates two components: problem-focused coping and emotional-focused coping.

Specifically, problem-focused coping refers to redefining problems, generating alternative solutions, weighting the alternatives in terms of individuals' costs and benefits, and choosing the most appropriate alternatives so as to be able to act (Lazarus and Folkman, 1984). Research has shown that the person who uses a problem-focused coping strategy may more easily avoid the strains that occur between work and life (Lapierre and Allen, 2006). Emotional-focused coping consists of actions or thoughts to control the undesirable feelings that result from stressful circumstances (Thoits, 1986). However, while emotional-focused coping can change individuals' perception of the environment, it does not change the external environment itself (Beaudry and Pinsonneault, 2005).

According to the literature in the field of mobile technology usage, MICTs provide multiple functions to facilitate users' demands and requirements in a specific context by personalizing these MICTs. For example, users can add context-based applications and software, or configure personal tools for work. Some mobile applications have also been developed to help users manage their schedule, such as notes, clock, timer, caller ID, reminders and so on (Sarwar and Soomro, 2013). In other words, MICTs enable users to actively adopt available applications to organize their lives and therefore may eventually release their sense of being strained. According to coping theory, these supporting functions of MICTs are problem-focused coping strategies for users that have the potential to enhance individual work effectiveness.

In addition, MICTs can also help users cope with the negative effects by providing timely information. Previous studies in the mobile technology design and use fields have widely referred to the timeliness characteristics of MICTs. Basole and Chao (2004) defined timeliness as the degree to which a system provides a user with current and appropriate information; they concluded that timeliness is an important contributor to the perceived usefulness of mobile technologies. That is, the timeliness characteristic of MICTs fits users' demands for efficient information provision and processing. Based on this stream of literature, MICTs provide users with solutions to cope with potential strains in situations characterized by tight time limits or parallel task requirements. Therefore, we propose that the timeliness characteristic of MICTs could constitute an effective problem-focused coping strategy for users given the information timeliness and communication efficiency enhanced by using MICTs (Liang *et al.*, 2007).

2.3 Coping model of user adaptation

The CMUA was first proposed by Beaudry and Pinsonneault (2005). This theoretical framework is grounded on coping theory (Lazarus, 1993). The user adaptation concept is illustrated in light of the coping theory in the CMUA framework, and defined as the "cognitive and behavioral efforts exerted by users to manage specific consequences associated with a significant IT event that occurs in their work environment" (Beaudry and Pinsonneault, 2005). Two appraisal processes have been included in this model: primary and secondary appraisal. The primary appraisal is triggered by a significant IT event that an individual evaluates as an opportunity or a threat. In the second appraisal, individuals first evaluate their personal control of the IT event and second consider the adaptation options for them. Therefore, according to the two appraisal processes, four kinds of adaptation strategies are proposed, namely, benefits maximizing, benefits satisficing, disturbance handling and self-preservation. After the adaptation, there are different outcomes. The comprehensive framework of the CMUA (Beaudry and Pinsonneault, 2005) is shown in Figure 1.

The CMUA framework demonstrates how individuals can take different outcome routes after the two appraisal processes. Few studies have explored the negative

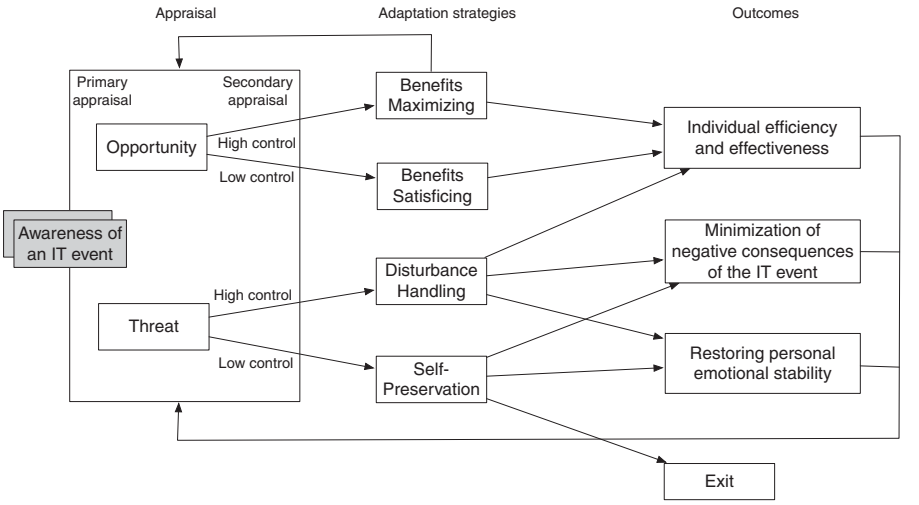

Figure 1.
Coping model of user adaptation (CMUA) framework

Source: Beaudry and Pinsonneault (2005)

consequences of IT, and even fewer researchers have investigated the positive outcomes of user adaptation to the negative consequences of IT use. According to the CMUA framework, while some users evaluate an IT event as a threat, those who have a high degree of control over the IT event adopt disturbance handling adaptation strategies, which may result in the improvement of individual efficiency and effectiveness. This route shows that a perceived threat turns out to enhance positive outcomes of employees by conducting appropriate adaptation strategies or coping strategies, which have been rarely studied in the literature.

In addition, according to CMUA, the outcome factors of user adaptation to the IT event are also worth exploring. IT applications exert negative impacts not only on human physical health but also on employees' psychological states (Lee *et al.*, 2014). The form and nature of work have been significantly changed as a result of MICT usage. Technology overload effects associated with the use of MICTs have also become increasingly significant. The new work forms may cause employees to experience a higher density of information exchange and greater negative impacts from work burdens. However, few studies have examined the effects of technology overload on aspects of employees' psychological status at work.

