Instant messaging, interruptions, stress and work performance

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Abstract

Purpose – The authors investigate the relationship between instant messenger (IM) use and work performance, mediated by interruptions and two key indicators of the stress associated with technology use: overload and complexity.

Design/methodology/approach – The authors validate this research model using partial least squares structural equation modelling (PLS-SEM) with data collected through a survey of 416 working professionals.

Findings – The data reveal that while IM use contributes minimally to work interruptions and to a greater extent to technological complexity, these two constructs fully mediate the direct influence of IM use at work on technology overload, and meanwhile significantly and directly contribute to work performance.

Research limitations/implications – This research provides theoretical insights into the deployment of IM and its actual impacts in the workplace. To improve the generalisation of the findings, the authors call for more IM-related research in other countries, with more native theories and various methodologies in this domain.

Practical implications – The level of stress generated through IM use is moderate, considering IM is not a significant contributor to work interruptions. Thus, despite the potential negative effects of IM communication, the positive effects of using IM at work prevail. As a result, the technology can be promoted as long as employees, their managers and the organisation as a whole are well prepared. Employees can transfer skills and behaviour from the personal setting to their work environment and thus may find an intrinsic motivation to make better use of the IM technology at work.

Originality/value – The authors argue that this research model is novel for its perspective on evaluating the actual impacts of IM use at work instead of the reasons of using it. The authors conceptualise the process to explain how IM contributes to interruptions and other technostress indicators in the working context, and the impact on performance. Contrary to some prior research, the authors find that overall IM applications do not have a negative impact on work performance, and instead may enhance it.

Keywords Instant messaging, Work interruptions, Work performance, Technostress

Paper type Research paper

1. Introduction

The instant messenger (IM) is a type of communication technology that enables text-based communication between Internet-connected users, first developed in the 1980s. By the early 2000s, the increasing popularity of IM meant that it was considered as a way of both reducing the frequency of back-and-forth phone calls and improving communication more generally (Cameron and Webster, 2005). Since that time, IM tools have proliferated in organisations, transforming the way in which employees work and collaborate with others. Both public (e.g. WhatsApp, Line, WeChat, Signal, Telegram) and private or enterprise (e.g. DingTalk,

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Yammer, MS Teams) versions of IM tools are encountered in organisations (Chen *et al.*, 2022; Hong *et al.*, 2023). Since the 2020s, IM has increasingly become the de facto standard for instantaneous communication within the workplace (Millard, 2020). IM tools enable employees not only to communicate but also to collaborate in an effective and efficient manner (Chen *et al.*, 2020). Apart from sending or receiving messages, IM users benefit from advanced features like voice and video communication and more specific collaboration tools (e.g. document sharing, group editing), all geared towards increasing their productivity.

While IM tools in the workplace mostly target teamwork, there are also benefits for individual workers, i.e. help with problem solving, knowledge sharing, or informal learning (Cheng *et al.*, 2019; Li *et al.*, 2011). Instant screenshots or file sharing capabilities enable how-to explanations and knowledge sharing, along with rich communication channels (audio, video, or group chat). In addition, messaging history automatically archives conversations, enabling employees to recall information that was previously communicated. Some IM tools also have a user activity log, which is a helpful way of keeping track of who communicated with whom and when. These various features may justify why organisations see value in IM, and some have gone a stage further, opting for an internally-hosted enterprise collaboration platform or a corporate social software (Ng *et al.*, 2019; Chen *et al.*, 2020).

These situations reflect that companies have started to consider IM as a legitimate alternative to email for business communication. However, notwithstanding their broad acceptance in the organisation, a darker impression persists. Although IM tools can foster interaction, they can also interrupt work: when a person requests the attention of another through IM this interruption can be disruptive, potentially resulting in less overview and control of the work process (Sellberg and Susi, 2014). More challengingly, IM raises the expectation of instant responses to messages sent by co-workers and a timelier manner to handle communication in workplace, which might even further increase the perceived workload and stress, as well as weaken the work-life boundary. These negative effects may further accumulate to create technostress (Sun and Lee, 2022; Ardèvol-Abreu *et al.*, 2022; Tarafdar *et al.*, 2010), a modern disease associated with the information society where individuals feel stressed by their use of technology.

Research on the adoption of communication technologies in organisations often indicates contradictory effects: they improve work conditions and performance yet paradoxically at the same time increase interruptions and generate stress (Ou and Davison, 2011). In this study, we combine the paradoxical perspective with the Transactional Theory of Stress and Coping (Lazarus and Folkman, 1984) to investigate both the negative and positive influences of IM use on individual work performance. Furthermore, to utilise IM at work more effectively, it is important to understand the internal mechanisms and influencing process of IM. As a result, we aim to address the following research question: *What are the positive and negative impacts of IM technologies in the workplace with respect to interruption, technological complexity, technostress and work performance for white-collar organisational employees?* We analyse the interactions between IM use at work and a selection of stressors (i.e. work interruption, technology overload and technological complexity) with survey data collected from white-collar employees. The present paper addresses Tarafdar *et al.*'s (2015) call for studies that focus on specific types of technologies and contributes to the current technostress literature with a multi-dimensional and specific measure for IM-related technostress. The specificity derives from joining classical technostress creators with work interruption and the analysis of their interdependence and impact on the outcome of individual work performance.

Following this introduction, we review the literature on IM use at work, interruptions and technostress before presenting our research model and hypotheses. We then explain the survey method of collecting responses from the white-collar organisational employees in Romania and analyse the data using structural equation modelling techniques. We discuss

the implications for research and practice, focussing on both organisational managers and employees.

2. Background literature

The theoretical foundations of this paper are based on prior research in two streams of research: work interruptions and technostress. We explain each of these research streams below.

2.1 IM use at work: interruptions and effects on work performance

Many scholars who study interruptions refer to the definition of O'Conaill and Frohlich (1995:262), namely, a work interruption is "a synchronous interaction which is not initiated by the recipient, is unscheduled and results in the recipient discontinuing their current activity". Studies undertaken before 2000 typically address the psychological factors and effects of interruptions, referring to the notion of "cessation and postponement" of a main task (Zijlstra *et al.*, 1999). More recent studies indicate several significant attributes of the concept of work interruption: suspension of the current task, unexpectedness, impetus (internal or external), intention to resume the interrupted task, or loss of attentional focus (Puranik *et al.*, 2020). Some authors consider that the introduction of a new task constitutes an interruption (Couffe and Michael, 2017; Andreasson *et al.*, 2017), while others observe that an interruption may or may not result in switching to a new task (McCurdie *et al.*, 2018). Alternatively, some simply declare that it results in "concurrent or sequential multitasking with a primary task" (Fletcher *et al.*, 2018: 224). For IM-related interruptions, we take into consideration "suspension of an ongoing task's execution and the unexpectedness of its occurrence" (Puranik *et al.*, 2020: 8) as relevant and sufficient for defining work interruption.

IT-related interruptions and their effects were extensively studied in the 1990s as a central research area of the human computer interaction domain. Solingen *et al.* (1998) reported three types of interruptions for employees: visits, phone calls and emails that in total took up 90 min of work time per day. However, at that time emails were responsible for only 10% of the interruptions. The growth of pervasive computing and the more diverse panorama of communication technologies, along with the extraordinary intensification of the use of social networks, progressively changed the research focus to internet-induced interruptions and later specifically to IM-related interruptions.

Organisations today encourage IM use because it facilitates employees maintaining permanent and real-time contact with critical interlocutors both within and beyond the organisation. Apparently, an IM message is less disturbing than a phone call, but more direct than an email; furthermore, IM tools can detect presence, i.e. the sender knows if the recipient has received and read the message. The sender may also be able to determine if the recipient is currently online (Ou *et al.*, 2014). Nevertheless, as Ou and Davison (2011) describe, IM-based interruption is potentially disruptive: the popping-up and flashing icon of an incoming message demands immediate attention, so employees may disengage their cognitive focus on the current task in order to address the interrupting message. The timing of an incoming message is unpredictable and beyond the control of the recipient (Li *et al.*, 2011), unless the recipient deliberately disables or mutes the IM tool for specific periods.

