

# **Email Stress and Desired Email Use**

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## ABSTRACT

This thesis is about workplace stress due to email and computer-mediated communication use. Rather than focusing on email-specific constructs such as email overload, email interruptions or email use outside working hours, it draws an overarching construct of '**email stress**' based on previous theories of traditional workplace stress. This cross-disciplinary approach emphasizes the individually appraised nature of email stress. As a result, the thesis gives a central importance to individuals using email and, more importantly, to their **desired email use**. The thesis is based on a three-stage multi-method design involving quantitative surveys and qualitative interviews. The results of these studies are part of the four self-sufficient papers composing the thesis. While the papers make their own contributions, they also build on one another to advance the understanding of email stress as being a kind of stress that is individually appraised and that affects workplace well-being. The papers adapt theories of workplace stress, such as Person-Environment Fit and Cybernetics, to the study of email stress, and empirically validate these adaptations. They reveal how email stress can be the result of unfulfilled desires in terms of email use or a reason for desiring fewer emails. As employees do not often have control over their email use, the findings encourage the emergence of a more empathetic organizational culture taking into account individuals' desires in terms of email use.

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## AUTHOR'S DECLARATION

I declare that this thesis is my own original work. As the thesis is composed of multi-authored papers currently under review or soon to be submitted, my co-authors have contributed to parts of their contents. The extent and nature of their contributions is detailed below (Table 0.1). These papers have mostly been written by myself and rely on original data that I collected during and for this thesis. The thesis is licensed under **Creative Commons CC BY-NC-SA 4.0**.



*Table 0.1. Extent and Nature of Contributions to Multi-Authored Papers*

Paper and authors	Contribution	Nature of contribution
<b>Paper 1 - Stress from Actual and Desired Computer-Mediated Communication Use</b>		
STICH Jean-François	70%	Data and writing
TARAFDAR Monideepa	20%	Comments and writing
COOPER Cary L.	5%	Comments
STACEY Patrick	5%	Comments
<b>Paper 2 - Appraisal and Outcomes of Email Load: A Person Environment Fit Approach</b>		
STICH Jean-François	70%	Data and writing
TARAFDAR Monideepa	20%	Comments and writing
COOPER Cary L.	5%	Comments
STACEY Patrick	5%	Comments
<b>Paper 3 - Email Overload, Workload Stress and Desired Email Use</b>		
STICH Jean-François	95%	Data and writing
TARAFDAR Monideepa	5%	Comments

## 1. INTRODUCTION

In France, protesters are currently stepping up against a new labor law, which is considered to threaten workers' rights. Interestingly, one measure of this law has gathered unanimous support and has never been questioned. This measure is called the 'right to disconnect' and is about encouraging or forcing organizations to regulate the use of computer-mediated communication (CMC) during and after work. The problems of information overload and CMC-related work-life conflict have gone out of control, and the legislator has taken the matter into its own hands. Although the law is about CMC in general, newspapers have named the main culprit: 'work emails' (Schofield, 2016). Again, "email became the interpretive scapegoat" (Barley, Meyerson, & Grodal, 2011, p. 903) that is now being prepared for sacrifice.

With these concerns in mind, this thesis explicitly focuses on **workplace stress due to CMC and to email**. Workplace stress is defined as a process by which individuals appraise work demands as potentially stressful, activate coping behaviors and experience varying levels of strain as a result (Cooper, Dewe, & O'Driscoll, 2001). **Email stress** is therefore defined as the process by which individuals appraise their email use as potentially stressful, activate email-related coping behaviors and experience varying levels of strain as a result. This incorporates strain resulting from various email uses, individual abilities and techniques to cope with their stressful email use, and individual appraisal processes.

The problem of email stress is almost as old as the email medium itself (E.g., Whittaker & Sidner, 1996). If this problem is so clear-cut and the culprit already identified, why is it that workers and organizations have so many difficulties tackling it until forced to do so? Perhaps the problem is more nuanced than we think it is. Within the definition of email stress is the idea that email stress is individually appraised. Acknowledging the individual appraisal of email stress, though, challenges the idea of a universal adverse impact of email. The 'right to disconnect' may be perceived as an 'obligation to disconnect' by some workers. For this reason, this thesis considers email stress to be influenced not only by email use itself, but also by individuals' **desired email use**. The following paragraphs motivate this choice and present the research gaps, problems and questions the thesis is investigating.

### 1.1. Research motivation and project

Research on email stress started over two decades ago (E.g., Whittaker & Sidner, 1996). Since then, numerous studies have been investigating email stress using various constructs such as email overload, email interruptions or email flaming (See Literature Review). Despite this accumulation of knowledge, conceptual frameworks of email stress have been scarce. A few have drawn frameworks on how email stress is influenced by email characteristics (Taylor, Fieldman, & Altman, 2008), email activities (Ducheneaut & Watts, 2005) or email miscommunication (Byron, 2008). Most studies on email stress have developed hypotheses and frameworks specific to email-related constructs such as email overload (E.g., Dabbish & Kraut, 2006; Vacek, 2013). As a result, these studies may have missed the similarities between email stress and traditional workplace stress. For instance, email overload bears resemblance to work overload in addition to being directly related to it (Barley et al., 2011; Gupta & Sharda, 2008; Jackson, Burgess, & Edwards, 2006). Once the similarities between email stress and workplace stress are acknowledged, a whole new set of perspectives on email stress emerges. Research on workplace stress has been abundant and has certainly exceeded the longevity of research on email stress. Theories of workplace stress such as transactional stress theory (Lazarus & Folkman, 1984), person-environment fit (Edwards, Caplan, & Van Harrison, 1998) or cybernetics (Cummings & Cooper, 1979), are well-researched and conceptually bound. In addition, these frameworks are often accompanied by robust methodological toolboxes that can be applied to diverse work settings (E.g., Yang, Levine, Smith, Ispas, & Rossi, 2008).

These theories, frameworks and methodologies have been ignored by most studies on email stress. As a result, these studies have developed a rich understanding of the email medium, yet an incomplete understanding of the email stress process. The thesis intends to fill this gap by adapting certain theories of workplace stress to the conceptual frame and understanding of email stress, and by empirically validating these adaptations. Its overarching aim is therefore *to explore the links between email stress and workplace stress*. It is important to fill this gap for two reasons. From the point of view of the literature, that will lead to a more complete understanding of the process of email stress that takes into account how and why individuals experience stress from email, thereby opening up opportunity for future studies. From the point of view of practice,

understanding how individuals experience email stress would help organizations to frame communication policies to help employees manage and mitigate such stress. As research on email stress has correctly pointed out, email is unique in its characteristics, uses and impacts. It may be a workplace stressor on its own, but it also impacts other workplace stressors such as work overload, work relationships or work-life balance. Theories of workplace must therefore be adapted to the specificities of the email medium. This challenge is summarized in the first research question of the thesis.

**Research question 1:** How can research on workplace stress enhance our understanding of email stress?

The objectives related to this first research question are to (1) identify the factors of email use that impact workplace stress (Literature review and Paper 1); (2) identify the workplace stressors most impacted by email use (Papers Paper 1 and Paper 2); and (3) adapt theories of workplace stress to the context of email use (Papers Paper 2 and Paper 3).

When trying to answer this first research question, new interrogations emerge. All theories of workplace stress aforementioned have in common the central role given to individuals' appraisals of stress. All these theories defend that environmental demand conditions lead to adverse outcomes only if individuals first appraise these demands as being stressful. In the transactional stress theory, for instance, individuals go through a process of appraising a demand as being stressful and of evaluating their ability to cope with this demand (Lazarus & Folkman, 1984). In Person-Environment fit (PE fit), stress arises from a perceived misfit between what is present in a work environment and what individuals would like to have in their work environments (Edwards et al., 1998). In cybernetics, stress occurs when individuals deviate and cannot maintain their desired state or working conditions (Cummings & Cooper, 1979; Edwards, 1992). All these theories show that workplace stress is not only influenced by work demands but also by the extent to which individuals desire to face such work demands.

This idea has implicitly surfaced in research on email overload. Email overload is defined as "users' perceptions that their own email use has gotten out of control" (Dabbish & Kraut, 2006, p. 431). It is therefore about facing an email use that exceeds one's abilities or desires in terms of email use. Again, similarities between email stress

and workplace stress emerge. However, the idea of a ‘desired email use’ has never explicitly appeared in research on email stress, despite studies on attitudes towards email (Sumecki, Chipulu, & Ojiako, 2011) or on social constructions surrounding email use (Mazmanian, Orlikowski, & Yates, 2005). This thesis relies on the intuition that desired email use may very well be the key to adapting some aforementioned theories of workplace stress to the specific study of email stress. Filling this gap may therefore provide an important missing piece of the email stress puzzle while answering the first research question. The next research question has thus been developed to explore the relevance of desired email use for the study of email stress.

**Research question 2:** How and to what extent is desired email use linked to email stress?

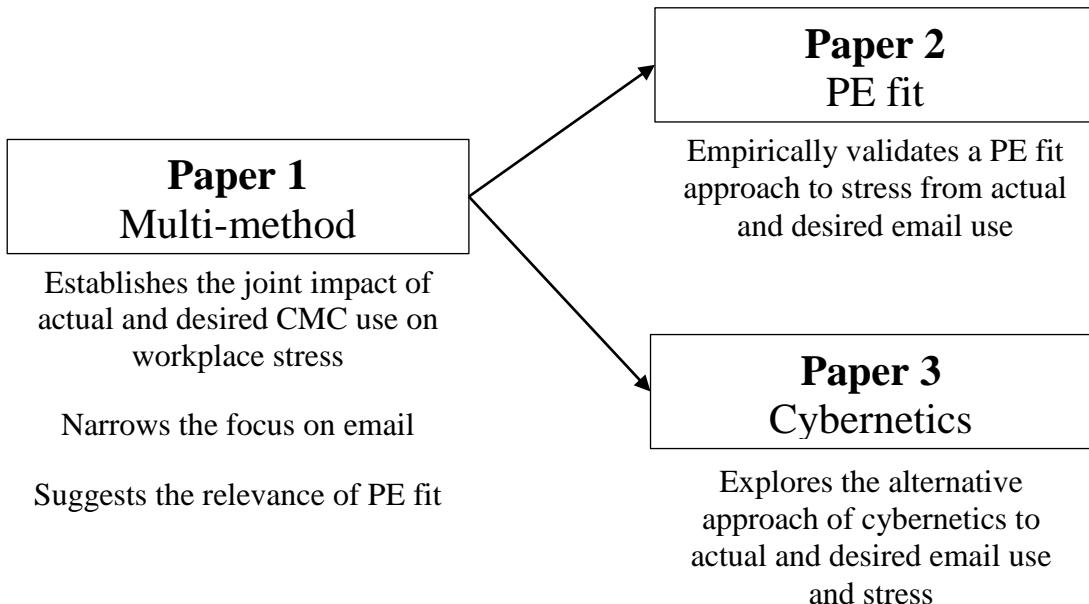
The objectives related to this second research question are to (1) explore how desired email use can impact email stress (Literature review and Papers Paper 1, Paper 2 and Paper 3); (2) establish the extent to which desired email use impacts email stress (Papers Paper 1 and Paper 2); and (3) explore the interactions between actual and desired email use (Papers Paper 2 and Paper 3).

These research questions and objectives have guided the research project, and run as an overarching theme across the individual papers. Each paper is based on a portion of the results, each develops its own research questions in order to tackle its own research problems, all of which address the overall research questions of the thesis. The following section introduces these papers as well as the roadmap of the thesis.

## **1.2. Plan of the thesis and overview of papers**

Each paper explores a different facet of email stress and desired email use. Although each paper is self-sufficient, reading them independently misses the fact that they have been crafted together as part of a common project with its own overarching narrative and research questions. The purpose of the following sections is therefore to explain this narrative, thereby showing how the structure and the contributions of the thesis have been crafted.

*Figure 1.1. Research Narrative and Contributions of Papers to the Thesis*



The thesis is structured as follows: first, a literature review on email stress is conducted in order to motivate the research problem. Second, the methodology of the thesis is presented, with a detailed description of the studies that were conducted and used for the papers. The papers are then included, each introduced by a foreword detailing its history and contributions to the thesis (See Figure 1.1).

The first paper is a multi-method exploration of how and the extent to which actual and desired CMC use impact workplace stress (Paper 1). It is titled “Workplace Stress from Actual and Desired Computer-Mediated Communication Use”. Although the paper is about CMC in general, it narrows the focus down to the email medium, and suggests the relevance of a Person-Environment fit approach to email stress. It prepares the ground for the contributions of the remaining papers.

The second paper empirically validates the relevance of a Person-Environment fit approach to the study of email stress (Paper 2). It is titled “Appraisal and Outcomes of Email Load: A Person Environment Fit Approach”. Its findings establish that some workplace stressors are more strongly appraised as a result of misfits between actual and desired email use. This paper has therefore successfully adapted a widely accepted theory of stress to the study of email stress, thereby clarifying one potential influence of desired email use.

The third paper unveils different relationships between actual email use, desired email use, and work overload with the help of cybernetics theories (Paper 3). It is titled “Email Overload, Workload Stress and Desired Email Use”. It enhances the findings of Paper 2 while introducing alternative frameworks to the thesis.

These papers build upon one another and are part of a common narrative centered on email stress and desired email use. They are linked together both in the forewords and in the final section. The former sets the stage for the narrative of the theses and the latter brings them together at the end to explain and discuss their findings, theoretical contributions and practical implications.

## 2. LITERATURE REVIEW

This review is about email and its consequences on stress. Research on this matter has started over two decades ago, the oldest article in the review being from 1996 (Whittaker & Sidner, 1996). Since then, numerous studies have continued to investigate the impact of this old and enduring email medium, with over half of the articles reviewed having been published after 2010. In parallel to this accumulation of findings on email stress, email remains widely implemented in organizations, and is certainly here to stay even longer.

Generally, stress is defined as a process by which individuals appraise environmental demands as potentially stressful, activate coping behaviors and experience varying levels of strain as a result (Cooper, Dewe, & O'Driscoll, 2001). Email stress is therefore defined as the process by which individuals appraise their email use as potentially stressful, activate email-related coping behaviors and experience varying levels of strain as a result. This definition thus incorporates strain resulting from various email use, individual abilities and techniques to cope with their stressful email use, and individual appraisal processes.

However, research on email stress has remained fragmented. The constructs under study are various, ranging from email overload (E.g., Dabbish & Kraut, 2006) to email interruptions (E.g., Sobotta & Hummel, 2015) or even ‘workplace telepressure’ (Barber & Santuzzi, 2015). Although these constructs are different and have been investigated separately (E.g., McMurtry, 2014), they resemble one another for several reasons. First, these constructs are subjective as they rely on being individually appraised. For instance, email overload is defined as “users’ perceptions that their own email use has gotten out of control” (Dabbish & Kraut, 2006, p. 431). Second, these constructs have similar potential adverse outcomes for individuals, ranging from strain to burnout or negative emotions. Third, they all relate to certain characteristics of email such as speed and convenience, which may be qualified as potential demand conditions. For these reasons and other that will be presented throughout the review, the various constructs aforementioned bear resemblance to one another and to workplace stress. They may therefore deserve to be reviewed together under an overarching construct of ‘email stress’. The main underlying assumption is that email stress, like workplace stress, is

experienced at an individual level. All potential sources and influences of email stress are therefore considered from an individually appraised perspective.

Several conceptual models have already been drawn about email stress or its related constructs. Taylor et al.'s email stress framework (2008) starts from email characteristics such as speed and convenience, recordability or lack of cues. For instance, speed and convenience are supposed to lead to increased email volume and email overload. While these characteristics surely create affordances and constraints (Orlikowski & Barley, 2001), they are unlikely to be the origin of email stress according to the underlying assumption. Stress is unlikely to arise from a lack of cues, which is just an abstract email characteristic, but more likely to arise from an email content misunderstood to be aggressive due to a lack of cues. Similarly, Ducheneaut and Watts' typology of email use (2005) focused on email activities (E.g., email archiving), but these activities have only the potential to be stressful. Byron's framework of email miscommunication (2008) analyzes email miscommunication from receiver, sender, message and context factors. The framework combines technological factors such as email content to individual factors such as gender and status.

These previous conceptual models have certainly emphasized the responsibility of email characteristics in the creation of email stress. After all, email stress exists because of email to begin with. However, these frameworks are difficult to apply to email stress due to its individually appraised nature. In such circumstances, email characteristics are mere creators of affordances and constraints (Orlikowski & Barley, 2001). For instance, an email can be rapidly sent, but is not necessarily read instantly. Its speed is not causing email stress *per se*. More importantly, email stress needs to be appraised first, and not everyone will experience email stress similarly because of a same email use (E.g., Kalman & Ravid, 2015). Rather than being focused on email use and characteristics, the review is focused on individuals using email. The 'techno-psychological' approach of this review identifies factors not only related to email characteristics, but also to individual email uses and individual characteristics. Furthermore, the organizing framework distinguishes between email stress related to email senders and to email receivers. This framework is used to map the findings of the 34 articles in the review, as explained in the next section on methodology. Such approach is important for two reasons. First, the approach groups distinct constructs

related to the psychological impact of email under a common overarching construct of email stress. This may help to integrate previous findings and hopefully provide clearer conceptual directions for future research. Second, the approach explicitly states the importance of individual appraisals in the perception of email stress, thereby building bridges with theories and literature on traditional workplace stress. Stress theories such as transactional stress (Lazarus & Folkman, 1984), person-environment fit (Edwards et al., 1998) or cybernetics (Cummings & Cooper, 1979) have rarely been applied to the study of email stress, which remained narrowly focused on email and its specificities.

This review is organized as follows. The review methodology is described first, introducing the organizing framework that serves as a structure. The review is therefore structured along three main parts. (1) The first part of the review deals with email stress resulting from emails and email use. (2) The second part discusses studies on email stress as experienced by email receivers. (3) The third part reviews studies on email stress caused and experienced by email senders. The review finally summarizes the gaps that will be addressed in the thesis.

## **2.1. Review Methodology**

The collection and filtering of articles follows advices from Webster and Watson (2002). Table 2.1 summarizes the methodology.

Firstly, research queries were built using keywords for email-related stress. The review was looking for academic papers having used in their titles both the word “email” (or its variants “e-mail” or “electronic mail”) and at least one word related to stress (“stress”, “load”, “overload” or “conflict”). The search was done in titles only in order to retrieve articles that were targeting first and foremost the email medium. Secondly, this query was ran on March 21<sup>st</sup> 2016 using the EBSCO search engine with the databases *Academic Search Complete*, *PsycInfo (JSIS)* and *Business Source Premier*. No date or journal restrictions were used. The search returned 34 articles. Email alerts and RSS feeds were setup so that new articles published from March 21<sup>st</sup> 2016 until the publication of this thesis would be automatically retrieved and considered for inclusion. All the articles were imported in the reference management software Zotero to be dealt with within the software.

*Table 2.1. Summary of Literature Review Methodology*

<b>Stage</b>	<b>Activity</b>	<b>Description</b>
<b>1</b>	Selecting keywords and designing a search query	(TI (stress OR load OR overload OR conflict)) AND (TI (email OR e-mail OR "electronic mail"))
<b>2</b>	Running the query	EBSCO: <i>Academic Search Complete, PsycInfo (JSIS) and Business Source Premier</i> 34 articles retrieved
<b>3</b>	Rejecting articles that were not about email stress	<ul style="list-style-type: none"> <li>• 7 articles rejected because of the word "email" incorrectly appearing in title (e.g. authors' email addresses)</li> <li>• 6 articles rejected because they were newspapers sources rather than academic articles</li> <li>• 3 articles rejected because they were technical papers solely about email software</li> <li>• 2 articles rejected because they had no organization context</li> <li>• 1 article rejected because it was not related to stress</li> </ul> <p>Total: 19 articles rejected and 15 articles kept</p>
<b>4</b>	Backward and forward searching (Webster & Watson, 2002)	<ul style="list-style-type: none"> <li>• Articles cited in the articles initially retrieved (i.e. backward search): 9 additional articles</li> <li>• Articles having cited the articles initially retrieved (i.e. forward search): 5 additional articles</li> <li>• Second forward search: 5 additional articles</li> </ul> <p>Total: 34 articles</p>
<b>5</b>	Developing framework	a Framework of causes and influences of email stress composed of (1) email, (2) receiver, and (3) sender factors
<b>6</b>	Mapping the articles on the framework	<ul style="list-style-type: none"> <li>• 30/34 articles mapped on <b>Email</b></li> <li>• 23/34 articles mapped on <b>Receiver</b></li> <li>• 17/34 articles mapped on <b>Sender</b></li> </ul>
<b>Total</b>		34 articles kept; 18 published after 2010

Thirdly, articles were rejected if they (1) were not about email, (2) were not discussing any outcome directly related to stress (e.g., trust), or (3) had no organizational context (e.g., private email use). 19 articles were rejected on this basis. Among these 19 rejected articles, seven articles were incorrectly referenced by EBSCO (i.e. had authors' email

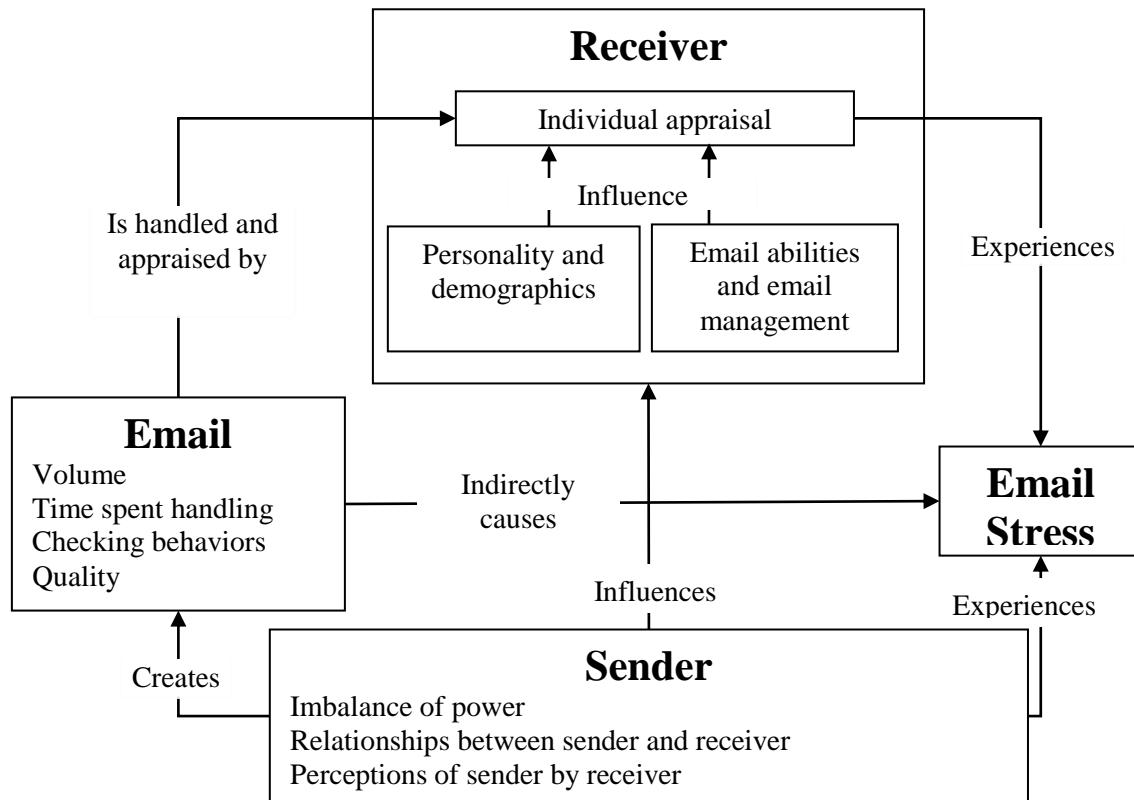
addresses in the title, hence the word “email”), six were newspapers articles incorrectly referenced as academic articles, three were technical papers about email software, two had no organizational context and one was not related to stress. As a result, 15 valid articles were kept for the review initially (See Table 2.1).

Fourthly, backward and forward search techniques were used (Webster & Watson, 2002) to retrieve relevant articles having cited or been cited in the articles previously selected. The backward search (i.e. articles having been cited) resulted in 9 additional articles. The forward search (i.e. articles having cited the initially retrieved articles) resulted in 5 additional articles. A second round of forward search added 5 final articles, for a total count of 34 articles. The oldest article reviewed was a seminal paper on email overload published in 1996 (Whittaker & Sidner, 1996) and 18 out of the 34 articles were published after 2010.

Fifthly, a conceptual framework was developed to map these articles according to the main research question. The framework was developed based on Byron’s (2008) framework on email misperceptions, identifying the influence of receiver, sender, message and context factors. Indeed, most of the studies reviewed have investigated how email stress is influenced by email use and characteristics (E.g., email volume, email interruptions, time spent handling email, email content...). Some, however, contained individual constructs (E.g., personality, email abilities or attitudes) deserving to be in the framework. Not only do the medium and messages matter, but also the individuals processing these messages (i.e. senders and receivers). To remain as close as possible to the individually appraised nature of email stress, the context factor was included in the sender factor (See Figure 2.1). Studies that dealt with social context factors surrounding email stress have mostly investigated expectations for constant availability and for response speed. These expectations often belong directly or indirectly to email senders (E.g., one’s supervisor’s expectations for prompt responses or 24/7 availability, or the expectations that are widespread in the email sender’s organization). From an individually appraised perspective, pressure to respond to an email may thus originate from how the email receiver perceives the expectations of the sender to be. These senders’ factors are reviewed in section 2.4. Additionally, email receivers may have self-expectations in terms of response speed and availability, which are covered in section 2.3. For these reasons and for others presented throughout the

review, the final framework of email stress factors consists in **Email** factors, **Receiver** factors and **Sender** factors (See Figure 2.1 and Table 2.2).

*Figure 2.1. Email, Receiver and Sender Factors Influencing Email Stress*



(1) Email stress originates within **email** itself. Firstly, an email is mostly perceived from its title, content and volume. Literature has for instance discussed emails contents creating conflicts and misunderstandings (E.g., Friedman & Currall, 2003) or harassing encounters (E.g., Ford, 2013). Emails may also be appraised as stressful due to their accumulated volume or time spent handling (Barley et al., 2011). Research in this area has mostly taken form in ‘email overload’ studies (E.g., Dabbish & Kraut, 2006). Finally, email is sometimes used outside working hours, which poses threats for work-life conflict (Derks, van Duin, Tims, & Bakker, 2015) or constantly monitored, thereby disrupting the workday (Renaud, Ramsay, & Hair, 2006). Email stress from emails and email handling is discussed in Section 2.2.

*Table 2.2. Definitions Associated with the Framework*

Categories	Definitions	Examples of related constructs or themes
<b>Email</b>	A textual and potentially asynchronous communication medium used by individuals to send messages of certain contents and purposes to others.	Email characteristics, email volume, time spent handling email, email content quality
<b>Receivers</b>	The persons receiving and handling emails sent to them on purpose.	Personality and demographics, email abilities, email management techniques...
<b>Senders</b>	The persons sending email of certain contents and purposes to one or several individuals.	Purposes, expectations in terms of response time or availability, status
<b>Email stress</b>	The process by which individuals appraise their email use as potentially stressful, activate email-related coping behaviors and experience varying levels of strain as a result.	Email overload, email interruptions, email-related work-life conflict

(2) Email stress is mostly experienced by the **receiver**, whose appraisal is influenced by a set of individual characteristics. Some of these are receivers' attitudes or preferences (E.g., Sumecki et al., 2011), abilities or self-efficacy (E.g., Soucek & Moser, 2010), demographics (E.g., Mano & Mesch, 2010). The receiver is also the one sorting, filtering or archiving the email, eventually feeling stressed by emails piling up in the inbox (E.g., Dabbish & Kraut, 2006). Email stress as experienced by email receivers is covered in Section 2.3.

(3) Emails are received and considered stressful because they have been sent in the first place. The email **sender** thus bears a responsibility in the email stress of others, and can also experience stress. An email can be considered more threatening when it comes from a **sender** of higher hierarchical status (Taylor, Fieldman, & Lahlou, 2005) or having norms of prompt responses (Barber & Santuzzi, 2015; Brown, Duck, & Jimmieson, 2014). Section 2.4 reviews how email stress may originate in email senders and perceptions of senders by receivers.

Sixthly and finally, this newly developed framework was used to re-analyze the 34 articles collected. The result of this process is presented in Table 2.3 and Table 2.4, and

is providing the structure of the review. Table 2.3 is a concept matrix (Webster & Watson, 2002) associating each article to elements of the framework. Table 2.4 summarizes the findings of the 34 articles for each category of the framework. The findings of the review are now discussed in three sections corresponding to the three main factors of the framework.

*Table 2.3. Concepts Covered in the Studies Reviewed*

Authors	Email	Receiver	Sender
(Barber & Santuzzi, 2015)			X
(Barley, Meyerson, & Grodal, 2011) <sup>a</sup>	X		X
(Baruch, 2005)	X		
(Bellotti et al., 2005) <sup>a</sup>			
(Brown, Duck, & Jimmieson, 2014) <sup>a</sup>	X	X	X
(Burgess, Jackson, & Edwards, 2005)	X	X	X
(Byron, 2008) <sup>a</sup>	X	X	X
(Dabbish & Kraut, 2006)	X	X	
(Dawley & Anthony, 2003)	X	X	X
(Derks & Bakker, 2010)	X	X	X
(Friedman & Currall, 2003) <sup>a</sup>	X		X
(Hair, Renaud, & Ramsay, 2007) <sup>a</sup>		X	
(Jerejian, Reid, & Rees, 2013) <sup>a</sup>	X	X	
(Kalman & Ravid, 2015)	X	X	X
(Kushlev & Dunn, 2015) <sup>a</sup>	X	X	
(Mano & Mesch, 2010)	X	X	X
(Mark, Iqbal, Czerwinski, Johns, & Sano, 2016)	X	X	
(Mark, Voida, & Cardello, 2012)	X	X	
(Mazmanian, Orlikowski, & Yates, 2005)	X	X	
(Mazmanian, Orlikowski, & Yates, 2013)	X	X	X
(McMurtry, 2014) <sup>a</sup>	X	X	
(Reinke & Chamorro-Premuzic, 2014) <sup>a</sup>	X	X	X
(Renaud, Ramsay, & Hair, 2006)	X	X	X
(Romm & Pliskin, 1999)			
(Sobotta & Hummel, 2015)	X	X	
(Soucek & Moser, 2010) <sup>a</sup>	X	X	
(Sumecki, Chipulu, & Ojiako, 2011) <sup>a</sup>	X	X	
(Taylor, Fieldman, & Altman, 2008)	X		X
(Taylor, Fieldman, & Lahlou, 2005)	X		X
(Thomas & King, 2006) <sup>a</sup>	X		X
(Turnage, 2007) <sup>a</sup>	X		
(Vidgen, Sims, & Powell, 2011) <sup>a</sup>	X		
(Whittaker & Sidner, 1996)		X	X
(Wright et al., 2014)	X	X	

<sup>a</sup>: Studies retrieved in the initial query

*Table 2.4. Factors of Email Stress Identified in the Review*

Category	Definition	Description of topics	Authors	Notes
<b>Email</b>	<b>Volume and time spent handling</b>	<b>Email volume</b>	(Barley, Meyerson, & Grodal, 2011) (Brown, Duck, & Jimmieson, 2014)  (Dabbish & Kraut, 2006) (Derks & Bakker, 2010)  (Jerejian, Reid, & Rees, 2013) (Kalman & Ravid, 2015)  (Mano & Mesch, 2010)  (Mark, Voida, & Cardello, 2012) (Mazmanian, Orlikowski, & Yates, 2005) (Reinke & Chamorro-Premuzic, 2014) (Soucek & Moser, 2010)  (Sobotta & Hummel, 2015)  (Sumecki, Chipulu, & Ojiako, 2011)  (Taylor, Fieldman, & Altman, 2008) (Vidgen, Sims, & Powell, 2011)	The more emails, the more time spent handling email The more emails sent, received and read, the more email overload and emotional exhaustion. The fewer emails, the more uncertainty The more emails sent, received and read, the more email overload Email volume can both facilitate work performance and engagement, and deplete energy to cause stress The more emails received, the more email overload Email overload may occur when a certain threshold of email volume in the inbox is attained The more emails sent and received, the more work stress but also the more work effectiveness. Perhaps even more stress when emails are unrelated to work Lowered physiological stress when email was banned for a week Email overload for email volume that is not directly addressed to oneself (inappropriate Cc) The more emails sent, received and read, the more burnout The more emails received, the more negative emotional responses, work impairment or problems and ambiguous communication It is supposed that the more emails, the more email overload (more interruptions and time spent using email) The more emails received, the more email overload. Perhaps even more when emails are not business critical It is supposed that the more emails, the more work overload It is supposed that the more emails, the more time spent handling email
		<b>Time spent handling</b>	(Barley, Meyerson, & Grodal, 2011) (Mark, Iqbal, Czerwinski, Johns, & Sano, 2016) (Sobotta & Hummel, 2015)  (Sumecki, Chipulu, & Ojiako, 2011)	The more time spent handling email, the more work overload The longer daily time spent on email, the higher the measured stress  It is supposed that time spent using email (caused by amount and interruptions) will moderate the relationship between amount of emails and email overload The more time spent managing email, the more email overload