Current studies have treated job satisfaction as one of the main objectives of an organization that is undertaking the development and adoption of IT (Weiss and Leimeister, 2012). Locke (1976) first defined job satisfaction as "a pleasurable or positive emotional state resulting from the appraisal of one's job or job experiences." Therefore, job satisfaction has been treated as an important psychological output variable, and has also been widely studied in the technostress literature because of its influence on both employee and organization performance (Suh and Lee, 2017). Thus, job satisfaction is selected as the main outcome factor in this study.

To summarize, according to the above literature review, we adapted the CMUA framework to build our conceptual model of technology overload. In the context of MICT usage in the workplace, we propose two important technology overload factors and two problem-focused coping strategies that reflect individual efficiency and effectiveness. In addition, we also examine the moderation effects of two adaptation strategies on the relationship of perceived technology overload and psychological outcomes.

3. Hypothesis development

In this section, grounded on the CMUA framework and coping theory, we explain our research model and hypothesis development in detail. The proposed research model is shown in Figure 1. In the research model, we explore the relationships among the technology overload factors (i.e. information overload and interruption overload), coping strategies (i.e. information processing timeliness and job control assistant support) and job satisfaction. Table I lists the definition of each construct used in this study.

3.1 The effects of information overload

Information overload is an increasingly significant problem encountered by individual employees. The continuous experience of a high level of information overload resulting in high levels of cognitive load is one of the main sources of job stress (Folkman *et al.*, 1986). The use of MICTs in the workplace has made the working environment more complex and information rich (Bawden and Robinson, 2009). Individuals need to quickly respond to information processing requirements and have to identify useful information to best fit the task requirements and make related decisions or conclusions based on this information. Employees are often requested to effectively extract information that needs continuous concentration and more cognitive resources. This environment causes individuals to experience different degrees of negative effects, which directly reduce the positive emotions associated with work. Therefore, information overload is an important factor that can reduce individuals' job satisfaction. We thus hypothesize that:

H1. Information overload has a negative impact on job satisfaction.

3.2 The influence of interruption overload

A few studies have discussed the negative effects of interruption resulting from IT use in the workplace (Garrett and Danziger, 2008). Specially, overload effects of interruptions may result in negative impacts on an individual's life, such as increasing stress levels and leading to inefficiency (Karr-Wisniewski and Lu, 2010). In fact, knowledge workers experience a high frequency of interruptions, since with the proliferation of MICTs, employees require almost 5–15 additional minutes to regroup for productive thinking (Rigby, 2006). The high level of interruption overload results in less productive employees. Frequently switching between multiple tasks also leads to an increasing level of negative feelings, such as stress

Principal variables	Definitions	Sources and scales
Information overload (IO)	The degree to which MICT users feel that the amount of information exceeds their limited human information processing capacity	Adapted from Eppler and Mengis (2004)
Interruption overload (ITO)	The degree to which MICT users experience an overload of disturbance from unscheduled MICT interactions, or the discontinuity of current work activity because of MICT interactions which are not initiated by the focal person	Adapted from Ou and Davison (2011)
Job satisfaction (JOBSA)	A pleasurable or positive emotional state resulting from the appraisal of one's job or job experience	Adapted from Locke (1976)
Information processing timeliness (IPT)	The degree to which an individual perceives the support from MICTs for timely information processing	Developed in this study based on Liang *et al.* (2007)
Job control assistant support (JCAS)	The degree to which an individual perceives the support from MICTs by using related functions to help himself/herself influence or manipulate the work process	Developed in this study based on Hung *et al.* (2011)

Table I. Principal variables and definitions

or frustration (Eyrolle and Celler, 2000). Thus, interruption overload can directly cause individuals to experience negative emotional feelings. Accordingly, we hypothesize that:

H2. Interruption overload has a negative impact on job satisfaction.

3.3 Coping strategies

3.3.1 The influence of information processing timeliness. Timeliness has been identified as an important indicator to measure the fit between task and technology in the literature (Lee *et al.*, 2007). Timeliness has also become an important indicator of the effectiveness and usefulness of information systems (Sharda *et al.*, 1988). With the development of the global economy, traditional forms of work have been changed. Individuals have to communicate and coordinate with others who are geographically remote and may be located across different time zones. These increasingly complex work environments require individuals to acquire and process information in a timely fashion in order to support decision making.

Furthermore, in the mobile context, the importance of timeliness has been amplified (Basole and Chao, 2004). Information timeliness and communication efficiency have become two of the important affordances of mobile technologies, and have improved individual productivity and organizational profitability (Liang *et al.*, 2007). These affordances of mobile technology are attributed to the synchronous characteristic of MICTs (Ragu-Nathan *et al.*, 2008), which enable employees to simultaneously deal with multiple streams of information that may come from different sources and be related to different tasks (Straus *et al.*, 2010).

Thus, the information timeliness provided by mobile technologies is also closely related to end-user satisfaction (Zviran *et al.*, 2006). ICTs support users by providing the ability to process information quickly and more effectively, and improving the perceived quality of their jobs. Therefore, as a high synchronicity technology, MICTs effectively support users with information processing timeliness. Thus, we hypothesize that:

H3. Information process timeliness improves an individual's job satisfaction.