According to Wilkes *et al.* (2018), technology-mediated interruptions have increased over the intervening 20 years to about two hours of an employee's workday. Email is one of the primary contributors to interruptions: many emails are not relevant for business use, yet they are still delivered to organisational email addresses and require some degree of cognitive attention, even if this is only to delete the message. Exactly the same issue applies to IM communication but, unlike emails, instant messages cannot be filtered or sent to a spam

folder; if they arrive in sufficient quantity, they may cause the recipients to feel bombarded (Ferrara, 2019). Extrapolating from Mark *et al.* (2016), IM may cause loss of work productivity due to the time taken away from primary work activities to check messages and take actions.

IM-related work interruptions are invariably distractions and most of them are unanticipated. These interruptions draw the individual's attention away from the current task and they may or may not result in moving to another task (e.g. respond to the message or start some new tasks when prompted by the IM message). IM-related interruptions inhibit progress on the primary task, reduce work control and may negatively affect individual work performance (Couffe and Michael, 2017). Furthermore, the invasive effect of IM may negatively alter work performance (Brooks and Califf, 2017). Other scholars (Karr-Wisniewski and Lu, 2010; Rennecker and Godwin, 2005) have indicated that unrestrained interruptions negatively affect human behaviour and, consequently, work performance. We acknowledge that some employees are interrupted more frequently than others, notably when they serve as an information repository and have a permanent support/dissemination function. Finally, some scholars indicate the potential power of interruptions to generate stress (Ayyagari *et al.*, 2011), while others mention the loss of control over the work tasks (Sellberg and Susi, 2014).

Notwithstanding the dark side to IM, some earlier studies (e.g. Cohen, 1980: 105) suggested that, "a certain level of interruption can actually improve performance by increasing an individual's focus on the primary task". In the same vein, other scholars indicate that IM itself is not interruptive, but it is used to manage interruptions. For instance, Garrett and Danziger (2008: 38) found that IM use has a positive impact, because it "promotes more frequent communications and reduces interruptions". These authors considered IM to be a good communication management tool, especially when compared to telephone or face-to-face communication. However, they also identified the need for further research on IM in the workplace, noting that negative workplace impacts of IM seem more plausible.

More recent studies have also indicated mixed results (e.g. Mansi and Levi, 2013) but the scales are increasingly tipped in favour of the positive effects. As Sonnentag *et al.* (2017) indicated, more frequent interruptions predict increased negative effects but they found that the total effect of interruptions on task completion was not significant. Sheer and Rice (2017) found that IM usage has a positive effect on job performance and job satisfaction. Jia *et al.* (2020) note that "the effective use of IM" may be achieved based on a comprehensive IM policy. Jafar *et al.* (2019) observed that the work-related use of social media has a significant positive impact on knowledge exchange, which then has a strong positive impact on job performance (see also Leftheriotis and Giannakos, 2014), particularly amongst employees who have developed an IM-use habit (Lebbon and Sigurjónsson, 2016). Song *et al.* (2019) demonstrated that 'work related social media' supports teams and employees' performance by creating highly efficient workflows. Esmaeili and Zantedeschi (2022) concluded that IM usage at work is interruptive but overall its negative impact on work performance is less significant than the positive impact of IM usage on communication and knowledge sharing. They also determined that communication and knowledge sharing have a significant positive impact on employee's work performance, consistent with Baethge *et al.* (2015), who argue that information acquisition is a benefit that compensates for the negative effect of the interruption.

2.2 Technostress: IM-related technostress creators

It is broadly recognised that while IM tools facilitate increases in communication quality and boost productivity, they may also precipitate negative outcomes, which are often grouped together under the concept of technostress (Tarafdar *et al.*, 2010). Technostress was first identified and defined by Brod (1984) as "the inability to cope or deal with new computer

technologies in a healthy manner" (Ragu-Nathan *et al.*, 2008: 418). Thus, technostress occurs when an employee negatively evaluates his/her experience when carrying out tasks using technology. A more recent definition suggests that technostress is "the stress that individuals experience due to their use of information systems" (Tarafdar *et al.*, 2017: 6).

With the increasing prevalence of ICT in the workplace, the frequency with which technostress is encountered has increased. Among the most mentioned manifestations of technostress are headaches, loss of concentration and the inability to sleep (Tarafdar *et al.*, 2010). These manifestations are also referred to as emotional exhaustion and are understood as emotional reactions (e.g. anxiety, fatigue, scepticism, inefficacy beliefs) to the encountered stimuli (Ayyagari *et al.*, 2011). Technostress has become a major problem in organisations because it negatively affects work productivity and job satisfaction (Mahapatra and Pillai, 2018).

In the organisational context, Ragu-Nathan *et al.* (2008) have identified five factors for technostress creators. These relate to the overload that users may experience, the sense of invasion by technology, the complexity of using the technology, the insecurity associated with the technology and the uncertainty related to the technology. These five factors are widely accepted in the literature and have been applied in technostress related research (e.g. Barley *et al.*, 2011; Fuglseth and Sorebo, 2014; Galluch *et al.*, 2015; Maier *et al.*, 2015b). In our research context, two of the five, namely technology overload and technological complexity, are particularly significant, given the context of IM tool use in the workplace. While complexity is a feature of any type of technology, overload from the use of IM is representative because this technology is associated with constant connectivity and ubiquity. As regards uncertainty and insecurity, in the case of IM these factors are unlikely to distress the employee: technological uncertainty stresses individuals when they do not have control over the technology use and technological insecurity is stressful when an individual feels that others may know more about new technology. A third factor, technology invasion, is conceptually very similar to the 'work interruption' that constitutes the core phenomenon of the current research. These same three factors have also been considered in two recent studies: Westermann's (2007) and Qi's (2019) investigations into the effects of students' academic use of mobile devices and the associated technostress. In the same vein, Tarafdar *et al.* (2015) identify four technostress creators, while D'Arcy *et al.* (2014) referred to three factors (techno-overload, techno-complexity and techno-uncertainty).

The term *technology overload* has emerged in the recent literature as an attempt to explain productivity loss. According to Karr-Wisniewski and Lu (2010: 3) it is defined as a "phenomenon that occurs at the point in which a marginal addition of new technology reaches the point of diminishing marginal returns". Technology overload brings together the earlier concepts of information overload and communication overload. Meanwhile, *information overload* happens when a person gets more information than he/she has the time or the cognitive ability to process (Eppler and Mengis, 2004). As O'Reilly (1980: 693) asserted, "perceived information overload is associated with decreased performance". *Communication overload* results when "a third party solicits the attention of the employee through such means as email, instant messaging, or mobile devices", which generates excessive work interruption to the point the individual becomes less productive (Karr-Wisniewski and Lu, 2010:5). If the volume of notifications and received messages exceed the user's capacity to manage them, then the user perceives an additional burden to the information overload.

In the context of social media use at work, Yu *et al.* (2018) identified three types of overload: information, communication and social. The first two types are the most significant stressors, influencing exhaustion associated with social media use. We are evidently witnessing the unintended negative effects of IM use in the workspace on individual work performance. Based on O'Reilly's (1980) work, many researchers have examined how information overload affects both organisational performance and individual work. Communication overload

negatively affects memory, correctness, efficiency, stress levels and overall work performance (Cho *et al.*, 2019; Yu *et al.*, 2018).

Delpechitre *et al.* (2019) show that the techno-overload dimensions have linear or quadratic relationships with factors such as role stress, performance and effort to use technology. Their results show that the benefits of using new technologies are not always linear, which means that managers should consider ways to regulate when technological improvements are made so as to reduce technostress. In many cases, techno-overload itself becomes a part of the regular workload, leading to a decrease in the general performance of workers.

Meanwhile, Bunjak *et al.* (2021) found that there is an interesting connection between the cognitive absorption of individuals with respect to technology, techno-overload and the creative capacity of workers. Thus, cognitive absorption positively predicts the creativity of workers, but overloading with advanced technology leads to burnout and a reduction in worker creativity.