		(Vidgen, Sims, & Powell, 2011)	Part of the framework
<b>Checking behaviors</b>	<b>Checking frequency</b>	<p>(Barley, Meyerson, &amp; Grodal, 2011)</p> <p>(Kushlev &amp; Dunn, 2015)</p> <p>(Dabbish &amp; Kraut, 2006)</p> <p>(Renaud, Ramsay, &amp; Hair, 2006)</p> <p>(Mark, Iqbal, Czerwinski, Johns, &amp; Sano, 2016)</p> <p>(Mazmanian, Orlikowski, &amp; Yates, 2005)</p>	<p>Most participants handled emails as they arrived (disruptive practice but not necessarily stressful). The inbox is a reminder of one's email overload</p> <p>Checking emails as they arrive increases work stress</p> <p>Checking emails as they arrive reduces email overload</p> <p>Workdays are disrupted by email inboxes being opened all day (but not necessarily stressful)</p> <p>No link found between handling email in batch and stress</p>
	<b>Outside workplace and working hours</b>	<p>(Barley, Meyerson, &amp; Grodal, 2011)</p> <p>(Baruch, 2005)</p> <p>(Mazmanian, Orlikowski, &amp; Yates, 2013)</p> <p>(Mazmanian, Orlikowski, &amp; Yates, 2005)</p> <p>(Reinke &amp; Chamorro-Premuzic, 2014)</p>	<p>Emails pile up when at home</p> <p>Abusive behavior and cyberbullying can extend beyond work</p> <p>Being available anytime anywhere can reduce autonomy and increase stress</p> <p>Email checking outside work can sometimes be a productive use of 'dead time' but prevents disengaging from work</p> <p>No link between checking emails outside work and email overload</p>
<b>Quality</b>	<b>Email ambiguity</b>	<p>(Brown, Duck, &amp; Jimmieson, 2014)</p> <p>(Burgess, Jackson, &amp; Edwards, 2005)</p> <p>(Byron, 2008)</p> <p>(Friedman &amp; Currall, 2003)</p> <p>(Soucek &amp; Moser, 2010)</p> <p>(Taylor, Fieldman, &amp; Altman, 2008)</p>	<p>The more ambiguity, the more email overload</p> <p>Less ambiguity thanks to email training</p> <p>More ambiguity because of email senders' abilities causing erroneous interpretations</p> <p>More ambiguity because of reduced visual cues, co-presence and synchronicity</p> <p>Less ambiguity thanks to email training</p> <p>More ambiguity because of reduced visual cues, co-presence and synchronicity. Causing conflicts to escalate</p>
	<b>Email flaming</b>	<p>(Baruch, 2005)</p> <p>(Friedman &amp; Currall, 2003)</p> <p>(Taylor, Fieldman, &amp; Lahlou, 2005)</p>	<p>Intimidation and insults are the most common form of negativity in email. + lead to stress-related illness</p> <p>Once the email is perceived as negative or aggressive, conflict escalate (responded in kind)</p> <p>Threatening email reprimands increased blood pressure</p>
		(Turnage, 2007)	Email flaming because of tone, message and style (E.g., profanity,

			all capital letters, excessive exclamation points)
	<b>Email content</b>	(Mano & Mesch, 2010)  (Thomas & King, 2006)	Work-related emails do not increase stress but perceptions of being too accessible and easy to reach  Discursive construction of email overload, with threads getting bigger and more complex
<b>Receiver</b>	<b>Individual appraisal</b>	<b>Appraisal</b>  (Dabbish & Kraut, 2006) (Brown, Duck, & Jimmieson, 2014)  (Byron, 2008) (Dawley & Anthony, 2003)  (Jerejian, Reid, & Rees, 2013)  (Kalman & Ravid, 2015)  (Reinke & Chamorro-Premuzic, 2014)  (Renaud, Ramsay, & Hair, 2006)  (Soucek & Moser, 2010)	The definition of email overload incorporates individual appraisal  Items used to measure email overload incorporate individual appraisal  Emails need to be appraised as hostile to be experienced negatively  Items used to measure email overload incorporate individual appraisal  Items used to measure email overload incorporate individual appraisal  Inbox cleaning thresholds varied from one individual to the other, suggesting varying appraisals of email overload  Items used to measure email overload incorporate individual appraisal  Items used to measure email overload incorporate individual appraisal  Items used to measure email overload incorporate individual appraisal
		<b>Attitudes</b>  (Dabbish & Kraut, 2006) (Dawley & Anthony, 2003) (Mazmanian, Orlikowski, & Yates, 2005) (Sobotta & Hummel, 2015)  (Sumecki, Chipulu, & Ojiako, 2011)	The more email work importance, the more emails  Perceptions of the productive use of email  Perceptions that the benefits of mobile email outweigh the costs can lead to higher email use  Email work importance is supposed to moderate the relationship between email volume and email overload  Email overload decreases as emails are perceived to be business critical
	<b>Personality and Personality demographics</b>	(Byron, 2008) (Hair, Renaud, & Ramsay, 2007)  (Jerejian, Reid, & Rees, 2013) (Reinke & Chamorro-Premuzic, 2014)	Negative affect can lead to increased negative perceptions of emails  Individuals can be relaxed, driven or stressed by email use. Self-esteem and locus of control are also associated with email overload  Email overload is influenced by personal propensities to worry  Core self-evaluations predict email overload, and are also influenced by neuroticism

	<b>Demographics</b>	(Burgess, Jackson, & Edwards, 2005)  (Byron, 2008)  (Dawley & Anthony, 2003) (Mano & Mesch, 2010) (Renaud, Ramsay, & Hair, 2006) (Sumecki, Chipulu, & Ojiako, 2011)	Age made a difference in perceptions of irrelevant and untargeted emails  Age could influence negative perceptions of emails because of disparities in terms of email abilities and emotion regulations  Education level differences in email overload  Managers more likely to send and receive more emails  Gender differences in perceiving emails to be a problem  Age did not impact email stress
	<b>Managerial status</b>	(Mano & Mesch, 2010)  (Whittaker & Sidner, 1996)  (Kalman & Ravid, 2015)	Managers more likely to send and receive more emails  Managers may be more likely to send and receive more emails, but not necessarily time to clean them  Managers more likely to send and receive more emails but do not necessarily have less time to clean them
<b>Email abilities and email management techniques</b>	<b>Abilities</b>	(Burgess, Jackson, & Edwards, 2005)  (Dawley & Anthony, 2003) (McMurtry, 2014) (Sobotta & Hummel, 2015) (Soucek & Moser, 2010)	Email stress can be reduced with an efficient use of email filters, flags, reminders and folders and accurate identification of email importance. Training can improve email abilities  Less email overload when more experience in using email  Training can improve email abilities  Email knowledge is supposed to moderate email overload  Email stress can be reduced with an efficient use of email filters, flags, reminders and folders and accurate identification of email importance. Training can improve email abilities
	<b>Email management</b>	(Barley, Meyerson, & Grodal, 2011)  (Dabbish & Kraut, 2006) (Kalman & Ravid, 2015)  (Whittaker & Sidner, 1996)	An untidy inbox serves as a reminder of email overload  The more email folders, the more email overload  Email management strategies vary from one individual to the other and should be considered in a continuum  Typology of email management strategies. Email overload can be tackled by sorting emails in folders
<b>Sender</b>	<b>Imbalance of power</b>	<b>Imbalance of power</b>  (Derks & Bakker, 2010) (Kalman & Ravid, 2015)  (Renaud, Ramsay, & Hair, 2006)	A resource for the sender can be a demand for the receiver  The effort to send emails is constant, whereas there is no limit as to how many emails can be received  Email senders have most of the authority over email receivers in terms of giving tasks
	<b>Control over email quality</b>	(Burgess, Jackson, & Edwards, 2005)	Training improved email abilities for email senders, thereby increasing email quality

		(Dawley & Anthony, 2003)	Peer misuse and peer lack of email abilities is perceived as a major antecedent of email overload
		(Soucek & Moser, 2010)	Training improved email abilities for email senders, thereby reducing feelings of email stress for receivers
<b>Relationships between sender and receiver</b>	<b>Hierarchical status</b>	(Byron, 2008)  (Taylor, Fieldman, & Lahlou, 2005)  (Romm & Pliskin, 1999)	Emails may be perceived more negatively when they come from individuals higher up in the hierarchy  Emails sent from individuals higher up in the hierarchy are perceived to be more threatening  Office tyranny can exploit email characteristics such as recordability and multiple addressability
	<b>Relationship status</b>	(Byron, 2008)  (Friedman & Currall, 2003)	The longer the relationships, the more positive and accurately perceived the emails may be  Risks of conflict escalation may be mitigated by strong social ties
<b>Perceptions of sender by receiver</b>	<b>Expectations for prompt responses</b>	(Barber & Santuzzi, 2015)  (Barley, Meyerson, & Grodal, 2011)  (Brown, Duck, & Jimmieson, 2014)  (Derks & Bakker, 2010)  (Taylor, Fieldman, & Altman, 2008)  (Thomas & King, 2006)	Expectations for prompt responses impact burnout, health-related absenteeism, sleep quality and stress  Expectations for prompt responses create annoyances  Expectations for prompt responses increase the impact of email volume and quality on emotional exhaustion  Receivers have to live up to the sender's expectations for prompt responses  Expectations for prompt responses are suggested to impact work overload  Terms indicating expectations for prompt responses (by noon today, THIS MORNING!...)
	<b>Expectations for constant availability</b>	(Barley, Meyerson, & Grodal, 2011)  (Mazmanian, Orlikowski, & Yates, 2013)  (Reinke & Chamorro-Premuzic, 2014)  (Wright et al., 2014)	Expectations for constant availability tend to operate at an organizational level  Expectations for constant availability are contagious in that receivers have in turn higher expectations of others  Expectations for constant availability have not been linked to email stress conclusively  Email use outside working hours lead to increased work-life conflict and burnout

## **2.2. Email stress from emails and email use**

This review first discusses how stress can arise from email itself because of (1) its volume, (2) the ways it is handled or (3) its quality. Special consideration is given to how email stress due to emails and email handling can be impacted by email characteristics such as speed and convenience (Taylor et al., 2008).

### ***2.2.1. Email volume and time spent handling***

More than half of the articles reviewed have investigated email volume. Email volume is hereby defined as the amount of emails sent, read or received over a certain timespan (E.g., Mano & Mesch, 2010) or the time spent dealing with email (E.g., Barley et al., 2011).

Regarding the amount of emails sent, read or received, studies agree that large amounts of emails are associated with email stress (Brown et al., 2014; Dabbish & Kraut, 2006; Sobotta & Hummel, 2015; Sumecki et al., 2011). Specifically, the amount of emails received was correlated with negative emotional responses, work impairment or problems, ambiguous communication (Soucek & Moser, 2010) and email overload (Brown et al., 2014; Jerejian, Reid, & Rees, 2013; Sumecki et al., 2011). Large combined amounts of emails sent and received (Mano & Mesch, 2010) or sent, received and read (Brown et al., 2014; Dabbish & Kraut, 2006; Reinke & Chamorro-Premuzic, 2014) were similarly found to predict email overload (Brown et al., 2014; Dabbish & Kraut, 2006), emotional exhaustion (Brown et al., 2014), work stress (Mano & Mesch, 2010) and burnout (Reinke & Chamorro-Premuzic, 2014).

In addition to these empirical findings, conceptual papers have similarly hypothesized that larger amounts of emails have the potential to lead to higher work overload (Taylor et al., 2008) and email overload (Sobotta & Hummel, 2015). For Sobotta and Hummel (2015), the amount of emails is supposed to lead to email overload both directly and indirectly through increased interruptions and time spent using email. Empirical studies indeed found that large amounts of emails were associated with more time spent handling email (Barley et al., 2011; Sobotta & Hummel, 2015; Vidgen, Sims, & Powell, 2011). Studies again agree that the more time spent dealing with email, the greater stress (Mark, Iqbal, Czerwinski, Johns, & Sano, 2016), email overload and work overload (Barley et al., 2011; Sobotta & Hummel, 2015; Sumecki et al., 2011).

Only one study, however, discussed the impact of low amounts of emails sent, received and read, and found that few emails led to more stress due to uncertain interpretation of email content (Brown et al., 2014). Interestingly, another study conducted a mixed methods quasi-experiment in which 13 employees were prevented from using email for a week (Mark, Voida, & Cardello, 2012). Their results showed lowered physiological stress in form of reduced heart rate variability due to this email ban. Participants also enjoyed more their work relationships because of the increased face-to-face interactions despite problems in terms of work coordination (2012). On the contrary, Mano and Mesch (2010) found that large amounts of emails sent, received and read were associated with more work effectiveness. Derks and Bakker (2010) concluded that email volume can both be a resource facilitating work performance and engagement, and a demand depleting energy and causing stress.

Some studies further nuanced these relationships between email volume and email stress. Kalman and Ravid (2015) suggested more complex indicators of email volume and looked at the longitudinal changes in emails received, sent, read and left in inbox. Although they have not measured email stress, they have unveiled interesting longitudinal behaviors that may indicate the presence of email stress or email overload. For instance, email overload may occur when a certain threshold of unread emails over a certain time period is attained, pushing users to cope with overload by reading and filing emails. However, emails are not all equal. Studies have suggested distinguishing between types of emails when looking at email stress. They have discussed that email stress may occur more for large amounts of emails that are not business critical (Sumecki et al., 2011), not related to work (Mano & Mesch, 2010), or not specifically destined to the receivers (Mazmanian et al., 2005). Section 2.2.3 will investigate how email content can impact email stress in more detail.

The articles about email stress due to email volume have been reviewed. In summary, large amounts of emails sent, received and read can cause email stress and email overload. This may also be due to increased time spent handling this large email volume. This finding can be nuanced by looking at emails contents and longitudinal dynamics. In addition, the impact of low email volume on email stress remains unclear and under-investigated. The impact of email checking behaviors on email stress is now considered.

### **2.2.2. Email checking behaviors**

Literature has discussed that email stress also depends on the ways emails are handled, and especially on the frequency and the places and times at which emails are handled.

Most employees have their mailboxes open all day, a practice which has the potential to create stressful disruptions throughout the workday (Renaud et al., 2006). Indeed, incoming emails are often associated with notifying pop-ups alerting the recipients although they may be using other software. When the receivers see these alerts, they could either deal with them and handle the incoming emails, or ignore them and stay focused on their work at hand.

Barley et al. (2011) found that most of their participants handled emails as they arrived in order to feel responsive and on top of their work. Although this practice can be highly disruptive and addictive, it may not be necessarily stressful (Barley et al., 2011; Mazmanian et al., 2005; Renaud et al., 2006). For instance, it has been suggested that this practice can be addictive because of positive reinforcement (Mazmanian et al., 2005). Among all the negative and disruptive incoming emails, some are positive and useful. Constant email monitoring can thus act as a lottery in which receivers continue to check email in hope of finally receiving these positive and useful emails (2005).

Kushlev and Dunn (2015) found that checking emails as they arrived increased work stress. Their findings somehow contradicted Dabbish and Kraut's (2006) who found that checking emails as they arrived actually led to less email overload. They interpreted their finding by saying that dealing with email in batch has the consequence of having to deal with more emails all at once, thereby increasing email overload. Although one study found no link between dealing with email in batch and stress (Mark et al., 2012), Barley et al. (2011) convincingly discussed that “the inbox served as a continuous and tangible reminder of how overloaded one was” (2011, p. 901). When emails are not dealt with as they arrive or when the receivers are absent or asleep, they pile up. Email stress may thus result from these piles of unanswered emails.

Emails also pile up when employees are absent from the workplace and at home (Barley et al., 2011). Email checking behaviors thus have the potential to extend outside of the workplace and beyond working hours. Studies on work-life conflict and related outcomes due to CMC being used outside work are numerous and deserve reviews of

their own. Some studies nevertheless appeared in the review when email stress was their main focus. When email is received on small handheld devices such as smartphones, they can be checked everywhere at any time. Employees highlight that work-related emails can be checked in ‘dead times’ such as while waiting at the airport (Mazmanian et al., 2005). This constant email checking outside work can lead to reduced autonomy and increased stress (Mazmanian, Orlikowski, & Yates, 2013), as well as to reduced disengagement (Mazmanian et al., 2005). Baruch (2005) further highlighted that email allows not only work to spillover, but also cyberbullying and abusive behavior. However, accessing email outside work has not been linked to email overload (Reinke & Chamorro-Premuzic, 2014), perhaps because this practice also prevents emails from piling up (Dabbish & Kraut, 2006).

This section has reviewed articles having discussed how email practices such as constant email checking both at work and outside work impact email stress. Although the articles highlighted the problems involved in constant email checking, they also suggested that this practice may reduce email overload by preventing emails from piling up. This intuition surely deserves to be investigated further. To conclude this review on email stress from email use, the impact of email content and quality is now discussed.

### ***2.2.3. Email quality***

The review has discussed so far how email use and behaviors surrounding email use can contribute to email stress. However, an email is first and foremost characterized by what it contains. Literature has thus frequently pointed out that email stress can also be due to emails contents and their quality (E.g., Taylor et al., 2008).

Regarding email quality, the problem of email ambiguity has been frequently mentioned. Authors suggested that email ambiguity is partly due to email characteristics such as reduced visual cues, co-presence and synchronicity (Friedman & Currall, 2003; Taylor et al., 2008). Byron (2008) further discussed how the ability of the sender to clarify the message conveyed can lead to the message being erroneously interpreted by the receiver. To tackle this problem, authors have suggested email training to increase both senders’ abilities to convey the desired meaning and receivers’ abilities to interpret messages correctly. These training interventions have been found to reduce email ambiguity and inaccuracy (Burgess, Jackson, & Edwards, 2005; Soucek & Moser,

2010) by making emails easier to read, more to the point and sent with clearer subject lines (Burgess et al., 2005). Regarding email stress, email ambiguity has then been associated with email overload (Brown et al., 2014) and conflict escalation (Friedman & Currall, 2003).

Conflict escalation can occur when a message is perceived – correctly or not – as hostile, unfriendly or aggressive and responded in kind (Friedman & Currall, 2003). As the message is responded in kind, it can then again be perceived as hostile by the receiver, and so on. Turnage (2007) further investigated this ‘email flaming’ and suggested that it was caused not only by email content but also by email tone and style. For instance, emails containing profanity, all capital letters and excessive exclamation points or questions marks were perceived as more hostile. Such threatening emails have for instance been found to increase blood pressure (Taylor et al., 2005). Baruch (2005) indicates that intimidation and insults are the most common form of hostility in email. These negative exchanges can in turn lead to stress and stress-related illness (2005).

In addition to email stress caused by email ambiguity and email flaming, some authors have discussed email content in particular. Notably, Mano and Mesch (2010) found that work-related emails – as opposed to emails unrelated to work – increased perceptions of being too easy to reach but were not considered to be more stressful. Thomas and King (2006) further explored email stress as discursively constructed. Email stress grew as email threads kept increasing in size. These email threads contained more and more receivers, tasks, updates and requests. Requests and tasks even changed from one email to the other. Email overload was thus the result of email content getting more complex and more unstable as email threads grew.

This section discussed articles having linked email quality to email stress. These articles mostly looked at email stress from email ambiguity, email flaming and email content. Although ambiguity and flaming are well investigated, the impact of email content remains relatively unexplored.

Overall, this section has reviewed how email use can impact email stress. Specifically, it has found that email stress is increased by large email volumes and time spent handling email, by some email practices such as constant email checking, and by poor email quality and email flaming. These antecedents can be called ‘quasi-material’ as

they are usually seen as objective constraints of email use despite their individual or social origins (Barley et al., 2011). The review on email stress from use has indeed pointed towards the importance of receivers' perceptions of email. Although these quasi-material antecedents seem to be related to email characteristics, they ultimately belong to individuals who appraise them to be stressful. Email stress from email receivers' perspectives is now investigated.

### **2.3. Email stress as experienced by email receivers**

Two-thirds of the studies reviewed on email stress have taken email receivers' perspectives. Specifically, these studies have looked at (1) how email stress is individually appraised, (2) how personality and demographics impact email stress, and (3) how email abilities and email management strategies impact email stress. The findings of each of these three categories are explored in turn.

#### ***2.3.1. Individual appraisal of email stress***

Not unlike stress, email stress relies on being appraised. Although authors rarely mention appraisal processes, their construct definitions and choices of variables often take them into account.

For Dabbish and Kraut (2006), email overload is defined as "users' perceptions that their own email use has gotten out of control" (2006, p. 431). Email overload is thus an individually appraised construct. This appraised nature of email overload is explicitly stated by Brown et al. (2014), who also use items such as "I find dealing with the amount of e-mails I receive stressful" (2014, p. 335). Such items do not assess the presence of email overload but the individual perception of it. In the studies reviewed, such items were common for measures of not only email overload but (Brown et al., 2014; Dawley & Anthony, 2003; Jerejian et al., 2013; Reinke & Chamorro-Premuzic, 2014; Renaud et al., 2006; Soucek & Moser, 2010). Individual appraisals were also central in studies not using self-report measures. Kalman and Ravid (2015) looked at how many unread emails it took for individuals to finally 'spring clean' their inbox. Some let unread emails pile up indefinitely, whereas others dealt with every incoming email. Clearly, thresholds varied much between participants, suggesting that individuals have their own tolerance to email stress. Even the aforementioned problem of conflict escalation in email relies on emails being appraised as hostile (Byron, 2008). Although

email stress is partly explained by email use – as discussed in the previous section – it thus mostly remains an individual appraisal of this use being stressful.

As individual appraisal is a subjective process, it can as such be altered by individual perceptions and attitudes. The studies covered in the review investigated several attitudes towards email, and some considered how such attitudes can influence the appraisal of email stress. These studies investigated attitudes regarding the productive use of email (Dawley & Anthony, 2003), the perception that email productivity benefits outweigh email costs (Mazmanian et al., 2005), the perception of email being ‘business critical’ (Sumecki et al., 2011) or important to one’s work (Dabbish & Kraut, 2006; Reinke & Chamorro-Premuzic, 2014; Sobotta & Hummel, 2015). The common theme is therefore attitudes towards email productivity benefits. Such attitudes have been found to influence email stress in several ways. First, email work importance has been found to lead to higher email volume (Dabbish & Kraut, 2006). Qualitative studies have similarly suggested that attitudes towards email productivity benefits can lead individuals to desire increased email use (Mazmanian et al., 2005). Second, email work importance has been suggested to moderate the relationship between email volume and email overload (Sobotta & Hummel, 2015), and was effectively linked to higher feelings of email overload (Dabbish & Kraut, 2006). Perceiving email to be important to one’s work, to be business critical or to have productivity benefits can thus not only impact email use directly, but also indirectly impact appraisals of email stress.

This section has discussed how email stress is a construct that is first and foremost individually appraised by receivers. Its appraisal can therefore vary from one receiver to the other and be influenced by their own attitudes towards email use. Due to these individual variations, studies on personality and demographical characteristics influencing email stress are now reviewed.

### **2.3.2. Personality and demographics**

Studies having recognized that email stress is individually appraised highlighted the importance of personality and demographical characteristics.

The studies mostly investigated neuroticism, which is an individual propensity to experience negative feelings such as worry, stress or anxiety. The only study that investigated neuroticism explicitly found that it impacted email overload indirectly

through core self-evaluations (Reinke & Chamorro-Premuzic, 2014), which are evaluations individuals hold about their own control and abilities. On the contrary, other studies implicitly investigated neuroticism by looking at negative affect, which is a tendency to experience negative emotions, and individual propensities to worry. Negative affect has been suggested to increase negative perceptions of emails in Byron's (2008) conceptual paper. Hair, Renaud and Ramsay (2007) further identified three types of propensities to feel stressed or pressured by email use. Individuals feeling 'relaxed' by email use were generally not stressed by email. On the contrary, email exerted pressure on individuals 'driven' by email use, and exerted stress on individuals generally 'stressed' by email use (2007). Similarly, stressful feelings of email overload have been associated with personal propensities to worry (Jerejian et al., 2013). Overall, these studies suggest that neuroticism is a personality trait having significant impact on email stress. This finding is not surprising, as neuroticism is also a significant predictor of stress itself (Costa & McCrae, 1980). More generally and as suggested by Reinke and Chamorro-Premuzic (2014), email stress may be influenced by core self-evaluations above and beyond neuroticism. Core self-evaluations are indeed composed not only of neuroticism, but also of self-esteem and locus of control, which have as well been associated with email stress (Hair et al., 2007; Reinke & Chamorro-Premuzic, 2014).

The influence of demographics on email stress is less clear. Although most studies report no influence of age on email stress, Byron (2008) hypothesized that age could exert such influence because of disparities in terms of email abilities and emotion regulations between younger and older workers. Among the studies reviewed, only one reported age differences in email perceptions (Burgess et al., 2005). Similarly, appraisals of email stress were related to (Renaud et al., 2006) and to educational differences in only one study as well (Dawley & Anthony, 2003). Overall, there is a lack of evidence on the potential influence of demographics on email stress.

However, studies have clearly unveiled differences in terms of managerial responsibilities. Managers are more likely to receive and send more emails (Kalman & Ravid, 2015; Mano & Mesch, 2010; Whittaker & Sidner, 1996). Although they have to deal with a higher email volume, they may also have less time to manage their inboxes (Whittaker & Sidner, 1996). This finding has been challenged by Kalman and Ravid (2015), who found inbox clearing dynamics to be relatively similar between managers

and non-managers. Overall, email receivers with managerial responsibilities may suffer more from email stress.

The studies discussed in this sub-section have emphasized the importance of neuroticism and core self-evaluations in receivers' appraisals of email stress. Core self-evaluations are partly composed on individuals' confidence about their abilities. Despite limited evidence, demographics are supposed to impact email stress because of differences in abilities. Taken together, these findings and hypotheses suggest investigating the impact of email abilities on email stress. This investigation is conducted in the following sub-section.

### ***2.3.3. Email abilities and email management strategies***

Email receivers vary in their abilities and strategies used to handle email. These email abilities and email management strategies can in turn moderate the email use – email stress relationship.

Sobotta and Hummel (2015) hypothesized that email knowledge could be a moderator of email overload. Dawley and Anthony's (2003) indeed found that individuals with more experience in using email suffered less from email overload. Such knowledge and experience have been investigated in more details in studies of email abilities. In order to mitigate feelings of email overload, studies have highlighted the importance of email processing abilities (Burgess et al., 2005; Soucek & Moser, 2010). Specifically, email receivers can reduce their email stress with an efficient use of email filters, flags, reminders and folders and accurate identification of emails importance (Burgess et al., 2005; Soucek & Moser, 2010).

Regarding email filtering, filing and archiving, literature has frequently discussed how email stress can be impact by one's inbox management strategies. An early study of email overload identified a typology of email receivers' strategies to deal with their inboxes (Whittaker & Sidner, 1996). Receivers were classified into frequent filers who cleaned their inboxes frequently, spring cleaners who cleaned their inboxes infrequently all at once, and no filers who kept all emails in their inboxes (1996). Since this paper, studies have expanded this typology. Notably, Kalman and Ravid (2015) found the inbox management strategies to be much more diverse. They suggested that inbox management strategies should be looked at as continuums rather than typologies. Their

participants had indeed diverse strategies ranging from pure piling to constant cleaning (2015).

The impact of such strategies on email stress remains unclear. An untidy inbox can serve as a reminder of email overload (Barley et al., 2011) and sorting emails in a number of email folders can help fighting email overload (Whittaker & Sidner, 1996). However, Dabbish and Kraut (2006) found that the higher the number of email folders, the higher the email overload. They suggested that emails may be harder to retrieve when too many folders are used.

Training employees to improve their aforementioned email abilities and strategies can in turn help to reduce their email stress (McMurtry, 2014). Soucek and Moser (2010) presented a comprehensive training intervention including formal training, role-playing exercises and peer support groups. This intervention dealt with email filtering, archiving and assessment. It helped trainees to better cope with email overload thanks to their enhanced information processing abilities (2010). Burgess and et al.' (2005) training intervention mostly targeted email senders and will be further discussed in the next section. Although a part of their training intervention taught email receivers to assess email quality and importance, its impact on email overload was not investigated.

This sub-section has reviewed studies on receivers' email abilities and strategies and found that information processing abilities and email inbox management can help tackling email stress. Such abilities and strategies can be enhanced by training interventions, thereby reducing email stress further.

This section has discussed email stress from email receivers' perspectives. It found that email stress is an individually appraised construct that can therefore be strongly influenced by individual characteristics. The studies covered receivers' attitudes towards email, personality and demographical characteristics, email abilities and email use strategies. In the last sub-section on email abilities, the idea that email senders bear a crucial responsibility in email stress was introduced. They are indeed the ones writing and sending emails in the first place. The following section discusses email stress because of and as experienced by email senders.

## **2.4. Email stress because of and as experienced by email senders**

In order for email stress to occur, emails have to be sent in the first place. This section discusses the responsibilities of email senders and their perceptions by email receivers in email stress. Studies are organized in two sub-sections. (1) It is first argued that the email medium gives most power to email senders, thereby making email senders major antecedents of email stress. (2) The discussion continues on how relationships between email senders and email receivers impact email stress. (3) The section finally reviews how email senders' expectations create societal, organization and individual norms that can influence email stress as experienced by email receivers. However, no study found during this review investigated email stress as experienced by original email senders except for one study that marginally discussed stress from emails left unanswered (Hair et al., 2007).

#### ***2.4.1. The power of email senders: control over email volume and quality***

The previous sections have dealt with the antecedents of email stress within email use and email receivers. However, emails need to be sent in the first place, putting email senders at the very beginning of the email stress process.

Studies have frequently discussed the imbalance of power inherent to the email medium. As there are no or very few restrictions on incoming emails, most emails sent ultimately reach their destinations. This had led authors to state that email senders have all the authority over the email receivers (Renaud et al., 2006). Email senders have the power to 'drop' tasks onto email receivers (2006). This can be beneficial to them when it eases their workload, but it can also create new demands (Derks & Bakker, 2010). On one hand, the effort required to send emails is limited to one's time and writing speed. Individuals are therefore limited in the amount of emails they can send, although these emails can be sent to plenty (Kalman & Ravid, 2015). On the other hand, there are no or very few restrictions on incoming emails, meaning that there can be unlimited amounts of them (2015). This represents an imbalance of power between email senders, whose outgoing email volume is limited and controlled, and email receivers, whose incoming email volume is unlimited and uncontrolled.

In addition to having the power to control the email volume of others, email senders control email quality. The problem of email quality previously discussed indeed finds its roots in email senders. When asked about what they believed to be antecedents of

email overload, email receivers report peer misuse and peer lack of email abilities (Dawley & Anthony, 2003). This is why all the studies reviewed on email training in the previous section mostly consisted of email senders training (Burgess et al., 2005; Dawley & Anthony, 2003; Soucek & Moser, 2010). The goal was to reduce email stress by teaching email senders to write more efficient emails. Email senders were trained to write more concise and to the point emails, to make better use of subject lines and to understand the strength and limitations of the email medium (Burgess et al., 2005; Soucek & Moser, 2010). These training interventions were found to improve emails quality as reported by email receivers (Burgess et al., 2005) and to reduce email receivers' feelings of email stress (Soucek & Moser, 2010).

This sub-section has emphasized the importance of email senders in the production of potentially stressful emails. It found that email senders have control over email volume and quality, thereby holding great responsibility in the email stress experienced by email receivers. In addition to directly influencing the volume and quality of emails, email senders can also implicitly influence email stress appraisals. This implicit impact is first implied in relationships between email senders and email receivers, which is now investigated.

#### ***2.4.2. Relationships between email senders and email receivers***

An email is constituted of a subject line, content, a date, a list of recipients, and above all a sender. Email senders can thus be part of the appraisal process of email stress. This sub-section specifically deals with how email stress can be influenced by relationships between email senders and email receivers.

First, email senders' status can influence email stress. Work emails are not anonymous, and the email receivers often know the email senders. Appraisals of email stress may differ when the email sender is one's supervisor or someone higher up in the hierarchy (Byron, 2008). This was the main focus of Romm and Pliskin's (1999) qualitative study on office tyranny through email. Although these harassing behaviors from individuals higher up in the hierarchy can appear in all media (Baruch, 2005), email is particularly at risk due to its speed, recordability and multiple addressability (Romm & Pliskin, 1999). Email can thus serve as an extra vehicle for abusive behaviors from supervisors. In addition, Byron (2008) suggested that emails sent from individuals higher up in the

hierarchy may be shorter, contain less positive and friendly emotions, and contain more negative emotions. The emails sent by individuals higher up in the hierarchy may thus be rightfully perceived as more negative by email receivers. These negative perceptions may further be aggravated by the desire of lower-status email receivers to seek approval from higher-status email senders (Byron, 2008). Quantitative results have also found emails sent from higher-status individuals to be more threatening (Taylor et al., 2005).

Such dynamics are, however, specific to supervisor-subordinate relationships. Relationships between email senders and email receivers regardless of status can also impact email stress. Two conceptual frameworks have dealt with this hypothesis (Byron, 2008; Friedman & Currall, 2003). Byron (2008) suggests that the longer the relationships between a sender and a receiver, the more positive and accurately perceived the email exchanged. Although the email medium allows for fewer opportunities to express emotions, individuals knowing each other may develop paralanguage over (2008). Friedman and Currall (2003) similarly argue that risks of conflict escalation may be mitigated by strong social ties between email senders and receivers. When email senders and receivers know each other well, they anticipate future interactions and may therefore be more careful about exchanging email that can damage their relationships (2003).

The articles discussed in this sub-section have suggested how relationships between email senders and receivers influence email stress. Specifically, they identified email senders and receivers' relative status and social ties as having influence on email stress. These two characteristics are relative, meaning that they are about both email senders and receivers. The next sub-section, however, discusses characteristics that are specific to email senders and implicitly appraised in form of norms surrounding email use.

#### **2.4.3. Perceptions of email senders by email receivers**

Research on email stress has abundantly discussed the importance of social context factors such as shared norms surrounding email use (Barley et al., 2011; Byron, 2008; McMurtry, 2014). In this review, however, norms are considered to relate to how email senders are perceived by email receivers. Although email receivers have internal norms and expectations regarding their email use, most norms investigated in literature are

expectations of email senders. Specifically, this sub-section investigates email senders' expectations for prompt responses and for constant availability.

Email senders' expectations for prompt responses to their emails have been abundantly encountered in the review. They can manifest themselves either implicitly, when the sender's expectations are known to the receiver, or explicitly. The discursive analysis of Thomas and King (2006) provides examples of such explicit display of expectations. In the emails they reviewed, email senders asked to receive a reply "by tomorrow", "right back", "by noon today" or even "THIS MORNING!" [sic]. These expectations for prompt responses impact email stress as experienced by email receivers. It has been noted that every email receiver has "to live up to the sender's expectations according to acceptable reaction times in answering emails" (Derks & Bakker, 2010). In addition to creating annoyances (Barley et al., 2011), these expectations have been found to increase the impact of email volume and quality on emotional exhaustion (Brown et al., 2014). By creating strong urges to respond, they also impact burnout, health-related absenteeism, sleep quality and stress (Barber & Santuzzi, 2015), and potentially work overload (Taylor et al., 2008).

In addition to response expectations, some studies have investigated email senders' expectations for constant availability. The evidence regarding their impact on email stress is inconclusive to date (Reinke & Chamorro-Premuzic, 2014). However, these expectations have been investigated outside of email research in studies of corporate smartphone use and work-life conflict. These studies deserve a review of their own, but have found that such email use outside of work hours led to increased work-life conflict and burnout (Wright et al., 2014). These expectations for constant availability also create strong pressure to response and tend to spread to email receivers, who have in turn heightened expectations of others (Mazmanian et al., 2005). Expectations for constant availability and prompt responses thus tend to operate at an organizational level (Barley et al., 2011) and constitute the "email culture" of each organization.

This sub-section has reviewed how the expectations of email senders in terms of response speed and constant availability can increase email stress among email receivers. Although these expectations are traditionally studied as part of social context factors, they were discussed as part of email senders' characteristics, as appraised and

perceived by email receivers. This approach to expectations deserves to be investigated further, as it brings social norms down to an individually appraised phenomenon.

More broadly, this section has dealt with email senders' impact on email stress. It found that the email medium gives email senders the power to impact others' email stress. This impact can be further nuanced by relationships between senders and receivers and the perceptions of senders' expectations by receivers. The next section summarizes the review findings and the gaps that will be addressed in the thesis.

## **2.5. Summary of findings and conceptual gaps**

The first section of the review has investigated the impact of email use on email stress. It found that email stress is increased by large email volumes and time spent handling email, by some email practices such as constant email checking, and by poor email quality and email flaming. Although this may be perceived as constraints relative to email characteristics (Barley et al., 2011), they are individual behaviors leading to individually appraised email stress.