3.3.2 The effects of job control assistant support. Based on the task technology fit theory (Goodhue and Thompson, 1995), the fit among task requirements, technological characteristics and personal capabilities can lead to enhanced performance (Liang *et al.*, 2007). Therefore, many intrinsic functions of MICTs have been designed to facilitate the interaction between humans and MICTs, such as filters for spam phone calls, job-task management, calendar reminders, etc. In this study, we regard these supporting functions as forms of job control assistant support in the work context. These supporting functions of MICTs help users to gain better control of their daily communication and task arrangements. Furthermore, these functions can also provide users with positive psychological hints for the high level of perceived control. That is, on the one hand, the functions of job control assistant support provide individuals with a more effective form of work. On the other hand, the these functions can positively affect users' psychological states due to the enhancement of the feeling of control, and the uncertainty reduction in the workplace, which directly improve an individual's job satisfaction (Ragu-Nathan *et al.*, 2008). Therefore, we hypothesize that:

H4. The functions of job control assistant support are positively related to an individual's job satisfaction.

3.4 Moderating effects of coping strategies

Researchers have also identified various kinds of moderators, such as personality features, social environment and organizational mechanisms (e.g. social support) in the field of technostress (Fuglseth and Sørebø, 2014). However, the results of the interaction effects are

diversified and inconsistent (Ragu-Nathan *et al.*, 2008). Further, aligned with the coping theory, plenty of research has been conducted to investigate the moderating effects of coping strategies on the stress–outcome relationships (Tidd and Friedman, 2002). However, few studies have been conducted to examine the specific moderating effects of coping strategies on the technology overload–outcome relationship. Therefore, in this section, we aim to investigate the moderating effects of the two proposed problem-focused coping strategies in the MICT context on the relationship between technology overload factors and job satisfaction.

3.4.1 The moderating role of information processing timeliness. Information processing timeliness has been identified as a factor that can improve an individual's work efficiency when using information technologies in the workplace (Gattiker and Goodhue, 2004). Typically, increasing information overload has led to an information processing environment that is very demanding (Tushman and Nadler, 1978). If the information is processed effectively and efficiently, the feeling of information overload can be reduced. On the one hand, MICTs have facilitated employees' work by changing the spatial distance, which enables employees to respond to communication requests without any geographical constraint in a timely fashion. On the other hand, MICTs also enable users to transform the information in a timely manner by providing multiple communication channels, thus bridging the temporal distance between interlocutors. Therefore, the timely manner of information processing can enhance employees' feeling of control of multiple tasks and thus reduce the feeling of information overload. Therefore, we hypothesize:

H5a. Information processing timeliness negatively moderates the relationship between information overload and job satisfaction, meaning information processing timeliness can reduce the negative effect of information overload on job satisfaction.

The contemporary work environment has changed a lot with the development and adoption of IT. Work tasks have become increasingly complex with the uncertainty of the market. These complex work tasks involve high cognitive load and may be easily susceptible to interference from frequent interruptions (Speier *et al.*, 2003). Specifically, the use of MICTs in the workplace may increase the complexity of work tasks, because various kinds of information can be transmitted through multiple channels, and individuals are busy handling overloaded information from multiple sources. It has been recognized that the use of MICTs in the workplace has resulted in increasing levels of interruption, such as cell phone interruptions (Avrahami *et al.*, 2007). In this context, the information processing timeliness function supported by MICTs facilitates users to complete their tasks more quickly. Therefore, when an interruption occurs, the fast information processing requirements and information processing timeliness facilitation will increase individuals' perceived cognitive load level, because complex tasks challenge individuals' cognitive capacity. In these cases, MICT users experience high levels of cognitive strain and feel exhausted. Therefore, according to cognitive dissonance theory (Bhattacherjee and Premkumar, 2004), individuals may change their beliefs or attitudes to their current jobs, resulting in an even higher level of negative feelings. Therefore, we hypothesize that:

H5b. Information processing timeliness positively moderates the relationship between interruption overload and job satisfaction, meaning information processing timeliness can further enhance the negative effect of interruption overload on job satisfaction.

3.4.2 The moderating role of job control assistant support. The functions of job control assistant support enabled by MICTs are designed to provide users with more control over the information that they receive and send. These intrinsic functions of MICTs have improved individuals' work effectiveness in the sense that MICTs help users work in an organized way. In the context of information overload, it is inevitable that MICT users must

process a larger amount of information. The function of job control assistant support can help users identify the extent to which the information is important or list the tasks according to their priority. Thus, although the absolute amount of information may increase for the employee, the technology-enabled ability for employees to arrange the work list and manage work-related uncertainty can nurture the feeling of control at work. These helpful functions may result in positive feelings about their job. Thus, we hypothesize that:

H6a. Job control assistant support negatively moderates the relationship between information overload and job satisfaction, meaning job control assistant support at MICTs can reduce the negative effect of information overload on job satisfaction.

On the other hand, the control enabled by the job control assistant support of MICTs may facilitate users to effectively manage their personal tasks and other daily affairs. That is, users would be informed in advance about potential interruptions and so would be able to prepare for corresponding coping strategies. Therefore, the function of job control assistant support of MICTs may significantly reduce individuals' strain level and we hypothesize that:

H6b. Job control assistant support negatively moderates the relationship between interruption overload and job satisfaction, meaning job control assistant support at MICTs can reduce the negative effect of interruption overload on job satisfaction.

In addition, to investigate the influence of the focal constructs in the proposed research model, we also control for the effect of differences in five individual characteristics on job satisfaction in the context of mobile technology use at workplace: age, gender, education, position and work experience. We select these five controls following the literature in the field of technostress. Specifically, demographics including gender, age, education and work experience can lead to different degrees of work-life conflict (Ahuja *et al.*, 2007), which may directly influence individual job satisfaction. It appears reasonable that employees with different individual characteristics may experience different levels of stress in the workplace, which may indirectly influence individual job satisfaction (Ragu-Nathan *et al.*, 2008). Consistently, based on our initial interview results, the patterns of using mobile technologies at workplace differ across different positions and age groups. Thus, we include these individual demographics in the research model so as to control their effects on job satisfaction. The proposed research model is then summarized in Figure 2.