Technological complexity is related to circumstances when users experience a feeling of inadequacy due to the complexity related to the technologies that they are required to use. They may feel incompetent (lack of skills) or forced to spend time and energy to learn or understand technologies or new features of those technologies (Tarafdar *et al.*, 2007). Given these exigencies, technological complexity may affect employees' productivity. In the context of IM tools, technological complexity is relevant because successive generations of the technology introduce new features and thus add to the complexity of the employee experience. Nevertheless, as employees become more familiar with IM tools, so they should find them less complex and easier to understand, i.e. by virtue of habitual use.

Recent literature on technostress (Califf *et al.*, 2020; Weinert and El-Robrini, 2021; Grummeck-Braamt *et al.*, 2021) also rationalises the need to investigate the positive effects that technostress may produce. These authors label the opportunities that technostress may generate as 'challenge techno-stressors' and the impediments caused by technostress as 'hindrance techno-stressors'. Considering techno-stressors as a challenge, employees have the opportunity to learn more and invest in their personal development. Zhao *et al.* (2020) similarly propose the appraisal of ICT as a challenge that creates an expectation of positive outcomes, such as increased work productivity. Nevertheless, as Califf *et al.* (2020) note, this differentiation between positive and negative effects of technostress depends on the employee's cognition; they have also determined that insecurity or overload have a negative effect on the employee's response to technostress.

According to Motowidlo *et al.* (1997), work (job) performance comprises task and contextual performance. Employee's cognitive ability is more predictive on task performance (carrying out "role-prescribed activities") than on contextual performance. Therefore, we consider work performance as the assessment of whether a person performs a job well, in connection with the organisational goals and task accomplishment expectations. In the following section, we theorise and test the positive and negative effects of IM-related interruptions and technostress creators on the work performance of white-collar employees.

3. Hypotheses development

Grounded on the overall theoretical framing of the Transactional Theory of Stress and Coping (Lazarus and Folkman, 1984), the IM-related work interruption literature (e.g. Ou and Davison, 2011) and the technostress research (e.g. Tarafdar *et al.*, 2007; Karr-Wisniewski and Lu, 2010; Tarafdar *et al.*, 2010), we propose a conceptual model to investigate the consequences of IM use at work and the subsequent impact on individual work performance. As explained in the previous section, we selected two IM-related stressors (i.e. techno-overload and techno-complexity) because they are most relevant in the context of IM use. This approach is supported by the fact that stress is a context-specific phenomenon

(Tarafdar *et al.*, 2015) and different stress creating factors are relevant for particular contexts, which in this case is the use of a specific technology.

Given the narrative on increased prevalence of the IM tools in the organisations, we assume that employees are using these tools to engage in a variety of work and non-work activities, such as asking and answering questions, sharing files and socialising with co-workers. In the organisational setting, instant messages are sometimes associated with negative effects because they can interrupt work tasks and activate technostress creators such as techno-overload. We also argue that IM use can introduce paradoxical effects in the workplace: their perception as popular and commonly-used tools can reduce the perception of techno-complexity and their usefulness and benefits for work-related communication can have a positive effect on individual work performance. We provide the definition of each principal construct in Table 1 and justify each of the proposed hypotheses below.

Over many years, IM has been consistently identified as an interruptive technology (Rennecker and Godwin, 2005; Ou and Davison, 2011; Li *et al.*, 2011; Mansi and Levy, 2013; Sonnentag *et al.*, 2017; Tams *et al.*, 2018). In this respect, Ou and Davison (2011) showed that there is a dark side of the use of IM at work, triggering both negative and positive effects on the employees' work. Garrett and Danziger (2008) explained that IM is "interruptive by definition" because of the mechanism of message notification. Gupta *et al.* (2013) also observed that as a near-synchronous communication technology, IM expects the employee's immediate attention and triggers interruption from the primary task. Chen and Karahanna (2018) consider that technology-mediated interruptions represent the norm in the contemporary workplace. In a study of Dutch workers, communication technology use not only facilitated accessibility and efficiency, but also increased interruptions and unpredictibility (Hoeven *et al.*, 2016). Furthermore, when employees use IM on their smartphones, this increases the frequency of interruptions (Duke and Montag, 2017). Nowadays, the increased use of IM at work and the predilection for mobile technology expose the employees to a greater number of interactions that consequently rise the level of work interruption. We thus hypothesise that.

H1a. IM use at work is positively correlated to work interruption.

In one of the first studies of the impacts of IM use, Rennecker and Godwin (2005) discovered that IM use at work might amplify the extent of interruptions but also the communicative workload. As reported by Karr-Wisniewski and Lu (2010) too many ways of connectivity interrupt work and create technology overload. Employees are constantly exposed to different streams of information and they need more time to respond to messages, which

Principal constructs	Definitions
IM Use at Work	The employee's utilisation of IM as a work-related contact and communication tool to ask and answer questions, share files and engage in work-related socialisation (Ou and Davison, 2011)
Work Interruption	The employee's perception of disturbance from unscheduled IM interaction, or the discontinuity of current work activity because of IM interaction, which is not initiated by the focal employee (Ou and Davison, 2011)
Technology Overload	Many simultaneous streams of information, which overwhelms the employee, forcing him to work faster and longer (Ragu-Nathan *et al.*, 2008)
Technological Complexity	The employee feels technically deficient and lacks knowledge due to the complexity of new technology (Ragu-Nathan *et al.*, 2008)
Work Performance	Assessment of whether a person performs a job well, in connection with organisation's goals and task accomplishment expectations (Kuvaas, 2006)

Source(s): Author's own creation/work

Table 1. Definitions of principal constructs and sources

leads to technology overload (LaRose *et al.*, 2014). As one of the preferred communication channels, IM delivers a large amount of information for employees to handle, which may result in information overload (Kamal *et al.*, 2020). Given the high volumes of messages and the unpredictability of when instant messages arrive, we argue that the use of IM at work negatively influences employees' perceived workload (Gupta *et al.*, 2013). According to Yu *et al.* (2018), excessive social media use at work is a determinant of information and communication overload. When employees are exposed to "too much information", they have to expend more time and energy and work more rapidly to handle the overload (Cao and Sun, 2018; Sun and Lee, 2022). Similarly, Tams *et al.* (2020) consider that technology usage breaks continuity of cognitive focus on the primary task having negative consequences like technology overload. Therefore, we posit that.

H1b. IM use at work is positively correlated to IM technology overload.

When discussing technology-related job demands that can trigger technostress, the technology's complexity should be considered. Employees may feel intimidated by the complexity of a technology if they feel compelled to become skilled in using it (Stana and Nicolajsen, 2021). The affected individual must spend time and effort to learn and overcome the complexity of the technology (Ragu-Nathan *et al.*, 2008).

IM is a technology that, through its features, helps employees to resolve different matters at work in an approachable and familiar manner. We can determine that IM-related technological complexity is perceived in a positive way because employees may in fact have a pleasant experience using this technology. Their perception is different here compared to other technologies, such as ERP systems, where they have to spend a lot of time learning how to work with them. Unlike those, IM tools do not require extensive training because most the employees have already developed the necessary digital literacy. Besides, due to the IM non-work use they have intuitively acquired solid abilities with this technology, so they may come to be more engaged and creative and in favour of using technology for work purposes. Furthermore, while other technologies represent organisational requirements, IM is very much used on a voluntary basis. According to Cameron and Webster (2005), employees prefer to use IM rather than another medium when communicating. Shu *et al.* (2011) suggest that there is a relationship between self-efficacy and technological complexity, such that if the employee has a higher level of digital self-efficacy, then a lower level of stress related to technology may be expected.

Given that IM technology's features are both well-known and widely used outside the workplace, we hypothesise that.

H1c. IM use at work is negatively correlated to IM technological complexity.

Interruptions have been extensively studied in prior research and negative outcomes were frequently reported. According to Fletcher *et al.* (2018), IM-related interruptions may be either distractions or breaks but in both cases, the individual can feel stressed. Similarly, Galluch *et al.* (2015) articulated that a high number of interruptions can serve as "demand stressors".