Email stress as perceived by email receivers has therefore been investigated. This investigation revealed that individual appraisal plays a central role in email stress. This appraisal can in turn be influenced by email receivers' attitudes such as perceived work importance of email, and personality and demographical characteristics such as neuroticism, core self-evaluations and managerial responsibilities. Email stress was found to be mitigated by email receivers' abilities in terms of email processing and by a skillful use of email filtering, filing and archiving. These email abilities can be improved by training interventions, as discussed in several studies covered in the review.

Finally, the review has discussed how email senders can impact the email stress of others. It emphasized that email senders are the ones producing potentially stressful emails and email volumes. The review then discussed how email stress can be influenced by relationships and status differences between email senders and receivers, and by perceptions of email senders' expectations in terms of availability and response speed.

The review has identified several factors of email stress and has grouped them in a simple yet comprehensive framework centered on email, receiver and sender factors (See Figure 2.1). Byron's (2008) framework of email misperceptions has been applied to email stress and expanded to take into account the individually appraised nature of email stress. This approach has given less importance to email characteristics (Taylor et al., 2008) in favor of individual characteristics, thereby following a call for "a shift of research focus to the individual level when examining virtual phenomena" (Wang & Haggerty, 2011, p. 301). By doing so, several gaps were encountered throughout the review and remain to be addressed.

First, no study has been found on email stress from low email volume. Low email volume may, however, impact email stress when receivers are being left out of email threads (Mulki, Bardhi, Lassk, & Nanavaty-Dahl, 2009) or when their emails are not answered (Hair et al., 2007). Current scales of email overload cannot capture 'email underload' because of unipolar items such as "I get too much email" (Hogan & Fisher, 2006, p. 1). This gap is investigated as part of the second research question on desired email use. Indeed, email underload can be conceptualized as having an email use that is not up to one's desired use. This conceptualization mirrors email overload, which is about having an email use exceeding one's desired use. As the review emphasized that attitudes towards email matter for email stress, this approach is of relevance.

Second, the appraisal process of email stress was not investigated enough in literature. Previous research on email stress has somehow stayed narrowly focused on email and developed frameworks without much consideration for the research not being done about email. For instance, popular stress theories have remained largely ignored in email stress research. This gap is investigated as part of the first research question on the links between email stress and workplace stress.

The next section presents the methodology that is used to answer the research questions that was set in the introduction and motivated in this literature review.

### **3. METHODOLOGY**

This section presents and justifies the multi-method design adopted for the project. It then discusses in more detail the purposes, samples, instruments and analytical tools used in each of the three studies that are part of this multi-method project. It also maps these studies onto the papers that constitute the thesis by describing how they have been used in each paper.

#### **3.1. Research philosophy**

Although email stress cannot be touched or contemplated, it is said to be real as “it has causal efficacy; has an effect on behaviour; makes a difference” (Fleetwood, 2005, p. 199). This broad definition does not limit the study to material entities, but also encompasses any entity that has an impact on the world. As such, ideas, feelings or organizations are considered to be as real as any material entity, although they belong to different modes of reality (2005). Starting from this definition taken from critical realism, the thesis adopts a postpositivist approach (Phillips, 1990). Postpositivism starts from a realist ontology supporting that reality exists independently of perceptions and current knowledge, but cannot be fully captured and always observed directly. However, human beings construct their own understandings and beliefs about reality. Reality can then be approached by examining observable indicators embedded in these social constructions. The chosen research philosophy thus adopts a realist ontology and a constructivist epistemology, which is not unlike critical realism.

Given the research questions set in the introduction, a strong positivist approach would not have been appropriate for this thesis. The reality and the concepts being studied can neither be observed directly nor be captured fully. For instance, *desired email use* and *email stress* are subjective constructs that can only be understood from an individual point of view. However, the use of postpositivism allows transcending these individual constructions to achieve an overall understanding of their impacts. For instance, individuals vastly differ in their appraisals of stress, and yet stress has common impacts on other variables such as depression, burnout or reduced mental health (Bond & Bunce, 2003; Faragher, Cass, & Cooper, 2005; Sutherland & Cooper, 2000). As this thesis is only looking at such common and transcending impacts, the fact that appraisals are unique to each individual does not matter and is not investigated further.

Authors have highlighted the appropriateness of such approach for the study of CMC (Sias, 2009). From a postpositivist point of view, entities such as relationships, despite their intangibility, transcend individual beliefs and can be examined through indicators such as self-report measures of relationship quality or quantity of interactions (2009). As email stress is individually appraised, it may similarly be investigated using indicators provided by individuals themselves. These indicators may take any form, from self-report surveys to interviews. As such, this research philosophy is welcoming the use of the multi-method design taken in the thesis and now introduced.

### **3.2. Multi-method design**

To answer the research questions raised in the introduction, the thesis adopted a multi-method design, which is a design including both quantitative and qualitative components (Greene, Caracelli, & Graham, 1989). Using a multi-method design allowed to look at different facets of email stress (Greene et al., 1989), combining the reach of quantitative surveys with the depth of qualitative interviews to achieve an enriched understanding of email stress (Mingers, 2001). Indeed, both quantitative and qualitative methods “can be employed to reveal different facets of the same reality and also to examine reality from different perspectives” (McEvoy & Richards, 2006, p. 72), which is consistent with the chosen research philosophy. Such a design is also particularly appropriate for the study of the subjective and intangible constructs involved in the thesis, given it allows probing for multiple indicators of email stress as experienced by individuals. These indicators can be used to triangulate the construct of email stress.

The research undertaken for this thesis consisted of three phases: a pilot study made of (1) a quantitative cross-sectional survey and (2) qualitative interviews, and (3) the main quantitative cross-sectional survey. When the pilot study was designed, the thesis was still about CMC stress rather than about email stress. The purpose of this three-phase multi-method project (Creswell & Clark, 2011) was to explore the influence of desired CMC use and desired email use on workplace stress with the intent of adapting existing stress theories to the study of CMC (See

Table 3.1). As this purpose involved theory testing, the quantitative studies were as important as the qualitative study. As each study was designed and conducted

subsequently, this design can also be qualified as sequential (Creswell & Clark, 2011). A sequential design was chosen in order to move the thesis forward in an iterative way, thereby refining hypotheses with the findings of each study.

Table 3.1 can be summarized using the multi-method notation of Morse and Niehaus (Morse & Niehaus, 2009): [QUANT → qual] → QUANT. This means that the project was sequentially (arrows) composed of a pilot study (brackets) consisting of an important quantitative component (caps) and a qualitative component of less importance (no caps), and a main quantitative study of greater importance (caps).

Each study, that is part of this thesis, will now be detailed, presenting their purposes, samples, ethical procedures, instruments and analytical techniques.

*Table 3.1. Overview of Studies*

Project	Pilot study	Main study	
Study	<b>1. Quantitative cross-sectional survey</b>	<b>2. Qualitative semi-structured interviews</b>	<b>3. Quantitative cross-sectional survey</b>
Date	June 2014	October 2014	February 2015
Purposes	- Explore the joint impact of actual and desired CMC use on workplace CMC media and workplace stressors	- Achieve an enriched understanding of the relationships between desired CMC use and workplace stress	- Confirm the pilot study findings on a larger sample, with stronger instruments and with a focus on the email medium
Used in papers	Paper 2	Paper 1	Paper 1, Paper 3
Theories adapted and tested	Person-Environment Fit	Person-Environment Fit	Person-Environment Fit, Cybernetics
Sample size	118	23	504
Sample source	Panel	Single organization	Panel

### **3.3. Study one: quantitative cross-sectional pilot survey**

#### **3.3.1. Purpose**

The first phase was a quantitative cross-sectional exploration of the joint impact of actual and desired CMC use on workplace stress, for various CMC media and workplace stressors. Parts of this survey were dedicated to the testing of a Person-Environment fit approach to workplace stress from actual and desired CMC use. The pilot survey data were only used in Paper 2.

#### **3.3.2. Sample**

The sample was composed of 118 U.S. workers recruited from a panel in June 2014. Participants had to (1) work full-time, and (2) interact not only face-to-face in their jobs. An organization was initially supposed to provide participants, but withdrew early in the project. Other organizations were approached, but to no avail. In June 2014, I decided with my supervisors to approach a panel company to collect this pilot data and move the project forward. I selected the panel company Qualtrics because of their reputation in providing good quality samples (Brandon, Long, Loraas, Mueller-Phillips, & Vansant, 2014) and their partnerships with my university. I self-funded this pilot study. It has to be noted that both panel data and data collected in a limited number of organizations are considered to be non-probability samples. Although panel data allow selecting participants using quotas, criteria and representativeness, it remains nonrandom.

Qualtrics sent a survey link by email to its pool of participants, and the link was clicked by 316 individuals. Out of these 13 were rejected because they were not working full-time, 179 were rejected because they were only interacting face-to-face at work, and 6 were rejected on the basis that they answered four times (or more) quicker than the average answering time. 118 valid responses were obtained with no missing data, which represents a usable response rate of 37 percent. The sample representativeness is further discussed in Paper 2.

#### **3.3.3. Ethics**

The study has been approved by the Lancaster University ethics committee before launch. Participants had to agree to the consent form presented in Appendix 9.2 to take part in the study. This consent form emphasized that participation was voluntary and

that non-participation was not going to incur any adverse effects. It also stated that the answers were completely anonymous and confidential, and provided contact details and information on data collection. The data was securely stored and handled throughout the thesis.

### **3.3.4. Instruments**

The questionnaire was composed of three sections. The first section was about CMC. Participants were asked to what extent they (1) interacted and (2) would have liked to interact at work using each CMC medium, using 7-point Likert scales ranging from “1 = Not at all” to “7 = To a very great extent”. CMC media were email, video conference, audio conferencing or phone calls, instant messaging, and enterprise social networking. These media are commonly investigated together in studies of CMC (Scott & Timmerman, 2005; Wang & Haggerty, 2011). In addition, participants were asked the same questions about a list of CMC activities developed for the study (See Appendix 9.2) based on existing scales of team virtuality (Chudoba, Wynn, Lu, & Watson-Manheim, 2005). These measures looked at (1) actual CMC use and (2) desired CMC use in a commensurate way (Klein, Jiang, & Cheney, 2009), as advised in PE fit literature and for reasons further detailed in Paper 2. The section further asked participants to what extent (1) they had CMC abilities and (2) they had to use these abilities. These items were based on previous research on CMC abilities (Wang & Haggerty, 2011). Finally, this section asked participants about their anxiety towards CMC using the CMC anxiety scale (Scott & Timmerman, 2005) and parts of the computer anxiety scale (Raub, 1981).

The second section was about workplace stress. Workplace stress was assessed by the presence of several workplace stressors, using the instrument ‘A Shortened Stress Evaluation Tool’ (ASSET) (Cartwright & Cooper, 2002; Faragher, Cooper, & Cartwright, 2004) and 5-point Likert scales of agreement from 1=“Strongly Disagree” to 5=“Strongly Agree”. This instrument contained the workplace stressors of work relationships (8 items), work-life balance (4 items), job security and change (4 items), job conditions (9 items), resources and communications (4 items), job control (4 items) and workload (4 items). Additionally, the paper included a scale of physical and mental health from ASSET, and the scale “Brief Measure of Positive and Negative Affect” (Watson, Clark, & Tellegen, 1988).

The third and final section was about demographics and asked participants about their gender, age, education, group of staff, organizations' employees and industry, and commuting time (See Appendix 9.2).

Paper 2, which used this pilot survey data, has only exploited a small portion of all these instruments, as can be seen in the paper. The items used were the commensurate measures of actual and desired email use, the workplace stressors of work relationships, job control and job conditions, and some control variables. As a result, most of the pilot study data has not been used in this thesis due to its lack of conclusive findings. The full dataset stripped of copyrighted elements will, however, be made freely available on my personal website, allowing other researchers to further exploit it.

### **3.3.5. Analytical tools**

The main analytical tool used for this pilot survey was quadratic polynomial regression (Edwards & Parry, 1993; Klein et al., 2009) and surface response analysis (Klein et al., 2009). This tool allows looking at the impact of fit and misfit between two commensurate measures on an outcome variable. It produces three-dimensional surfaces of fit (See Figures Figure 5.2, Figure 5.3 and Figure 5.4) and assesses the significance of these surfaces using polynomial regressions. I ran the analyses using the *IBM SPSS* software version 20 and procedures from Jeff Edwards' institutional website (Edwards, n.d.-b). The surfaces were plotted using an Excel tool developed by Edwards (Edwards, n.d.-a). The procedures are further detailed and explained in Paper 2.

## **3.4. Study two: qualitative pilot interviews**

### **3.4.1. Purpose**

The second phase consisted of qualitative interviews intending to probe and explore the previous quantitative results in more depth. The aim was to achieve an enriched understanding (Mingers, 2001) of the relationships between desired CMC use and workplace stress. The pilot interview data were only used in Paper 1.

### **3.4.2. Sample**

The interviews were conducted in September 2015 with 23 employees of a multinational IT organization. I gained access to this organization based on previous work experiences. The organization was also selected because its employees would

have certainly faced email stress among other types of CMC stress. Indeed, the organization employs a young workforce that uses most CMC media, namely, email, instant messaging, phones, audio-video conferencing, wikis and enterprise social networking. It has operations in 20 countries, making an abundant use of virtual teams. The interviewees were selected at random from a list of employees working in the French headquarters. The interviewees, 17 men and 6 women, had a mean age of 32 years. 12 participants declared to have at least one person under their supervision, 5 had none but were experienced professionals, and 6 had none with entry-level jobs. The sample demographics are further presented in Paper 1.

### **3.4.3. Ethics**

The study has been approved by the Lancaster University ethics committee before launch. Before the beginning of the interviews, participants were presented a consent form (See Appendix 9.3). This consent form emphasized that participation was voluntary and anonymous, and that non-participation was not going to incur any adverse effects. The participants had the time they wished to read the consent form. I then summarized the content of the consent form to them one more time to verify that they were aware of its details. They were made aware that the interviews were going to be recorded, and that they were free to withdraw from the study at any point and to ask for their recording to be destroyed. Participants then signed two copies of the consent forms, one for them to keep and one that I collected and stored.

The interviews were then recorded, with the recorder placed visibly on the table. At the end of each interview, I discussed with the participant the findings of the pilot survey and answered questions about the research project. At the end of each day, the recordings were transferred from the recorder to an encrypted drive and destroyed from the recorder. Regarding confidentiality, participants were made aware that their answers could be used in the thesis and future publications in form of anonymized quotes. No participant asked for their answers to be taken off record during the interviews. Participants' anonymity was guaranteed by removing any identifying information from the transcript and translating the transcripts to English for publication.

### **3.4.4. Instruments**

The pilot interviews relied on an interview guide (Rubin & Rubin, 2011) of open-ended questions. A consent form was first presented and signed, followed by some closed demographical questions (See Appendix 9.3). The rest of the interview consisted of three sections but was semi-structured and encouraged the emergence of unanticipated content. In the first section on actual CMC use, I asked questions about CMC media used, volume of CMC use or daily routines. In the second section on desired CMC use, I asked interviewees about their attitudes towards CMC and their opinions on their actual CMC use. In the third section on workplace stress, I asked participants about their feelings of workplace stress due to CMC use and probed them to specific examples (See Appendix 9.3). All the interviews except one were conducted in French, as the interviewees and I are French natives.

### **3.4.5. Analytical tools**

The interviews were recorded and later transcribed on text-processing software. Participants were given pseudonyms and information that could have identified them was removed. The transcripts were then imported in the computer-assisted qualitative data analysis software *NVivo 10* for analysis. An initial list of *a priori* codes was drawn up based on the pilot survey findings (Creswell & Clark, 2011). This initial list was completed with codes that emerged during the analysis, and some *a priori* codes were dropped in the process. A detail of these codes is provided in Paper 1.

## **3.5. Study three: quantitative cross-sectional main survey**

### **3.5.1. Purpose**

The first and second phases were part of a multi-method pilot study exploring the joint impact of actual and desired CMC use on workplace stress, for various CMC media and workplace stressors. The third and final phase of this research project was designed based on their findings. It consisted of a quantitative cross-sectional survey intending to confirm the pilot study findings on a larger sample, with more robust instruments and with a focus on email. Its purpose was thus to confirm that workplace stress was indeed the result of a misfit between individuals' actual and desired email use. The main study data were used in Papers Paper 1 and Paper 3.

### **3.5.2. Sample**

Similar to the pilot survey, the sample was composed of full-time U.S. workers recruited from a Qualtrics panel ( $N = 504$ ) in February 2015. This time, however, the study was not self-funded but was granted the Qualtrics Behavioral Research Grant worth \$3,000. This grant is selectively awarded by Qualtrics for research projects wishing to use their panels. I naturally applied to this grant following the pilot survey in order to reproduce its findings on a larger sample coming from a similar panel. The company was not involved in any stage of the study except for participant recruitment because they recruited the participants.

The procedure was similar to the one used in the pilot survey. A link to the survey was sent by Qualtrics in February 2015 to their pool of participants. 795 individuals clicked on this link and filled in the questionnaire. 67 of those were screened-out because they were not working full-time. 2 participants were rejected on the basis that they answered four times quicker than the average answering time, and 222 because they failed to correctly answer the attention filter question (See Appendix 9.4). Finally, 504 valid responses were collected with no missing data, which represents a usable response rate of 63%. Demographics are further detailed in Papers Paper 1 and Paper 3.

### **3.5.3. Ethics**

The study has been approved by the Lancaster University ethics committee before launch. Participants had to agree to the consent form presented in Appendix 9.4 to take part in the study. This consent form was similar to the one used for the pilot survey. It equally emphasized that answers were anonymous and voluntary. The data was handled along with the pilot data in a secure way throughout the research.

### **3.5.4. Instruments**

The instruments were relatively similar to those of the pilot survey, but were improved following the results of the pilot survey and interviews. The questionnaire similarly consisted of three sections.

The first section was about CMC. Just as in the pilot survey, participants were asked to report the extent to which (1) they interacted and (2) would have liked to interact using each CMC medium. As the main study was more focused on email, it also included new

items specific to actual and desired email use. For instance, participants were asked about their actual and desired extent of work emails checked, received, read or sent, of time spent handling work emails, or of email use outside working hours (See Appendix 9.4). These items were adapted from studies on email use and email overload (E.g., Dabbish & Kraut, 2006). Furthermore, participants were asked to report the numerical amount of work emails sent, read and received over the last 24 hours, and the numerical amount of work emails they have sent, read and received or would have liked to on average on a daily basis. A scale of possessed and required email abilities was also administered, adapted from previous studies (Dabbish & Kraut, 2006; Wang & Haggerty, 2011). Outside of email use, participants were asked to report the extent to which their organizations had implemented CMC policies such as email etiquettes, telecommuting restrictions or email training interventions, and the extent to which they would have liked to see these policies implemented (See Appendix 9.4). As CMC control variables, I included measures of email work importance (Dabbish & Kraut, 2006), computer anxiety (Raub, 1981), email software, and the number of coworkers with whom the participants had regular email exchanges. Finally, participants had the opportunity to answer an open-ended question on email stress.

The second section was again about workplace stress and included the same instruments already described in the pilot survey section, with the addition of work engagement from ASSET. The third and final section included the demographics. It again included questions on age, gender, work seniority, industry and so on (See Appendix 9.4). This time, however, participants had to enter numerical values in most demographical questions in order to retrieve continuous variables. I also followed the demographical categories of the United States Department of Labor, Bureau of Labor Statistics (2013) in order to compute sample representativeness.

Paper 1, which used the main survey data, has exploited the entire workplace stress instrument but only a small part of the CMC instrument, that is the actual and desired extent of CMC media use. The items related to email have been completely left out. On the contrary, Paper 3 used parts of the email instrument but only one workplace stressor. Just as the pilot survey, the full main survey dataset will be made freely available on my website. Additionally, parts of the dataset appear in Paper 3 in form of a covariance matrix.

### **3.5.5. Analytical tools**

The main survey was again analyzed using quadratic polynomial regression and surface response analysis. As these analyses failed, I decided to turn to structural equation modeling (SEM) in order to test more elaborate models (See Paper 3). I learnt SEM procedures in a massive open online course. The software *IBM SPSS 20* was used to compute the scale, clean the data, compute the demographics, run the PE fit analyses, and run the hierarchical linear regressions used in Paper 1. SEM was conducted using the open source software *R* version 3.2.3 with the packages *lavaan* (Rosseel, 2012) version 0.5-20 and *semTools* (Pornprasertmanit, Miller, Schoemann, & Rosseel, 2013) version 0.4-11. The syntaxes used for the SEM analysis are provided in Paper 3. Further details on the procedures are presented in Papers Paper 1 and Paper 3.

## 4. PAPER 1

- **Title:** Stress from Actual and Desired Computer-Mediated Communication Use
- **Authors:** Stich, J.-F., Tarafdar, M., Cooper, C.L., Stacey, P.
- **Status:** At the second round review for *New Technology, Work and Employment* (NTWE)

### 4.0. Foreword

The following paper is titled “Workplace Stress from Actual and Desired Computer-Mediated Communication Use”. It explores the joint impact of actual and desired use of CMC on workplace stress using both quantitative and qualitative findings. The quantitative results show that workplace stress is impacted by actual and desired use of mostly email but not of other media. The qualitative results illustrate such joint impact using different cases and introduce the idea of ‘fit’ between how individuals desire to use CMC and how they have to use CMC. It builds upon the literature review by providing statistical results and vivid illustrations of how stress can be the result of both actual and desired CMC use, and how it can be influenced by individual attitudes towards CMC.

#### 4.0.1. Paper history

The paper is currently at the second round of reviewing in *New Technology, Work and Employment* (NTWE). Initially, the paper was covering the results from the pilot survey I conducted in June 2014 (N=118) and the pilot interviews I conducted in September 2014 (N=23). The purpose of this pilot study was to explore the relevance of a Person-Environment fit (PE fit) approach to the topic (See Methodology). It contained both a qualitative component, and a quantitative component showing interesting correlational results. As the hypotheses were supported using both the pilot study (N=118) and the main study (N=504), it has been decided to use the main study dataset that contained the largest sample instead. The resulting paper was submitted to NTWE on the 4<sup>th</sup> of June 2015.

The paper received a positive and encouraging ‘revise and resubmit’ decision in November 2015. The revised version, which is part of this thesis, was submitted in April 2016 and was reworked based on the reviews. It explains and validates the joint

impact of actual and desired CMC use on stress. PE fit definitions and theories were suggested as a way forward to build on the findings of the paper, leading to the next paper.

#### ***4.0.2. Paper contribution to the thesis***

This paper is an essential component of my thesis as it prepares the ground for the remaining papers. The exploratory nature of this paper is also consistent with how I approached the topic of my thesis. The survey instrument was long and included most CMC media (E.g., email, videoconferencing, enterprise social networking...) and several stressors. When I conducted the pilot study, I wanted to look at CMC as a whole and was unsure about which stressors would be impacted by CMC. The qualitative component of the paper was also open and exploratory. The thesis adopted a ‘trial and error’ approach, with multiple pilot studies to advance in an iterative way (See Methodology). The following paper is the result of this exploration. Some areas of future research it has identified were exploited in my main study and in Papers Paper 2 and Paper 3. It thus prepared the ground for the remaining contributions of the thesis.

The first lead that gave a new direction to my thesis was that among all CMC media, email was the only medium for which actual and desired use had a systematic joint impact on workplace stress. This led us to conclude that although employees’ actual and desired CMC uses are organizationally-bound, most employees use email and have desires in terms of email use. Email is therefore a medium of crucial importance when investigating workplace stress across organizations. This finding has contributed to the shift in focus from CMC stress to email stress.

The second important lead was about PE fit. This lead was not exactly found in an exploratory way because it was part of my initial hypotheses. The main purpose of the pilot study was to test the relevance of a PE fit approach to CMC stress. However, the current version of this paper has been made broader and now explains why PE fit might be one interesting approach among others. It is therefore an introduction to both Paper 2 taking a PE fit approach and Paper 3 taking a cybernetics approach. I wish you a pleasant read of this paper that prepares the ground for the main thesis contributions.

## **Workplace Stress from Actual and Desired Computer-Mediated Communication Use**

### ***Abstract***

The potential of computer-mediated communication to impact workplace stress is frequently discussed among academics and practitioners alike. Emails especially have been blamed for increased workloads or constant interruptions at work. Clearly, computer-mediated communication is highly topical. This research investigates how workplace stress is impacted not only by computer-mediated communication use, but also by how individuals desire to use it and appraise its' use. It does so across a range of media such as emails or instant messaging, and workplace stressors such as workload or work relationships. This investigation is conducted using a multi-method design. The quantitative study found that desired and actual use together, impacted workplace stress, mostly for email, but not for other media. The qualitative study further showed that such impact depends on organizational conditions such as available media or co-workers preferences. The research emphasizes taking into account desired use, subjectivity and differences between media.

### ***Keywords***

Technostress, computer-mediated communication, email, workplace stress, misfit,  
multi-method study

#### **4.1. Introduction**

The introduction of computers in the workplace has transformed interpersonal communications. Potential negative consequences of their use have attracted considerable attention among practitioners and academics alike. Specifically, the use of computer-mediated communication (CMC) has been investigated as a potential cause of workplace stress. Studies have found that CMC use increases work demands, leading to increased workload (Barley et al., 2011; Day, Paquet, Scott, & Hambley, 2012) and work-life conflict (Stich, Farley, Cooper, & Tarafdar, 2015; Wright et al., 2014). It can lead to adverse psychological outcomes such as burnout and distress (Barber & Santuzzi, 2015; Mano & Mesch, 2010). Email applications, widely implemented in organizations and used for a wide variety of tasks (O’Kane, Palmer, & Hargie, 2007), are seen as producing frequent interruptions (Jackson, Dawson, & Wilson, 2003) and overwhelming in their volume (Dabbish & Kraut, 2006; Mano & Mesch, 2010). Practice-based findings echo and emphasize this negative impact of CMC use on the individual’s workplace stress. Titles such as “your email habits are ruining your life” (Bratskeir, 2016) or “checking your emails outside of work really IS bad for your health” (Davies, 2015) exemplify the notion that use of CMC in the workplace can cause stress and damage health.

However, while use of CMC can potentially increase workplace stress, the appraisal of stress is individual-specific. For instance, not every employee who experiences work-life conflict attributes it to the use of corporate smartphones - some actually perceive smartphones as part of their overall lifestyle. In such a case, they experience less work-life conflict (Derks, Bakker, Peters, & Wingerden, 2016) and feel a greater sense of professionalism (Cavazotte, Heloisa Lemos, & Villadsen, 2014). In another example of the importance of individual appraisal, individuals having positive views towards emails are less stressed by them (Sumecki et al., 2011). As these examples show, every person does not experience workplace stress from the use of CMC to the same extent, and in the same way. Additionally, each person’s perception of the extent of CMC use is also not the same. This is exemplified in studies showing that measures of actual and self-reported use are hardly correlated (Andrews, Ellis, Shaw, & Piwek, 2015; Higgins, McClean, & Conrath, 1985). For instance, when compared to the actual number, individuals tend to underestimate the number of phone interactions that are relatively

short, and overestimate the length of phone calls (Higgins et al., 1985). Thus, it is important to take into account the individual's perception regarding the use of media, when investigating workplace stress.

As the above examples show, there are grounds to believe that the impact of CMC use on workplace stress is influenced both by actual CMC use, and by how individuals desire to use CMC. However, the simultaneous impact of these two factors has not been investigated systematically in empirical studies or literature reviews. Do actual CMC use and desired CMC use impact workplace stress jointly? If so, which workplace stressors are affected and how? Is this impact the same for every communication medium? The lack of answers to these questions is theoretically and practically problematic. From a theoretical point of view, individuals' appraisals are central to constructs such as email overload and workplace stress. Lack of understanding of how they influence the relationship between CMC use and workplace stress leaves a gap in our understanding of how and why an individual may or may not experience workplace stress due to CMC use. For practice, as media share common characteristics, it is easy to mistakenly extend a finding on the effect of email on work overload to a conclusion that all CMC affect work overload, and subsequently to design inappropriate workplace interventions. This research has the aim, therefore, to explore how individuals' 'desired use' of CMC influences the relationships between CMC use and workplace stress. Specifically, we address the following two research questions:

**Research Question 1:** To what extent do actual and desired computer-mediated communication use together impact workplace stress?

**Research Question 2:** How do actual and desired computer-mediated communication use together impact workplace stress?

A multi-method design including quantitative and qualitative data is used to investigate these research questions (Creswell & Clark, 2011). This complementarity allows us to use the distinctive strength of each method to create a richer and more complete understanding (Greene et al., 1989) of how and why workplace stress from the use of CMC is individual-dependent. The first study uses quantitative data and mostly addresses the first research question by looking at the extent to which actual and desired CMC use together impact workplace stress. The second study uses qualitative data and

mostly focusses on the second research question, while still providing some additional understanding of the first research question. It explores situations in which individuals experience workplace stress due to their actual and desired CMC use together, and identifies the conditions for these experiences. Both studies' purposes, samples, methods and results are presented separately, with a final part merging their respective discussions, as recommended (Creswell & Clark, 2011).

The quantitative study found that desired and actual use together impacted workplace stress, mostly for email, but not for other media. The qualitative study further qualified these findings. It showed that actual and desired use could impact workplace stress for other media as well, but such impact depends on particular organizational conditions, such as the extent to which the desired media were available in the organization, and co-workers had similar preference regarding media. The paper contributes to the theoretical understanding of workplace stress due to CMC use. It emphasizes the importance of taking into account desired use and subjectivity in such understanding. It also suggests that media vary in their impact on workplace stress, and that widely used and highly visible media such as email (Barley et al., 2011) might be more prone to causing workplace stress.

The paper is organized as follows. In the next section, we present literature on the impact of actual and desired CMC use on workplace stress and set our theory background. Section 4.3 presents the study's mixed-method research approach. The quantitative and qualitative studies' objectives, data and results are discussed in Sections 4.4 and 4.5 respectively. An integrative discussion is presented in Section 4.6, along with a summary of contributions and implications of our research. Section 4.7 presents the concluding remarks.

## **4.2. Theory Background and Literature Survey**

In this section we first present the literature discussing the impact of the extent of CMC use on workplace stress. We then describe studies that have explored how workplace stress could potentially be impacted by actual and desired CMC together.

### **4.2.1. Computer-mediated communication use and workplace stress**

A traditional approach has been to consider the CMC use as a potential source of workplace stress. Stress is defined as the process by which individuals appraise demand

conditions in the environment as stressors, activate coping behaviors, and experience varying levels of resulting strain (Cooper et al., 2001). Employees who communicate with each other using CMC could face various demands, such as pressures to respond quickly to incoming messages, pressures to remain constantly available using CMC, increased workload due to CMC or relationship problems like misunderstandings or cyberbullying (Day et al., 2012; Stich et al., 2015). These demands influence diverse workplace stressors such as work-life conflict or work overload, resulting in strain outcomes such as distress, burnout or anxiety (Stich et al., 2015).

This approach considers CMC use in terms of use patterns, volumes of interactions, message content or media characteristics. For instance, a number of studies focus on the ‘amount’ or ‘extent’ of communication or time spent using the CMC application. According to their findings, the higher the amount of email sent and received, the higher the feelings of email stress and distress (Mano & Mesch, 2010) and of email overload (Sumecki et al., 2011). Similarly, the more time spent handling email or managing email, the higher the feelings of work overload (Barley et al., 2011). In these findings, the volume of email and time spent dealing with email were theorized to cause workplace stress regardless of other parameters.

Another set of studies have focused on the characteristics of different CMC applications. Friedman and Currall (2003) showed that email characteristics such as a-synchronicity and lack of visual and emotional cues make it more likely to escalate disputes due to ambiguity and potential miscommunication (Byron, 2008; Friedman & Currall, 2003). Barley et al. (2011) investigated the effects of email use on work overload by showing that the a-synchronicity of email communications contributed positively to this relationship. CMC use may thus cause workplace stress partly because of some intrinsic characteristics of media.

Most studies focusing on the relationship between CMC use and workplace stress have used self-reported rather than system-generated measures of use (Andrews et al., 2015; Higgins et al., 1985). The stress literature has long emphasized that demand conditions first need to be subjectively appraised by individuals as stressors (Lazarus, 1990). In this context it is interesting to note the potential inadequacies of system-generated measures of CMC use. The same ‘length’ or ‘volume’ of CMC use as generated by the system might impact the appraisal of the workplace stress differently from one

individual to another (Ingham, 2003; Karr-Wisniewski & Lu, 2010). A higher system-reported volume of email may be by one individual than a lower-system reported volume of email by appraised as more stressful another. Similarly, even very short communications may also lead to interruptions that come across as intense because of the compressed time, potentially leading to workplace stress and burnout (Barber & Santuzzi, 2015). The perceived number of very short communications however tend to be underestimated and the length of phone conversations to be overestimated, in comparison to the actual number (Higgins et al., 1985). These studies suggest that individuals might also differ in their appraisals of workplace stress due to CMC use. The following paragraphs will thus discuss how the impact of CMC use on workplace stress might be influenced by subjective constructs as perceived by the individual.

#### **4.2.2. Desired computer-mediated communication use and workplace stress**

Individuals have various desires in terms of how they wish to use CMC. For instance, some employees desire to possess a corporate smartphone in order to remain constantly available and feel more professional (Cavazotte et al., 2014). Some feel apprehensive towards using CMC and will try to avoid using these media (Scott & Timmerman, 2005). In this study we use the phrase ‘desired CMC use’ to describe how individuals would like to use CMC.

Desired CMC use influences actual CMC use. For instance, studies show that individuals who are highly anxious about using CMC in general tend to communicate less using CMC (Scott & Timmerman, 2005). The idea that desired use guides actual use is also exemplified in research on corporate smartphones. Work-life conflict, work-life imbalance and burnout are among the negative consequences of CMC outside work using devices such as corporate smartphones (Derks et al., 2015; Matusik & Mickel, 2011; Wright et al., 2014). Despite employees being aware of these potential negative outcomes, they frequently desire these devices and ask them of their own free will (Cavazotte et al., 2014; Matusik & Mickel, 2011; Waller & Ragsdell, 2012). They want to remain available and perceive their smartphones as being enablers for them to be so.

Interestingly, even as employees feel themselves to be constantly on call because of CMC use outside work, they feel more satisfied with their jobs (Diaz, Chiaburu, Zimmerman, & Boswell, 2012), more productive (Bailey & Kurland, 2002; Matusik &

Mickel, 2011) and feel a greater sense of professionalism (Cavazotte et al., 2014; Day et al., 2012) as a result. This paradox of feeling empowered yet being damaged by CMC has been recently pointed out in the literature (E.g. Mazmanian, 2013; Stich et al., 2015; ter Hoeven & van Zoonen, 2015).