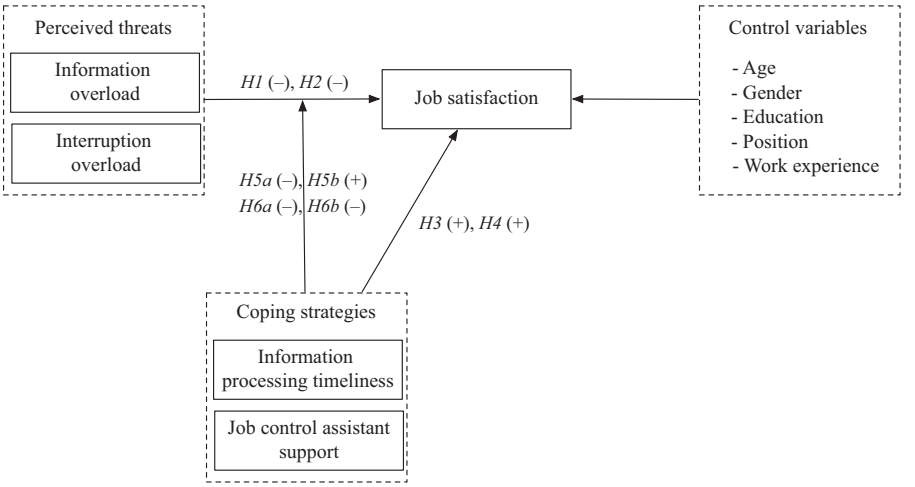

Figure 2.
Research model

4. Methodology

In this study, we went through several procedures to empirically develop and validate the instrument for technology overload factors and coping strategy factors. First, following the literature review, we developed the measurements for the constructs, which we pre-tested through a series of procedures including card sorting and ranking (Moore and Benbasat, 1991). We then conducted a survey to validate the instrument with 178 valid data points. We detail those procedures below.

4.1 Instrument development and questionnaire design

The literature does not provide consistent definitions about the constructs of information overload, information processing timeliness and job control assistant support. Therefore, we clarified the definitions and the developed measures of these three constructs based on the literature review. The corresponding definitions and measurements for other two constructs, namely, interruption overload and job satisfaction, are adapted from prior studies.

To ensure the face and content validity of the definitions, we showed the definitions to ten randomly selected practitioners and invited them to comment on the fitness of these definitions with their work practice. According to their feedback, we revised the definitions. Then, based on these definitions and literature, we developed a list of initial items in a pool to measure the constructs of information overload, information processing timeliness and job control assistant support. The interruption overload was operationalized based on the conceptual definition which has been proposed in Ou and Davison (2011). The measures of job satisfaction are adapted from Ragu-Nathan *et al.* (2008) and Spector (1985). The initial constructs validity and reliability for the instrument are established according to the procedures introduced by Straub (1989).

Following the processes used in prior studies (Moore and Benbasat, 1991), two rounds of card sorting were conducted to further test the constructs' reliability and validity. First, four judges (PhD students) were presented with the items without the labels and randomly sequenced. They were asked to perform two tasks: group the related items into several categories; and label and define each category that they have classified. The correct hit ratio was 79 percent. The results provide initial evidence for construct validity. The items that are classified into the same group indicated convergent validity. The distinct dimensions that emerged from this process demonstrate the discriminant validity. The items with multiple classifications were revised and used for the next analysis. We then revised some wordings that were ambiguous and conducted a second round of card sorting. Four new judges, including two research students and two IT professionals (one is an IT maintenance management employee and the other one is a CIO's assistant), were enrolled. The construct names were provided in this round and the correct hit ratio was 94 percent, indicating sufficient item-construct reliability (Moore and Benbasat, 1991). All the selected judges fit our research context in the sense that they are MICT users, and they frequently use MICTs to deal with their work-related tasks.

We notice that only two items were included in the measure of information processing timeliness after the card sorting exercise. In order to examine the validity of using a small number of items, we looked for support from past studies. We found that Verhoef (2013) used two items to measure "payment equity." Consistently, Eisinga *et al.* (2013) comprehensively analyzed the reliability of a two-item scale, and pointed out that the most appropriate reliability coefficient for the two-item scale is the value of Spearman–Brown statistic and coefficient α, rather than Pearson correlation. Therefore, we calculate the Spearman–Brown value and coefficient α of "information processing timeliness" as suggested in their research. The results shown that the Spearman statistic value is 0.535 ($p < 0.01$) and the coefficient α equals to 0.66, which are both acceptable. Furthermore, Bergkvist and Rossiter (2007) have demonstrated that there is no difference in predictive validity between single-item and

multiple-item measures, especially for singular and concrete constructs. The concept of "information processing timeliness" is essentially a singular construct, because it reflects the effects of time factors during information processing. Thus, the two-item construction of this construct should not reduce its predictive validity. As a result of the above scrutiny, we decide to take the two-item scale to measure "information processing timeliness" in this study, but we meanwhile acknowledge in the future research that this scale can be further improved.

After the above procedures, a pilot study was conducted with a sample of 30 Chinese graduate students from a university in Mainland China. We further revised the questionnaire based on the results and feedback of the pilot test. The final questionnaire (as shown in Table AI) was used for large-scale data collection.

4.2 Data collection

This research aims to study the employees who are using MICTs for work purposes. To ensure that we could include respondents from a variety of backgrounds, we collected the data from two sources simultaneously. First, we conducted a web-based survey. The questionnaire link was randomly sent to several qualified respondents located in different cities in China (i.e. Beijing, Shenzhen, Nanjing and Chengdu), and then the web-based survey was disseminated using a snowball method to the colleagues of respondents in the first round in this web-based survey. In total, 98 valid data points were collected. Second, we sent the paper-based questionnaire to working professionals who are also undertaking part-time post-graduate study at a university in Hefei, China. With the paper-based survey, we collected 80 valid respondents, with a response rate of 89 percent. All of the respondents have adopted MICTs in their workplace and most of them are working in the internet industry.