Interruptions have a bad reputation for increasing task completion time, amplifying the mental workload and stressing employees (Gupta *et al.*, 2013). It is likely that an employee is engaged in a task when an interruption occurs: as a result, the interruption competes with that task for the individual's limited cognitive processing resources (Li *et al.*, 2011). Some people are able to ignore low priority inputs or train themselves to be less disturbed by environmental stimuli (Jett and George, 2003). Nevertheless, while this behaviour minimises the disruptive effect of the interruptions, there will still be an eventual impact on the employee who, sooner or later, is likely to need to tackle the pile of postponed messages. Synchronously or asynchronously, IM communication interrupts employees and can potentially overwhelm them with high volumes of incoming information, both of which contribute to their experience

of stress (Fonner and Roloff, 2012). In related research, Mark *et al.* (2008) discovered that after an interruption, people work faster and therefore experience higher levels of workload that may also generate stress. On these grounds, we hypothesise that.

H2. Work interruption is positively correlated to technology overload.

According to Maier *et al.* (2015b), technological complexity reflects the negative perception of technology being difficult to handle. Although recognised as a user-friendly technology, IM requires a certain level of competence and adaptation. Employees who feel incompetent or insufficiently trained with IM have to dedicate time to upgrade their technological skills, which slows down their work and may cause them to feel overwhelmed (Karr-Wisniewski and Lu, 2010). Ragu-Nathan *et al.* (2008) observed that ICT adoption may complicate work and contribute to "a misfit situation between employees and technology" that induces technology overload. Some studies (Yin *et al.*, 2018; Beveridge, 2018; Delpechitre *et al.*, 2019) point out that employees with limited technical skills or training are liable to experience technology overload.

Untrained employees who perceive that the technology is more complex than they are able to manage are also likely to experience technology overload (Cho *et al.*, 2019). In this line of thought, we consider that the failure to manage IM communication due to a lack of digital skills creates pressure on the employee when facing an excessive amount of information communicated through IM. Hence, we argue that.

H3. IM technological complexity is positively correlated to technology overload.

Similar to previous research, we examine interruptions as stressors (Fonner and Roloff, 2012; Baethge *et al.*, 2015; Tams *et al.*, 2020) and determine the effects of perceived interruption overload on individual work performance. Much prior work focused on the effects of technology-related interruptions on people's work, indicating that technology-related interruptions negatively affect individual productivity and, consequently, organisational productivity (Galluch *et al.*, 2015). The simple notification of an incoming message can introduce an interruption and negatively affect the task performance (Cutrell *et al.*, 2001). According to Puranik *et al.* (2020), the effects of work interruption include delays in starting or restarting a task, errors encountered or lower quality of work. An IM-related interruption is an external disruption that switches attention and time from the primary work task and also requires time to return to the initial activity, slowing down the task execution (Gupta *et al.*, 2013). Moreover, Sonnentag *et al.* (2017) rationalised that work interruptions diminish the employee's 'expectancy of work accomplishment' and LePine *et al.* (2016) explained that when an interruption is perceived as a hindrance it can compromise work performance. Based on these findings, we argue that IM-related interruptions have negative effects on work performance and so hypothesise that.

H4a. Work interruption is negatively correlated to individual work performance.

In the workplace, employees benefit from the ubiquitous and permeable nature of electronic communication but also face challenges (like overload and multi-tasking) when using it for work. The effects of technostress on individual work performance were previously studied (e.g. Tarafdar *et al.*, 2007; Tarafdar *et al.*, 2010; Karr-Wisniewski and Lu, 2010; Yu *et al.*, 2018; Cho *et al.*, 2019) and the general conclusion is that more information technology in the workplace has a negative effect on the individual's work performance. On the other hand, other scholars (Badke, 2010) suggested that excessive information is not necessarily a negative phenomenon because of the value of potentially useful information. Tu *et al.* (2005) revealed that technology overload has a positive influence on employees' work productivity, while Li and Wang (2021) determined techno-overload to be a technostress creator that is positively associated with individual work performance.

In the case of IM technology, it facilitates information sharing, which (1) saves the time and energy allocated to searching for information and (2) creates new behaviours. Instant messages are communicative and information seeking in nature; therefore their use imposes new work practices and new workflows based on a creative approach (Wajcman and Rose, 2011). It is thus reasonable to assume that IM gives employees a sense of usefulness by providing them with work related useful information. According to the original definition of Tarafdar *et al.* (2007), technology overload forces employees to work faster and longer. If we corroborate these demands on the employee with the positive effects mentioned above we may presume that technology overload may be detrimental for the individual but not for his/her work performance. Perceiving the technology as a challenge (Tarafdar *et al.*, 2017) helps the employee to overcome the negative aspects of the IM-related overload and sense it as an opportunity for enhancing their work performance. Taking into consideration the specifics of IM usage, we hypothesise that.

H4b. IM technology overload is positively correlated to individual work performance.

The mandatory use of technology forces employees to adapt and may cause them to experience technostress. Studying the characteristics of technology that are responsible for stress creation, Ayyagari *et al.* (2011) found that an employee's stress grows when the technology competence requirements exceed the competence level. Previous research (Tarafdar *et al.*, 2010; Brooks and Califf, 2017; Qi, 2019) suggested that technological complexity represents a source of technostress and has a significant negative influence on work performance. Likewise, Li and Wang (2021) have validated that technological complexity has a significant negative effect on university teachers' work performance. As also remarked by Mahapatra and Pillai (2018), when employees are not proficient in developing new technical skills, their inappropriate use of technology may lead to errors and affect their work.

In line with Ragu-Nathan *et al.* (2008), we argue that employees affected by technological complexity feel they need to commit work time and effort to develop competence in the technology. We suggest that the negative outcomes associated with IM use while undertaking work tasks are also the result of perceived technological complexity, and therefore we hypothesise.

H4c. IM technological complexity is negatively correlated to individual work performance.

We affirmed that IM use at work improves communication and knowledge sharing but also foists new working practices and workflows on employees. Prior research also argued that work-oriented use of social media applications provides specific benefits such as more effective communication and better work-related information (Song *et al.*, 2019) or permanent and real-time connection with the interlocutors inside and outside the organisation (Ou *et al.*, 2014). The same conclusion was reached for the positive effects of SM use at work due to the stronger connections amongst employees and better knowledge sharing (Leftheriotis and Giannakos, 2014).

Being connected with their co-workers helps employees to stay up to date with tasks and to be told about new developments (Wajcman and Rose, 2011). All these beneficial effects of IM use may affect individual work performance, though both positive (Song *et al.*, 2019) and neutral (Garrett and Danziger, 2008; Lebbon and Sigurjónsson, 2016) effects are reported. Other authors have observed that work-related social media use can enhance job performance due to the formation of knowledge exchange behaviour (Jafar *et al.*, 2019).

Moreover, it has been suggested that when IM use is governed by organisational IM policy, work performance will be enhanced (Jia *et al.*, 2020). Garrett and Danziger (2008) suggest that IM is less disruptive than other communication technologies (e.g. email), which

contributes to IM being both a convenient and an efficient communication tool (Ou and Davison, 2011) with a positive net effect on work performance. In this vein, we hypothesise that.

H5. IM use at work is positively correlated to work performance.

4. Research methodology

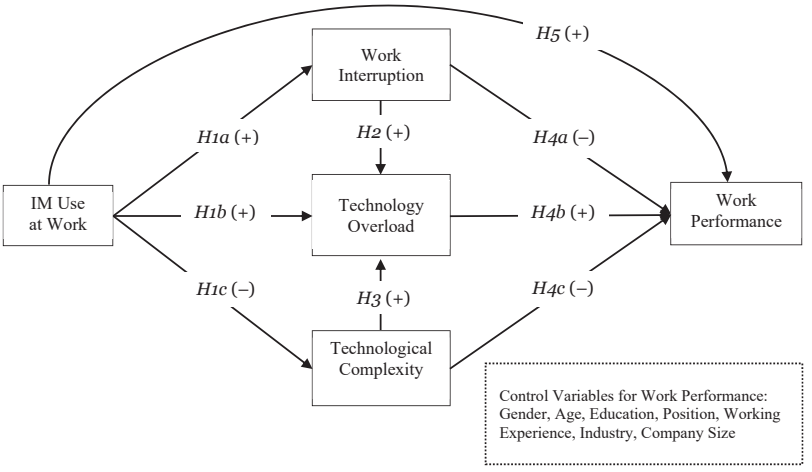
To answer our research questions, we develop a research model (see Figure 1) and an associated measurement instrument, analysing data collected through a survey. In this section, we give details on the measurement development, sampling and data collection method.