Desired CMC use has also been investigated as a moderator of the relationship between CMC use and workplace stress. Work-life conflict due to smartphone use outside work is mitigated for individuals desiring blurred work boundaries (Derks et al., 2016; Park, Fritz, & Jex, 2011) or viewing smartphone-enabled constant availability positively (Wright et al., 2014). Similarly, positive views on email as a business critical tool have been found to lower feelings of email overload (Sumecki et al., 2011). (Barley et al., 2011) made a strong case for the importance of attitudes. They showed that email use was not only a strong potential cause of workplace stress, but that it also “distracted people from recognizing other sources of overload in their work lives” (2011, p. 887). Although other media such as smartphones, clearly had the potential to impact overload and work-life conflicts, participants only blamed email. This was because they focused so much on workplace stress due to email that the potential of other media to cause workplace stress was somehow overlooked. Viewing email negatively thus increased the appraisal of email being the cause of workplace stress (Barley et al., 2011). These findings highlight that the appraisal of workplace stress resulting from CMC use may be influenced by desires to reject or embrace CMC use.

#### **4.2.3. Misfit between actual and desired CMC use, and workplace stress.**

The literature we have discussed so far has considered the impact of CMC use on workplace stress and how this impact might be influenced by the individual’s desired use. However, there might be situations in which individuals do not have the option of fulfilling their desires. For instance, even though one might want fewer emails, reducing one’s volume of email in the workplace might not be as easy or possible. The resulting misfits between one’s actual and desired CMC use may influence the extent to which the individual appraises workplace stress.

Such misfits have mostly been discussed in the form of mismatch in ‘volume’. In particular, email overload has been defined as “users’ perceptions that their own email use has gotten out of control” (Dabbish & Kraut, 2006, p. 431), which implies the importance of both the actual email volumes and the perceptions of these volumes.

Email overload has been found to increase workplace stress (Mano & Mesch, 2010), burnout and absenteeism (Barber & Santuzzi, 2015). Other media have also been subject to the problem of overload. For instance, social overload can occur when social media users feel overloaded by requests for social support coming from their contacts (Maier, Laumer, Eckhardt, & Weitzel, 2015). More generally, these findings inherit from research on information overload and underload (O'Reilly, 1980).

The literature that we have discussed highlights that although CMC use can impact workplace stress on its own (E.g., Barley et al., 2011; Day et al., 2012; Mano & Mesch, 2010), desired CMC use influences this relationship in several ways. Desired use can moderate this impact, in that individuals embracing CMC could be less stressed because of CMC use (Sumecki et al., 2011; Wright et al., 2014), or individuals rejecting CMC can appraise workplace stress due to CMC use to a greater extent (Barley et al., 2011). Desired use can also guide actual use, such as when individuals who are anxious about CMC reduce their actual use accordingly (Davis, 1989; Scott & Timmerman, 2005). Finally, experience of workplace stress might also be the unique result of misfits between desired and actual use, such as when individuals feel forced to answer work email at home because of managerial pressures (E.g., Waller & Ragsdell, 2012).

### **4.3. Research design**

We adopt a multi-methods approach in this study in order to provide an understanding of the relationships between actual CMC use, desired CMC use and workplace stress. A multi-method design is defined as one that includes both quantitative and qualitative components (Greene et al., 1989). The research problem we have identified is that of a lack of understanding of how actual and desired CMC use can together impact workplace stress. The multi-method design allows us to look at different facets of desired and actual CMC use impacting workplace stress together. Such a research design has been termed as complementary (Greene et al., 1989) because it leverages the strengths of both qualitative and quantitative data in achieving an enriched understanding of the phenomenon (Mingers, 2001). In this research, the quantitative study allowed us to look at the extent to which actual and desired CMC use together influenced workplace stress, for a wide range of media and workplace stressors. The qualitative design provided rich examples of the underlying conditions under which such impacts were experienced by employees in the workplace.

We adopt a sequential multi-method design (Creswell & Clark, 2011) where a quantitative study precedes a qualitative one, as described in Table 4.1. Each study primarily answers one research question. The quantitative study aims at identifying the extent to which actual and desired CMC use together impact workplace stress, for different media and workplace stressors. It thus mainly answers the first research question. In addition, it also provides guidance for answering the second research question in the subsequent study. The qualitative study then explores how individuals' appraised workplace stress is impacted by desired and actual CMC use together, mainly answering the second research question. It also partially contributes to the first research question by building on the media and workplace stressors identified in the quantitative study to clarify the conditions for such impacts. The results of the first study thus feed the purpose and design of the second, consistent with sequential designs (Mingers, 2001). Both studies were analyzed separately.

In the next sections, we present the respective backgrounds and findings for each study separately, in their own parts. We also explain in more detail how and where each study's data were collected and analyzed. We then draw overall contributions from each into a merged discussion (Creswell & Clark, 2011). Similar structures have been used for mixed methods papers to provide an enriched understanding of impact of CMC use on workplace stress (E.g., Mann & Holdsworth, 2003).

#### ***4.4. Study One – Investigating the extent to which actual and desired CMC use together impact workplace stress***

##### ***4.4.1. Purpose***

Although workplace stress has been shown to be impacted by CMC use only (E.g., Barley et al., 2011; Day et al., 2012; Mano & Mesch, 2010), we have presented literature showing that desired CMC use might also play an important role in this relationship. Literature has discussed many workplace stressors such as work-life conflict (E.g., Wright et al., 2014), relationships (E.g., Byron, 2008) and overload (E.g., Dabbish & Kraut, 2006). It has also looked at the use of several different media such as email (E.g., Sumecki et al., 2011), instant messaging (Li, Gupta, Luo, & Warkentin, 2011) or social networks (E.g., Maier et al., 2015).

*Table 4.1. Study Design*

		<b>Study 1: Quantitative</b>	<b>Study 2: Qualitative</b>
<b>Research question 1:</b> To what extent can actual and desired computer-mediated communication use together impact workplace stress?	<b>Purpose</b>	Investigate the impact of actual and desired CMC use together on workplace stress.	
	<b>Findings</b>	The impact of actual and desired CMC use together on workplace stress is significant primarily for email. For other media, use alone mostly impacted workplace stress.	Participants mostly discussed email and instant messaging despite having access to all other media investigated in Study 1.
<b>Research question 2:</b> How can actual and desired computer-mediated communication use together impact workplace stress?	<b>Purpose</b>		Explore how actual and desired CMC use can together impact workplace stress.
	<b>Findings</b>	The impact of actual and desired use together on workplace stress might matter more for media more widely used or fostering more involved attitudes such as emails.	<p>Three conditions of misfit were revealed:</p> <ul style="list-style-type: none"> <li>• Misfits between desired and available media</li> <li>• Misfits between desired and imposed CMC use</li> <li>• Misfits between one's own desired CMC use and those of others.</li> </ul>

Given this diversity of both media and workplace stressors, there might be reasons to wonder whether the impact of actual and desired CMC use together on workplace stress holds regardless of the media and workplace stressors under study. Study 1 thus had **the purpose of investigating the extent to which actual and desired CMC use together impact workplace stress.** Actual and desired CMC use was measured for different media, and workplace stress was measured for different workplace stressors. It primarily answers the first research question.

In absence of specific guidance from the literature to the contrary, we hypothesize that the impact of actual and desired use together will hold for all media and workplace stressors. The literature has shown that the extent of CMC use can impact workplace stress alone, regardless of the medium or workplace stressor. For instance, cyberbullying has been found to lower psychological health for a range of media, although these media differed in terms of anonymity, location constraints or abilities to transmit visual cues (Ford, 2013). In another example, the result that apprehensions towards CMC influence CMC use was found for a range of different media such as emails, instant messages or phone calls (Scott & Timmerman, 2005). We thus have reasons to hypothesize that workplace stress will be better explained by actual and desired CMC use together rather than by actual CMC use alone, although the joint impact might differ in magnitude, for different media and workplace stressors. We therefore draw the following hypothesis.

**Hypothesis:** *The variation in workplace stress will be explained significantly more by actual and desired CMC use together than by actual CMC use alone.*

#### **4.4.2. Sample**

The sample for this study consisted of full-time U.S. workers recruited from a Qualtrics panel. This company has been selected as the source of the sample panel due to the acknowledged quality of their samples and their prevalent use in academic research (Brandon et al., 2014). Qualtrics provided financial support for participant recruitment, but was not involved at any stage of the research. 795 individuals clicked on the link received by email and filled out the questionnaire. 67 of those were screened-out because they were not working full-time. Additionally, 2 participants were rejected on the basis that they answered four times quicker than the average answering time, and 222 because they failed to answer the attention filter question correctly. The attention filter question was “this is an attention filter, please answer "not at all”” and was placed in the middle of the questionnaire. Finally, 504 valid responses were collected with no missing data, which represents a usable response rate of 63%. The sample was composed of 47.4% men and 52.6% women aged from 20 to 73 years, with a mean age of 44 years<sup>1</sup>.

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<sup>1</sup> The full dataset is made freely available to readers who wish to examine or exploit it further.

#### **4.4.3. Measures**

##### ***Independent variables: computer-mediated communication***

The first part of the questionnaire measured the extent of CMC use at work. This was assessed by the use of different media, included email, video conferencing, audio conferencing or phone calls, instant messaging, and enterprise social networking. These media are commonly investigated together in studies of CMC (Scott & Timmerman, 2005; Wang & Haggerty, 2011), except for enterprise social networking which is a newer workplace medium inspired from social networking platforms (Leonardi, Huysman, & Steinfield, 2013). For each of these media, measures of actual and desired CMC use were administered. For actual CMC use we asked participants to report the extents to which they (1) were interacting at work using each medium. For desired CMC use, we asked participants to report the extents to which they (2) would like to interact at work using each medium. As an example, the two respective items for email were (1) “At work, to what extent do you interact with others using email?” and (2) “At work, to what extent would you like to interact with others using email?”. As suggested by the literature, these measures were ‘commensurate’ (Edwards, 1996). That is, they were worded similarly in order to allow the respondent to compare the actual and desired use along the same dimension. These items indeed measured actual and desired CMC use rather than actual and desired sociability, as demonstrated by the low correlations between the different media. If participants had answered about sociability, their answers would have indeed been similar for all items regardless of the medium (I.e., interacting with others by any mean). All items were assessed using 7-point Likert scales ranging from “1 = Not at all” to “7 = To a very great extent”.

##### ***Dependent variables: workplace stress***

The second part of the questionnaire looked at workplace stress. This was assessed by the presence of several workplace stressors, using the ‘A Shortened Stress Evaluation Tool’ (ASSET) (Cartwright & Cooper, 2002; Faragher et al., 2004) that has been found reliable across multiple studies (Donald et al., 2005; Faragher et al., 2004; Johnson, 2009). These workplace stressors were work relationships (Cronbach  $\alpha = .907$ , 8 items), work-life balance (Cronbach  $\alpha = .790$ , 4 items), job security and change (Cronbach  $\alpha = .811$ , 4 items), job conditions (Cronbach  $\alpha = .771$ , 9 items), resources and communications (Cronbach  $\alpha = .845$ , 4 items), job control (Cronbach  $\alpha = .896$ , 4 items)

and workload (Cronbach  $\alpha = .861$ , 4 items). Participants answered on a 5-point Likert scale from 1="Strongly Disagree" to 5="Strongly Agree".

#### **4.4.4. Findings**

The hypothesis suggested that workplace stress would be better explained by the impact of actual and desired CMC use together than by the impact of actual CMC use alone. The hypothesis was tested using hierarchical linear regressions for each workplace stressor as the dependent variable, for each medium. Hierarchical regressions were used in order to see the increment in variance explained by actual and desired CMC use together compared to actual CMC use alone. As shown in Table 4.2, the regression in Step 1 contained only the control variables. We selected age, gender, education, company size and persons under supervision as the control variables, as suggested in literature on workplace stress due to email (Mano & Mesch, 2010, p. 68). In Step 2, we added actual CMC use as an independent variable to the regression equation. Finally, Step 3 contained both actual and desired CMC use as independent variables.

The hypothesis is supported when the increase in  $R^2$  (i.e. in predictive power) between Step 2 and Step 3 is significant, meaning that the model containing both actual and desired CMC use predicts stressors more than the model containing actual CMC use only. On the contrary, a significant increase in  $R^2$  between Step 1 and Step 2 but not between Step 2 and Step 3 would mean that workplace stress is better predicted by actual CMC use alone.

*Table 4.2. Results of hierarchical regressions and changes in R-squared*

Medium	Workplace Stressor	Step1. R <sup>2</sup> Control	Step 2. R <sup>2</sup> Actual	Step 3. R <sup>2</sup> Actual, Desired	ΔR <sup>2</sup> Step1-Step2	ΔR <sup>2</sup> Step2-Step 3
E-mail	Resources and Communication <sup>a</sup>	.011	.013	.045***	.002	<b>.032***</b>
	Control <sup>a</sup>	.013	.020	.066***	.007	<b>.046***</b>
	Work Relationships <sup>a</sup>	.023	.027	.060***	.004	<b>.033***</b>
	Work Life Balance	.045***	.045	.052	.000	.007
	Workload <sup>a</sup>	.005	.006	.026***	.001	<b>.035***</b>
	Job Security & Change <sup>a</sup>	.021	.027	.060***	.006	<b>.033***</b>
	Job Conditions <sup>a</sup>	.031**	.047**	.066***	.016**	<b>.019**</b>
Video conference	Resources and Communication	.011	.013	.013	.002	.000
	Control	.013	.013	.013	.000	.000
	Work Relationships <sup>b</sup>	.023*	.035*	.036*	<b>.012*</b>	<b>.001</b>
	Work Life Balance <sup>b</sup>	.045***	.095***	.097***	<b>.050***</b>	<b>.002</b>
	Workload <sup>b</sup>	.005	.040***	.040***	<b>.035***</b>	<b>.000</b>
	Job Security & Change <sup>b</sup>	.021	.033*	.035*	<b>.012*</b>	<b>.002</b>
	Job Conditions	.031**	.035	.035	.004	.000
Audio conference	Resources and Communication <sup>a</sup>	.011	.011	.020	.000	<b>.009*</b>
	Control <sup>a</sup>	.013	.017	.030*	.004	<b>.013*</b>
	Work Relationships <sup>a</sup>	.023*	.024	.027	.001	.003
	Work Life Balance <sup>b</sup>	.045***	.057*	.062*	<b>.012*</b>	<b>.005</b>
	Workload	.005	.009	.016	.004	.007
	Job Security & Change	.021	.021	.022	.000	.001
	Job Conditions	.031**	.031	.037	.000	.006

	Resources and Communication	.011	.011	.011	.000	.000
	Control	.013	.016	.016	.003	.000
Instant Messaging	Work Relationships	.023*	.023	.024	.000	.001
	Work Life Balance <sup>b</sup>	.045***	.069***	.069**	<b>.024***</b>	<b>.000</b>
	Workload	.005	.005	.012	.000	.007
	Job Security & Change	.021	.023	.023	.002	.000
	Job Conditions	.031**	.031	.032	.000	.001
	Resources and Communication	.011	.014	.017	.003	.003
	Control	.013	.013	.015	.000	.002
Enterprise Social Networking	Work Relationships <sup>b</sup>	.023*	.039**	.041**	<b>.016**</b>	<b>.002</b>
	Work Life Balance <sup>b</sup>	.045***	.095***	.097***	<b>.050***</b>	<b>.002</b>
	Workload <sup>b</sup>	.005	.042***	.042***	<b>.037***</b>	<b>.000</b>
	Job Security & Change <sup>b</sup>	.021	.031*	.037*	<b>.010*</b>	<b>.006</b>
	Job Conditions <sup>b</sup>	.031**	.038*	.042	<b>.007*</b>	<b>.004</b>

\*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$ ,  $\Delta R^2 X-Y$ : Change in R-squared between Step X and Step Y

<sup>a</sup> The hypothesis is supported: actual and desire use both impact the workplace stressor

<sup>b</sup> The hypothesis is not supported but post-hoc analyses reveal that actual use alone impact the workplace stressor

### ***Media and Workplace Stressors for which Hypothesis was Supported***

As shown in Table 4.2, the hypothesis was not supported for every communication medium and workplace stressor. The impact of actual and desired use together was found more predictive than the impact of actual use alone for mostly email (See rows labeled “a” in Table 4.2). Within email, the impact of use and desired use together was found to be significant for resources and communication stress, job control stress, relationship stress, workload stress, job security stress and job conditions stress. The impact of actual and desired use together was also found significant for audio conference and phones on resources and communication stress and job control stress.

This finding shows that the impact of actual and desired use together on workplace stress mostly concerns the use of the email medium. One possible explanation is that because it is the most commonly used CMC application, email is often considered as an “interpretive scapegoat” (2011, p. 903) and serves as a symbol of workplace stress. This common perception that emails cause workplace stress, might act as a self-fulfilling prophecy in that negative attitudes toward email may favor the appraisal of emails being stressful (Sumecki et al., 2011). Another potential explanation for this finding is that email and phones are widely used and individuals are thus more likely to have precise desires regarding their email or phone volumes regardless of their organization. The desired use for other media might not be very high, due the diversity of organizations present in the sample. Indeed, the mean extent of email use ( $M = 4.56$ ) and audio conferencing and phone use ( $M = 3.67$ ) were much higher of those for the other media ( $M = [1.77, 2.72]$ ).

### ***Media and Workplace Stressors for which Hypothesis was not Supported***

For some other media and workplace stressors, our hypothesis was not supported. An interesting relationship was however found. That is, actual CMC use alone, rather than actual and desired CMC use together, was significant in determining workplace stress. These results are shown by rows marked ‘b’ in Table 4.2. Specifically work-life balance stress was impacted by CMC use alone for all non-email media, namely video conferencing, audio conferencing, instant messaging and enterprise social networking, as shown in the fourth row of each medium in Table 4.2.

The impact of CMC use alone on work-life conflict was positive for all non-email media. It might be that using these media causes work-life balance stress regardless of desired use, due to the difficulty of accessing them from outside work. Compared to email, which can be easily accessed from various devices asynchronously, accessing the organization's social network, instant messaging system or video conferencing system is often a stressful experience regardless of individuals' desired use. This is because, to be accessed, these media might require the use of a virtual private network (VPN) or a laptop. Using these media could thus require more time and isolation from the family environment compared to briefly checking emails on a corporate smartphone in "dead time" (Mazmanian et al., 2005, p. 3). Furthermore, when these media cannot be accessed from home, employees might have to stay longer at the office to use them, such as when a video conference or a phone call must be made with others across multiple time zones (Chudoba et al., 2005). This suggests that the use of non-email media might be related to work-life conflict regardless of desired use due to the complexity and uncertainty of operating these media outside work.

The impact of CMC use alone was found significant for video conferences, and relationship stress, workload, job security stress, as well as for enterprise social networks and relationship stress, workload stress, job security stress and job conditions stress. (There could be two reasons for this. One, that use of video conferencing or enterprise social networks alone impacted these workplace stressors. Two, the participants may not have answered differently enough about their actual and desired use, perhaps because they did not have enough opinions about video conferencing and ESN due to their novelty and infrequent implementation in organizations. We note here that collinearity between actual and desired use for each medium was at acceptable levels. The maximum *VIF* was 4.292, which is below the threshold for concern (Bowerman & O'Connell, 1990).

Finally, neither actual CMC use, nor actual and desired CMC use together had any impact on the rest of the media – workplace stressors combinations. This is depicted in the rows in Table 4.2 unlabeled by either 'a' or 'b'. This includes for example the impact of email use on work-life balance stress or the impact of instant messaging use on all workplace stressors but work-life balance. The general lack of findings related to instant messaging is surprising given its potential for interruptions (Gupta, Li, &

Sharda, 2013; Li et al., 2011). Additional research is suggested to explore these media and workplace stressors, perhaps using different measures of use such as content, frequency or characteristics.

The quantitative study primarily established that desired use and actual use influenced most workplace stressors together, but only for email and not for any other media. They thus suggested that the importance of desired CMC use depends on the particular media. For media other than email, we observed that CMC use alone had a significant effect on workplace stress. The absence of support for our hypothesis for media other than email might have been due to the variety of organizations investigated. In the second study we investigate the effect of actual and desired CMC use in one single organization. The organization provided its employees access to all the media that we investigated in the quantitative study. We expected the qualitative nature of the study to allow us to investigate the effects of actual and desired CMC use in greater detail and richness and to qualify the nature of their relationship with workplace stress.

#### ***4.5. Study Two – Exploring how actual and desired CMC use together impact workplace stress***

##### ***4.5.1. Purpose***

Our quantitative study established that actual and desired CMC use can together impact workplace stress, at least for email. However, it did not explain *how* actual and desired use together impacted workplace stress, and why it was important mostly for email. The intention of our qualitative study was to examine these issues. We did so by investigating situations in which the use of CMC led to workplace stress, in a single organization that had implemented all the media examined in study 1. The purpose of Study 2, as explained in Table 4.1, was to ***explore how actual and desired CMC use can together impact workplace stress***. Specifically, we looked at situations in which actual and desired CMC use might interact or conflict to impact workplace stress. We also explored whether desires were more salient for some media in particular, as was found in the preceding quantitative study. This study built on the quantitative study results in that participants were asked about the same media previously investigated and the initial list of codes was designed based on the quantitative findings.

##### ***4.5.2. Study site, data collection and data analysis***

The setting for this study was a large multinational IT company having operations in 20 countries. The organization employed a young workforce that used all the media we examined in our quantitative study, namely, email, instant messaging, phones, audio-video conferencing, wikis and enterprise social networking. Access to the employees was obtained by the first author's previous collaboration with the organization's human resources department. 23 employees were interviewed at the French headquarters. None of them participated in Study 1. Our interviewees, 17 men and 6 women, had a mean age of 32 years. 12 participants declared to have at least one person under their supervision, 5 had none but were experienced professionals, and 6 had none with entry-level jobs. We conducted the interviews based on an interview guide (Rubin & Rubin, 2011) of open-ended questions. Except for some preliminary demographical questions, the interview was semi-structured (See Table 4.3). The participants were asked about actual and desired CMC use, and about their perceived impact on workplace stress. For instance, participants were asked about the media they used, their desires and apprehensions regarding CMC use, and how the use and desires impacted their workplace stress. Participants were encouraged to draw on specific cases they encountered or routines they deployed. These common questions helped to ensure comparability across the participants. Yet, their open-ended nature did not restrict the emergence of unanticipated content. The interviews were conducted in French by the first author who is a French native speaker. Each interview lasted approximately 20 minutes and was recorded after the participant signed a consent form. The interviews were then transcribed and translated into English for analysis.

In order to analyze our interview data, participants were given pseudonyms, as illustrated in Table 4.4. An initial list of codes was drawn up, as shown in Table 4.4, based on the insights from Study 1, as well as from literature (E.g., Barley et al., 2011; Wajcman & Rose, 2011). The initial list of *a priori* codes included each medium and workplace stressor also present in the first study and the codes "Perceived fit" and "Perceived misfit" (See rows labeled "a" in Table 4.4). These *a priori* codes were "predetermined topic codes in the qualitative analysis that are based on the important factors identified in the quantitative results" (Creswell & Clark, 2011, p. 236); a practice consistent with our multi-method design. A few new codes emerged in the process, which were added to our initial list of codes. For instance, different types of fit between actual and desired CMC use were added (See unlabeled rows in Table 4.4).

Some predetermined codes like job conditions stress were however dropped as they did not appear in the interviews. Broadly described, the codes were grouped under the categories actual CMC use, desired CMC use, workplace stress, and the impact of actual and desired CMC use together on workplace stress. The transcripts were read and coded according to this list.

*Table 4.3. Interview Guide for Study 2*

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### **1. Demographics**

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Gender: Male/Female

Age: (in years)

Job role: Senior Management, Middle Management, Front Line Management,  
Experienced: Professional or Non-Management, Entry Level

Commuting time: return (in hours)

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### **2. Actual CMC use**

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Media used by the interviewee (mail, video, audio, instant messaging ...)

Frequency and volume of the interviewee's CMC use (actual and desired)

Skills related to CMC use possessed by the interviewee or required by the interviewee's job

Daily routines of the interviewee regarding CMC use

Interviewee's use of remote access to CMC

Persons with whom the interviewee has regular interactions

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### **3. Desired CMC use**

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Interviewee's opinions and previous experiences regarding remote access to CMC

Interviewee's attitudes and apprehensions toward CMC use

Interviewee's most and least preferred media

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### **4. CMC use and workplace stress**

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Interviewee's experience of workplace stress due to CMC use

Specific examples and contexts describing the interviewee's experience of workplace stress due to CMC use

Influence of each medium on the interviewee's experience of workplace stress

Influence of each workplace stressor (work relationships, work-life balance, workload, control, security, job conditions) on the interviewee's experience of workplace stress

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*Table 4.4. Codes used in Study 2*

Code category and code	Number of participants who mentioned the code	Number of occurrences of the code	Example Quote
<b>Category:</b>			
<b>Actual CMC use</b>			
Audioconference <sup>a</sup>	15	47	"I have at least two phone calls a day. It can go up to five a day."
Email <sup>a</sup>	23	136	"I receive between twenty and thirty emails a day."
Instant Messaging <sup>a</sup>	20	76	"After two hours, I log into the instant messaging system and I send a message 'so have you seen my email?' I think it puts a bit of pressure [laughs]."
Other media	10	21	"People will use and refer to this [ticketing] tool for all their queries related to my department, and depending on their query they will be redirected directly to the person who is the more able to solve their problem. So this is reassuring for me."
Videoconference <sup>a</sup>	11	29	"I always activate my video. When I do this, the other does it as well."
Remote access	23	108	"On my corporate smartphone, I only receive emails. Sometimes I read them in the morning during coffee and that's it."
<b>Category:</b>			
<b>Desired CMC use</b>			
Desired media use	15	29	"I am more of a phone person. [...] I send an instant message with 'hey, do you have a minute?' and if they say yes, I call them straight away. I think people have identified me as someone who calls [laughs]."
Desired remote work use	13	17	"I do not want to be contacted during my personal time. But I would like to do it on my own when I believe it serves me or my team."
Perceived volume	18	32	"I am not an email person very much, so I don't even like when there are few of them [laughs]."

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<b>Category:</b> <b>Impact of actual and desired use</b>			
Media Fit	13	24	"Our media are well integrated."
Perceived fit <sup>a</sup>	21	50	"It fits me well. It would have been harder for me in terms of stress if I received 200 emails a day and 45 instant messaging chats. These are demands that would be hard for me to deal with."
Perceived misfit <sup>a</sup>	13	27	"The email volume is way too important. I realized it when I came back from holidays."
Short-term fit	14	22	"There are moments in which I cut off the emails to focus on the task at hand."
Supplementary fit or misfit	16	38	"Emails are pushed... Since I impose them on others, I know that they will be read."
Temporal fit or misfit	7	8	"[CMC] can have an impact in terms of volume. But not here [smile]. If I take again the example of my previous organization, I received roughly 250 emails per day."
<b>Category:</b> <b>Workplace stress</b>			
Workplace stress in general <sup>a</sup>	19	30	"For emails, stress probably comes mainly from the volume, the amount."
Job control <sup>a</sup>	19	50	"I think it is really stressful for a team to receive emails from their manager at 2am. So I forced myself to follow certain rules of conduct. First I did that for my team but then I realized it was also for myself."
Job Conditions <sup>a</sup>	0	0	
Job Security <sup>a</sup>	0	0	
Resources and Communications <sup>a</sup>	10	16	"Lack of resources, lack of personnel. I would like to do more regular meetings."
Work Life Balance <sup>a</sup>	20	34	"It does not invade my personal life. Because I drew a line although I see emails coming in at 8.30pm, 9pm."
Work relationships <sup>a</sup>	20	58	"It is never positive to receive an email saying 'you are late' copying the boss, the boss's boss and two clients... It is part of the game but it is... Some people do it. It is really toxic."
Workload <sup>a</sup>	14	37	"It could be stressful to realize that the

			to-do list keeps getting bigger, as many emails are waiting for my answer. This is a visual indication that my workload is increasing, increasing, increasing."
Immediacy	20	69	"Even when there are no emails, there is [the instant messaging system] and people coming to see you at your desk, so..."
Focus or concentration	16	33	"Morning hours were precious as these were hours in which you can work uninterrupted for an hour and a half because people have not woken up yet"

<sup>a</sup>: *a priori* codes based on the findings of the first study

#### 4.5.3. Findings

We begin by noting that all media were not used to the same extent. The numbers in columns 2 and 3, under “Actual CMC Use” in Table 4.4 show the occurrences of codes in our data that correspond to the use of different media. As we can see, employees identified email as the most commonly used medium, followed by remote access and instant messaging.

Participant responses revealed three key conditions through which actual and desired CMC use together impacted workplace stress. The first condition was that of participants not having access to the media they wanted to use for their work (Table 4.4, Codes: “Media fit” and “Desired media use”). This misfit between media that were desired to be used, and those which were available to be used, increased workplace stressors such as work overload (Table 4.4, Code: “Workload”). The second condition was use of media that were not preferred by employees, being imposed on them through organizational norms and policies (Table 4.4, Codes: “Perceived misfit” and “Perceived fit”). This condition manifested in the form of interruptions and unwanted communications (Table 4.4, Code: “Immediacy”). The third condition was colleagues imposing their desired CMC use, such that employees’ own desired use conflicted with the desired use of others (Table 4.4, Code: “Supplementary fit or misfit”). These three conditions illustrated the joint impact of actual and desired CMC use on workplace

stress beyond the quantitative results of Study 1. We now present our findings in respect of these three conditions:

***Condition 1: Misfits between desired and available media***

We found that the actual and desired CMC use together increased workplace stress. However we obtained substantively richer and more granular insights, over and above the statistical relationships in Study 1. For instance, employees who felt they had access to the ‘right’ kind of media or combination of media, felt less exposed to workplace stress. Participants articulated that the range of media they had in their jobs made them whole and allowed them to interact smoothly and without stress, because it gave them access to a wide array of means of communication that they wanted to use (Table 4.4, Code: “Media fit”). This was made salient by Gabe, a manager in his early thirties who tried to use all media at his disposal. When asked about additional media that he could have used, Gabe declared: ‘I don’t feel there is a missing link’. He was satisfied with the range of media he had access to because in that range he could find the ones he wanted to use. Judith, who recently switched to part-time work, explained that the corporate smartphone she asked to use allowed her to switch from home matters to work matters in a smooth and soothing way:

“My children were playing football. I took my Blackberry and answered emails for a few minutes. It felt good. [...] I told them ‘I won’t be with you for ten minutes, I will be in my own bubble’ and that was it”.

She declared earlier: ‘these media make my life easier. Honestly, they are not a source of stress but of tranquility.’ By being allowed to access emails from home, Judith felt a sense of flow or completeness that could be termed as ‘media fit’. Mazmanian et al. (2005) have already highlighted such productive use of “dead times”, but the satisfaction Judith expressed was also the result of being allowed to access to the desired medium at the appropriate time. This condition was embodied in the codes “media fit” and “short-term fit” in Table 4.4.

A sense of misfit appeared when the need for a specific medium was not met. This had similarities with the concept of task-technology fit (Ayyagari, 2012; Goodhue & Thompson, 1995), which is in part, about having access to the technologies that fit the employees’ workflows and are needed. Some participants complained about lack of

specific media (Table 4.4, Code: "Resources and Communications"). Roy, whose role is to provide real-time technical support to other employees, was annoyed that users were not using the ticketing system enough and used emails or instant messages to contact him instead. Although minor, these annoyances seemed to contribute to a sense of inefficiency and sometimes even increased workload. This type of frustration might also be related to studies showing that new media such as instant messaging, social networks or ticketing systems compete with older media such as emails to fulfill individuals' needs and demands (c.f. Ramirez, Dimmick, Feaster, & Lin, 2008).

### ***Condition 2: Misfits between desired and imposed CMC use***

Our study participants frequently discussed how the use of particular media was imposed on them by the organization or by colleagues (Table 4.4, Code: "Supplementary fit or misfit"). This mostly took the form of interruptions and notifications of incoming messages to which employees were expected to respond even if they did not want to (Table 4.4, Codes: "Immediacy", "Focus or concentration", "Job control"). Russell, a manager who used to work abroad for a time, compared these interruptions with the action of 'tapping you on the shoulder virtually', as he found them as disturbing as physical interruptions. Roy, the employee in the frontline technical support function, declared having tried a small experiment to calculate the frequency at which he was being interrupted by other employees. He tried to listen to a three-minute song but was never able to finish listening to it without being interrupted by an instant message or an email from someone asking for his help. The consequences of such interruptions could include higher perceived workload and workplace stress (c.f. Barber & Santuzzi, 2015; Gupta et al., 2013; Jackson et al., 2003).

To fight these constant interruptions, techniques were suggested. Roy and others sometimes logged out of the instant messaging system, deactivated the email notification pop-ups, or tried to put a 'busy' status on the instant messaging. Peter, who declared being a 'people's person', sometimes nevertheless 'played dead' and faked being away by not responding. This generally failed as the frustrated senders decided to come to see Peter, Roy and others face-to-face instead, thus interrupting them anyway. The need for immediate answers and the frustration of having to wait for a reply or for someone to be logged in was apparently difficult to some (Table 4.4, Code: "Immediacy").

Even the classic technique of slowing the pace of email delivery (c.f. Kushlev & Dunn, 2015; McMurtry, 2014) did not prevent such behaviors. Carl had been successful at doing this in several other companies where he had worked previously, but was not able to make it work in the current one:

“[In my previous job] I had my software retrieve emails every hour or every hour and a half, so I was not interrupted for an hour. Here in this company, I don’t do this because even when there are no emails, there is [the instant messaging system] and people coming to see you at your desk, so...”

Only one participant reported a working technique. Philip, formerly an auditor, systematically arrived to work at a time when nobody could interrupt. He valued coming earlier in the office, as morning hours ‘were precious as these were hours in which you can work uninterrupted for an hour and a half because people have not woken up yet’.

On the contrary, some respondents also explained how they used various media to impose communications on others. Gabe, the manager who earlier declared being satisfied with the media at his disposal, was nevertheless a heavy user of email. One reason why he liked email in particular was that ‘emails are pushed... Since I impose them on others, I know that they will be read’. Although the more senior managers might have more power to impose their desired communications onto others (c.f. Waller & Ragsdell, 2012), others successfully imposed their communications as well (Table 4.4, Code: “Job control”). Natalie, despite being a young entry-level accountant with no managerial responsibilities, discussed her technique to get prompt answers: ‘After two hours, I log into the instant messaging system and I send a message ‘so have you seen my email?’ I think it puts a bit of pressure [laughs]’. Natalie was clearly able to impose her communications onto others despite her young age and lack of managerial responsibilities. These cases interestingly highlight that interruptions disturbing some employees are created by others in the first place (Table 4.4, Codes: “Immediacy”, “Focus or concentration”, “Supplementary fit or misfit”). Although senders higher up in the hierarchy bear special responsibility (Gupta et al., 2013; Markus, 1994; Waller & Ragsdell, 2012), all senders have power over the receivers’ CMC use (Hiltz & Turoff, 1985).