We verified that the non-response bias was not a concern using the methods described in Armstrong and Overton (1977). The demographic characteristics of the respondents from both of these sources were similar. A *t*-test of the demographic characteristics of respondents who submitted their answers in the first two weeks and in the last two weeks did not significantly differ ($p > 0.05$). It is worth noting that sample overlapping did not appear to be a significant issue in this study. When the web survey is answered, the hosted website (a third-party platform) automatically captures the IP address and a duplicate of this IP address is not allowed for a second response. Each student in the MBA class can answer only one paper-based questionnaire. Furthermore, we collected data in different cities at almost the same time. It is very unlikely that one person could answer both the web-based and the paper-based questionnaire. Hence, the 178 data points were used in the subsequent statistical analysis. The demographic characteristics of the sample are shown in Table II.

Categories	Items	%	Categories	Items	%
Age	16–20	1.7	Gender	Male	53.4
	21–25	24.2		Female	46.6
	26–30	55.6	Working experience (years)	< 1	30.9
	31–35	12.9		1–3	31.5
	36–40	5.1		3–5	15.7
	41–45	0.6		5–7	7.3
	> 45	0		7–10	8.4
				> 10	6.2
Education	High school	1.7	Position	Non-manager	61.8
	Associate degree	3.9		General manager	23.6
	Undergraduate	55.6		Middle manager	12.4
	Graduate	38.8		Top manager	2.2

Note: $n = 178$

Table II. Demographic characteristics

Our respondents all work in the internet industry. As shown in Table II, most of the respondents are in the age group between 21 and 35, and only 5.7 percent are aged from 36 to 45. Such an age distribution is consistent with the current information about employees in the internet industry (see Table AII). The work experiences of the employees are reasonably diverse. Our sample also includes all the subgroups of education level including high school, associate degree, undergraduate and graduate, with the majority having undergraduate and graduate qualifications. The ratio of females and males in the sample is almost equals. The ratio of managers and non-manager employees is also approximately equal. Thus, although our sample is relatively young, these respondents are distributed in different work positions and also cover different degrees of work experience. Thus, our respondents can be considered reasonably representative of the sample in the internet industry.

5. Data analysis and results

5.1 Validating the measures

SPSS 22.0 was employed to calculate the construct validity and reliability. First, we conducted the exploratory factor analysis (Fabrigar *et al.*, 1999). As shown in Table III, all factor loading scores on their expected factors are above 0.7. The factor loading scores on their expected factors are higher than those on other factors, which indicates healthy discriminant validity. All the communality scores are higher than 0.5. Based on these results, we have demonstrated the adequate validity of the measures.

Second, we conducted a confirmatory factor analysis using SmartPLS 2.0. The corresponding results are shown in Tables IV and V. The factor loadings of all items with CFA approaches are larger than 0.7. The construct reliabilities for all principal constructs are assessed by identifying the composite reliability scores, all of which are above 0.8 and so are greater than the recommended minimum value of 0.7. The average variance extracted (AVE) values ranged from 0.6934 to 0.7743 and are larger than the suggested value of 0.5. These results demonstrate the acceptance of convergent validity. In addition, all Cronbach's α

	Components					
Items	1	2	3	4	5	Communalities
IO_1	0.108	*0.862*	0.022	0.242	0.176	0.844
IO_2	0.036	*0.876*	−0.037	0.204	0.175	0.842
IO_3	0.105	*0.925*	−0.041	0.109	0.025	0.881
ITO_1	0.033	0.174	0.083	*0.793*	0.238	0.724
ITO_2	−0.030	0.074	0.017	*0.898*	0.021	0.814
ITO_3	0.046	0.301	0.024	*0.800*	−0.007	0.733
IPT_1	0.303	0.061	0.204	0.057	*0.828*	0.826
IPT_2	0.050	0.377	0.129	0.189	*0.734*	0.736
JCAS_1	*0.826*	−0.007	0.190	0.068	0.180	0.756
JCAS_2	*0.871*	0.083	0.198	−0.045	0.140	0.827
JCAS_3	*0.839*	0.050	0.218	0.058	0.055	0.761
JCAS_4	*0.768*	0.185	0.308	−0.031	0.030	0.720
JOBAS_1	0.250	−0.071	*0.837*	0.047	0.064	0.774
JOBAS_2	0.249	−0.014	*0.830*	0.022	0.128	0.768
JOBAS_3	0.306	0.034	*0.816*	0.063	0.156	0.789
Eigenvalues	3.076	2.689	2.343	2.244	1.445	Total variance = 78.64%
% of variance	20.508	17.923	15.621	14.957	9.633	

Notes: IO, information Overload; ITO, information Overload; IPT, information processing timeliness; JCAS, job control assistant support; JOBAS, job satisfaction. Extraction method: principle component analysis; rotation method: varimax with Kaiser normalization

Table III.
The results of exploratory factor analysis

values are greater than the recommended minimum value of 0.6, which demonstrates the reliability of the measures (Lyberg *et al.*, 1997). As shown in Table V, the square roots of AVE are all above 0.8, and are greater than all other cross-correlations. This result indicates that each construct captures more expected construct variance than error variance. That is, the discriminant validity of the measures is good. In all, the above-mentioned results demonstrate adequate reliability, and convergent and discriminant validity for all constructs used in this study.