4.1 Measurement development

We operationalise the five principal constructs in the proposed research model using existing measurement items from the literature and adapt some of the items in the context of Instant Messaging usage, as shown in the complete set of questions in Table A1.

The measurement items for IM use at work are adopted from Ou and Davison (2011). The respondents had to evaluate the extent to which they use IM for various work purposes: (1) ask questions, (2) answer questions, (3) share files and (4) engage in work-related socialisation. Work interruption is also operationalised based on Ou and Davison (2011). It indicates the employee's perception of disturbance from unscheduled IM interaction, or the discontinuity of current work activity because of IM interaction, which is not initiated by the focal employee.

The measures for technology overload and technological complexity are adapted from Ragu-Nathan *et al.* (2008). Technology overload indicates the extent to which employees are confronted with many simultaneous streams of information, which overwhelm them and force them to work faster and longer. Technological complexity weighs the extent to which employees feel technologically deficient and lacking in knowledge due to the complexity of new technology. The IM context was made explicit for measuring these constructs and questions were rephrased to suit the IM context.



Source(s): Author's own creation/work

Figure 1. The proposed research model

The measurement items of work performance are adapted from Kuvaas (2006) with the intention of assessing whether a person performs a job well, in connection with the organisation's goals and task accomplishment expectations.

The items for IM use at work are measured with 7-point Likert scales anchored on 1 = "Not at all" and 7 = "Very frequently". All other items are measured with 7-point Likert scales anchored on 1 = "I fully disagree" and 7 = "I fully agree". We also collected demographic information from our respondents including industry, company size, position and working experience in the company as well as gender, age and education.

Since we undertook the survey in Romania[1], we followed the translation committee approach (Van de Vijver, 2006) to convert the original English survey into Romanian. The survey was first translated into Romanian and then a back-translation procedure was conducted to ensure the equivalence of meaning across all question items. Three qualified individuals tested the instrument and provided feedback regarding the content clarity and face validity. A few items were revised as a result of this checking procedure.

4.2 Sample and data collection

The data used in this study were collected using an online survey. The online survey method has the advantages of reachability to the target population and goes beyond time and space. Our target was Romanian professionals who undertake office work in different industries and company sizes. Conducting a web-based survey, we have applied non-probabilistic sampling methods: purposive sampling, followed by the snowball (referral) method (Fricker, 2015:177). In this regard, the survey link was distributed online by email, LinkedIn, Facebook, and through alumni groups of some major universities of Romania, mainly but not exclusively in the cities of Timisoara and Iasi. After completing the survey, recipients had the choice to forward the link to their peers or friends, so they may have referred us to new respondents. The survey includes a qualifying question that determines whether the respondent uses IM for work purposes and the survey then ends for those respondents who do not qualify. We also asked which IM tools are usually used. The survey was conducted from August to November 2021 and 427 valid responses were collected. With 11 negative responses to the qualifying question, we have a total of 416 useable responses for testing the research model. Table 2 includes the demographic characteristics of our respondents. As regards the actual IM tools that our respondents are using at work, WhatsApp is the most wide-spread application, being used by almost 70% of the surveyed employees.

5. Data analysis

We employed Partial Least Squares Structural Equation Modeling (PLS-SEM) to examine our proposed research model. Compared to other methods, PLS-SEM offers distinct benefits, such as reducing reliance on normal distribution assumptions and being capable to estimate intricate models with smaller sample sizes (Hair *et al.*, 2022). The analytical software is SmartPLS 4.0 and we performed additional statistical tests using the statistical package SPSS.

Prior to the PLS-SEM analysis, we conducted tests to assess common method bias since we collected data from the same source. Firstly, following Podsakoff *et al.* (2003) recommendations, we performed Harman's one-factor test. Specifically, we conducted an unrotated principal components factor analysis on all the measurement items of the constructs in the research model. The test result showed that there were more than one factor and the largest factor only accounted for 27.79% of the variance, which was much less than the recommended threshold of 50% (ibid.). Secondly, we followed Kock's (2015) suggestions to perform a full collinearity assessment. The variance inflation factors (VIFs) resulting from

Gender	#	%	Duration of work experience	#	%
Female	233	56.0	6 months or less	37	8.9
Male	183	44.0	More than 6 months to 1 year	51	12.3
Age			More than 1 year to 2 years	69	16.6
18–25	153	36.8	More than 2 years–5 years	137	32.9
26–35	159	38.2	More than 5 years–10 years	76	18.3
36–45	73	17.6	More than 10 years	46	11.0
46–55	28	6.7			
56–65	3	0.7			
Education			*Size of Company (number of employees)*		
High school	5	4.2	50 or below	138	33.2
Bachelor's degree	172	42.3	51–300	132	31.7
Master's degree	218	51.3	301–800	32	7.7
Doctoral degree	21	5.0	801–2000	42	10.1
			2001–10,000	31	7.4
			10,001 or above	41	9.9
Industry Sector			*IM tools utilised (multiple answers possible)*		
IT	130	31.3	WhatsApp	282	–
Commercial service	81	19.5	Microsoft Teams	203	–
Automotive industry	61	14.7	Facebook Messenger	119	–
Education	26	6.2	Google Chat	34	–
Banking	18	4.3	Skype	21	–
Public service	17	4.1			
Others	83	19.9	Others	44	–

Source(s): Authors' own creation/work

Table 2. Demographic characteristics of the respondents ($n = 416$)

the full collinearity assessment were below 2.32, less than the suggested maximum value of 3.33 (Hair *et al.*, 2006). Based on the results of the two assessments we conclude that there is no common method bias problem in our data set. We then followed a two-step procedure to examine the measurement model and the structural model.

5.1 Measurement model

We evaluated the measurement model to examine the construct reliability, unidimensionality, convergent and discriminant validity (Gefen and Straub, 2005; Benitez *et al.*, 2020). Specifically, we examined the construct reliability for all constructs by identifying the composite reliability scores and the square roots of the average variance extracted (AVE), all of which are summarised in Table 3.

As shown in Table 3, all constructs have composite reliability and Cronbach's alpha values greater than 0.8, indicating good construct reliability (Hair *et al.*, 2012). Furthermore, the AVE of each construct is greater than 0.5, demonstrating an adequate convergent validity of the measurement model (Hair *et al.*, 2012). Using Fornell and Larcker's (1981) criterion analysis, we then examined the discriminant validity. The square roots of the AVEs for each construct were greater than the correlation value on other constructs. In addition, we conducted an HTMT test to assess the discriminant validity. The HTMT ratios between each pair of constructs were all below 0.9. Therefore, we can confirm the discriminant validity of the measurement model. Table A2 shows the loadings and cross-loadings table.