***Condition 3: Misfits between one's own desired CMC use and those of others***

As discussed above, being imposed an interaction through CMC use by someone else was found to be disturbing and annoying (Table 4.4, Code: “Supplementary fit or misfit”). This was especially the case when employees having to work together had different desired CMC use. In such situations, the desired CMC use of one employee could very well conflict with that of another. Michael, a manager in his late thirties, was the fourth oldest worker in the sample. Due to his managerial responsibilities, he had to use a large variety of media to communicate with his team on-site and abroad. Yet in this large variety of media, he strongly disliked one in particular:

“I limit my phone calls a lot. I never call. I don’t like the phone, I don’t know why [laughs]. I don’t like it, and I don’t like it either when I am called.”

Michael was obviously not into phone calls. On the other hand, Peter, the people person who sometimes ‘played dead’ to avoid instant messages, said:

“I am more of a phone person. [...] I send an instant message with ‘hey, do you have a minute?’ and if they say yes, I call them straight away. I think people have identified me as someone who calls [laughs].”

Perhaps because Peter did not enjoy being interrupted by instant messages, he always warned his colleagues that he was about to call them. He used instant messages as a buffer to transition into the medium he really enjoyed using: the phone. Although Peter and Michael were not in the same team and hence did not have to put up with the desires of one another, they each had to deal with their own desires. Michael never expressed his dislike of the phone to anyone. He just lived with it. Peter claimed that others knew his phone preference, but were not bothered by it: ‘I never met anyone who disliked the phone. I even think some are pleased with my calls... They can vent out and make jokes.’ As Peter always warned his colleagues with an instant message beforehand, he also claimed that they sometimes just ignored his message if they did not wish to be called.

There was therefore a misfit between Peter’s and Michael’s desired use of phone calls and the actual use that was possible in their jobs, due to different desired use of colleagues. Person-Environment (PE) fit research has examined the concept of ‘supplementary’ fit. Supplementary fit occurs when an individual does not possess

preferences or desires which are similar to those of others in the same environment (Muchinsky & Monahan, 1987, p. 269). Thus, employees having similar desires in terms of CMC or media use, or greater supplementary fit, might have less stressful interactions with one another (Table 4.4, Code: “Work relationships”). For instance, individuals who enjoy multitasking might appreciate frequent synchronous interactions on instant messaging systems when working in a team together (Li et al., 2011). Similarly, employees who enjoy constant connectivity to work through the smartphone might be able to work well with supervisors who share such preferences (Derks et al., 2015).

Therefore, being able to understand the desired CMC use of colleagues becomes a useful skill for employees to have. As one participant described, ‘it is about adapting the medium to the person’. Some individuals were particularly aware that others knew their desired CMC use. Just as Peter who preferred phone communication in our example above, was identified ‘as someone who calls’, Russel, a former virtual worker, said ‘I’ve been here almost three years now. I think people are aware of the best way to get hold of me’. That said however, being able to understand the desired CMC use of work colleagues is not always easy. It requires understanding of various media as well as empathy, both of which might be hard to come by:

“It is hard for me to tell because I have been using these technologies for a very long time. They have become so natural that it is sometimes hard for me to realize that they might not be as natural to others.” (Jerry, a manager in his late twenties).

In studies of work-life conflict and smartphone use, managers are often urged to explicitly share their expectations regarding CMC use, such as constant availability. Not doing so, could inadvertently damage their subordinates’ work-life balance (Derks et al., 2015; Matusik & Mickel, 2011; Waller & Ragsdell, 2012). The “supplementary fit or misfit” code in Table 4.4 captures this finding.

*Table 4.5. Participants highlighted in Study 2*

Pseudonym	Description	Example Quote
<b>Gabe</b>	Manager in his early thirties	“Emails are pushed... Since I impose them on others, I know that they will be read”.
<b>Judith</b>	Part-time experienced professional	“These media make my life easier. Honestly, they are not a source of stress but of tranquility.”
<b>Roy</b>	Technical support agent	“I tried to listen to music. And I could not manage to listen to a song in full [until being interrupted].”
<b>Russell</b>	Manager and former virtual worker	“I’ve been here almost three years now. I think people are aware of the best way to get hold of me”
<b>Peter</b>	Phone and so-called people person	“I am more of a phone person. [...] I send an instant message with ‘hey, do you have a minute?’ and if they say yes, I call them straight away. I think people have identified me as someone who calls [laughs].”
<b>Carl</b>	Employee with varied previous working experiences in multiple companies.	“[In my previous job] I had my software retrieve emails every hour or every hour and a half, so I was not interrupted for an hour. Here in this company, it is less... I don’t do this because even when there are no emails, there is [the instant messaging system] and people coming to see you at your desk, so...”
<b>Philip</b>	Former auditor	“Morning hours were precious as these were hours in which you can work uninterrupted for an hour and a half because people have not woken up yet”
<b>Natalie</b>	Young entry-level employee	“After two hours, I log into the instant messaging system and I send a message ‘so have you seen my email?’ I think it puts a bit of pressure [laughs]”
<b>Michael</b>	Manager disliking the phone	“I limit my phone calls a lot. I never call. I don’t like the phone, I don’t know why [laughs]. I don’t like it, and I don’t like it either when I am called.”
<b>Jerry</b>	Manager in his late twenties	“I have been using these technologies for a very long time. They have become so natural that it is sometimes hard for me to realize that they might not be as natural to others.”

Through these findings we thus identify three conditions illustrating the joint impact of actual and desired CMC use on workplace stress. Table 4.5 summarizes the participants who made this account more vivid. We now discuss the implications of our two studies.

## **4.6. Discussion**

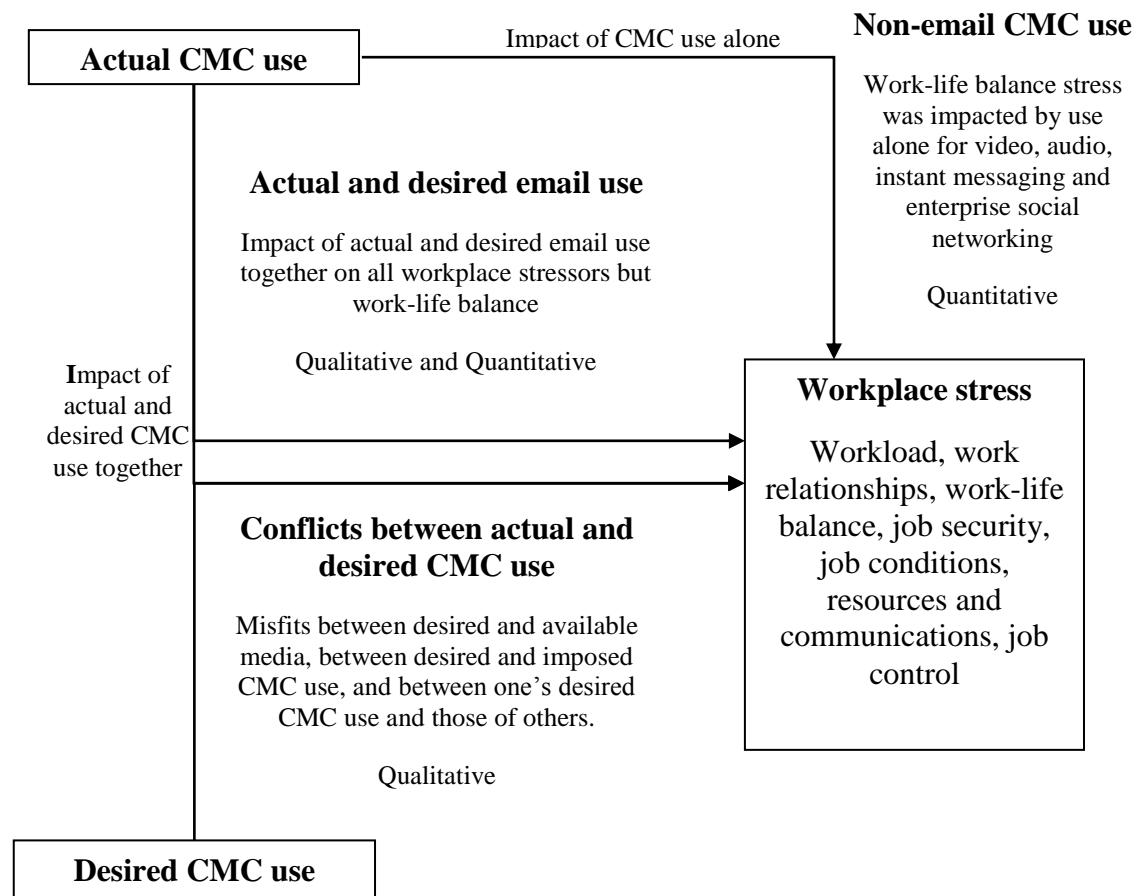
### **4.6.1. Multi-method results**

In this section, we discuss how the combined findings of the two studies helped generate a richer understanding of how and why employees experience workplace stress due to the use of CMC at work, beyond that of each study alone. Through the complementarity of results (Greene et al., 1989) between the two studies, we understand for what kind of media and workplace stressors, actual and desired CMC use together influence workplace stress (See Figure 4.1). We also identify specific conditions under which a mismatch between desired and actual CMC use leads to workplace stress.

First, with regard to which medium was most used or found to most influence workplace stress, both studies revealed the prominence of email use. The qualitative study showed that although the interviewees worked in a company which was fairly advanced in terms of CMC implementation and had access to all major media, they mainly discussed their use of email, and the workplace stress they attributed to its use. In the quantitative study, the hypothesized relationship of actual and desired use together influencing workplace stress more strongly than actual use alone, was found true for most of the workplace stressors, yet only for email. This leads us to suggest that along with actual CMC use, individuals would perceive the desired use of CMC to additionally be a potential cause for workplace stress, for those media that were highly used. That is, their desires regarding the use of such media would be more salient. The other media widely discussed were instant messaging and audio-video conferences. For these media, we find from the quantitative study that the individuals' desired use did not influence workplace stress, rather the extent of use alone did. We interpret this to mean that individuals may not have strong desires regarding use that would impact workplace stress, for those media which they not frequently used. In addressing our first research question therefore, we note that desired CMC use matters to workplace stress mostly for those media which are widely used. In our qualitative study, email emerged as that medium. The organizational context in which social norms are developed over time regarding to what extent specific media are used (Jerejian et al., 2013; Symon, 2000)

might thus play an important role in the impact of desired CMC use on workplace stress.

*Figure 4.1. Findings of both studies on the impact of actual and desired CMC use on workplace stress*



Regarding the second research question, the qualitative study found three conditions under which actual and desired CMC use together impacted workplace stress. First, participants expressed frustration when they were forced to use media inappropriate to the task at hand or when alternative media considered more appropriate were not available. Second, imposed interactions and unwanted interruptions regarding use of media that employees were reluctant to use, were considered stressful. Finally, workplace stress from CMC use was experienced by employees who interacted with co-workers possessing different or conflicting preferences for using media than they did.

The limitations of the studies must be kept in mind when reflecting on our results. The quantitative study included participants from diverse organizations and industries, and

measured a number of variables, some relying on single items. Although this revealed interesting results such as the importance of actual and desired use of email, due to its wide sampling, it might have also downplayed or reduced the significance of other media. Furthermore, the qualitative study used a sample unrelated to the quantitative one, which, while providing the opportunity to triangulate and identify integrative findings, makes direct comparison between the two sets of results difficult. Notwithstanding these limitations, the paper makes important contributions to literature and practice, which we discuss below.

#### **4.6.2. Theoretical contributions and future research**

The paper's first contribution is in revealing that all media are not the same with regard to the phenomenon of stress that employees experience from their use in the workplace. We found that the impact of actual and desired CMC use, together, on workplace stress was significant mostly for email, in the quantitative study. In the qualitative study, participants reinforced the importance of email by articulating how their desired use was important to understand the process of workplace stress associated with their use of email. Recent literature shows that email is associated with strong attitudes regarding workplace stress from its use (Barley et al., 2011). Our study extends this notion to suggest that workplace stress from email use is more influenced by the individual's preference for using email, in comparison with other media. We thus suggest that media that are more widely used, should be designed as to take into account the individual's preferences and choices regarding use (E.g., Stacey & Tether, 2015, p. 114). One avenue for future research that naturally suggests itself from this finding is the investigation of separate media through separate nomological models in terms of their users, workplace stress generating potential, and circumstance of use. This would be in contrast to the existing models of CMC research which aggregate measures of various media.

Our second theoretical contribution is in articulating the concept of 'misfit' in the context of workplace stress from the use of CMC. The fit between the individual and the environment has been investigated under the purview of person-environment fit theories (Kristof-Brown, Zimmerman, & Johnson, 2005). Person-environment fit has been defined as "the compatibility between an individual and a work environment that occurs when their characteristics are well matched" (Kristof-Brown et al., 2005, p. 281).

Such compatibility increases positive work outcomes such as job satisfaction, job engagement and satisfaction with coworkers. ‘Misfit’ or a lack of compatibility reduces these outcomes. Drawing on these concepts, we make a theoretical contribution by showing that lack of fit can manifest in the form of three conditions, which embody what we term as ‘misfit’. The presence of these conditions is an indication of misfit between the way in which the individual desires to use media, and actually uses them, and creates workplace stress for the individual. Current literature on use of IT articulates concepts such as task-technology fit (Goodhue 1985) and supplementary fit (Muchinsky & Monahan, 1987). Our findings extend this literature and articulate conditions of misfit that could lead to workplace stress from CMC use. Future research could further explore and identify additional conditions of misfit both through qualitative analysis such as longitudinal field studies and quantitative analysis such as surface response modeling and polynomial regressions (Klein et al., 2009). We believe this to be an interesting and new conceptual area for future research on CMC use and workplace stress.

Our third contribution is in focusing attention on the individual’s desires in terms of CMC use. While the literature informs us that use of media, particularly email, can cause workplace stress for the user, it does not explain how this relationship may be individual specific. We show different facets of the individual’s desires regarding CMC use that are important in this context. The quantitative study revealed that the extent of actual use and desired use together influence workplace stress. The qualitative study showed that in addition to desired CMC use, other aspects such as the type of media desired to be used, other peoples’ desires regarding media to be used, and the organization’s norms regarding which CMC should be used and how, determine the workplace stress from CMC use. These findings open a new conceptual direction in CMC research, which has so far focus mainly on the extent of use.

#### **4.6.3. Practical contributions**

Our findings also have practical contributions both for individuals and organizations. Individuals and especially those frequently initiating communications (Hiltz & Turoff, 1985) or having managerial responsibilities (Gupta et al., 2013) have a special responsibility in terms of others’ workplace stress. By imposing their messages and favorite media onto others who might have different desired CMC use, they risk

creating ‘misfit’, thereby worsening workplace stress due to CMC use. The fit of one could cause the misfit of another. This warning emphasizes the importance of having empathy for others’ desired CMC use as well as knowing one’s own. As such, we must remain aware that all the interactions we initiate or encourage also impact others, and that we therefore have a responsibility in what CMC does to our wellbeing and others’. This also suggests that teams might benefit from having members with similar desired CMC use (Kristof, 1996; Muchinsky & Monahan, 1987).

Organizations might also benefit from our findings by investigating which media are widely used by their employees and by considering their employees’ desired CMC use. As such, refusing to implement media widely desired by employees has the potential of creating misfit, thereby increasing workplace stress. On the contrary, imposing media that are widely rejected by employees has the similar potential to increase workplace stress. Organizations could therefore be suggested to act on employees’ desires of wanting access to specific media, rather than trying to adjust the extent of CMC use. In addition, the impact of CMC use on workplace stress should be assessed within the organization’s specific context, and the results be collectively discussed with employees (Barber & Santuzzi, 2015). This might help in educating employees about the positive and negative impacts of CMC use on workplace stress, thereby making them more aware of their attitudes towards CMC. Finally, our multi-methods approach emphasized that there might not be a ‘one size fits all’ solution and that each organization and individual should try to apply our findings to their own contexts.

#### **4.7. Conclusion**

In conclusion, our study has highlighted the importance of considering individuals’ desired CMC use, in understanding the subjective appraisal of workplace stress from CMC use. This subjectivity not only influences the impact of CMC use on stress, but also conflicts with the nature of CMC use that is imposed on individuals by their co-workers, managers, jobs or organizations. We believe our paper provides a conceptually derived and empirically validated starting point for further studies on this under-studied topic.

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## 5. PAPER 2

- **Title:** Appraisal and Outcomes of Email Load: A Person Environment Fit Approach
- **Authors:** Stich, J.-F., Tarafdar, M., Cooper, C.L., Stacey, P.
- **Status:** Rejected by the *Journal of Management Information Systems* (JMIS). Under review at the *Journal of the Association for Information Systems* (JAIS)
- **Dataset:** Quantitative pilot survey

### 5.0. Foreword

The following paper is titled “Appraisal and Outcomes of Email Load: A Person Environment Fit Approach”. It is applying Person Environment fit (PE fit) theories and methods to the study of email load and stress. It looks at stress as the result of a misfit between individuals’ actual and desired extent of email use. By doing so, it expands the study of email overload to the study of email load, including the understudied phenomenon of email underload. The paper is currently under review by the *Journal of the Association for Information Systems* (JAIS), following a rejection by the *Journal of Management Information Systems* (JMIS).

#### 5.0.1. Paper history

As explained in the 4.0. Foreword of Paper 1, this paper uses data from the pilot survey conducted in June 2014. It was initially part of Paper 1, but the quantitative PE fit components were eventually moved to another distinct paper. In order to make the paper consistent and impactful, we decided to focus only on the email medium and on certain workplace stressors. The paper therefore contains only a small subset of the pilot study variables.

The initial version of this paper was presented and improved in October 2014 at the *European Association of Work and Organizational Psychology* (EAWOP), in a small group workshop on PE fit (Stich, 2014a). It was subsequently submitted to JMIS on the 11<sup>th</sup> December 2015. Although it faced a first round rejection on the 2<sup>nd</sup> April 2016, the review comments were encouraging, detailed and helpful. We took the reviewers’ comments into account and further improved the paper. The current version was submitted to JAIS on the 4<sup>th</sup> May 2016 and is still under review.

### **5.0.2. Paper contribution to the thesis**

As we explain in the paper, the PE fit approach to email stress is novel and of high relevance. PE fit comes with concepts refined over the years (Edwards & Shipp, 2007) and robust methods such as quadratic polynomial regression and surface response analysis (Klein et al., 2009). These existing materials have greatly benefited the paper, which just had to adapt them to email stress. Because of its robustness and novelty, I believe Paper 2 is a central component of my thesis and perhaps the most impactful. I have presented its results not only at the EAWOP conference but also in a popular press article in HR Magazine (Stich, 2014b), a practitioner conference in France, a practitioner paper for the Chartered Management Institute, an academic ESRC seminar on big data and wellbeing (Stich, 2016b), a practitioner/academic E-Resilience Conference (Stich, 2016a), and in two of my academic job interviews. Although the paper is not yet published, I believe its results have already had an impact beyond the thesis.

From a conceptual point of view, it builds upon the ground prepared in Paper 1, which has identified that actual and desired email use can jointly impact stress, and that fit could be one approach to the study of this joint impact. Paper 2 empirically confirms such intuition and finds evidence for a PE fit approach to email load and stress. This contributes to answering the first research question (See Figure 1.1) and provides a strong theoretical grounding for it.

## **Appraisal and Outcomes of Email Load: A Person Environment Fit Approach**

### ***Abstract***

The paper develops and tests theory that explains how a higher extent of email use can be associated with both positive and negative employee outcomes, depending on the individual's appraisal. Drawing on Person-Environment theory, we conceptualize email (mis) fit as (mis) match between an individual's actual and desired extent of interaction with email. We then develop hypotheses framing the relationship between email fit and misfit, and three key workplace stressors – work relationship stressor, job control stressor and job conditions stressor. We test our hypotheses by applying quadratic polynomial regressions and surface-response analysis, to survey data obtained from working individuals. Our results show that while email misfit is associated with greater levels of these workplace stressors, email fit is not. The paper makes theoretical contributions to the understanding of stress from use of Information Technology (IT), in this case, email. Firstly, it explains how individuals appraise email as being stressful (or not), by focusing on the concepts of email fit and misfit that individuals perceive, rather than their absolute extent of email use. Secondly, it conceptualizes and demonstrates the presence of a U-shaped relationship between the extent of demand from IT use (i.e. email use) and work stressors, showing that both too much and too little use of email, compared to the desired extent, are associated with high levels of stressors. The target audience for this paper is scholars and practitioners who are interested in understanding and managing the workplace effects of stress due to the use of IT.

### ***Keywords***

Email overload, workplace stress, technostress, appraisal, person-environment fit, response-surface methodology, polynomial regression

### **5.1. Introduction**

Email is the most widely used and enduring medium of electronic communication in organizations. Multi-year surveys in the US – in 2002, 2008, 2014 - indicate that on an average about 61% of employees consider email to be very important to their jobs (Pew Research Center, 2014). Even as email has become the backbone of electronic organizational communication, studies indicate that use of email has impacts beyond organizational communication, particularly on employee well-being (e.g., Barley et al., 2011; Mano & Mesch, 2010). Research shows that employees using high volumes of email experience adverse outcomes such as increased absenteeism, risks of burnout (Barber & Santuzzi, 2015), longer workdays and stress (Barley et al., 2011). In contradictory findings, research also shows that a higher extent of email use is associated with positive employee outcomes such as improved supervisor-subordinate relationships (de la Rupelle, Fray, & Kalika, 2014) and greater work effectiveness (Mano & Mesch, 2010). We undertook this research with the objective of understanding why and how a high volume of email can lead to both positive and negative outcomes on employee well-being.

Studies show that the individual subjectively experiences high volumes of email. The most common manifestation of this in the literature is ‘overload’. Email overload (Whittaker & Sidner, 1996), is the feeling the individual experiences of being submerged by emails that he or she considers too numerous or frequent or difficult to handle (Dabbish & Kraut, 2006). Similarly, studies on technostress focus on concepts like techno-overload, where the individual feels that he or she has to work more or faster due to IT (e.g. Tarafdar et al. 2007). These studies suggest that individuals’ appraisals of the effects due to demands from IT and email volume are characterized by subjectivity (Ingham, 2003; Karr-Wisniewski & Lu, 2010). Although helpful, that does not explain how this appraisal takes place such that a high volume of email can have both positive and negative impacts on well-being. Complementing this theoretical gap, organizations are faced with a lack of practical solutions to deal with the problem of email load faced by employees. They continue to use one-size-fits-all solutions to deal with email overload, such as, for instance, Volkswagen unilaterally locking down email servers after a given time for specific employees (Williams, 2011). Acknowledging this lack of understanding, the objective of this paper is to addresses this knowledge gap –

**how is greater extent of email use associated with both positive and negative outcomes on employee well-being, depending on the individual's appraisal?**

We do this by investigating the relationship between email load and three key workplace stress creators, or stressors (Faragher et al., 2004) experienced by the individual - work relationships stressor, job control stressor and job condition stressor. These workplace stressors are important because they have been highlighted as strong predictors of burnout, depression and reduced mental health (Bond & Bunce, 2003; Faragher et al., 2005; Sutherland & Cooper, 2000). We first develop a theoretical explanation of how individuals appraise a given extent of email use as being stressful (or not). Our explanation is based on Person-Environment (PE) theory, which theorizes 'fit / misfit' between the individual and environment (French, Caplan, & Van Harrison, 1982). We conceptualize 'email (mis) fit' as the (mis) match between an individual's actual and desired extent of interaction with email. We then frame hypotheses suggesting that a given extent of email interaction is appraised as being associated with high levels of these three workplace stressors in case of email fit and with low levels in case of email misfit. We test our hypotheses by applying congruence research methods, that is, quadratic polynomial regressions and surface-response methodology (Klein et al., 2009), to survey data obtained from 118 working individuals in the US. Our results show support for the majority of our hypotheses, showing that while email misfit is associated with greater levels of work stressors, email fit is not.

The paper makes theoretical contributions to the understanding of "factors that promote greater fit between technology and people's needs, attitudes and capacities" (O'Driscoll, Biron, & Cooper, 2009, p. 129). One, it explains how the individual appraises a higher level of email to be stressful or not, by focusing on the concepts of email fit and misfit that individuals perceive in their use of email, rather than the absolute extent of use. In doing so, we explain why greater use of email can be associated with both positive and negative impacts, depending on the individual's assessment of email fit or misfit, thus providing an answer to our research question. Two, the paper reports a U-shaped relationship between the extent of email use and the work stressors. To our knowledge this is the first study to report this relationship in the domain of stress from IT use. In doing so, it introduces the idea to the technostress literature, that both too much (overload) and too little (underload) demand from use of IT, compared to what the

individual desires, are potential causes of stress, thus advancing this literature which has so far considered only the former. As implications for practice, we suggest that not everyone wants ‘less’ email, rather employees experience greater well-being when they feel they have enough email. Organizations should thus tailor email management solutions to employee preferences.

The paper is organized as follows. In the next section we present our theory background that covers prior research on email overload, articulates research gaps in the current understanding of the stress creating effects of email and IT, and introduces the PE approach to appraisal through the concepts of fit and misfit. In section 5.3, we develop our theoretical model, define email misfit and fit, and present our hypotheses. Section 5.4 describes the methods adopted in this study – specifically the data, its analysis and results. Section 5.5 discusses the paper’s contributions to theory and practice, and ends with concluding comments.

## **5.2. Theory Background**

In this section we first review prior research on email load and identify research gaps in our current understanding of the stress creating effects of email and IT. We then present the PE fit framework (Edwards, 1996; French et al., 1982) from the organizational stress literature to explain how individuals subjectively appraise the presence of stressors due to the presence of an attribute in the environment, through the concepts of ‘fit’ and ‘misfit’ – that is, through what they perceive as a match or mismatch between the desired and actual levels of the attribute.

### **5.2.1. Email Overload**

Studies examining email load have focused primarily on the effects of email ‘overload’. Email overload is defined as email users’ perceptions that their email use has got out of control because they receive and send more email than they can process effectively (Dabbish & Kraut, 2006, p. 431). Technologically, email applications are convenient for one to many communication (Taylor et al., 2008; Thomas & King, 2006), and extensive use of the ‘copy’ function (Ingham, 2003; Kimble, Hildreth, & Grimshaw, 1998) helps exacerbate the number of emails that individuals send and receive. Studies thus primarily focus on the ‘volume’ of emails, the focal idea received from the literature being that more emails received/sent, the higher the feeling of email overload (Soucek

& Moser, 2010; Sumecki et al., 2011) perceived by the individual. Other reasons due to which individuals perceive email overload include time spent managing emails (Barley et al., 2011; Sumecki et al., 2011), email interruptions (Wajcman & Rose, 2011), incoming emails piling (Whittaker & Sidner, 1996), too many email folders (Dabbish & Kraut, 2006), and a negative attitude towards email (Sumecki et al., 2011). Actions to mitigate the perception of email overload, depending on the individual (Reinke & Chamorro-Premuzic, 2014), include frequent filing (Whittaker & Sidner, 1996), checking emails whenever they arrive to prevent piling up (Dabbish & Kraut, 2006; Soucek & Moser, 2010), and grouping emails by common themes or folders (Schuff, Turetken, & D'Arcy, 2006). Email skills that help reduce email overload experienced by colleagues include improving one's email writing (Jackson et al., 2006), tailoring the message to fit the recipients' requirements, and giving and receiving timely feedback (Wang & Haggerty, 2011).

Research on the consequences of email volume on the individual finds contradicting results. One the one hand, higher email volume has adverse consequences. Studies have found that it leads to higher workload in the form of more time spent handling email and a longer and faster paced workday (Barley et al., 2011; Vidgen et al., 2011). This higher workload has the potential to increase work overload stress (Barley et al., 2011) and lower productivity on non-email tasks (Karr-Wisniewski & Lu, 2010). Time spent handling a high volume of email has been associated with high levels of work stress (Mano & Mesch, 2010), emotional exhaustion, burnout (Barber & Santuzzi, 2015; Brown et al., 2014; Reinke & Chamorro-Premuzic, 2014), health-related absenteeism, and poor sleep quality (Barber & Santuzzi, 2015). These studies highlight adverse psychological and health consequences of email volume.

On the other hand however, a higher email volume can also have other positive workplace consequences. Mano and Mesch (2010) found that large amounts of email sent, received and read were associated with higher work performance because of greater efficiency in work coordination. Other studies have suggested that a higher email volume can be a sign of good supervisor-subordinate relationships brought about by regular communication and clarification (de la Rupelle et al., 2014; Hill, Kang, & Seo, 2014). Email has the potential to facilitate good work relationships (Hovick, Meyers, & Timmerman, 2003; O'Kane et al., 2007) due to speed, immediacy and

convenience of communication. A higher email volume can be important to conducting one's work or improving one's work relationships and have positive workplace consequences depending on its content and context (Mano & Mesch, 2010; O'Kane et al., 2007).

Email volume is thus a double-edged sword (Derks & Bakker, 2010; Mano & Mesch, 2010), the consequences of which bear further examination.

### **5.2.2. Research Gaps**

Attempts to explain these contradicting findings lead us to note a number of research gaps: First, the mix of positive and negative consequences of a high email volume suggests that while in some cases this condition is not beneficial, in other cases that is not true. The negative condition implies that the individual has too much email that is possibly overwhelming and overloading, to the detriment of important workplace aspects such performance, workload, and psychological and physical well-being. Literature has addressed this condition in the form of email overload. However the positive condition highlighting the potential benefits of high email volume suggests that the individual is not able to adequately harness the benefits of email because of there not being enough to meet his or her needs. This is a possible condition of email underload, which the literature does not address. For example, studies examine how much 'excess' email the individual receives (Kammerer, Sprenger, Hetzenecker, & Amberg, 2012), using measures such as "I find dealing with my email overwhelming" (Dabbish & Kraut, 2006, p. 434) or "I get too much email" (Hogan & Fisher, 2006, p. 1). They have looked at individuals' perceptions of having 'too much' email, and have not considered the condition of individuals having 'not enough' email. Similarly, studies on technostress focus on concepts like techno-overload and work overload, where the individual feels that he or she has to work more or faster due to IT (e.g. Tarafdar et al 2007, Ayyagari et al 2011).

Second, the fact that high email volume has positive consequences in some cases and negative in others implies that email overload is a subjective construct. That is, individuals must appraise that they feel overloaded by emails. This being so, considering the overall volume of email as an indication of email overload (Soucek & Moser, 2010; Sumecki et al., 2011) ignores individuals' variations in the amount of email they are able to cope with. The same volume of email could have varying impacts

depending on individuals' appraisal and thresholds (Ingham, 2003; Karr-Wisniewski & Lu, 2010). Third, studies on email overload do not consider or explain the appraisal process – how individuals perceive email overload or underload. From the literature (e.g., Lazarus, 1990), we know that appraisal occurs by the individual noticing a condition in the environment and subjectively analyzing whether or not it can be coped with. Existing assessments of email overload, which primarily consider whether or not the individual is in some way ‘overwhelmed’ by email, do not consider the individual’s particular appraisal situations. Similarly, from the research on technostress, we see that while studies acknowledge that individuals can appraise technology characteristics such as pace of change, anonymity, synchronicity as sources of stress, how they do that is not theoretically explained or empirically verified (Yan, Guo, Lee, & Vogel, 2013). Theoretical understanding of appraisal – lacking in these literatures - is thus needed for email overload and underload to be studied meaningfully

### **5.2.3. Person-Environment Fit Approach to Understanding Appraisal**

Appraisal is the process by which an environmental condition is interpreted by the individual (Cooper, Dewe, & O'Driscoll, 2001, McGrath 1976). Person-Environment (PE) Fit approaches from the psychological stress literature (Edwards, 1996; French et al., 1982) provide a conceptual and methodological framework to understand how the individual appraises particular environmental attributes to be stressors, that is, sources of demand placed on him or her. These approaches look at how individuals appraise a particular attribute in the work environment as ‘presenting a demand’ or ‘stressful’ by comparing the extent to which the attribute is present to the extent to which they would like it to be present. Supplies (S) are described as the extent to which the particular attribute is *actually present* in the *environment*. Values (V) represent the extent to which the attribute is *desired* by the *person* (Edwards, 1996, p. 294). The difference (match) between the two is classified as misfit (fit). The person undertakes a cognitive comparison of the actual and desired extents (Edwards, 1996, p. 294), the result of which is perceived as a fit or misfit. When present and desired extents of the attribute diverge, the individual appraises a Supplies-Values misfit (S-V misfit). The greater this divergence, the more the S-V misfit, and the greater the experienced level of ‘demand’ or ‘stressor’. When the present and desired amounts of the attribute match, the individual experiences Supplies-Values fit (S-V fit). The greater this convergence, the more the S-V fit, and the lower the experienced level of ‘demand’ or ‘stressor’.

A second concept pertinent to appraisal is that of the relationship between the extent to which the environmental attribute is present, and the perceived level of demand posed by the stressor. Key works in stress (e.g., Lazarus, DeLongis, Folkman, & Gruen, 1985; McGrath, 1976; Selye, 1956) conceptualize this as a non-linear relationship. That is, the environmental attribute is associated with high levels of ‘demand’ or ‘stressor’ when there is a misfit between supplies and values from both sides. When the supply is greater than values ( $S$  minus  $V$  is positive), the individual experiences an ‘excess’ condition in which the level of the attribute goes ‘over’ what he or she can handle. Any further increase in  $S$  for the specific attribute will be bad for the individual and *increase* the perceived stressor condition. However, when the supply is less than values ( $S$  minus  $V$  is negative), the individual experiences a ‘deficit’ condition in which the level of the attribute is ‘under’ what he or she can handle. Under this condition the individual experiences not enough challenge, and any increase in the  $S$  for the specific attribute will be good for the individual and *decrease* the perceived stressor condition.