Furthermore, we have subjected the data to tests of common methods bias. As shown in Table III, the exploratory factor analysis results have revealed a five-factor structure (all the eigenvalues of the five factors are greater than 1), and all the factors roughly explain equal variance (9.633–20.508 percent) in the data, reflecting the lack of substantial common method variance (Anand *et al.*, 2010). In addition, the correlation matrix in Table V indicates that the highest inter-construct correlations are below 0.56, thereby also reflecting the lack of substantial common methods bias, since common methods bias is usually exhibited by extremely high correlation among constructs ($r > 0.9$) (Bagozzi *et al.*, 1991). Finally, we conducted the multicollinearity diagnostics for these constructs using SPSS. The commonly accepted standard to evaluate the existence of multicollinearity is that the tolerance value is less than 0.1, or the variance inflation factors (VIFs) are greater than 10 (Kutner *et al.*, 2004). The results show that the lowest tolerance value was 0.408, and the highest VIF was 2.45. Thus, the multicollinearity did not seem to be a significant problem in our data set.

5.2 Testing the conceptual model

To test the proposed research model, statistical procedures described by Baron and Kenny (1986) were conducted. We first created the multiplicative interaction terms between technology overload factors and each of the coping strategy factors. Second, hierarchical regression model analyses were carried out, including multiplicative interaction terms. All the control variables (age, gender, education, position and work-age) were put into the model and named as Model 1. In Model 2, both the control variables and technology overload factors are selected into the model. The problem-focused coping variables are added into the Model 2, and labeled as Model 3. Both Models 2 and 3 indicated the main effects of

Table IV.
SmartPLS results of confirmatory factor analysis

Items	Loading	Composite reliability	Cronbach's α	AVE
Information overload (IO1-IO3)	0.7236–0.9953	0.8691	0.9144	0.6934
Interruption overload (ITO1-ITO3)	0.7883–0.9305	0.8797	0.8186	0.7102
Information processing timeliness (IPT1-IPT2)	0.7755–0.9316	0.8459	0.6603	0.7346
Job control assistant support (JCAS1-JCAS4)	0.8522–0.8991	0.9244	0.8908	0.7536
Job satisfaction (JOBSA1-JOBSA3)	0.8658–0.9013	0.9114	0.8545	0.7743

Table V.
Assessment of discriminant validity

Principal constructs	Mean	SD	1	2	3	4	5
1. IO	4.2584	1.3093	*0.8327*				
2. ITO	4.3202	1.2909	0.4392	*0.8427*			
3. IPT	5.2640	1.0619	0.4013	0.3013	*0.8571*		
4. JCAS	4.9677	1.0255	0.2032	0.0944	0.4034	*0.8681*	
5. JOBSA	5.1498	0.9756	0.0836	0.1308	0.3868	0.5526	*0.8799*

Notes: The diagonal elements are the square root of AVE. The off-diagonal elements are correlations between factors

independent variables on job satisfaction. In Model 4, the multiplicative interaction terms (coping strategy factors × technology overload factors) were entered. The significance of interaction terms indicates the existence of moderating effects; otherwise, there will no moderating effects (Osborne and Costello, 2004). The results of the hierarchical regression analysis are shown in Table VI.

In Table VI, Model 4 shows the proposed research model results. According to Model 4, we can see that the information overload is significantly and negatively related to job satisfaction ($b = -0.147$, $p < 0.05$), supporting *H1*. There are no significant effects between interruption overload and job satisfaction ($b = 0.023$, $p > 0.05$), rejecting *H2*. Both the coping strategy factors significantly improve individuals' perceived job satisfaction level (for information processing timeliness $b = 0.217$, $p < 0.01$; and for job control assistant support $b = 0.515$, $p < 0.001$, respectively). Therefore, both *H3* and *H4* are supported. The significances of the interaction items show the results of the moderating effects. The negative moderation effect of information processing timeliness on the relationship between information overload and job satisfaction is significant ($b = -0.151$, $p < 0.05$), supporting *H5a*. The positive moderation effect of information processing timeliness on the relationship between interruption overload on job satisfaction is also significant ($b = 0.366$, $p < 0.001$), supporting *H5b*. On the other hand, the moderation effect of job control assistant support on the relationships between information overload and job satisfaction is supported by our data, though not significant ($b = 0.131$, $p > 0.05$), thus rejecting *H6a*. Job control assistant support demonstrates a negatively moderating effect on the relationship between interruption overload and job satisfaction ($b = -0.269$, $p < 0.001$), supporting *H6b*. It is worth to note that by adding the information processing timeliness and job control assistant support into the Model 3 and then their moderating effects in Model 4, both values of R^2 show a significant increase. This result indicates that the problem-focused coping functions supported by the MICTs significantly changed individuals' attitude to their job by improving their work efficiency and effectiveness.

	DV = job satisfaction			
Model	Model 1	Model 2	Model 3	Model 4
Control variables				
Gender	−0.072	−0.066	−0.063	−0.040
Age	−0.062	−0.035	−0.026	−0.037
Education	0.038	0.028	0.035	0.023
Work experience	0.086	0.071	0.036	0.068
Position	0.138	0.127	0.088	0.100
Main effects				
IO (*H1*)		−0.047	−0.207**	−0.147*
ITO (*H2*)		0.101	0.069	0.023
IPT (*H3*)			0.221**	0.217**
JCAS (*H4*)			0.494***	0.515***
Interactions				
IPT × IO (*H5a*)				−0.151*
IPT × ITO (*H5b*)				0.366***
JCAS × IO (*H6a*)				0.131
JCAS × ITO (*H6b*)				−0.269***
R^2	0.030	0.038	0.372	0.470
Adj. R^2	0.002	−0.001	0.339	0.428
ΔR^2	0.030	0.008	0.334***	0.098***

Notes: *$p < 0.05$; **$p < 0.01$; ***$p < 0.001$

Table VI. Hierarchical regression analysis results

6. Discussion, implications and future research

In this section, we summarize the key findings and potential contributions and implications of this study. The future research directions are also discussed.