5.2 Structural model

We examined the structural model by creating the whole research model in the SmartPLS software and executing the PLS-SEM algorithm for model estimation to obtain explained

Table 3.
Descriptive statistics, correlation matrix and AVE

Construct	Mean (S.D.)	Composite reliability	Cronbach's alpha	AVE	IM use at work	Work interruption	Technology overload	Technological complexity	Work performance
IM Use at Work	5.25 (1.72)	0.93	0.91	0.73	*0.85*				
Work Interruption	3.68 (1.67)	0.91	0.85	0.77	0.13	*0.88*			
Technology Overload	3.25 (1.70)	0.97	0.96	0.89	0.04	0.73	*0.94*		
Technological Complexity	1.96 (1.29)	0.95	0.93	0.87	−0.35	0.32	0.42	*0.93*	
Work Performance	4.93 (1.43)	0.94	0.92	0.72	0.35	0.18	0.17	−0.07	*0.85*

Note(s): Diagonal values are the square root of AVE
Source(s): Authors' own creation/work

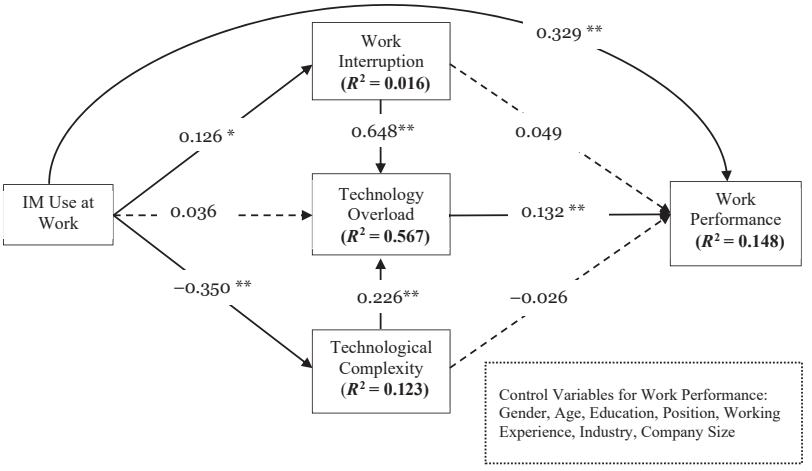
variance measures for each construct and the path coefficients for each hypothesis. We also conducted a bootstrapping procedure with 5,000 samples of 416 cases to determine the statistical significance of the path coefficients (Hair *et al.*, 2012). Figure 2 shows the SmartPLS results of the structural model. In addition, we examined the multi-collinearity of the constructs in the structural model by performing collinearity diagnostic. Using VIFs to measure multi-collinearity amongst the constructs enabled us to capture both vertical and lateral collinearity (Kock and Lynn, 2012). All VIFs resulting from the collinearity diagnostic test were below the suggested threshold of 3.33 (Hair *et al.*, 2006), indicating there is no multi-collinearity issue.

Work performance was influenced by technology overload (H4b: $\beta = 0.132$, $p < 0.001$) and IM use at work (H5: $\beta = 0.329$, $p < 0.001$), explaining 14.8% of the variance in the dependent variable. As expected in the proposed research model, IM use at work significantly increases work interruption (H1a: $\beta = 0.126$, $p < 0.05$), though only 1.6% of its variance was explained. IM use at work also significantly reduced the perceived technological complexity (H1c: $\beta = -0.350$, $p < 0.001$), with an explained variance of 12.3%. However, the proposed effect of IM use at work on technology overload (H1b) was not supported. On the other hand, technology overload was affected by work interruption (H2: $\beta = 0.648$, $p < 0.001$) and technological complexity (H3: $\beta = 0.226$, $p < 0.001$), with an explained variance of 56.7%. Table 4 summarizes the results of the hypothesis testing.

Additionally, we further explored the hypothesised mediation effects in our model. We conducted mediation analysis using the bootstrapping method (Hair *et al.*, 2022; Nitzl *et al.*, 2016). Specifically, we ran the SmartPLS bootstrapping calculation routine with 10,000 subsamples on the full model. The results from the bootstrapping method are shown in Table 5.

5.3 Additional analysis

Our sample includes relatively young working professionals. According to Table 2, we conducted additional statistical analyses for the proposed model by separating the full



Note(s): Paths in solid lines are significant links (*$p < 0.05$; **$p < 0.001$). Paths in dotted lines are insignificant links

Source(s): Author's own creation/work

Figure 2. SmartPLS analysis results ($n = 416$)

Table 4. Summary of hypothesis testing

Hypothesis	Statement	Results
H1a	IM use at work is positively correlated to work interruption	Supported
H1b	IM use at work is positively correlated to technology overload	Rejected
H1c	IM use at work is negatively correlated to technological complexity	Supported
H2	Work interruption is positively correlated to technology overload	Supported
H3	Technological complexity is positively correlated to technology overload	Supported
H4a	Work interruption is negatively correlated to individual work performance	Rejected
H4b	Technology overload is positively correlated to individual work performance	Supported
H4c	Technological complexity is negatively correlated to individual work performance	Rejected
H5	IM use at work is positively correlated to individual work performance	Supported

Source(s): Authors' own creation/work

Table 5. Results of mediation analysis

Hypothesised mediation effect (specific indirect effect)	Confidence intervals 95% bias corrected		Significant Indirect effect	Direct effect	Type of mediation
IM Use → Work Interruption → Overload	0.004	0.156	Yes	No	Full
IM Use → Complexity → Overload	−0.113	−0.052	Yes	No	Full
Work Interruption → Overload → Work Perf	0.009	0.167	Yes	No	Full
Complexity → Overload → Work Perf	0.005	0.060	Yes	No	Full
IM Use → Work Interruption → Overload → Work Perf	0.001	0.033	No	Yes	No mediation
IM Use → Complexity → Overload → Work Perf	−0.022	−0.002	Yes	Yes	Partial

Source(s): Authors' own creation/work

dataset into three groups, namely age 18 to 25 (n = 153), age 26 to 35 (n = 159) and age 36 or above (n = 104). Except H4b and H5, the statistical results across the three data sets remain the same when compared to the complete dataset, suggesting the robustness of the research model. Regarding H4b, while the complete dataset only supports H4b (Overload → Work Perf.), interestingly, the groups of age 18 to 25 and age 26 to 35 do not support H4b. Only the group of age 36 or above supports H4b. Moreover, the findings also indicate that the strength of H5 (IM Use → Work Perf.) for the group of age 18 to 25 is the strongest with a path coefficient of 0.47, followed by the group of age 26 to 35 with a path coefficient of 0.258. However, H5 is not significant for the group of 36 or above. It remains significant, though, when considering the complete dataset with a path coefficient of 0.329. We discuss the implications of these additional analyses below.

6. Discussion

It has been over a decade since Ou and Davison (2011) published their paper investigating the use and impact of IM tools in the workplace. IM use has become ubiquitous and increasingly important to organisations since then. We examined the positive and negative impacts of IM use in the workplace and analysed how it affects individual work performance. Furthermore, we extended and tested a model that includes not only work interruption but also two relevant technostress factors, namely technology overload and technological complexity. It is important to undertake a granular level of analysis for technostress because there may be dissimilar effects of each technostress factor on specific outcomes (Sarabadani *et al.*, 2018).

Besides uncovering the explicit contribution of individual factors, such analyses can help in developing specific mitigation measures.

We investigate whether IM use at work contributed to work interruption, technology overload and technological complexity. In line with other studies, our data show that computer mediated communication is a predictor of work interruption (H1a), though our data explains only 1.6% of the variance suggesting both that there are many other factors that contribute to work interruption and that the negative effect on IM use on work interruption reflects the contemporary societal norm. As regards the influence of IM use in evaluating technological complexity (H1c), we have demonstrated a significant negative effect, in contradiction with classical studies (e.g. Tarafdar *et al.*, 2007). This finding provides distinct evidence that employees take the use of IM as an embedded mechanism in the work process and hence no longer find it challenging to be deployed in the work environment.

Our data suggest IM use at work does not significantly increase technology overload (H1b). To further understand this result, we conducted a mediation analysis using the bootstrapping method to examine the mediation effects of work interruption and technology complexity between IM use at work and technology overload. The additional test results (see Table 5) show that work interruption and technology complexity fully mediate the direct influence of IM use at work on technology overload. One possible explanation of the full mediation effect is related to obligations that can function as technostress eliminators, with employees feeling that "it is their individual obligation to avoid technostress, and they devise strategies to cope with technostress creating conditions" (Stana and Nicolajsen, 2021:6,639). In the same vein, employees using IM at work may consider it their individual obligation, so they develop obligation-based habits to avoid technostress.