Conceptually integrating these two perspectives enables us to identify the inadequacies in the current literature of stress-creating attributes of technology. Specifically, the it does not take into account that the attribute can be stressful, both when it is either in excess or in deficit of what the person can handle. In current email studies, items such as “I get too much email”<sup>2</sup> (Hogan & Fisher, 2006, p. 1) do not separate out or distinguish between the extent to which the attribute is present (supplies) and the extent to which the individual would like it to be present (values). This presents the problems that only one side of the relationship (i.e.  $S$  is greater than  $V$ ) is considered by looking at ‘too much email’, thus overlooking the conditions of ‘not enough email’ (i.e.  $S$  is less than  $V$ ). Similar to the email overload studies, those on technostress have developed indicators that address the condition of ‘too much’. Techno-overload is measured by indicators such as ‘I am forced by the technology to do more work than I can handle’ (Tarafdar, Qiang Tu, Ragu-Nathan, & Ragu-Nathan, 2007). Technology attributes are measured by indicators such as ‘I feel that there are frequent changes in the features of ICTs’ (Ayyagari, Grover, & Purvis, 2011, p. A4). These indicators are not able to empirically investigate the relationship between *fit/misfit* and the stress creating

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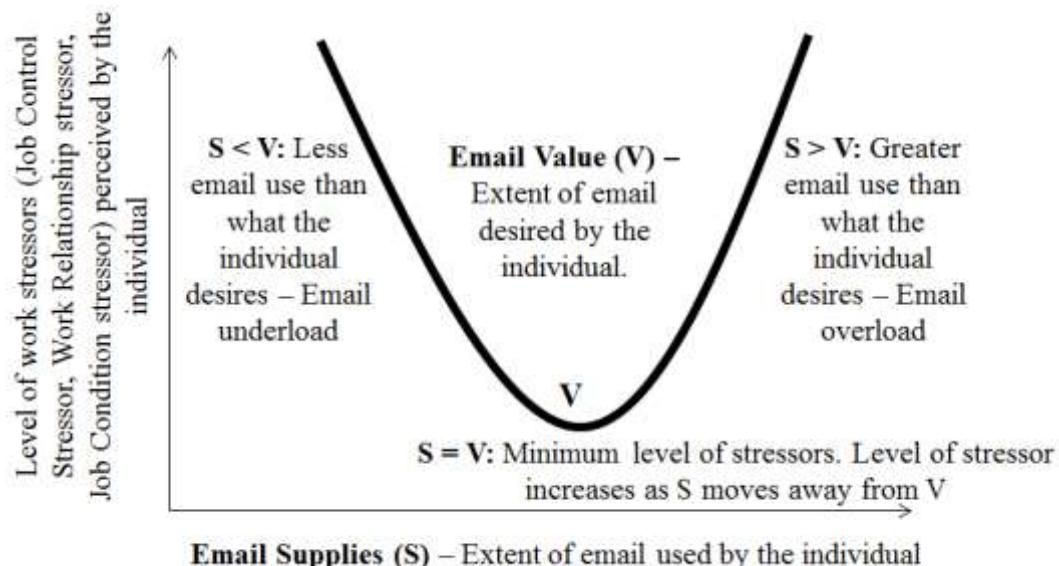
<sup>2</sup> In the psychological stress literature, this measurement approach is termed as ‘molecular’ (Edwards, Cable, Williamson, Lambert, & Shipp, 2006).

conditions due to technology, and thus do not clarify how individuals appraise stressors due to technology.

### **5.3. Conceptual Model For Understanding Email Load: A Person-Environment Fit Approach to Understanding Email Fit and Email Misfit**

We develop a conceptual to explain the relationships between extent of email used by the individual and the level of work stressors perceived by him or her, by adapting the PE fit approach. We consider the extent or volume of email the individual interacts with, as an indicator of email load (e.g., Dabbish & Kraut, 2006; Soucek & Moser, 2010; Sumecki et al., 2011)<sup>3</sup>. As shown in Figure 5.1, we define **email supplies** ( $S$ ) as the actual extent to which the individual sends and receives email, and **email values** ( $V$ ) as the desired extent. For individuals to experience '**email fit**', they should thus send or receive email to the extent they want to, which is the point  $S=V$ . Otherwise, they would experience '**email misfit**' when the extent of email sent or received is too much or in excess (i.e. email overload,  $S>V$  – right side of Figure 5.1) or too little or in deficit (i.e. email underload,  $S<V$  – left side of Figure 5.1). The more the actual deviates from the desired (i.e. misfit on both sides of the  $S=V$  position in Figure 5.1), the higher the level of stressors appraised by the individual.

*Figure 5.1. Conceptual Model for Understanding Appraisal of Email Load*



<sup>3</sup> Another characteristic of email, that is, email frequency, is considered more an indicator of email interruptions rather than email load (Barber & Santuzzi, 2015) and in any case, should have a positive correlation with email volume.

*Table 5.1. Summary of Definitions and Hypotheses*

	<b>Email misfit</b>	<b>Email fit</b>
<i>Definition</i>	<i>Hypotheses</i>	<i>Hypotheses</i>
<b>Work relationships stressor:</b> Stress creating stressor will conditions due to poor, when email misfit not be significant when the damaging, absent or increases, that is, when actual and desired extents of unsupportive relationships with use deviates from the coworkers (Leiter & Maslach, 1988; McGrath, 1970; O'Driscoll & Beehr, 1994).	H1a: Work relationships stressor will increase when email misfit not be significant when the actual extent of email use increase jointly.	H1b: The increase in work email use increase jointly.
<b>Job control stressor:</b> Stress creating will increase when email control stressor will not be conditions due to lack of misfit increases, that is, significant when the actual control over or influence when the actual extent of and desired extents of email in the job and the way email use deviates from use increase jointly. work is organized the desired extent. (Karasek, 1979).	H2a: Job control stressor will increase when email control stressor will not be conditions due to lack of misfit increases, that is, significant when the actual control over or influence when the actual extent of and desired extents of email in the job and the way email use deviates from use increase jointly.	H2b: The increase in job email use increase jointly.
<b>Job conditions stressor:</b> Stress creating stressor will increase conditions stressor will not conditions due to lack of when email misfit be significant when the job satisfaction or good increases, that is, when actual and desired extents of working conditions the actual extent of email use increase jointly. (Faragher et al., 2005).	H3a: Job conditions stressor will increase conditions stressor will not conditions due to lack of when email misfit be significant when the job satisfaction or good increases, that is, when actual and desired extents of working conditions the actual extent of email use increase jointly.	H3b: The increase in job email use increase jointly.

We examine the impact of email fit and email misfit on the perceived levels of three work stressors or stress creators, namely **work relationships stressor**, **job control stressor** and **job conditions stressor** (Cooper et al., 2001). These three stressors are selected because research shows that they are important to predicting higher risks of

burnout, depression and reduced mental health (Bond & Bunce, 2003; Faragher et al., 2005; Sutherland & Cooper, 2000). For each stressor, it is theorized that email misfit ("too much" and "too little" email) will be associated with higher levels of the stressor. Conversely, email fit (enough) will be associated with lower levels of the stressors. Specifically therefore, each stressor has one hypothesis predicting the outcome of misfit (i.e. of using emails to an undesired extent) and one predicting the outcome of fit (i.e. of using emails to a desired extent), leading to 6 hypotheses as summarized in Table 5.1. We next develop the logic for each hypothesis.

### **5.3.1. Research Hypotheses**

Email misfit occurs when the actual extent of email interaction diverges from the desired extent. Email fit occurs when the actual extent is equal to the desired extent; both actual and desired can be at any level (i.e. high or low).

#### ***Hypotheses H1: Relationships between Email Misfit and Email Fit, and Work Relationships Stressor***

'Work relationships stressor' is defined as conditions of poor, unsupportive, deficient or damaging relationships with colleagues (juniors and/or superiors) experienced by the individual in the workplace (Leiter & Maslach, 1988; McGrath, 1970; O'Driscoll & Beehr, 1994). Sutherland and Cooper (2000) highlight the importance of this stressor by writing that "having to live and work with others can be one of the most stressful aspects of life" (2000, p. 98).

Email misfit can cause individuals to experience high levels of work relationships stressors in two ways. First if the actual extent is greater than the desired, they might feel that they are being sent too many emails because workplace colleagues feel that they are not doing enough (Smith & Tabak, 2009). They may thus feel that they need to send emails even when they do not want to, just to keep others informed of their work. They may also feel unsure of what is expected of them, and on the whole may feel irritated or annoyed with colleagues for sending too many emails and/or for having to respond to them. This further means that they might feel that they are sending more email than they want to. They may also feel that the excessive email communication comes at the cost of face-to-face work communication and the accompanying immediacy and empathy or that it places undue demands on their time.

When the amount of email received or sent is less than the desired amount, individuals may feel that they are not getting enough social support (Mikal, Rice, Abeyta, & DeVilbiss, 2013), especially when emails are left unanswered. There is also increased opportunity for misunderstandings (de la Rupelle et al., 2014; Huang, 2002) when, for instance the individual feels that email contents are unclear and not explained further in subsequent emails. A perceived paucity of emails might also lead to increased feelings of isolation, especially in virtual teams or teleworking situations which rely heavily on emails for socialization (Golden & Veiga, 2005). Finally, receiving fewer emails than desired might also cause the individual to feel that work colleagues are not pulling their weight (Chidambaram & Tung, 2005) and might lead to soured workplace relationships. In general therefore, as email communication involves several participants, email misfit may be associated with individuals feeling that relationships with workplace colleagues are poor due to problematic communication between colleagues.

In situations of fit however, receiving or sending ‘enough’ or an ‘appropriate’ amount of email might lead to feelings of adequate social support and work communication and to an overall perception that their work relationships are not stress creators. This would be so regardless of the actual extent of email interaction. We hypothesize the following to reflect the relationship between email misfit and fit, and work relationships stressor.

**Hypothesis 1a:** Work relationships stressor will increase when email misfit increases, that is, when the actual amount of emails deviates from the desired amount of emails.

**Hypothesis 1b:** The increase in work relationships stressor will not be significant when the actual and desired amounts of emails increase jointly.

### ***Hypotheses H2: Relationships between Email Misfit and Email Fit, and Job Control Stressor***

The job control stressor is defined as a lack of control or influence that the individual perceives over his or her (Karasek, 1979) job. This has been an important stressor because it predicts low mental health, job satisfaction and job performance (Bond & Bunce, 2003).

Email misfit can be linked to job control in the following ways. In the context of email use after working hours, sending or receiving more email than desired might, on the

face of it, seem like a good idea to improve flexibility in work-home life and information access, but may ultimately result in lowered autonomy and job control (Cavazotte et al., 2014; Mazmanian et al., 2013). One's own email volume is partly the result of other's decisions to send emails (Waller & Ragsdell, 2012). Having more email than desired may lead to the feeling that others are in control of one's email volume (Sumecki et al., 2011). Individuals may feel compelled (rather than choose) to send more emails than desired in order to stay 'in the loop' and remain visible (Mulki et al., 2009), and may find it more difficult to disengage from work (Mazmanian et al., 2013). When receiving fewer emails than desired, they might feel left out of important email threads and might not have access to information necessary to their jobs (2009). These sorts of conditions may lead to sense of low job control (Hiltz & Turoff, 1985).

On the contrary, if individuals appraise that email communication is 'enough', they may feel that they have access to the information they want and are in control of their work communication. They may feel that they are able to adequately use email communication to have their say in matters and decisions important to their jobs such as their performance targets. They are thus likely to, feel that key aspects of their jobs are designed after taking their inputs into account, experience greater control over their job, and thus lower levels job control stressors. We thus hypothesize the following:

**Hypothesis 2a:** Job control stressor will increase when email misfit increases, that is, when the actual amount of emails deviates from the desired amount of emails.

**Hypothesis 2b:** The increase in job control stressor will not be significant when the actual and desired amounts of emails increase jointly.

### ***Hypotheses H3: Relationships between Email Misfit and Email Fit, and Job Conditions Stressor***

The job conditions stressor describes conditions such as job dissatisfaction and difficult working conditions perceived by the individual. This stressor is important because unpleasant working conditions increase physical strain and create an undesirable working climate (e.g., Jones, 1983). Job dissatisfaction is associated with increased risks of burnout and depression as well as poor mental health (Faragher et al., 2005).

If an individual receives or sends more email than what he or she desires, he or she might perceive greater workload and repetitive work in managing them – technolo-

overload has been shown to be an aspect of technostress creating conditions (Tarañdar et al., 2007). Email overload is associated with longer workdays (Barley et al., 2011). If dealing with clients and customers is an inherent part of the job, too many emails coming from customers or clients could increase the feelings of not being able to cope with communication demands from key stakeholders (Barley et al., 2011). Given the surveillance potential of electronic communication<sup>4</sup>, individuals interacting with excess email than what they are comfortable with may also be subject to the feeling of being monitored (Smith & Tabak, 2009). Too much email accompanied by lack of email civility (e.g. rude or improper email content) on part of colleagues may leave the individual feeling defenseless because ignoring or marking as spam emails sent by coworkers may not be considered acceptable (Park, Fritz, & Jex, 2015). All of these situations may give rise to a perception of difficult job conditions and impacts such as lower work engagement (Reinke & Chamorro-Premuzic, 2014), and lead to job dissatisfaction.

Although we did not find many studies in the specific context of email overload, findings from the information load literature suggest that individuals experiencing information overload can be even more dissatisfied with their job conditions than those who experience information overload, in a large part because of frustration associated with lack of necessary information (O'Reilly, 1980). Underload can occur when there is not enough information to process such that the available information is processed quickly with respect to the time available (Schultz & Vandenbosch, 1998). In such situations, individuals can become bored or find their work to be dull and repetitive (Slagle & Weinger, 2009). Email underload may thus affect the job conditions stressor by making work less interesting and enjoyable.

When individuals perceive that they are interacting with email to the desired extent, they are not subject to these above conditions. They would not experience greater workload, or a feeling of being monitored, or potential incivility, nor would they experience a paucity of important information. We thus hypothesize:

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<sup>4</sup> The recently and widely reported case of Amazon (<http://www.nytimes.com/2015/08/16/technology/inside-amazon-wrestling-big-ideas-in-a-bruising-workplace.html>) described the use of an electronic feedback system through which employees reported on their colleagues to bosses. Although this was not done through email, it is possible to conceive of email being used for similar purposes.

**H3a:** Job conditions stressor will increase when email misfit increases, that is, when the actual amount of emails deviates from the desired amount of emails.

**H3b:** The increase in job conditions stressor will not be significant when the actual and desired amounts of emails increase jointly.

#### **5.4. Methods**

We used the survey method to test our research hypotheses. We first collected data measures of the independent variables (email fit and email misfit) and the dependent variables (work relationships stressor, job control stressor and job conditions stressor) from a survey of email users working full-time in organizations in the US. The data was then analyzed using polynomial quadratic regression and surface response methodology to examine the relationships between email fit and misfit, and the three work stressors. We describe below the following steps: (1) Survey questionnaire development; (2) Data collection; and (3) Data analysis.

##### **5.4.1. Survey Questionnaire Development**

###### ***Independent Variables: Email Supplies and Email Values***

The organizational stress literature shows that fit and misfit are subjectively appraised by the individual (Van Harrison, 1978). Individuals appraise supplies and values by making self-assessments of the desired and actual levels of the relevant attribute for which fit and misfit are studied (e.g. Caplan, 1987; Van Harrison, 1978), in this case, email load. Hence the measurement for supplies and values should allow for that. Methodological considerations from PE fit research (Benlian, 2013; Klein et al., 2009) recommend the use of ‘commensurate measures’. They suggest the use of items that allow supplies and values to be compared based on the same attribute dimension, through simple and *comparable content/wording*. Using a self-reported item that reports the ‘extent of actual email interaction’ and the ‘extent of desired email interaction’ allows for such commensurate measurement. Such single item indicators have been extensively used in the organizational psychology literature to investigate fit and misfit of attributes such as workload (e.g. “How much work load do you have?” for supplies and “How much workload would you like to have?” for values) (Edwards & Van Harrison, 1993, p. 632). We evaluated email supplies and values by asking respondents to report respectively, the extents to which they (1) were interacting at work using

emails and (2) would like to interact at work using emails. The indicator items were (1) “At work, to what extent do you interact with others using e-mail?” and (2) “At work, to what extent would you like to interact with others using e-mail?”. These items Each item was assessed using a 7-point Likert scale ranging from “1 = Not at all” to “7 = To a very great extent”<sup>5</sup>.

***Dependent Variables: Work relationships stressor, Job control stressor and Job condition stressor***

The three dependent variables – Work relationships stressor, Job control stressor and Job conditions stressor - were measured using scales adapted from and found psychometrically sound and reliable in previous studies on workplace stress (e.g., Donald et al., 2005; Faragher et al., 2004; Johnson, 2009; Johnson & Cooper, 2003).

**Work relationships stressor** was assessed with 8 items addressing the extent to which individuals are troubled that (1) they have poor relationships at work, (2) feel isolated or (3) lack support; (4) they are unsure about what is expected from them; (5) they believe that others take the credit for their work or (6) are not contributing enough to team efforts; (7) their superiors are constantly criticizing their work or (8) intimidating them.

The **job control stressor** was assessed with 4 items measuring the extent to which individuals are troubled that (1) they have little control over their jobs, (2) their performance targets or (3) decisions impacting their jobs; (4) decisions impacting their jobs do not take into account their inputs. **Job conditions stressor** was assessed with 8 items that measured the extent to which individuals are troubled that (1) they are not satisfied by their jobs or (2) find them repetitive; (3) they might have to do the same job for a long time; (4) their job performance is monitored; (5) their working conditions are

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<sup>5</sup> As further discussion, we note that single item measures are recommended when (1) correlations between independent and dependent variables are low, typically less than 0.30; (2) weak effect sizes are expected between them; (3) items are highly homogenous and have high inter-item correlations; (4) single items would be easily understood and capture the measured construct, whereas multiple items would be semantically redundant; and (5) relatively small sample sizes are used (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). The third and fourth conditions apply to and have held true for previous studies on email overload. Multiple aspects such as amount of email sent, read and received have been incorporated into a single item scale due to their high homogeneity and semantical redundancy (e.g. Dabbish & Kraut, 2006). In our study we additionally found the first condition to be true, that is, cross-item correlations of below .30 between independent and dependent variables. We also expected the second condition to be true, that is, we expected weak effect sizes between email fit/misfit and work relationships, job control and job conditions stressors, because the latter are also likely to be predicted significantly by non-email factors. All of these conditions further confirmed that single-item measures are appropriate for our investigation (Diamantopoulos et al., 2012).

difficult or (6) risky; (7) their customers are difficult to deal with; (8) their pay and benefits are not up to their expectations. Each item was assessed on a 6-point Likert scale from “strongly disagree” to “strongly agree” and each scale was computed as the average of its items.

### ***Control Variables***

We controlled for four variables – (1) age; (2) gender; (3) education; and (4) company size - as typical of studies on email overload (Mano & Mesch, 2010). This was done to take into account the possible effects of individual and organizational differences.

#### **5.4.2. Data**

We collected data from a sample (recruited from a Qualtrics panel - Brandon et al., 2014) of individuals in the U.S. who fulfilled the following criteria – (1) working full-time; and (2) using email and not interacting exclusively face-to-face in their jobs. 316 participants clicked on the link received by email to take part in the study and filled out the questionnaire. Out of these (1) 13 were rejected because they were not working full-time, (2) 179 were rejected because they were only interacting face-to-face at work, and (3) 6 were rejected on the basis that they answered four times (or more) quicker than the average answering time. 118 valid responses were obtained with no missing data, which represents a usable response rate of 37 percent. Our sample thus consists of 118 full-time working individuals in the US. Sample characteristics are shown in Table 5.2. They include gender, age, education, organization size, and industry of employment of the respondents.

We compared our sample to the overall US population along two aspects – *demographically* and along *general indicators of stress/well-being*, the latter being relevant to the theoretical focus of this study. Demographically, we compared the gender and industry sector characteristics of our sample to that of the full-time working population in the U.S. as obtained from the 2013 data of the United States Department of Labor, Bureau of Labor Statistics. We find that our sample is largely representative, by gender and sector of employment, of the working population of individuals in the US. The details are presented in Appendix 5.1.

*Table 5.2. Sample Characteristics*

	Count	Percentage
<b>Gender</b>		
Male	42	36%
Female	76	64%
Total	118	100%
<b>Industry (North American Industry Classification System - NAICS)</b>		
Mining, quarrying, and oil and gas extraction	2	2%
Construction	4	3%
Manufacturing	11	9%
Wholesale and retail trade	3	3%
Transportation and utilities	5	4%
Information services(e.g. telecommunications, broadcasting, data hosting etc.)	8	7%
Financial services	15	13%
Professional and business services	23	20%
Education and health services	13	11%
Leisure and hospitality	6	5%
Other services	22	19%
Public administration	6	5%
Total	118	100%
<b>Age</b>		
18-30 years	38	32%
31-40 years	28	24%
41-50 years	22	19%
51-60 years	25	21%
More than 60 years	5	4%
Total	118	100%
<b>Education</b>		
High school or less	13	11%
Undergraduate	82	69%
Postgraduate	19	16%
Doctorate, Law or Professional Degree	4	3%
Total	118	100%
<b>Number of employees in the organization</b>		
1 - 49	15	13%
50 - 499	27	23%
500 - 999	18	15%
1,000 - 4,999	25	21%
5,000 or more	31	26%
Don't know	2	2%
Total	118	100%

Regarding indicators of stress/well-being, we compared our sample's values of physical and psychological health, to that of a reference database of these parameters obtained from a business-psychology well-being research firm<sup>6</sup>. The database contained values of these parameters, over the past 10 years, for 38,240 employees from 27 organizations from the US, UK and Western Europe. Physical health was measured through symptoms such as muscular tensions, insomnia or headaches, and psychological health through symptoms such as constant irritability, mood swings or anxiety attacks. We selected these criteria because they are indicative of overall levels of well-being (Faragher et al., 2004). There was no significant difference between the mean and standard deviation (t-values) for our sample and those of the reference database, for  $p < 0.05$ . Specifically, for physical health, the details were ( $Mean_{sample} = 13.84$ ,  $Standard Deviation_{sample} = 3.94$ ,  $Mean_{population} = 13.66$ ,  $Standard Deviation_{population} = 4.26$ ,  $t = 0.50$ ) and for psychological health the details were ( $Mean_{sample} = 21.45$ ,  $Standard Deviation_{sample} = 7.22$ ,  $Mean_{population} = 22.56$ ,  $Standard Deviation_{population} = 7.32$ ,  $t = 1.67$ ).

These comparisons show that our sample is a good representation of the population of working individuals in the US in terms of demography and employment sector, and of employees in the US, UK and Western Europe in terms of general physical and physiological health.

#### **5.4.3. Hypotheses Testing**

The construct means, standard deviations, reliabilities and correlations of the dependent and independent variables are shown in Tables Table 5.3 and Table 5.4.

*Table 5.3. Construct Reliability, Mean, and Standard Deviation*

	Mean	Standard deviation
Actual extent of email interactions (Supplies)	5.42	1.57
Desired extent of email interactions (Values)	5.11	1.43
Work relationships stressor ( $\alpha = .901$ )	2.44	1.08
Job control stressor ( $\alpha = .878$ )	2.80	1.25
Job conditions stressor ( $\alpha = .768$ )	2.92	0.91

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<sup>6</sup> Details available on request.

*Table 5.4. Construct Correlation Matrix*

	S	V	REL	CTRL	JOB
Actual extent of email interactions (S)	1				
Desired extent of email interactions (V)	.76**	1			
Work relationships stressor (REL)	-0.12	-.18*	1		
Job control stressor (CTRL)	-0.08	-.22*	.76**	1	
Job conditions stressor (JOB)	-0.13	-0.16	.76**	.73**	1

*Table 5.5. Hypothesis Testing Using Response Surface Methodology*

	Tests for email misfit	Tests for email fit
Line of interest	Supplies=-Values line (i.e. the line where the actual amount of emails is symmetrically opposite to the desired amount of emails)	Supplies=Values line (i.e. the line where the actual amount of emails is equal to the desired amount)
Equation for this line	Stressor = $b_0 + (b_1 - b_2)S + (b_3 - b_4 + b_5)S^2 + e$ ; ( $S = -V$ ) in Equation 1	Stressor = $b_0 + (b_1 + b_2)S + (b_3 + b_4 + b_5)S^2 + e$ ; ( $S = V$ ) in Equation 1
Slope coefficient	$b_1 - b_2$ (first derivative)	$b_1 + b_2$ (first derivative)
Curvature coefficient	$b_3 - b_4 + b_5$ (second derivative)	$b_3 + b_4 + b_5$ (second derivative)
Hypothesis test	Positive curvature coefficient (i.e. concave upward) (H1a, H2a, H3a) – Figures Figure 5.2, Figure 5.3 and Figure 5.4	Non-significant curvature coefficient (i.e. linear) with non-significant slope (i.e. flat) (H1b, H2b, H3b) – Figures Figure 5.2, Figure 5.3 and Figure 5.4

We tested the hypotheses using quadratic polynomial regressions as suggested by studies on PE fit (Benlian, 2013; Klein et al., 2009). The following equation was analyzed, using S for supplies (i.e. the actual extent of interaction with emails) and V for values (i.e. the desired extent of interaction with emails) and “Stressor” for either work relationships stressor, job control stressor, or job conditions stressor. We thus analyzed three equations, one for each stressor.

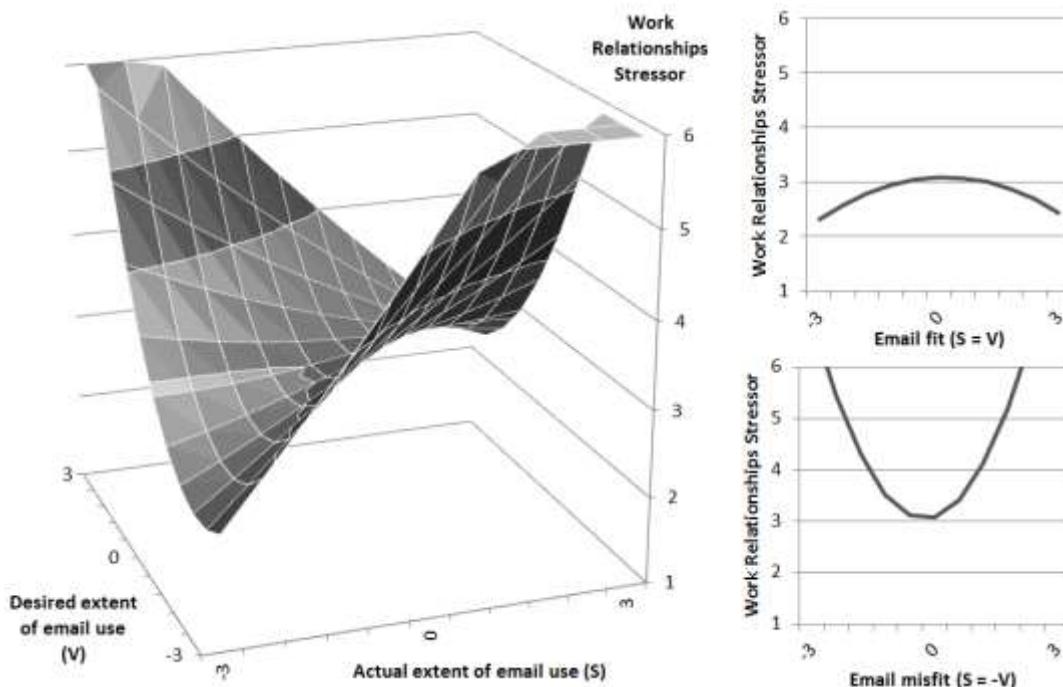
$$\text{Stressor} = b_0 + b_1S + b_2V + b_3S^2 + b_4SV + b_5V^2 + e \quad (1)$$

S and V were scale centered by subtracting 4 (i.e. mid-point of the 1-7 Likert Scale), which is the scale midpoint, in order to facilitate interpretation of the intercept and to

reduce multicollinearity. Equation (1) allows us to examine how the joint impact of the supplies and values will impact each stressor jointly, as required by our hypotheses. The quadratic regressions allow us to examine the curvilinear relationships predicted by hypotheses H1a, H2a and H3a (Edwards & Parry, 1993).

In order to explore the effect of email fit and email misfit on the three stressors, we represented the equations in three-dimensions (Figures Figure 5.2, Figure 5.3 and Figure 5.4 – Respective stressor in the z-axis, Supplies in the x-axis and Values in the y-axis) using response surface methodology (Edwards & Parry, 1993). Response surface methodology analyzes the significance of slopes and curvatures across a two dimensional surface in order to demonstrate whether they are significant or not. The slopes and curvatures were examined using the first and second derivatives of Equation 1. We next describe how we tested each hypothesis by analyzing Equation 1 and using the response surface method for S, V, and each of the three stressors. The results are shown in Figures Figure 5.2, Figure 5.3 and Figure 5.4, and Tables Table 5.5 and Table 5.6.

*Figure 5.2. Estimated Surfaces Relating Email Fit and Misfit to Work Relationships Stressor, controlled for age, gender, education, and organization size*



*Table 5.6. Results from Polynomial Quadratic Regressions of the Stressors on Supplies and Values, controlling for Age, Gender, Education and Company Size*

Outcome variable	Results from quadratic regression in Equation 1						Shape along the email fit line ( $S = V$ )		Shape along the email misfit line ( $S = -V$ )	
	$b1 (S)$	$b2 (V)$	$b3 (S^2)$	$b4 (SV)$	$b5 (V^2)$	$R^2$	$b1 + b2$	$b3 + b4 + b5$	$b1 - b2$	$b3 - b4 + b5$
							Slope	Curvature	Slope	Curvature
Work relationship stressor <sup>a</sup>	0.138	-0.116	0.023	-0.296**	0.194	0.172**	0.047	-0.083*	0.140	0.53*
Job control stressor <sup>ab</sup>	0.276*	-0.307*	0.039	-0.320*	0.205	0.215***	0.024	-0.083	0.445	0.657**
Job conditions stressor <sup>ab</sup>	0.104	-0.11	0.005	-0.243*	0.193*	0.156*	0.017	-0.048	0.132	0.497**

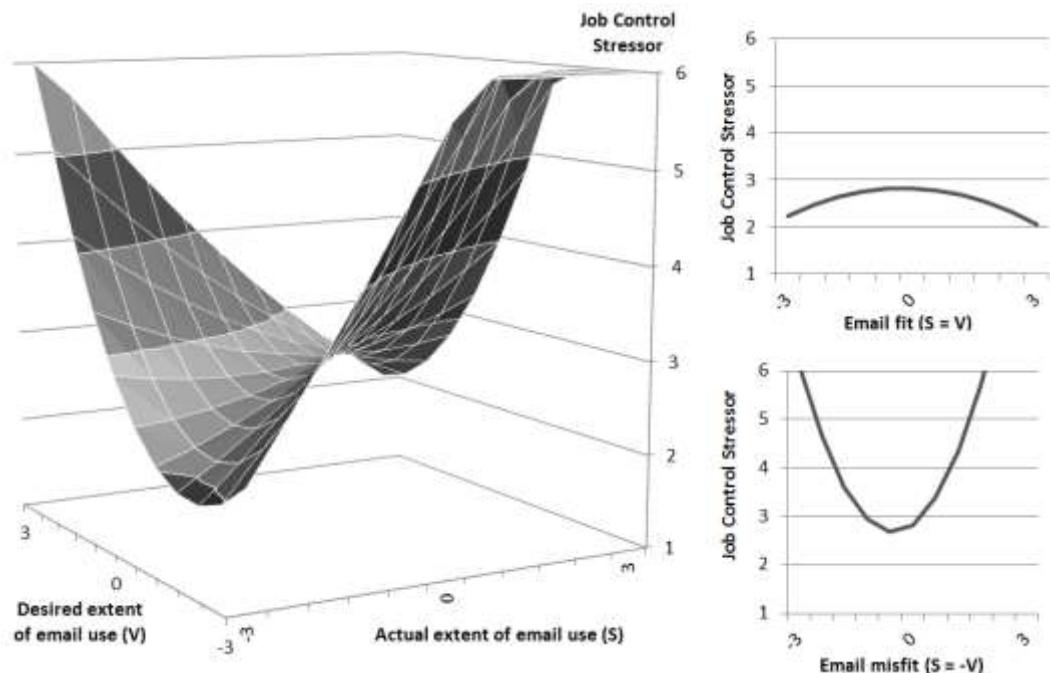
*Notes.* Only significant regressions were kept;  $b1$ ,  $b2$ ,  $b3$ ,  $b4$ , and  $b5$  are the coefficients on  $S$ ,  $V$ ,  $S^2$ ,  $SV$ , and  $V^2$ , respectively

<sup>a</sup> Hypothesis 1a is supported, Hypothesis 1b is not supported

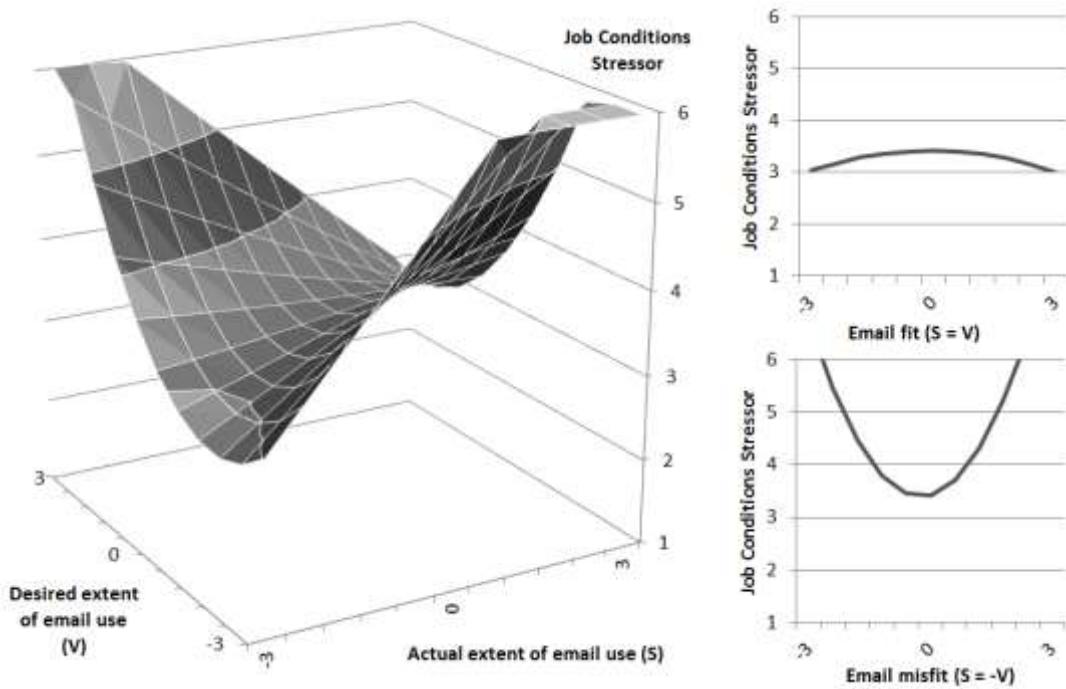
<sup>ab</sup> Hypothesis 2a and 2b, and Hypotheses 3a and 3b are supported

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

*Figure 5.3. Estimated Surfaces Relating Email Fit and Misfit to Job Control Stressor, controlled for age, gender, education, and organization size*



*Figure 5.4. Estimated Surfaces Relating Email Fit and Misfit to Job Conditions Stressor, controlled for age, gender, education and organization size*



### ***Misfit Hypotheses (H1a, H2a, H3a)***

The three misfit hypotheses suggested that stressors will be appraised to greater levels as actual extents of emails deviate from desired amounts of emails. These hypotheses are tested by looking at the surface along the  $S = -V$  line, which should be concave upward (Edwards & Parry, 1993). This line of interest represents the cases where the actual extent of emails is diametrically opposed to the desired extent of emails (i.e. the line of perfect misfit). Setting  $S$  equal to  $-V$  in Equation (1) to capture this line of perfect misfit and solving for coefficients (see Table 5.5) indicates that  $b_1 - b_2$  represents the slope (i.e. the first derivative) and  $b_3 - b_4 + b_5$  represents the curvature (i.e. the second derivative) of the surface at the point  $S = 0$  (and  $V = 0$ ). Thus for the  $S = -V$  line to be concave upward,  $b_3 - b_4 + b_5$  would need to be significantly positive (Edwards & Parry, 1993).