6.1 Key findings

First, our results indicate that employees experience significant information overload that directly reduces their perceived job satisfaction. This violates managers' initial intention of promoting mobile work in order to facilitate effective communication rather than become a potential barrier to knowledge sharing in the organization (Yuan *et al.*, 2010). Furthermore, unlike traditional organizational IT, MICTs are embedded into individuals' work and life. Thus, MICT users are more thoroughly addicted to the multiple sources of information than ever before. This result is consistent with previous literature that highlights the negative effects of information overload on individuals. However, it also is harder for both individuals and organizations to alleviate the negative effects of information overload in the context of mobile technology use.

Second, contrary to the negative characteristic of interruption overload in previous literature, interruption overload does not have a significant effect on individuals' job satisfaction. In a traditional environment, the organization-related IT and IT used in personal life can be clearly separated. Therefore, the work tasks can be distinguished from individuals' personal life. However, in the context of using MICTs, the boundaries between work and personal life are blurred and ambiguous. Thus, while individuals feel a certain level of interruption, the extent of the interruption might not exert a significant impact on individuals' behavioral or attitudinal change to their work. This finding is also consistent with Ou and Davison (2011) who proposed that work interruptions caused by the use of instant messengers do not significantly affect group outcomes.

Furthermore, according to Addas and Pinsonneault (2015), IT interruptions may have both positive and negative effects. Furthermore, an individual's work task boundaries also have a direct impact on how one perceives the nature and consequences of one's interruptions. In the mobile technology use and multitasking context, employees' task boundaries are blurred, with the result that they are unaware of interruption effects.

The above findings are interesting. Although individuals perceived increasing levels of cognitive load when using MICTs, these cognitive load effects do not significantly influence employees' job satisfaction. This indicates that individual employees would prefer to enjoy the relatively *ad hoc* working style that is shaped by MICTs, and have more tolerance for the corresponding increasing levels of cognitive load and interruption caused by the use of MICTs. Furthermore, some prior studies have also shown that MICTs play a crucial role in individuals' lives: these individuals form an intimate relationship with their mobile devices and may have already become accustomed to the continuous high level of cognitive load (Yoo, 2010; Bødker *et al.*, 2014). In this way, the perceived cognitive load may not significantly negatively influence individuals' perceived level of job satisfaction. This result is also consistent with some studies in the sense that the technostress caused by mobile technologies does not exert significant impacts on Chinese workers' job satisfaction (Tu *et al.*, 2005).

Third, the two proposed problem-focused coping factors (i.e. information processing timeliness and job control assistant support) significantly facilitate individuals' work by supporting their efficiency and effectiveness. The designers of MICTs have paid increasing attention to user experience (Albert and Tullis, 2013; Olsson *et al.*, 2013). The enhanced level of convenience, ease of use and usefulness of MICTs enable employees to handle complex work situations more flexibly, which subsequently increases their job satisfaction. Furthermore, the moderation effects of these two coping factors are also noteworthy. These two factors moderate the technology overload effects in different directions, but according

to our results, *H6a* (moderating effects of job control assistant support on the information overload–job satisfaction relationship) is not significant. This suggests that the job control assistant support functions of MICTs are insufficient to help employees effectively reduce the perceived negative effects of information overload on job satisfaction. As illustrated in Section 2.1, information overload refers to both volume and time issues. This also indicates that although MICTs are used to facilitate efficient information processing, the large amount of information is still the main source of stress in the workplace. Thus, practicing managers should provide more effective business process control policies and related tools to decrease individual perceived overload levels.

Fourth, as shown in Table VI, the two key technology overload factors together explained only 3.8 percent of the variance of job satisfaction in Model 2. However, when we put the two problem-focused coping strategies (i.e. information processing timeliness and job control assistant support) into the model, we can see that these factors explained 37.2 percent of the variance of job satisfaction. The change in R^2 is 33.4 percent and is significant at the level of $p < 0.001$. This indicates the important role of MICTs with respect to reducing individual perceived negative impacts and increasing employees' job satisfaction. This also helps us understand why users complain about the disturbance of MICTs but still continuously use them: MICTs give employees the sense that they are more in control of their daily work tasks. In organizations, the introduction of information technologies did increase employees' work burden and make tasks more complex. However, MICTs provide a more flexible solution for employees to handle increasingly complex tasks and enable multitasking. This finding is supported by the principle of behavioral consistency theory (Wernimont and Campbell, 1968). That is, individuals who were previously successful at handling a task should enhance their self-efficacy and technical skills in that realm, increasing the probability of repeating that behavior.

6.2 Contributions and implications

With the widespread use of IT in organizations, the phenomenon of technology overload has aroused increasing attention from both practitioners and academics. In this study, we contribute to the literature by first distinguishing two concepts, information overload and interruption overload, and then integrating them into a cohesive framework of technology overload. The corresponding instruments have also been created and validated to facilitate researchers to further investigate the phenomenon of technology overload. As claimed by Karr-Wisniewski and Lu (2010), the concept of technology overload gives researchers a new problem to address. This study is in line with this stream of research and investigates the phenomenon of technology overload from a new perspective, in order to inspire more research in this field.