Furthermore, our empirical data indicate that it is not the technology itself (H1b), but the evaluations of interruption (H2) and the complexity (H3) that determine the overload perception. The finding related to the significant impact of interruption on interruption is in line with evidence in prior literature on interruptions (Gupta *et al.*, 2013; Fonner and Roloff, 2012; Li *et al.*, 2011) and research on communication overload (Karr-Wisniewski and Lu, 2010). Regarding the effect of complexity, we argue that when employees find the IM technology too complex to use, or they do not use it purposefully, the use of technology is predisposed to a sense of overload. As far as we are aware, there are no previous examinations of the correlation amongst technostress creators, but it is logical to assume that the difficulty to use IM at work in an effective way can lead to the feeling of frustration. It is also logical that if IM use at work generate a lot of information which is overwhelming to answer the messages or make decisions, this can lead to frustration and a negative perspective of the IM usage for overload.

Regarding the impacts of work interruption (H4a), technology overload (H4b) and technological complexity (H4c) on work performance, only technology overload is positively significant. First of all, according to our results, there is no significant correlation between technological complexity and work performance. This contradicts prior studies that have highlighted that when employees face constant requirements for refreshing and updating their digital competencies, their work productivity is negatively affected (Tarafdar *et al.*, 2007). The reason for this unexpected result could be related to the employees' technological antecedents that offer them effective control over the IM technology. This finding is in agreement with Shu *et al.* (2011) who have ascertained that employees with high computer self-efficacy are prepared to surmount the technology-related efforts, adopting a behaviour that can be characterised by its positive coping and confident features. An explanation could be related to the positive role of autonomy that neutralises technostress because it encourages employees and supports learning and technical skills improvement (Karimikia and Singh, 2019). We can also connect this result with the age characteristic of the sample, considering that three-quarters of the respondents are between 18 and 35 years old. Furthermore, 70%

of the employees have at most 5 years of work experience and so are perhaps more determined to prove themselves valuable for their companies.

Secondly, work interruption does not significantly influence work performance. Some prior studies determined that more interruptions negatively affect the primary task quality (e.g. Gupta *et al.*, 2013), while others agree that when employees cope effectively with interruption overload, the work outcome is not negatively affected (Ou and Davison, 2011). A possible explanation is provided by Tan and Richardson (2011): they demonstrated that interruptions that demand a user's immediate response diminish the extent to which those users can complete their tasks efficiently and accurately, while interruptions that allow users to negotiate a delayed response do not have these consequences. It is highly likely that further investigations into interruptions' effects on work performance, taking into consideration different technologies as sources of interruption, will produce different results and offer more insights.

Thirdly, our findings confirmed that technology overload is positively correlated with work performance (H4b). That means the empirical data show that working with more tasks and with a tighter schedule, as well as changing the work habit, as enforced by IM, can help improve the work performance. Furthermore, as Tarafdar *et al.* (2017) observed, individuals may change their attitude towards a technology that has the potential to create stress and view it in a positive light. They refer to this positive stress as "eustress", a form of stress that "creates a challenge or opportunity" (ibid:12). Tarafdar *et al.* (2017) further argue that eustress is appraised as a challenging or thrilling phenomenon that promotes personal growth. Our results suggest that younger employees that are deeply engaged with technology, specifically IM and embed this technology into their communication, are able to optimise their stress levels and thereby reap a positive transformation of their work practices. Hence, although they may experience information and communication overload, the associated stress may be positively related to their work performance. The information communicated through IM can thus be efficiently harnessed and its dissemination can benefit task performance. Future research can also consider the positive effects of technostress in the context where multiple technologies are used in order to reveal the new type of behaviours in the workplace.

Our empirical findings also suggest the use of IM at work can directly result in better work performance (H5). The results of our SEM analysis are consistent with Ou and Davison's (2011) findings and indicate that employees' IM usage prevails over the negative effects of work interruption. In line with Sheer and Rice (2017), LePine *et al.* (2016) and Lebbon and Sigurjonsson (2016), we imply that the IM benefits (i.e. efficient communication and information sharing) positively influence individual work performance. This specific result may also be related to the characteristics of the population in this study: young and well-educated employees, of whom 93.6% hold Bachelor or Master degrees. They use IM tools extensively on a daily basis and are extremely skilled with them; furthermore, they appreciate work-style autonomy where they are in control of how they perform their tasks. In addition, more than 70% of the respondents work in small and medium sized companies, where the management is feasibly more liberal than in large companies.

Moreover, we conducted additional analysis across three age groups, namely 18 to 25 ($n = 153$), 26 to 35 ($n = 159$) and 36 or above ($n = 104$) against the proposed research model. These additional analyses indicate that for younger age groups (35 and below), IM has significant and influential impacts directly on work performance, while overload does not have any significant influence on their work performance. Interestingly, these results are exactly opposite for the mature group with age of 36 and above. We discuss the associated implications of these findings below.

7. Implications, limitations and future research

The current study enhances scholarly understanding of the circumstances regarding work interruptions and the occurrence of technostress, and their effects on work performance. There are a number of theoretical and practical implications for scholars, as well as managers and the relevant entities associated with IM use in organisations.

7.1 Theoretical implications

The first significant contribution of the current research is the combined study of work interruptions and technostress creators that gives a new perspective for the IM use effects in organisations. The research model is consistent with the need to select a granular approach by studying specific technostress creators because their implications can significantly differ. Using this approach, the study extends our understanding of the consequences of IM use at work. Our results are partially consistent with those of Ou and Davison (2011) and suggest that the use of IM creates benefits that exceed the negative effects associated with work interruption and technostress. According to our results, IM use is only marginally related to work interruption, suggesting that IM use has become so prevalent in the workplace that its negative effects are less an issue. Nevertheless, we note that more work interruption leads to a higher incidence of technology overload, which in turn leads to technology related stress.

Secondly, the study contributes to the technostress literature by empirically demonstrating a positive relationship between the investigated technostress creators, namely, technology complexity and overload. We observed that employees who are sensitive to the complexity of technology are more inclined to experience technology overload. The results insinuate that the failure to deal with IM communication attributable to poor digital skills generates pressure on the employee when confronted with too much information through IM.

Given the increased presence of IM tools in companies and the relevance of their consequences for work performance, this study contributes to the literature on effects of IM use in organisations. According to most of the extant studies, IM-related technostress exerts a negative effect on work performance. As Gupta *et al.* (2013:142) noted, "overwhelming information leads to productivity loss through fatigue". However, according to the findings in this study, neither IM technology overload, nor IM technological complexity are stressors for work performance. This confirms the recent findings of Tarafdar *et al.* (2017) who found that eustress ('encouraging' stress) has such positive effects. A recent bibliometric review of technostress (Grummeck-Braamt *et al.*, 2021) also revealed the growing research attention on positive technostress appraisal.

Last, but not least, our study has demonstrated the full mediation of interruption and technological complexity on the impacts of IM on overload, which yields interesting theoretical implications. That means the IM alone does not cause the technostress, while the use of IM, as an external physical event, can affect the internal psychological significance such as overload via the triggers of interruption and complexity. In other words, the significance of these two mediators is likely to have been underestimated and the effect of the IM on overload is likely to have been overestimated in the past. Meanwhile, IM has both direct and indirect effects on work performance. Recognising these mediators in a theoretical model can provide a more complete picture of the internal mechanisms and process on IM's various positive and negative impacts in the workplace.

7.2 Practical implications

The findings from the current study are insightful for both managers and employees in organisations that promote IM for information sharing, collaborative work and decision support. The results indicate that the level of stress generated with IM use is moderate, and

that IM is not a significant contributor to work interruptions as before. This implies that the negative effects of IM communication are less significant than the positive effects, and looking at the new generation of employees, we think that this technology should be promoted. Our instrumentation can be used to examine how much technological overload and technological complexity is associated with IM usage in an organisation as well as their effects on work performance.

Although prior research indicates that knowledge workers who receive instant messages frequently are cognitively burdened (Gupta *et al.*, 2013), the results of current study suggest that IM has an insignificant effect on technology overload. Also, by finding a negative significant influence on technological complexity, the study results suggest that individuals, and especially younger employees, are able to transfer skills and behaviour from the personal setting to their work environment. Our findings suggest that work performance is positively affected by IM use. As anticipated by Tarafdar *et al.* (2017), employees may find an intrinsic motivation to make better use of technology in the workplace. As this study implies, it may be yet more applicable for the digital natives that have spent their lives surrounded by technology.