These relationships were supported for all the three stressors (See Table 5.6, Figures Figure 5.2, Figure 5.3 and Figure 5.4). Looking at Table 5.6 we see that the surfaces were indeed concave upward (i.e. concave) for the work relationships stressor (Curvature =  $b_3 - b_4 + b_5 = 0.53, p < .05$ ), job control stressor (Curvature =  $b_3 - b_4 + b_5 = 0.657, p < .01$ ) and job conditions stressor (Curvature =  $b_3 - b_4 + b_5 = 0.497, p < .01$ ). We also note that neither “too few” nor “too many” emails caused the stressors to be appraised more, as the line of email misfit had no significant slope at the origin (i.e.  $b_1 - b_2$  did not significantly differ from zero) for work relationships (Slope =  $b_1 - b_2 = 0.140, p > .05$ ), job control (Slope =  $b_1 - b_2 = 0.445, p > .05$ ) and job conditions (Slope =  $b_1 - b_2 = 0.132, p > .05$ ). These are illustrated in Figures Figure 5.2, Figure 5.3 and Figure 5.4 where we clearly see the curvilinear shape of the diagonal running from the back left corner to the front right corner. The slope and curvature along this  $S = -V$  diagonal is also displayed in the top right two-dimensional graph for each figure. **H1a, H2a and H3a were thus supported.** In other words, individuals experiencing both email underload and overload appraised high levels of stressors.

### ***Fit Hypotheses (H1b, H2b, H3b)***

Fit hypotheses (See Table 5.5) examined the extent to which stressors are appraised as the extent of emails increases in situations of fit. Specifically, they theorized that the stressors

will be appraised to the same level regardless of the actual extent of emails as long as it is equal to the desired extent, that is, as long as email fit is achieved. The line of interest for these hypotheses is the  $S = V$  line, representing the cases where the actual and desired amounts of emails are equal (i.e. the line of perfect fit). Setting  $S$  equal to  $V$  in Equation (1) to capture this line of perfect fit and solving for coefficients (see Table 5.5) indicates that  $b_1 + b_2$  represents the slope (i.e. the first derivative) and  $b_3 + b_4 + b_5$  represents the curvature (i.e. the second derivative) of the surface at the point  $S = 0$  (and  $V = 0$ ). Thus for the  $S = V$  line to be flat, there needs to be a non-significant slope (i.e. when  $b_1 + b_2$  and  $b_3 + b_4 + b_5$  do not significantly differ from zero) (Edwards & Parry, 1993).

Consistent with the requirements of Table 5.5, the  $S = V$  line showed no slope and no significant curvature for the job control stressor (Curvature =  $b_3 + b_4 + b_5 = -0.083, p > .05$ ; Slope =  $b_1 + b_2 = 0.024, p > .05$ ) and the job conditions stressor (Curvature =  $b_3 + b_4 + b_5 = -0.048, p > .05$ ; Slope =  $b_1 + b_2 = 0.017, p > .05$ ) (See Table 5.6). This is also shown in the top right corners of Figures Figure 5.3 and Figure 5.4 where the curvatures of the  $S=V$  line are not statistically significant. **Thus H2b and H3b are supported.** In other words, these two stressors were appraised to the same extent regardless of the actual extent of email use, as long as email fit was maintained, that is, the actual email extent equaled the desired email extent.

Regarding the impact of email fit on work relationship stressor (H1b), the coefficient  $b_3 + b_4 + b_5$  was significantly negative, meaning that the  $S=V$  line was concave downward (i.e. convex) and flat at the origin (Curvature =  $b_3 + b_4 + b_5 = -0.083, p < .01$ ; Slope =  $b_1 + b_2 = 0.047, p > .05$ ) (See Figure 5.2). This shows that when actual extent of email is equal to the desired extent, work relationships stressor was appraised at a higher level at the extremes (i.e. when the actual extent of email is too high or too low) and less around the center (i.e. when the actual extent of email is moderate). That is, even when there was a fit, workplace relationships stressors increased with increase in the extent of email, when the extent of email use was too high or too low. This could mean that even when the individual perceives a fit, if his or her extent of email use is too high or too low, co-workers may not appreciate that. They may feel over-burdened (in case of too much email) or not feel socially

supported (in case of too little email), as a result of which workplace relationships may suffer. This result highlights the importance of collective or supplementary fit (Muchinsky & Monahan, 1987) and merits further investigation.

Before describing the study's contributions we make a note of its limitations. Our results hold for a sample that is generally representative of the overall US population of working adults, controlled for age, gender and organization size. The sample is also representative in its physical and mental health, of employees in organizations from the US, UK and Western Europe. However, the following limitations call for cautious interpretation of the findings. First, although the single item measurement of desired and actual extent of email provided a basis for the survey's respondents to report on the extent of actual and desired email communication in a commensurate manner as discussed in PE research (Benlian, 2013; Klein et al., 2009), multi-item measures could be more robust. Second, conducting the study on a larger set of respondents would increase the confidence in its results. Finally, as with all survey research, the cross-sectional nature of the study along with self-reported data can be imbued with potential biases of the respondents.

## **5.5. Discussion**

We set out in this research, to address a knowledge gap concerning how a higher extent of email is associated with both positive and negative employee outcomes, depending on the individual's appraisal. In order to do this, we drew from the PE fit perspective in psychological stress studies to theoretically and empirically develop and understand the appraisal process. We describe the study's contributions as follows.

### **5.5.1. Theoretical Contributions**

Our first contribution is in theoretically explaining the process of stressor appraisal from email load. While previous studies have commented on the positive and negative effects associated with high email volume without explaining how, we introduce the concept of email misfit as a possible reason for negative effects such as the three discussed in this paper – high job control stressor, job condition stressor and work relationship stressor. Rather than the actual extent of email interaction, it is the difference between actual and desired extent of interaction that is appraised as stress creating. The same individual can

experience increasing volume of email to be less stressful in the email underload region and more stressful in the email overload region of the U-shaped curve. Further, different individuals would have different U-shaped curves. A given extent of email interaction could thus be associated with both high and low level of stressors, depending on how close it was perceived to be by the individual to his or her desired extent of email interaction on the respective U-shaped curve. We thus highlight the significance of the individual's appraisal in assessing the effects of email load, through the concept of email fit. The results of H1b, H2b and H3b indicate that a particular extent of interaction with emails can have different levels of stressors for different individuals, depending on the extent to which they want to interact with email. Not only that, as long as the desired and actual extents of email use increase jointly and together, two of the stressors we studied – job control and job conditions, do not increase. This shows that it is the individual's assessment of email fit or misfit that affects these stressors, rather than the actual extent of email interaction. This is in contrast to existing studies that focus only on the extent of email, rather of the individual's appraisal of it in terms of email fit and email misfit.

Explaining the process of stressor appraisal is a contribution to the technostress literature as well. Although this literature discusses various stressors, strains and coping mechanisms due to use of IT, the appraisal process that focuses on how technostress creators are appraised by individuals to be such, has not received much attention. By reporting a theoretical and empirical construction of fit and misfit with respect to IT use related attributes, we clarify how demands from technology use, in this case email, can be appraised as a source of stress.

Second, we conceptually introduce and empirically validate a U-shaped relationship between email load and work stressors. Prior research has looked at email load in a unidirectional manner, showing that excessive emails in the form of email overload are associated with negative effects such as increased burnout, absenteeism (Barber & Santuzzi, 2015) or longer workdays (Barley et al., 2011). The support we find for H1a, H2a and H3a empirically demonstrates that as a consequence of misfit on both sides of the desired extent of email interaction, both email overload (when the actual extent is more

than desired) and underload (when the actual extent is less than desired) can lead to high levels of stressors. These findings thus suggest that the concept of email overload be revisited in order to capture various email loads, ranging from underload to overload.

To the best of our knowledge this is the first study to theoretically conceptualize and empirically examine the U-curve relationship between a technology use related attribute and appraised stressors. This is a contribution to the technostress research where studies (e.g., Ayyagari et al., 2011; D'Arcy, Herath, & Shoss, 2014; Maier et al., 2015; Ragu-Nathan, Tarafdar, Ragu-Nathan, & Qiang Tu, 2008; Tarafdar et al., 2007) implicitly assume that IT imposes demands that exceed the individual's ability to cope and thus creates stress for the user. That is, while the right side of Figure 5.1 has been explored, the left side has not. Our results show that stressors are appraised as high both because of excesses and deficits in the technology attribute, suggesting that IT use can cause stress *both when it exceeds and fails to meet, the user's expectation and preference.*

As a method related contribution, the paper tackles the issue of fit and misfit measurement in the context of email use based on insights from PE fit research (Klein et al., 2009). The technostress literature combines the individual's perception (i.e. the *person* aspect) and the technology's characterization (i.e. the *environment* aspect) into a single construct when assessing technostress creators, with measurement indicators such as 'I feel overloaded due to IT' (Tarafdar et al., 2007). In this study we look at potential stressors due to email by separating the environment (i.e. extent to which the individual actually sends and receives email) and the person (i.e. extent to which the individual wants to send and receive email). This separation, referred to as an atomistic measurement of PE fit (Edwards, Cable, Williamson, Lambert, & Shipp, 2006) acknowledges the importance of individuals' preferences and makes it easier to understand why individuals might react differently to a same volume of email. It captures a variety of circumstances ranging from individuals having 'not enough' email to having 'too much'. This kind of separation of measurement of supplies and values can be applied to the broader context of demands due to use of IT, such as constant availability, rate of change and innovation etc.

This study opens up a number of new ways that future research can consider in the study of stress from use of IT. Other factors salient to the appraisal process such as personality traits, organizational expectations, work-life situations, societal norms and culture, importance of the message, content of the message, and sender of the message can be examined. For instance email messages from organizational superiors are considered more important (Gupta et al., 2013) and can cause greater stress if not quickly attended to. Or the specific content of an emails, such as for instance in an extreme case, cyberbullying (Baruch, 2005) can cause stress, irrespective of volume. Our paper does not consider these factors. Further, stress research suggests that PE fit could change over time as the individual gets used to higher levels of demands (Lazarus, 1990). Longitudinal research designs that study fit over time (Taris & Feij, 2001) could capture such a process along with changing email load (Lantz, 2003). Another avenue for future research could be to look at antecedents of the desired technology attribute, in this case of the volume of email, such as organizational expectations and workload.

### **5.5.2. Practical Contributions**

Emerging practical concerns are beginning to focus on the problems associated with one size fits all solutions and interventions to deal with things like technostress and information overload (Tarafdar, D'Arcy, Turel, & Gupta, 2015), where a key assumption is that everyone wants 'less'. An important contribution to practice of this study is to direct managerial attention to the individual's preferences in dealing with email load. Our results show that if the actual extent of email use is satisfying or 'enough' to the individual, the level of stressors is low, regardless of the extent itself. That is, not everyone wants 'less'. Rather than assuming that everyone wants fewer emails, organizations should encourage employees to reflect on how much they are interacting with email, and if that matches the extent to which they would like to interact with email. Based upon that, interventions should be designed.

Related to the above, in order to reduce the stressful impacts of email use, human resources (HR) management policies should be thoughtfully designed. For instance, not every employee would welcome the idea of an email ban after office hours, as some organizations

have done (Williams, 2011). Similarly, not every employee would be agreeable to reduce email use. HR policies could (1) alert employees to potential differences in email use of their colleagues and (2) provide a wide range of resources and tools to enable employees to manage their email volume the way they are *comfortable with*, rather than mandating the way they *should*. For example, those individuals who think they are interacting with too much email should be directed towards resources such as email training sessions (Burgess et al., 2005; Jackson & Lichtenstein, 2011) or support groups (Leonardi, Treem, & Jackson, 2010) to deal with email overload. Those who think they are interacting too little could be advised to seek the necessary information through other channels such as face-to-face meetings (Mulki et al., 2009) or enterprise social networks.

A third practical contribution is to suggest that individuals have a responsibility to understand their tolerance level for workplace email. They also have a responsibility to be mindful and empathetic that not all of their colleagues are similarly disposed towards email, and thus should not get stressed if they think they are not receiving enough email communication from colleagues. The current thinking is that the extent to which an individual interacts using email is a ‘given’, that is, he or she cannot change it. However, individual mindfulness about the importance of the difference between actual and desired extents of email use could help users adjust the volume of emails.

To conclude, our paper develops theoretical understanding of how the extent of email use impacts employees both positively and negatively, by explaining how they appraise email volume as a source of workplace stress. Our study suggests that rather than looking at ‘too much’ email as uniformly ‘stress-creating’, it is more instructive to understand *under what conditions* individuals consider email use as being too much (i.e. when desired less than actual) and stress-creating (i.e. when a misfit exists). That is, email use, and in general technology use, has both a misfit-related ‘dark’ side and a fit-related ‘bright’ side. Given the perennial workplace importance of email and the increasingly observed effects of technostress these are interesting findings that future research can build on.

*Appendix 5.1. Observed and Expected Counts for Sample Characteristics*

	Percentage Sample	Percentage U.S. population
<b>Gender</b>		
Male	36%	53%
Female	64%	47%
Total	100%	100%
<b>Industry (North American Industry Classification System - NAICS)</b>		
Agriculture, forestry, fishing, and hunting	0%	1%
Mining, quarrying, and oil and gas extraction	2%	1%
Construction	3%	6%
Manufacturing	9%	10%
Wholesale and retail trade	3%	14%
Transportation and utilities	4%	5%
Information services (broadcasting, telecommunications, data hosting etc.)	7%	2%
Financial services	13%	7%
Professional and business services	20%	12%
Education and health services	11%	23%
Leisure and hospitality	5%	9%
Other services	19%	5%
Public administration	5%	5%
Total	100%	100%

## 5.6. References

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## 6. PAPER 3

- **Title:** Email Overload, Workload Stress and Desired Email Use
- **Authors:** Stich, J.-F.
- **Status:** Will be submitted to the *International Journal of Information Management* (IJIM).
- **Dataset:** Quantitative main survey

### 6.0. Foreword

The following paper is titled “Email Overload, Workload Stress and Desired Email Use” and will be submitted to the *International Journal of Information Management* (IJIM). It is a quantitative paper using structural equation modeling to explore new dynamics between actual email use, desired email use and stress. Paper 1 prepared the ground and established the importance of desired email use. Paper 2 looked at desired email use with a PE fit approach to email load and stress. This paper is instead looking at desired email use as a consequence rather than a cause of email load and stress. It relies on my main study data (N=504).

#### 6.0.1. Paper history

The initial plan for this paper was to reproduce the findings of Paper 2 on a larger dataset, collected in February 2015, as part of my main study. This attempt was unsuccessful, and I had to find alternative ways to exploit the main study data. None of the PE fit methods at my disposal worked. Quadratic polynomial regression (See Paper 2) did not work for any email use scale or any work stressor. Difference scores did not work either and are widely criticized in literature (Edwards & Parry, 1993; Klein et al., 2009). The latent congruence model for PE fit (Cheung, 2009) did not work and is also subject to serious criticism (Edwards, 2009). Following my exploration of the data, in January 2016, I decided to take a new look at the data using an alternative theory of workplace stress. One model seemed to be of particular interest and was inspired by cybernetics theories (Carver & Scheier, 1982). It suggests that (1) the more email use, (2) the more stress, and the more stress, (3) the less desired email use. In other words, stressful email overload might lead individuals to desire

fewer emails. Paper 3 explains this model with cybernetics principles and tests it using structural equation modeling. The current version was written in March 2016 and will be submitted to IJIM.

### **6.0.2. Paper contribution to the thesis**

I believe that Paper 3 is not as impactful as Paper 2, but I believe that Paper 3 is complementary and enriches my thesis (See Figure 1.1). PE fit (See Paper 2) is one piece of the puzzle. It shows that desired email use can impact stress jointly with actual email use. Cybernetics shows that desired email use can also be a consequence of a stressful email use. Having negative attitudes towards email (Barley et al., 2011) might thus be the result of frequent negative email encounters. These temporal dynamics are not accounted for by PE fit theories. Longitudinal PE fit studies look at the evolution of fit and misfit over time (Caplan, 1983) but not at the temporal relationships between attitudes and behaviors. Although the main study was cross-sectional and thus not able to perfectly capture such relationships, I believe it is an interesting first attempt at applying cybernetics to the study of email overload and technostress. It has to be noted, however, that the instrument used in this study (i.e. work overload stress from ASSET) made it impossible to incorporate the construct of “email underload” discovered in the previous paper. Although Paper 3 therefore focuses on email overload only, it nevertheless provides further answers to the first research question, while still contributing to the second. This paper concludes my thesis. As future work, I am exploring newer methodological tools such as spline regression, for understanding and explaining other possible relationships.

## Email Overload, Workload Stress and Desired Email Use

### ***Abstract***

Using email is a time-consuming activity having the potential to increase workload stress. This article investigates how such negative consequence of email use can foster negative attitudes towards emails and lower desired email use in particular. We further explore how individuals can try to reduce their email use following stressful email encounters. Empirical data were collected from a survey sample of 504 full-time workers. A quantitative data analysis was performed using structural equation modeling. We found that workload stress increased with higher perceptions of email use. Workload stress was then associated with lower desired email use. Finally, lower desired email use was linked to lower perceptions of email use. The findings clarify how individuals might reject emails because of previous inappropriate email use, and how individuals might try to use emails to extents they desire. The paper discusses these results, their limitations and their theoretical and practical implications.

### ***Keywords***

Email, Overload, Stress, Attitude, Structural Equation Modeling

### ***6.1. Introduction***

Checking, receiving, reading, sending and sorting email is a time-consuming activity with a clear impact on workload (Barley et al., 2011; Jackson et al., 2006), especially in situations of improper email use (Kimble et al., 1998; Thomas & King, 2006). Feelings of being overloaded by work or by email can have serious adverse outcomes such as increased risks of burnout, sleep difficulties (Barber & Santuzzi, 2015), stress (Brown et al., 2014; Jackson & Farzaneh, 2012; Mano & Mesch, 2010) or even financial costs to organizations (Jackson, Dawson, & Wilson, 2001).

Even more important for stress than the sheer volume of email is how individuals perceive their email volumes (Dabbish & Kraut, 2006). Perceptions indeed matter, and as such have the potential to alter the email volume - workload stress relationship. For instance, perceiving the email medium positively could alleviate feelings of email overload (Sumecki et al., 2011). On the contrary, stress might also increase because of email being symbolically perceived as a medium inherently causing stress (Barley et al., 2011). Whether individuals perceive email to be a blessing or a curse, they seem to have precise expectations and desires regarding their email volume.

This led us to wonder how these desired email volumes and attitudes towards email were formed. Some studies investigated their existence (E.g., Barley et al., 2011) or their potential consequences (E.g., Sumecki et al., 2011), but few looked at their antecedents. In contrast, research on attitudes towards remote working is abundantly discussing social and organizational norms surrounding desired smartphone use (E.g., Matusik & Mickel, 2011). We decided to take another route and look at a potential antecedent that remained relatively unexplored both in email and remote working literature. This antecedent is simply the occurrence of stressful encounters or potential stressful encounters. In other words, we want to look at how negative attitudes towards email form because of negative email experiences. These negative attitudes could in turn motivate individuals to reduce their email use in order to achieve a state of balance.

The research question we thus want to ask and answer is whether desired email use is lowered by feelings of email overload, and if so, is associated with lower email use? To

answer this research question, we consider a conceptual model based on cybernetics principles (Carver & Scheier, 1982). Cybernetics is looking at how individuals react to stressful encounters by dynamically adjusting to them. In particular, we investigate how individuals react to email overload by first desiring fewer emails (i.e. distancing themselves from the stressful source), and second trying to reduce their email load down to their newly desired load (Carver, 2006).

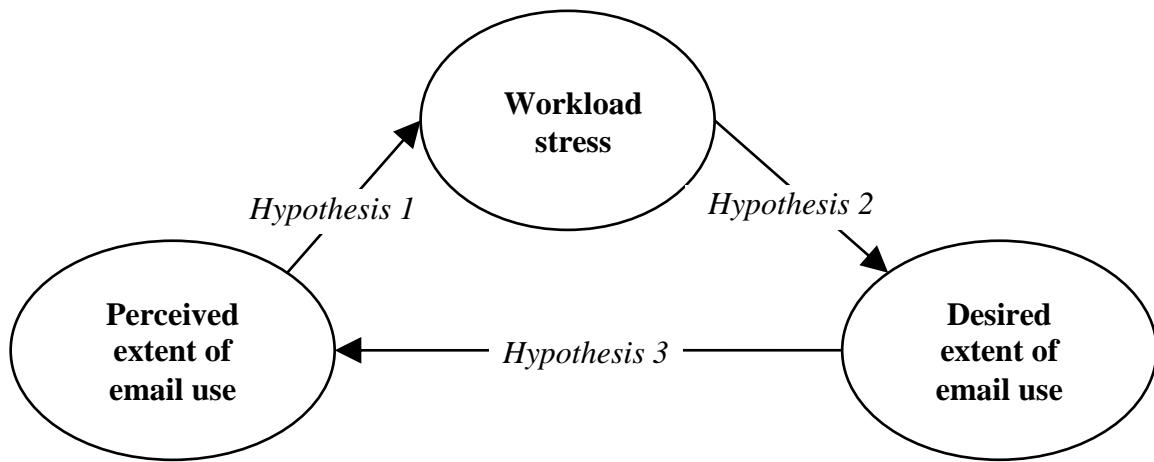
This model was successfully tested on a sample of 504 U.S. full-time workers using structural equation modeling. We found that workload stress increased with higher perceptions of email use (Hypothesis 1). Workload stress due to this email overload was then associated with lower desired email use (Hypothesis 2). Finally, lower desired email use was linked to lower perceptions of email use (Hypothesis 3). Despite the study limitations such as cross-sectional data, we found evidence that cybernetics principles could indeed be of interest in email overload or technostress research.

The paper is organized as follows. The next section builds a set of hypotheses supported by previous literature and a possible theoretical model. The third section presents the method of the study. The fourth section details the results of the model testing. Finally, the last section discusses the results, their limitations and their theoretical and practical implications.

## ***6.2. Theoretical background and proposed model***

In this section we introduced our conceptual model and defend our hypotheses. Our hypotheses predict that the extent of email use will increase with workload stress (H1). The increase in workload stress will be associated with a decreased in the desired extent of email use (H2). Finally, the lowered desired extent of email use will be associated with a lowered actual email use as perceived by individuals (H3). These three hypotheses are visually depicted in the following structural model. Each section is introducing and defending one hypothesis.

*Figure 6.1. Hypothesized Conceptual Model*



#### **6.2.1. Hypothesis 1: Email volume and workload stress**

Research has frequently discussed the potential of email to increase workloads. The volume of emails sent and received is particularly exacerbated by the speed and convenience to send emails to multiple recipients (Taylor et al., 2008; Thomas & King, 2006), and the extensive use of the ‘copy’ function (Ingham, 2003; Kimble et al., 1998). The activity of reading and sending emails can thus become really time-consuming in modern workplaces. It has been estimated that employees spend on average 29 minutes per day reading emails, let alone sending and answering them (Jackson et al., 2006). This estimation mirrors the finding that the more emails received, the longer the workday and the greater the feelings of work overload (Barley et al., 2011). Although some work-related emails can increase work effectiveness (Mano & Mesch, 2010), others distract employees from accomplishing other tasks (Burgess et al., 2005), potentially leading to increased feelings of work overload.

This interruption of the workflow is also exemplified in studies of email interruptions. A high daily volume of emails is often the sign of frequent emails throughout the workday. Every incoming email is usually notified to employees. Within a large UK company, employees have been found to react to these notifications in under six seconds, with an average of one minute and forty-four seconds (Jackson et al., 2001). Such prompt reactions necessarily fragment employees’ attention and make it harder for them to reengage in their

primary tasks. Within the organization aforementioned, employees took on average 64 seconds to reengage in their main activity following an email interruption (Jackson et al., 2001). Gupta and Sharda (2008) estimated that knowledge workers lose four to five percent or 28 minutes of their workday because of such interruptions.

Apart from studying the impact of email volume on workload in general, literature has considered the construct of email overload within the broader construct of information overload. Email overload has been defined as “users’ perceptions that their own email use has gotten out of control because they receive and send more email than they can handle, find or process effectively” (Dabbish & Kraut, 2006, p. 431). It is thus a perception of one’s email volume being too high to be dealt with effectively. In general, the higher the volume of emails, the higher the feelings of email overload (Soucek & Moser, 2010; Sumecki et al., 2011). Other predictors of email overload include email interruptions (Wajcman & Rose, 2011), time spent managing email (Barley et al., 2011; Sumecki et al., 2011), emails piling up in the inbox (Whittaker & Sidner, 1996) or too numerous email folders (Dabbish & Kraut, 2006). These numerous predictors exemplify the multiple ways email can increase workloads and feelings of being overwhelmed. Email overload in particular and information overload in general have important implications in terms of stress (Jackson & Farzaneh, 2012). Specifically, they have then been associated with increased risks of burnouts and sleep disorders, stress and distress (Barber & Santuzzi, 2015; Brown et al., 2014; Mano & Mesch, 2010).

Although the sheer volume of emails sent and received has been linked to stress on its own (Brown et al., 2014; Mano & Mesch, 2010), this volume first needs to be appraised as stressful by individuals (Lazarus, 1990). The importance of appraisal moves the investigation from the objective volume of emails to how employees perceive this volume to be. This is one reason why the construct of email overload already incorporates employees’ perceptions (Dabbish & Kraut, 2006).

It has to be noted that most studies asked respondents to indicate the amount of emails they read, sent or received in an average or in the previous workday (E.g., Barley et al., 2011; Dabbish & Kraut, 2006; Mano & Mesch, 2010). They then linked this volume to feelings of

email overload (E.g., Dabbish & Kraut, 2006) or to stress directly (E.g., Brown et al., 2014). Due to their self-report nature, these measures of email volume are already likely to be a perception of the actual email volume. Studies of phone and smartphone use indeed revealed that self-reported volumes hardly correlate to objective volumes as measured directly in the systems (Andrews et al., 2015; Higgins et al., 1985).

For these reasons, our study decides to look directly at individuals' perceptions of the extent to which they perceive their volumes to be rather than at their self-reported email volumes (e.g. sending emails "to a small extent" or "to a very large extent" rather than sending X emails). Hypothesis 1 reflects the aforementioned literature and the importance of appraisal and individual perceptions. It predicts a positive influence of the perceived extent of emails sent, received and read on workload stress.

**Hypothesis 1:** The perceived extent of emails sent, received and read has a positive influence on workload stress.

### **6.2.2. Hypothesis 2: Work overload and desired email volume**

We have discussed so far how the perceived email volume can increase workload stress. We now suggest how workload stress can subsequently foster negative attitudes towards email by lowering the desired email volume. Desires are hereby defined as "any state or condition the employee consciously wants" (Edwards, 1992, p. 249). A desired email volume thus simply refers to the amount of emails sent, read and received an employee consciously wants.

The idea that stress caused by email overload could subsequently foster rejection and avoidance of email draws on cybernetic theories (Carver & Scheier, 1982) and attitudinal research. Cybernetic theories applied to human behavior are concerned about human beings self-regulating their behaviors by feedback loops (1982). One such loop is the *discrepancy enlarging loop* (Carver, 2006). When individuals face a threatening stimulus, they might try to increase the distance between them and this undesired state. By doing so, they try to enlarge the discrepancy between their actual and undesired states (2006). This concept has

notably been applied to stress in form of coping behaviors (Edwards, 1992), and in information systems in form of avoidance of IT threats (Liang & Xue, 2009).

Applied to email overload, cybernetics allows investigating the coping behaviors that follow email overload. More importantly, it provides a first potential explanation as to why email users might perceive email as a symbol of their stress and view this medium as a scapegoat (Barley et al., 2011). The main hypothesis inferred from this discrepancy enlarging loop (Carver, 2006) is that employees may hate email because it causes them to experience many stressful encounters, some of which taking the form of email overload. These negative attitudes towards the email medium are adapted to our study of email volume in Hypothesis 2. Hypothesis 2 predicts that workload stress will decrease the desired extent of emails sent, received and read.

**Hypothesis 2:** Workload stress has a negative influence on the desired extent of emails sent, received and read.

### **6.2.3. Hypothesis 3: Actual and desired email volume**

Our previous hypotheses predicted that the extent of email use will increase workload stress (H1), which will in turn decrease the desired extent of email use (H2). In other words, employees will appraise their workload to be stressful once they appraise their email use to be too high. They will then react to this email overload by desiring fewer emails. Hypothesis 3 predicts that once employees desire fewer emails, they will try to readjust their actual email volume by using email less.

This hypothesis is rooted in both cybernetics (Carver & Scheier, 1982) and the technology acceptance model (Davis, 1989), which incidentally shares similarities with cybernetics (Liang & Xue, 2009). Specifically, another feedback loop investigated in cybernetics is the *discrepancy reducing feedback loop* (Carver, 2006). The discrepancy enlarging loop previously discussed was about distancing oneself from an undesired state. In contrast, the discrepancy reducing loop is about trying to bring the actual and desired states closer. It thus bears resemblance to the technology acceptance model components of intentions to use driving use (Venkatesh & Davis, 2000). Applied to our construct of email load, the

discrepancy reducing loop is therefore about employees trying to use email to their desired extents.

Literature on email use and computer-mediated communication (CMC) use has long emphasized attitudes and apprehensions as potential antecedents of use. For instance, individuals who are apprehensive towards CMC tend to use CMC less (Scott & Timmerman, 2005). Studies about corporate smartphone often report how some employees strongly desire to possess such devices and feel rewarded by finally obtaining them (Cavazotte et al., 2014; Matusik & Mickel, 2011; Waller & Ragsdell, 2012). For email in particular, the link between intentions to use email leading to greater use of emails has been core to the technology acceptance model. Email was indeed the first technology having been applied this model in Davis' seminal paper (1989). Although the desired email volume might just be one potential antecedent of email use among others (Burgess et al., 2005), Hypothesis 3 is drawn to reflect that the desired extent of email use might drive email use in form of its perceived extent.

**Hypothesis 3:** The desired extent of emails sent, received and read has a positive influence on the perceived extent and amount of emails sent, received and read.

We now proceed to test our conceptual model. We present our participants, procedure and measures in following part number three. We then describe the results of the structural equation modeling analysis in the fourth part. We finally discuss these results and their implications for theory and practice in the fifth and last part.

### **6.3. Method**

#### **6.3.1. Participants and procedure**

We collected data from a sample of full-time U.S. workers recruited from a Qualtrics panel. This panel company was selected because of the quality of their samples as reported in literature (Brandon et al., 2014). We then managed to secure a research grant from Qualtrics to cover the costs of participant recruitment, but the company was not involved in any stage of the research, including its design and analysis. 795 individuals accessed the online survey from a link they received by email. 67 of those were rejected as they were not

full-time workers. 222 were rejected because they failed to answer correctly our attention filters, and 2 because they answered four times quicker than the average answering time. In total, 504 complete valid responses were collected, representing a usable response rate of 63%. This sample was composed of 47.4% men and 52.6% women aged from 20 to 73 years and having a mean age of 44 years.

### **6.3.2. Measures**

#### *Perceived and desired extents of email volumes*

We measured the perceived and desired extents of email volumes on the basis of emails sent, received and read. These three components of email volume have been commonly used in email research (E.g., Dabbish & Kraut, 2006). The perceived extent of email volume was measured with three items: “At work, to what extent do you (1) receive / (2) send, forward or reply to / (3) read work e-mail?” This scale was found to be equally reliable ( $\alpha = .875$ ). The desired email extent was measured using three similar items: “At work, to what extent would you like to (1) receive / (2) send, forward or reply to / (3) read work e-mails?” The scale was also found reliable ( $\alpha = .871$ ). These items were assessed using 7-point Likert scales ranging from “1 = Not at all” to “7 = To a very great extent”.

#### *Work overload*

Work overload was measured using items adapted from workplace stress instruments found psychometrically sound and reliable in previous studies (Donald et al., 2005; Johnson, 2009; Johnson & Cooper, 2003). The three items assessed the extent to which participants were troubled about (1) facing unmanageable deadlines, (2) facing unmanageable workloads, and (3) lacking time to do their jobs as well as they would like. This scale was found reliable ( $\alpha = .860$ ) and used a 5-point Likert scale of agreement from 1=“Strongly Disagree” to 5=“Strongly Agree”.

### **6.3.3. Statistical analysis**

Our measurement model and hypotheses were tested using structural equation modeling (SEM) with maximum likelihood (ML) estimation. The analyses were done using the *R* software with the package *lavaan* (Rosseel, 2012) version 0.5-20 for SEM and *semTools*

(Pornprasertmanit et al., 2013) version 0.4-11 for the calculations of Cronbach's Alpha and Average Variance Expected (AVE). For reproducibility, the covariance matrix (See Table 6.1) and the R syntax (See Appendix 6.1) are made freely available to the readers. The full dataset is also made freely available on the journal and main author's websites.

To evaluate our measurement and structural models, we relied on a mix of recommended fit indices. We notably followed the recommended cut-off values of Hu and Bentler (1999) to assess whether our models were of acceptable fit (See Table 6.3). For each model, Chi-Square ( $\chi^2$ ) with its degrees of freedom and significance, the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA), the Standardized Root Mean Square Residual (SRMSR), the Goodness-of-Fit index (GFI), the Adjusted Goodness-of-Fit index (AGFI), the Normed Fit Index (NFI), and the Tucker-Lewis Index (TLI) were computed. For a good fitting model, the CFI should exceed .95, the RMSEA should not exceed .06 and the SRMSR should not exceed .08 (Hu & Bentler, 1999), the GFI, AGFI, NFI and TLI should exceed .90 (Salisbury, Chin, Gopal, & Newsted, 2002), and the  $\chi^2/df$  should be between 1 and 5 (2002). Using these techniques and guidelines, we now present the results for the measurement and structural model.

## **6.4. Results**

### **6.4.1. Measurement model**

Prior to estimating the structural model, we first estimated the quality of the measurement model (Anderson & Gerbing, 1988). The constructs were formed with theirs aforementioned items, fixing the loading of each first path to 1.0 to identify the model (See Table 6.2). We allowed items from the perceived extent of email use and desired extent of email use scales to correlate. Specifically, the perceived extent of emails sent was correlated with the desired extent of emails sent, and so on for emails read and sent. These items have to correlate because they were worded in a commensurate way. We then analyzed the quality of the measurement model in terms of its convergent and discriminant validity.

Using Fornell and Larcker's (1981) criteria, the convergent validity of a construct is satisfactory when (1) all of its indicators are significant and have loadings exceeding 0.7 and (2) its Average Variance Extracted (AVE) value exceeds 0.50. As shown in Table 6.2, all items are significant at  $p < .001$  and their standardized loading range from .746 to .986. The scales thus demonstrated satisfactory convergent validity.