Furthermore, in the technostress literature, scholars have proposed the concept of "techno-overload" as an important component of technostress creators (Ayyagari *et al.*, 2011; Ragu-Nathan *et al.*, 2008). Rather than treating techno-overload as one dimension of technostress, we operated technology overload as an independent construct including two sub-components: information overload and interruption overload. Based on the CMUA, we investigated the user appraisal process while facing technology overload in the context of MICT usage at work. In addition, we identify information processing timeliness and job control assistant support as two moderators in the relationship between technology overload and job satisfaction. So the direct impacts of technology overload on employees' job satisfaction have also been examined, according to the CMUA and cognitive load theory. Therefore, we provided a comprehensive conceptual model to understand the overload effects experienced by knowledge workers in modern workplace.

Our findings also provide useful insights for practitioners. The two identified technology overload factors can be treated as the indexes to examine the degree of employees'

perceived overload. This is useful for managers who wish to have a better understanding of the work situation of individuals, which may usefully contribute to a re-organization of their tasks. Our study has empirically demonstrated that the two identified coping strategies can significantly increase individuals' job satisfaction. In essence, these two MICT-supported functions actually improve individuals' work efficiency and effectiveness. Therefore, managers may invest more resources to provide available mobile functions of job control assistant support for employees, reducing employees' perceived overload. Finally, managers should pay attention to the moderating effects of the two coping factors. That is, the practitioners could achieve a better control of the technology overload effects by utilizing these MICT functions.

6.3 Limitations and future research

In this study, the development of information processing timeliness, as an important construct, should be further enhanced. Although the predictive validity and reliability are considered reasonable in this study, the limitations of a two-item scale for this construct means that there is room for improvement. Many studies have explored the phenomenon of information overload. However, the interruption overload has aroused little attention. It is worthwhile to investigate the interactions among interruption events, primary tasks and employee reactions in future work, so that more fluent workflow design implications can be drawn. We note that our survey participants work in the internet industry, where MICTs have been widely adopted. Therefore, although individuals have experienced high levels of cognitive load stress, the impact of these negative effects on individuals' job satisfaction may be not significant. Future studies should involve employees from different industries, so that comparisons can be made, and more specific suggestions can also be provided for practitioners. It would be interesting and valuable to include more individual characteristics or psychological factors in future studies. Furthermore, we considered a comprehensive range of mobile technologies in this study. However, in different contexts, employees may use different kinds of technologies to help them complete tasks. Different MICTs or social media as well as diverse system features may have diverse impacts on individuals. Future work can explore the context-dependent negative effects of MICTs, so that more specific implications and suggestions can be drawn to promote the further improvement of MICTs development and application in the workplace.

7. Conclusion

The dark side of IT has aroused increasing attention in recent years (Tarafdar *et al.*, 2015). Some research has also been conducted to examine the increasing significant negative effects of social media (Mäntymäki and Islam, 2016; Fox and Moreland, 2015). However, the negative effects resulting from the use of MICTs (including various mobile social media applications and devices) have been paid little attention by academics. Specifically, with the prevalence of massive amounts of information, humans are experiencing increasing levels of overload. With the increasingly intimate relationship between humans and MICTs, the technology overload effects may be reflected in new forms, such as techno-dependency. However, few studies have been conducted to examine this phenomenon. The context-dependent technology overload effects have also not been identified or illustrated. Responding to the call of this special issue, this study constitutes the starting point for investigations into the phenomenon of technology overload. Future research needs to consider the different dimensions of technology overload and their corresponding influences on both individual performance and organizational behavior in different industry backgrounds.

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Appendix 1

Code	Constructs and measurements	References
IO	Information overload, scale: strongly disagree (1) to strongly agree (7)	Adapted from Eppler and Mengis (2004)
IO_1	When I use MICTs, the amount of information I have to deal with exceeds my capability to process it	
IO_2	When I use MICTs, the increased amount of information makes me feel overloaded	
IO_3	When I use MICTs, the speed of information processing is beyond my ability	
ITO	Interruption overload, scale: strongly disagree (1) to strongly agree (7)	Adapted from Ou and Davison (2011)
ITO_1	I feel overload because my current work is always interrupted by MICTs	
ITO_2	I feel overload because using MICTs always inhibits my concentration on work	
ITO_3	I feel that MICTs are quite disturbing which makes me feel overload	
JOBSA	Job satisfaction, scale: strongly disagree (1) to strongly agree (7)	Adapted from Locke (1976)
JOBSA_1	My job is enjoyable because I use MICTs	
JOBSA_2	I enjoy cooperating with my colleagues by using MICTs	
JOBSA_3	Generally speaking, by using MICTs I feel satisfied with my job	
IPT	Information processing timeliness, scale: strongly disagree (1) to strongly agree (7)	Developed in this study based on Liang *et al.* (2007)
IPT_1	When I use MICTs, I need to deal with information more quickly	
IPT_2	When I use MICTs, the way I handle information is constrained by tight time schedules	
JCAS	Job control assistant support, scale: strongly disagree (1) to strongly agree (7)	Developed in this study based on Hung *et al.* (2011)
JCAS_1	Use of MICTs enables me to set (or get) advanced notices (or reminders) to control my work	
JCAS_2	Use of MICTs enables me to easily manage work tasks	
ICAS_3	Use of MICTs enables me to take full advantages of fragmented time, thus I feel workload is reduced	
JCAS_4	Generally speaking, use of MICTs is helpful to me to improve my job performance	

Table AI.
Construct measures

Appendix 2

Table AII.
Demographics of Employees in the internet industry in China in 2016

Categories	Items	%	Categories	Items	%
Age	16–20	2.19	Gender	Male	65.87
	21–25	32.90		Female	34.13
	26–30	29.72	Working experience (years)	< 1	9.02
	31–35	21.14		1–3	28.44
	36–40	11.01		3–5	23.24
	41–45	3.03		5–7	19.27
				7–10	13.94
				> 10	6.08

Source: The White Paper of China Internet Workplace Eco (2016)

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