Furthermore, managers can review their technology use policies to articulate more flexible organisational expectations. According to Jia *et al.* (2020), IM policy encourages employees to acquire skills that establish the effective use of IM at work. Policies that are aligned with work requirements can provide workers with autonomy and enhance control over how they work, which considerably lessens their levels of stress (Galluch *et al.*, 2015). Based on our conclusion, managers should be open to encouraging employees to experiment with new technologies and to share their knowledge regarding which technologies help them to achieve which outcomes.

When considering age difference, our results from additional analyses imply IM impacts the age groups in various ways. For younger work professionals aged between 18 and 35, the usage of IM can directly enhance work performance. On the other hand, for the age group of 36 and above the perception of overload is more important than the use of IM in the workplace, suggesting organisations should provide tech-savvy younger employees with efficient IM platforms to improve productivity, quicker problem solving and smoother collaboration. For older professionals, using the IM doesn't make a direct difference, while their assessment of overload can influence work performance. These findings provide a snapshot of the current situation. As technology and work dynamics evolve, organisations should continually evaluate the impact of IM on different age groups at work. By tailoring communication strategies and addressing specific needs, organisations can harness the benefits of IM while minimise the challenges for employees for all ages.

7.3 Limitations and future research directions

A key limitation is related to the fact that we have used perceptual measures to obtain the individual responses, which raises the concern of subjectivity, though we assured the respondents of their anonymity. Also, our analysis does not quantify the number of interruptions that a respondent received. It may be that an increase in the number of interruptions leads to "a new quality of effects" and employees may experience time pressure, failures and raised effort (Baethge *et al.*, 2015:320). There are also other aspects that we did not investigated, like interruption duration or relevance to the primary task and they can also change the effect of the work interruption. They may be part of an extended model in our future work.

Additional research is required to understand the factors that affect the extent to which employees are affected by work interruptions and their effects. We theorised only the negative forms of technostress (distress) and we only tested two technology stressors that

were reasonably considered relevant to IM use. We believe that eustress (also known as 'good stress') should also be taken into more careful consideration, in order to rationalise how employees regard technology as a challenge that activates coping behaviours and leads to positive results (Tarafdar *et al.*, 2017). Future research should thus tackle the positive effects of technostress caused by IM use during work. Several additional concepts could be considered appropriate to this analysis. For example, we are aware of the potential influence of the organisational culture or job design characteristics on employee's behaviour. It would also be relevant to investigate if and how organisational norms may help employees to manage technostress. This study demonstrates that employees cope with technological overload and even transform it into a positive driver of work performance. This positive correlation also deserves future investigation bearing in mind the potential long-term effects of technological overload on work performance.

When considering age group, the sample of this study is relatively young, with 75% of the participants aged 35 or below. Although our additional analyses across different age groups largely support the robustness of the proposed research model, such a young sample is limited with respect to representing the whole working professional population. We call for more research that examines the differences between age groups as this will help organisations adapt their practices to changing workforce demographics.

Our research extends the understanding of IM based work interruptions as a techno-stressor and their effects. Scholars can explore additional measures (e.g. personal factors) that might cause some employees to be more predisposed or sensitive to technostress. In future research on interruptions as a stress creator, scholars can explore employee's coping behaviours, as well as the role of stress inhibitors such as support and literacy.

8. Conclusion

Taking into account the proliferation of IM tools and their higher presence at the workplace, it is important for research to offer deeper insights of their effects, both negative and positive. In this respect, the current study empirically determined that IM use at work can create paradoxical effects; while it creates work interruption and technology overload, it diminishes the perception of IM technological complexity and improves individual work performance. Furthermore, our results suggest a positive correlation between technological complexity and technology overload, which is novel. The study, further, suggests that IM-related technology overload positively impacts individual work performance, which is also a notable finding because it implies that IM-related technostress can be managed.

Notes

1. The Romanian version of the questions is available from the authors.

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Further reading

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(The Appendix follows overleaf)

Appendix 1

IM use at work
The employee's use of IM as a work-related contact and communication tool to ask and answer questions, share files and engage in work-related socialization. (All items: Ou and Davison, 2011)

IMU_1	I use IM tools to contact other people for my work
IMU_2	I regularly use IM tools to communicate with colleagues or customers in my daily work
IMU_3_1	I use IM tools to ask questions
IMU_3_2	I use IM tools to answer questions
IMU_3_3	I use IM tools to share files
IMU_3_4	I use IM tools for work-related socialization *

Work Interruption
The employee's perception of disturbance from unscheduled IM interaction, or the discontinuity of current work activity because of IM interaction, which is not initiated by the focal employee. (all items: Ou and Davison, 2011)

WI_1	My work is always interrupted by IM messages
WI_2	I feel IM messages are quite disturbing
WI_3	Using IM tools inhibits my concentration on work

Technology Overload
Many simultaneous streams of information, which overwhelms the employee, forcing him to work faster and longer. (all items: Ragu-Nathan *et al.*, 2008)

IMTO_1	I am forced by the IM technology to do more work than I can handle
IMTO_2	I am forced by the IM technology to work with very tight time schedules
IMTO_3	I am forced to change my work habits when using IM technology
IMTO_4	I have a higher workload because of increased complexity of the IM technology

Technological Complexity
Employee feels technically deficient and knowledge lacking due to the complexity of new technology. (all items: Ragu-Nathan *et al.*, 2008)

IMTC_1	I do not know enough about the IM technology to handle my job satisfactorily. *
IMTC_2	I need a long time to understand and use new technologies such as the IM tools
IMTC_3	I do not have enough time to study and upgrade my IM technology skills
IMTC_4	I often find it too complex for me to understand and use new technologies such as the IM tools

Work Performance
Assessment of whether a person performs a job well, in connection with organization's goals and task accomplishment expectations. (all items: Kuvaas, 2006)

IWP_1	I almost always perform better than an acceptable level
IWP_2	I try to work as hard as possible
IWP_3	I often perform better than can be expected from me
IWP_4	I often put in extra effort in my work
IWP_5	I intentionally expend a great deal of effort in carrying out my job
IWP_6	The quality of my work is top-notch

Table A1. Construct Measures

Note(s): * indicates items that were removed due to weak loadings
Source(s): Authors' own creation/work

Appendix 2

	IM use at work	Work interruption	Technology overload	Technological complexity	Work performance
IMU_1	*0.8619*	−0.027	−0.1114	−0.4616	0.1837
IMU_2	*0.8628*	−0.02	−0.0753	−0.368	0.1915
IMU_3_1	*0.8804*	0.209	0.1331	−0.2075	0.4035
IMU_3_2	*0.9138*	0.1895	0.1049	−0.2801	0.4146
IMU_3_3	*0.7425*	0.1515	0.082	−0.1935	0.2432
WI_1	0.4859	*0.7757*	0.4688	−0.007	0.2549
WI_2	−0.0591	*0.9311*	0.7	0.4006	0.1267
WI_3	−0.0351	*0.9178*	0.7198	0.4145	0.1026
IMTO_1	0.0907	0.6834	*0.9414*	0.3525	0.1603
IMTO_2	0.0439	0.6978	*0.9539*	0.389	0.1476
IMTO_3	−0.0388	0.6374	*0.9266*	0.4672	0.1316
IMTO_4	0.0486	0.7189	*0.9564*	0.3914	0.1963
IMTC_2	−0.3411	0.2778	0.3879	*0.9407*	−0.0698
IMTC_3	−0.3113	0.3469	0.4427	*0.9303*	−0.0621
IMTC_4	−0.3308	0.2779	0.349	*0.932*	−0.0647
IWP_1	0.3095	0.2187	0.2108	−0.0295	*0.8322*
IWP_2	0.3301	0.1162	0.0987	−0.1133	*0.8638*
IWP_3	0.3277	0.1064	0.0761	−0.115	*0.9002*
IWP_4	0.2315	0.2504	0.2707	0.0524	*0.8627*
IWP_5	0.1927	0.2261	0.2539	0.0855	*0.7641*
IWP_6	0.3677	−0.0152	−0.045	−0.2199	*0.8522*

Source(s): Authors' own creation/work

Table A2. Loading and cross loadings

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