*Table 6.1. Covariance Matrix Used in the Study (N = 504)*

	1.	2.	3.	4.	5.	6.	7.	8.	9.
<b>1. P_receive</b>	3.30								
<b>2. P_send</b>	2.20	3.24							
<b>3. P_read</b>	2.24	2.25	3.01						
<b>4. D_receive</b>	1.93	1.58	1.54	2.86					
<b>5. D_send</b>	1.46	2.21	1.58	1.94	2.92				
<b>6. D_read</b>	1.51	1.66	2.07	2.10	2.16	3.19			
<b>7. LOAD1</b>	0.08	0.06	-0.19	-0.28	-0.21	-0.48	2.02		
<b>8. LOAD2</b>	-0.10	-0.12	-0.21	-0.44	-0.31	-0.56	1.56	2.20	
<b>9. LOAD3</b>	-0.03	-0.07	-0.15	-0.47	-0.35	-0.60	1.25	1.75	2.57

*Note.* P: Perceived extent of email use (E.g., P\_receive: perceived extent of emails received).

*Note 2.* D: Desired extent of email use (E.g., D\_receive: desired extent of emails received).

*Note 3.* LOAD: Workload stress item.

*Table 6.2. Items Loadings and Significance Levels for Model (N = 504)*

Items or items descriptions	Mean	Standard deviation	Standardized loading	Loading	Sig.
<b>Perceived extent of email use</b>					
<i>(<math>\alpha = .875</math>, AVE = .699)</i>					
At work, to what extent do you receive work e-mails?	4.87	1.82	.809	1.000	
At work, to what extent do you send, forward or reply to work e-mails?	4.50	1.80	.821	0.999	.000
At work, to what extent do you read work e-mails?	5.29	1.74	.878	1.047	.000
<b>Desired extent of email use</b>					
<i>(<math>\alpha = .871</math>, AVE = .693)</i>					
At work, to what extent would you like to receive work e-mails?	4.06	1.69	.819	1.000	
At work, to what extent would you like to send, forward or reply to work e-mails?	3.94	1.71	.814	0.985	.000
At work, to what extent would you like to read work e-mails?	4.48	1.79	.861	1.103	.000
<b>Work overload stress</b>					
<i>(<math>\alpha = .860</math>, AVE = .694)</i>					
Facing unmanageable deadlines	2.42	1.42	.752	1.000	
Facing unmanageable workloads	2.51	1.48	.986	1.366	.000
Lacking time to do your job as well as you would like	2.79	1.60	.746	1.117	.000

The discriminant validity of the constructs is satisfactory when the square root value of their AVE is greater than their highest correlation with other constructs (Chin, 1998). This was the case for each of our constructs. For perceived extent of email use, the square root of its AVE was .836 and its highest correlation .724. For desired extent of email use, the square root of AVE was .833, which was greater than its highest correlation of .724. Finally, the square root of AVE for workload stress was .833, which was again greater than its highest correlation of .213. The criterion for discriminant validity has hence been satisfied.

### **6.4.2. Structural model**

The measurement model being satisfactory, the hypotheses were then examined using SEM (Anderson & Gerbing, 1988). The conceptual model (See Figure 6.2) presents the direct effects for each of the hypotheses. The fit indices are presented in Table 6.3. The results showed that the model had a good overall fit,  $\chi^2(21, N = 504) = 40.235$ ,  $p < .01$ , CFI = .994, RMSEA = .043, SRMR = .028, GFI = 0.983, AGFI = 0.963, NFI = 0.987, TLI = 0.989,  $\chi^2/df = 1.96$ . The path coefficients (direct effects) also supported our hypotheses. Workload stress was not significantly influenced by participants' age, gender, industry, education level or number of persons under supervision (i.e. path coefficients from control variables to workload stress were not significant).

Hypothesis 1 relates to the positive direct effect of the perceived extent of email use on workload stress. As shown in Table 6.4, the standardized path coefficient from the perceived extent of email use to workload stress has a positive value of 0.198, which is statistically significant at  $p < .005$ . Hypothesis 1 has therefore been supported. Hypothesis 2 then refers to the negative direct effect of workload stress on the desired extent of email use, and has been supported too. The standardized path coefficient from workload stress to desired extent of email use has a negative value of -0.352, which is statistically significant at  $p < .001$ . Finally, Hypothesis 3 is the positive direct effect of desired email use on perceived extent of email use. Results also support this hypothesis, as the standardized path coefficient from the desired email use to the perceived extent of email use has a positive value of 0.756, which is statistically significant at  $p < .001$  (See Table 6.4).

*Table 6.3. Fit Indices for the Measurement and Structural Models (N = 504)*

Fit indices	Recommended values	Structural model
$\chi^2$		40.235
d.f.		21
Sig.		.007
CFI	> .95 (Hu & Bentler, 1999)	.994
RMSEA	< .06 (Hu & Bentler, 1999)	.043
SRMR	< .08 (Hu & Bentler, 1999)	.028
GFI	> .90 (Salisbury et al., 2002)	.983
AGFI	> .90 (Salisbury et al., 2002)	.963
NFI	> .90 (Salisbury et al., 2002)	.987
TLI	> .90 (Salisbury et al., 2002)	.989
$\chi^2/df$	[1;5] (Salisbury et al., 2002)	1.96

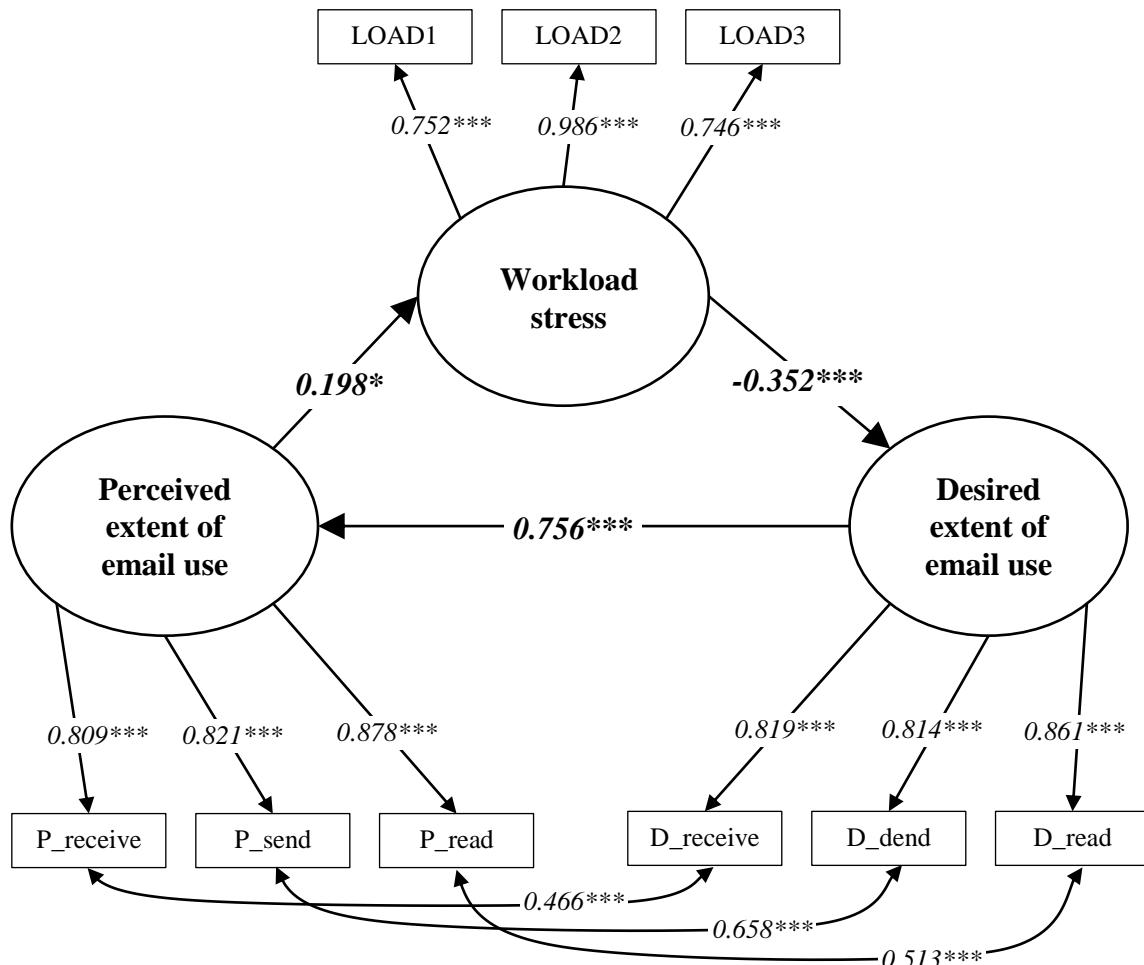
*Table 6.4. Hypotheses and Results from the Model (N = 504)*

Hypotheses	Standardized estimate	Estimate	Sig.
<b>H1*</b> : Perceived extent of email use → Workload stress	0.198	0.145	.027
<b>H2*</b> : Workload stress → Desired extent of email use	-0.352	-0.459	.000
<b>H3*</b> : Desired extent of email use → Perceived extent of email use	0.756	0.795	.000

Note.  $\chi^2(21, N = 504) = 40.146$ ,  $p < .01$ , CFI = .994, RMSEA = .043, SRMR = .028, GFI = 0.983, AGFI = 0.963, NFI = 0.987, TLI = 0.989,  $\chi^2/df = 1.96$ .

\*: Hypothesis supported

Figure 6.2. Results of the Structural Equation Modeling Analysis ( $N = 504$ )



Note.  $\chi^2(21, N = 504) = 40.146$ ,  $p < .01$ , CFI = .994, RMSEA = .043, SRMR = .028, GFI = 0.983, AGFI = 0.963, NFI = 0.987, TLI = 0.989,  $\chi^2/df = 1.96$ .

\*\*\*:  $p < .001$ ; \*:  $p < .05$

## **6.5. Discussion**

In this research, we set out to investigate how desired email use could both be impacted by email overload and impact email use. First, we reproduced previous findings showing that workload stress can be negatively impacted by perceptions of high email load. More importantly, we indeed found that desired email use was lowered by feelings of email-related workload stress, and was associated with lower email use. The model hereby introduced and empirically tested suggests that individuals can react to workload stress due to email overload by wanting to reduce their email volume.

### **6.5.1. Limitations**

The results should however be nuanced by several important limitations. First, the study relied on cross-sectional data and was thus not able to establish any causal relationship. Our hypotheses developments suggested potential causal relationships such as increased email volume causing increased workload stress, causing in turn reduced desired email volume, finally causing reduced email volume. Although this cross-sectional study did not allow proving or disproving such causalities, it nevertheless found interesting correlational relationships between the constructs under investigation. We suggest these relationships are directional because of the arguments advanced in the hypotheses justification. For instance, it is unlikely that a desired email volume can cause workload stress on its own. It is therefore more likely that the relationship found goes indeed from increased workload stress to reduced desired email volume.

A second limitation is that the final hypothesis linking desired email volume to actual email volume did not take into consideration the importance of control (Hair et al., 2007). Indeed, employees might not have entire control over their email volumes. Desiring one's email volume to decrease might thus not be enough to decrease one's email volume. For instance, literature has discussed the imbalance in control over email volume between managers and subordinates (E.g., Derkx et al., 2015) or between senders and receivers (E.g., Burgess et al., 2005; Hiltz & Turoff, 1985). This consideration has also been pointed out in literature on technology acceptance, as intention to use might not be a reliable predictor of use in situations of constrained use (Pillet & Carillo, 2016). Future research could tackle this

limitation by including measures of control over email volume or email self-efficacy (E.g., Hair et al., 2007). These limitations notwithstanding, the results supported our initial hypotheses and model and their implications are now discussed.

### ***6.5.2. Theoretical implications and future research***

This study has several notable implications for theory. First, it provides a first rough application of cybernetics to the study of email overload. Specifically, it considers how discrepancy enlarging and discrepancy reducing loops (Carver, 2006) could be applied to email overload. The former was tested in form of desiring fewer emails following email overload. We investigated the latter by looking at the positive association between increases in desired email volumes and increases in perceived email volumes. We believe these feedback loops deserve to be investigated further, as they increase our understanding of antecedents and outcomes of email overload. Future studies could capitalize on longitudinal methods such as diaries to look at how these loops develop over time.

Cybernetics also has implications for research on technology acceptance. The cyclical model suggested in this study suggests that actual use could in turn impact intentions to use. One potential feedback loop has been investigated in form of users' habits (Pillet & Carillo, 2016). Our study investigated another in form of stressful encounters during use. Future studies could try applying cybernetics to the specificities of the technology acceptance model (Venkatesh & Davis, 2000) in order to reveal new interesting feedback loops between technology use and intention to use technology. Finally, future research could apply a similar model to alternative stressful email encounters such as harassing or conflictual emails (Ford, 2013) or email interruptions (Jackson et al., 2003).

### ***6.5.3. Practical implications***

The practical implications of this study are again to be found in cybernetics. We empirically demonstrated the existence of discrepancy enlarging and discrepancy reducing feedback loops. On one hand, employees may want to distance themselves from email following stressful email overload (i.e., enlarge discrepancy). On the other hand, employees probably want to send, receive and read emails to the extent they desire (i.e., reduce discrepancy). These desires and coping mechanisms should be respected by those who have

control over others' email use. Managers have for instance a particular responsibility in the email use of their subordinates (Derks et al., 2015). Senders share equal responsibilities as they are the ones causing emails to be received in the first place (Edmunds & Morris, 2000; Hiltz & Turoff, 1985; Mark et al., 2012). As power about email use is unequally distributed (Markus, 1994), employees might not be in position to reduce discrepant feelings by using email to the extent they desire.

Employees might have equal difficulties distancing themselves from email. Organization and societal norms play a considerable role in employees' attitudes towards email (Barley et al., 2011; Matusik & Mickel, 2011). An organizational culture emphasizing attitudes of email being business critical (Sumecki et al., 2011) might for instance create problems in terms of individuals' rejection of email (Barley et al., 2011). Considering email to be stressful and undesired in an organization glorifying email might create further stressful discrepancies.

#### **6.5.4. Conclusion**

This study investigated the idea that attitudes towards email or desired email use in particular could be influenced by email-related work overload, and could in turn impact email use. Applying cybernetic concepts (Carver, 2006) helped our understanding of how individuals might reject email because of previous inappropriate email use, and how individuals might try to use email to extents they desire. However desirable these mechanisms might be, they can get crushed by the realities of email use. That is, we are never fully in control of the amount of emails we receive or even send (Hiltz & Turoff, 1985). Trying to swim against organizational norms (Barley et al., 2011) and colleagues expectations (Barber & Santuzzi, 2015) by rejecting email might not prevent us from drowning by email overload.

### Appendix 6.1. R and Lavaan Syntax Used to Test the Structural Model

```

# install.package("lavaan") # Lavaan package must be installed.
library(lavaan)

lower_matrix <- '
3.30
2.20 3.24
2.24 2.25 3.01
1.93 1.58 1.54 2.86
1.46 2.21 1.58 1.94 2.92
1.51 1.66 2.07 2.10 2.16 3.19
0.08 0.06 -0.19 -0.28 -0.21 -0.48 2.02
-0.10 -0.12 -0.21 -0.44 -0.31 -0.56 1.56 2.20
-0.03 -0.07 -0.15 -0.47 -0.35 -0.60 1.25 1.75 2.57 '
covariance_matrix <- getCov(lower_matrix, names = c("P_receive",
"P_send", "P_read", "D_receive", "D_send", "D_read", "LOAD1",
"LOAD2", "LOAD3"))

model <- '
    # Measurement model
    Mail_Extent =~ P_receive + P_send + P_read
    Mail_Desire =~ D_receive + D_send + D_read
    Load_Stress =~ LOAD1 + LOAD2 + LOAD3

    # Correlations
    P_receive ~~ D_receive      # Perceived-Desired correlations
    P_send ~~ D_send           # Perceived-Desired correlations
    P_read ~~ D_read           # Perceived-Desired correlations

    # Structural model
    Load_Stress ~ Mail_Extent      # Hypothesis 1
    Mail_Desire ~ Load_Stress      # Hypothesis 2
    Mail_Extent ~ Mail_Desire      # Hypothesis 3
    '

fit <- sem(model, sample.cov=covariance_matrix, sample.nobs=504)
summary(fit, fit.measures=TRUE, standardized=TRUE)
fitMeasures(fit, c("cfi", "rmsea", "srmr", "gfi", "agfi", "nfi",
"tli"))

# Optional: Plot the model using the semPlot package
# install.package("semPlot")
# library(semPlot)
# semPaths(fit, what="path", whatLabels="std", reorder=FALSE,
latents=c("Mail_Extent", "Load_Stress", "Mail_Desire"),
nCharNodes=15, curvePivot = TRUE, residuals=FALSE, rotation=1,
layout="tree2")

```

## 6.6. References

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## 7. CONCLUSIONS

Each paper has made its own contributions, but it is now time to restore the narrative binding the papers together. This conclusion (1) summarizes each paper and its findings; (2) discusses the theoretical contributions of the thesis along with areas for future research; (3) considers its practical implications; (4) details the limitations of this research; and (5) provides concluding remarks on email stress and desired email use.

### 7.1. Summary of findings

The multi-method paper (Paper 1) has shown that workplace stress is jointly impacted by actual and desired email use. Such joint impact was not found for other CMC media in the quantitative study. However, the qualitative study within this paper has revealed that workplace stress can indeed be impacted by both actual and desired use, for CMC media that are highly used. Desired use would be made more salient for such highly used media. This can explain why the joint impact was found only for email in the quantitative study. Participants came from diverse companies, and email is indeed widespread and used intensively in most organizations. The paper has further identified specific cases illustrating such joint impact. These cases have in common the idea of a misfit between individuals' desired email use and their actual email use. First, participants expressed frustration when they were forced to use media inappropriate to the task at hand or when alternative media considered more appropriate were not available. This means that email overload may occur when email is perceived to be an inappropriate medium compared to other media. Email underload may similarly occur when email is perceived to be the most appropriate medium and yet other media are used instead (E.g., face-to-face, phone...), or when email is not available when wanted (E.g., from home). Second, imposed interactions and unwanted interruptions regarding use of media that employees were reluctant to use, were considered stressful. This case illustrates the lack of control faced by email receivers and discussed in the literature review. Finally, workplace stress from CMC use was experienced by employees who interacted with co-workers possessing different or conflicting preferences for using media than they did. This finding again emphasizes that email senders should

remain aware that the emails they send will be received, and that email receivers may have different desired email use than they do.

Subsequently, the PE fit paper (Paper 2) has empirically validated one particular approach illustrating this lack of control. This paper has looked at fits and misfits between individuals' actual email use and their desired email use. Its results have shown that misfits are associated with higher workplace stress due to work relationships, job control and job conditions. These u-shaped relationships have also discovered that feelings of email underload may be considered as stressful as feelings of email overload. Work relationships may be damaged by email misfit for reasons explained in Paper 1 (I.e., inappropriateness of email interactions, unwanted interruptions, lack of empathy, incompatible desires). In situations of fit however, good work relationships may be the consequence of an empathetic culture in which colleagues respect their desires in terms of email use and feel they use email "enough". For job control stress, misfit can both be a cause and a consequence. Lacking control over one's email use can be experienced as stressful, and feeling stressed about one's lack of control can also heighten feelings of misfit. Finally, the impact of misfit on job conditions stress (E.g., lack of job satisfaction) is clearly suggesting that misfit may have adverse consequences for organizations such as turnover intentions.

The cybernetics paper (Paper 3) took an approach that was both distinct and parallel to the PE fit approach of Paper 2. Rather than looking at misfits between actual and desired email use, it has investigated how desired email use can both influence and be influenced by stressful email use. Its results have shown that (1) the perceived extent of email use was positively associated with workload stress; (2) workload stress was negatively associated with the desired extent of email use; and (3) the desired extent of email use was positively associated with the actual extent of email use. Combined, these findings suggest that when individuals perceiving their email use to be large may experience higher work overload, which may in turn make them want to use email less and act to reduce their email use accordingly. This approach has complemented the PE fit findings by showing that individuals may not only feel stressed by misfits between actual and desired email use, but they may reject email even more as a result. Actual and desired email use may therefore

interact with one another to an extent that could not have been investigated using PE fit theories.

The findings of each paper have built upon one another (See Figure 1.1). This narrative has shown the importance of attitudes towards email (taking form of desired email use) and appraisal for the study of email stress. They have surely highlighted that email stress is an individually appraised phenomenon, which can as such be influenced by subjectivity and attitudes. These attitudes can increase or decrease email stress, impact email stress jointly with email use (Paper 1), conflict with actual email use to cause email stress (Paper 2), and both influence and be influenced by stressful email use (Paper 3). All papers have therefore contributed to answering both research questions (See Table 7.1).

Regarding the first research question, objectives have been met by (1) identifying email volume as a major factor of email stress and exploring it further (Papers Paper 1, Paper 2 and Paper 3); (2) identifying workload (Paper 3), work relationships, job control and job conditions (Paper 2) as major workplace stressors impacted by email use among others (Paper 1); and (3) adapting Person-Environment Fit (Paper 2) and Cybernetics (Paper 3) theories to email stress. Regarding the second research question, objectives have been met by (1) discovering that desired email use can impact email stress jointly with actual use (Paper 1), or because of misfits between desired and actual use (Paper 2); (2) establishing the extent to which desired email use impacts email stress jointly with actual use (Paper 1) and because of misfits (Paper 2); and (3) discovering that desired email use may be driven by stressful use (Paper 3), that actual use may be driven by desired use (Paper 3), and that desired use may be inseparable from actual use (Paper 2). The contributions of this body of findings will now be discussed.

*Table 7.1. Research Questions, Aims, Objectives and Results*

<b>Aim</b>	<b>Questions</b>	<b>Objectives</b>	<b>Results</b>
	<b>Research Question 1</b> How can research on workplace stress enhance our understanding of email stress?	1. To identify the factors of email use that impact workplace stress  2. To identify the workplace stressors most impacted by email use  3. To adapt theories of workplace stress to the context of email use	Focus on email volume (Papers Paper 1, Paper 2 and Paper 3) among other factors identified in the literature review  Focus on workload (Paper 3), work relationships, job control and job conditions (Paper 2) among other stressors identified in Paper 1  Person-Environment Fit (Paper 2) and Cybernetics (Paper 3)
<b>To explore the links between email stress and workplace stress</b>	<b>Research Question 2</b> How and to what extent is desired email use linked to email stress?	1. To explore how desired email use can impact email stress  2. To establish the extent to which desired email use impacts email stress  3. To explore the interactions between actual and desired email use	Jointly with actual use (Paper 1), misfit between desired and actual use (Paper 2)  Joint impact across workplace stressor (Paper 1) but misfit mostly for work relationships, job control and job conditions (Paper 2)  Desired email use driven by stressful use (Paper 3), actual use driven by desired use (Paper 3), desired use inseparable from actual use (Paper 2)

## 7.2. Theoretical contributions and future research

Paper 1 has made contributions to both CMC and email research. For CMC research, its results have shown that media vary in their impacts on workplace stress and, as such, deserve to be studied separately. This contrasts with most previous CMC studies that have looked at CMC as a single construct aggregating all media such as email, phone and instant messaging (E.g., Scott & Timmerman, 2005). Although this may work for some research problems, Paper 1 has shown that it is unlikely to succeed for the study of workplace stress. In addition, the findings have highlighted the importance of individual's preferences and

choices regarding use. A second contribution of Paper 1 has been within PE fit research. PE fit has rarely been applied to technology use. The qualitative findings have suggested how such theory could be adapted to the study of CMC or technology in general.

This suggestion for future research on PE fit and technology has been directly applied in Paper 2. Its results have shown that PE fit is indeed an interesting theory for the study of technology use. The fact that this theory comes with a robust methodological toolbox and concepts developed over decades should encourage similar studies in the future. The successful application of this theory has also helped explaining the process of stressor appraisal, which is an interesting contribution for technostress research. Additionally, the results of this paper have challenged current research on email overload by showing that email underload can equally impact workplace stress. This gap has incidentally unveiled limitations with instruments that are currently not able to capture email underload at all. Future research on email load could therefore benefit from multidimensional instruments or from techniques such as quadratic polynomial regressions to investigate email underload further. In addition to desired email use, other factors salient to the appraisal process such as personality traits, organizational expectations, work-life situations, societal norms and culture, importance of the message, content of the message, and sender of the message can be examined. Finally, future research on PE fit and technology could investigate antecedents of desired use such as organizational expectations or negative technology encounters.

This final suggestion for future research has been partly explored in Paper 3. To understand the interactions between actual and desired email use, this paper has applied cybernetics to the study of email stress. This approach helps understanding how desired email use may develop as a reaction to stressful email overload. This finding needs to be explored further as part of wider studies on attitudes towards technology, as discussed later in this section.

In addition to these contributions of the individual papers, the thesis has contributions on its own because of the way these papers build upon one another. This section will discuss how the thesis theoretically contributes to technostress and email stress research by (1) the application of unexplored theories of stress that have revealed new aspects of the

phenomenon of email stress; and (2) an exploration of attitudes towards technology. These overall contributions weave through the thesis and traverse across all the papers. The main theoretical contribution of the thesis is to have revealed and explained new aspects of the phenomenon of email stress. All the results support the idea that email stress is individually appraised and therefore bears resemblance to traditional workplace stress. We have done this by the adaptation of currently under-explored theories of stress to the study of email stress. Most research on email stress has developed their own theories specific to constructs such as email overload or email interruptions (See Literature Review). Technostress research has instead applied theories of stress, but has mostly relied to date on transactional theories of stress (Lazarus & Folkman, 1984). This has created conceptual gaps in our understanding of email stress such as an insufficient investigation of appraisal processes and coping behaviors. The PE fit approach I took up in Paper 2 is emergent (Ayyagari, 2012), and the cybernetics approach from Paper 3 has not been applied to technostress yet. These approaches are complementary as they look at different facets of technostress. For instance, it is difficult to predict technology use with PE fit theories, which stops at the stress created by misfits. On the contrary, cybernetics can predict use adjustments but cannot account for stressful misfits. Each of these theories therefore looks at different appraisal processes and outcomes. These stress theories and others can further be applied to the study of technostress and email stress. In addition, as identified in Paper 2, technostress creators are well known but the appraisal process of technostress remains to be thoroughly investigated. These examples of psychological theories applied to the study of email stress and technostress show the value and richness of cross-disciplinary research. The individual papers explain how these theories from other disciplines have been identified and applied.

This thesis has also regularly highlighted the importance of attitudes towards technology, thus opening up many avenues for future research. Attitudes are composed of more than a desired use and can have more diverse impacts on behaviors. Much is thus left to research on attitudes towards technology. I am, however, not aware of any study that has looked at attitudes towards email or technology using the large arsenal of attitudinal theories and scales developed in psychology research. More than eighty years ago, Allport stated that “attitudes are probably the most distinctive and indispensable concept in contemporary

social psychology" (Allport, 1935, p. 798). Since then, a large variety of theories and instruments has been developed to study attitudes. For instance, the theory of psychological reactance explains that restricting an individual's behaviors makes the individual evaluate these restricted behaviors more positively (Brehm & Brehm, 2013). This theory may be applied to the study of email ban outside or within working hours. Although email ban may mitigate work-life conflict even for those who hold positive attitudes towards such practices (Boswell & Olson-Buchanan, 2007), it may also create misfit (See Paper 2) and make such practices seem transgressive and even more desirable as a result. Other theories could be borrowed and applied. Instruments such as semantic differential scales, Thurstone scales, disguised or implicit measures could also be adapted to the study of attitudes towards workplace technology. These measures may also interestingly complement objective data of email use such as screen recording (E.g., Jackson et al., 2003) or inbox data (E.g., Kalman & Ravid, 2015) in order to unveil more relationships between actual use and attitudes. Accessing organizational big data would thus be a logical and fruitful extension to the studies conducted in this thesis. Such data could prove valuable to compare self-reported email use to objective email use (E.g., amount of emails sent and received over time). Literature already suggests that perceived CMC use is either a distortion of objective use (Higgins et al., 1985) or a completely distinct construct (Andrews et al., 2015). Future research could thus compare the perceived extent of email use, the perceived amount of emails, and the objective amount of emails in terms of stress.

This section has discussed the theoretical contributions made in the individual papers and across the thesis. The next section presents the implications of the thesis findings for practice.

### **7.3. Practical implications**

Overall, the practical implications of the individual papers are similar. Each paper is noting in its own way that (1) email stress is an individually appraised process, and that (2) email stress stems from email users.

As email stress is an individually appraised process, organizations should beware 'one size fits all' interventions. For instance, banning emails outside working hours may have

benefits in terms of work-life conflict (Boswell & Olson-Buchanan, 2007), and replacing email with other media may have benefits in terms of collaboration (Pillet & Carillo, 2016). However, the thesis shows that individuals vary in their desired email use (Papers Paper 1, Paper 2 and Paper 3), and that unfulfilled desired use can lead to stress (Paper 2) or create a need to adjust use (Paper 3). In other words, not everyone may be positively impacted by a non-customized policy restraining email use. The thesis findings are thus advocating for customized interventions or interventions taking into consideration individual attitudes towards email and desired email use. As such, email policies should ideally be preceded by a survey of users' attitudes towards email and actual email use. Interventions conducted at a team or individual level may be preferable. For instance, peer support groups on email overload and email use outside working hours may help individuals share their fears, develop empathy about others expectations (Barber & Santuzzi, 2015), and find their own techniques to deal with email stress. Such empathy is particularly important for teams in which individuals have different desires in terms of email use and email use outside working hours (Paper 1). Understanding one's own tolerance to email stress and sharing it to others is an introspective activity that may greatly foster a more positive email culture (Paper 1). If coworkers do not respect this email stress threshold, feelings of misfit may still be reduced by distancing oneself from email as much as possible (Paper 3).

Email stress is strongly influenced by email users (See Literature Review and Paper 1). As such, it may also be tackled with interventions on email users themselves. Interventions may first target email senders. In an unforgettable yet inapplicable suggestion, Hiltz and Turoff (1985) advised desperate organizations to invoice email senders based on the number and length of emails sent. This system was supposed to tackle the problem that email senders control most of others' email volume, as most work emails that are sent arrive at their destinations. Although they are not necessarily read, they are often acknowledged and dealt with (Jackson et al., 2003). On a more practical level, organizations could use training interventions to help individuals send more efficient emails (Burgess et al., 2005; Soucek & Moser, 2010). Awareness campaigns could also be designed to remind email senders and managers in particular (Gupta et al., 2013) of their responsibility in terms of email stress. A second kind of intervention may target email

receivers, who are the common victims of email stress. Again, training interventions may help them to manage more efficiently their inboxes and information processing abilities (Soucek & Moser, 2010). On a personal level, attitudes towards email may be improved with a more precise awareness of the risks and benefits of email. For instance, a ‘non-email week’ event may help participants understand what they gain and what they miss when not using email. This increased awareness may subsequently make attitudes towards email more rational and balanced (Mark et al., 2012).

Practitioners using email or intervening on email use may find interest in these implications and suggestions. Although most of these suggestions have not been empirically tested in this thesis, they naturally follow on its findings.

#### **7.4. Limitations**

As discussed in the individual papers, the studies that form this thesis are not without limitations. First, the quantitative studies were conducted on a sample generally representative of full-time U.S. workers. As such, it may not generalize to other cultures or other working configurations (E.g., part-time teleworker). Second, the exploratory nature of the thesis made the instruments on CMC use difficult to calibrate. The aggregation of CMC media in a single scale in the pilot survey, as advised in literature, proved unsuccessful and forced the subsequent analyses to be done on single measures (See Paper 2). Third, and as with all survey research, the cross-sectional nature of both quantitative studies along with self-reported data can be imbued with potential biases of the respondents and prevents from making causal conclusions. Fourth, the qualitative study used a sample unrelated to the quantitative ones, which, while providing the opportunity to triangulate and identify integrative findings, makes direct comparison between the quantitative and qualitative sets of results difficult. Fifth, the qualitative study sample was imbalanced towards men and younger employees. Although this is fairly representative of the company that was investigated, it is not of the general population. Although no gender differences in terms of email stress have emerged so far (Mano & Mesch, 2010), the results of the qualitative study should be interpreted with caution.

Sixth and finally, the main quantitative study failed to reproduce the PE fit findings of the pilot study reported in Paper 2 (N=504 instead of N=118). This created an interesting opportunity to investigate alternative theories of stress such as cybernetics (See 6.0. Foreword, Paper 3). Seizing this opportunity led to Paper 3, which gave more depth to the thesis that would have otherwise been too focused on PE fit. Nevertheless, the lack of reproducibility may have been caused by three limitations. First, the pilot sample had some differences such as a younger workforce. However, such sample differences are unlikely to have caused such differences in results. Second, both studies might suffer from low quality samples. Although attention filters were used to identify and reject invalid responses, there is no way of being certain that the participants who remained in the studies have answered truthfully, as in any survey research. However, literature reports a satisfactory quality of Qualtrics samples (Brandon et al., 2014). Third and more importantly, the relationships between email load and stress might not be as clear as the ones identified in the pilot study. Indeed, quadratic polynomial regressions constrain email underload and email overload to have a symmetrical impact on stress. In Figures Figure 5.2, Figure 5.3 and Figure 5.4, surfaces of email underload (back left) resemble those of email overload (front right). This method implies that misfit will lead to more stress, and fit to less stress. On the contrary, there might be reasons to believe that email overload has a different impact on stress than email underload has. One way of testing this would be to use spline regressions. Spline regressions (Edwards & Parry, 2015) allow the surfaces for both kinds of misfit to vary. These techniques have not been applied to PE fit yet, but future studies could use them to tackle the methodological limitation faced in this thesis.

## 7.5. Conclusion

The thesis has explored various relationships between email stress and desired email use. Email stress has been defined and reviewed, highlighting influences of subjective constructs such as attitudes towards email. These influences have been explored in the following papers using various and complementary conceptual frameworks. Email stress was found to be jointly impacted by actual and desired email use (Paper 1), and by misfits between actual and desired email use (Papers Paper 1 and Paper 2). Examples of misfits included unwanted amounts of emails (Paper 2), incompatible email desires within a team

or an organization, unwanted use of email instead of other media, and email interruptions (Paper 1). Finally, desired email use was investigated as a consequence rather than a cause of email stress (Paper 3), in that individuals may hold negative attitudes towards email following stressful feelings of email overload. Theoretical and practical implications of these findings were discussed both in the individual papers and in the conclusion.

Apart from the research questions set in the introduction and answered throughout the thesis, one question motivated this research project from the very beginning. How could a same email use be so diversely appraised and experienced by individuals? Or as expressed by Macik-Frey et al. (2007), “why do some individuals thrive in this environment whereas others suffer?” (2007, p. 823). Hated or ignored by some and vigorously defended by others, email surely continues to foster vivid debates. These debates involve diverse protagonists such as common employees trying to use email to their desired extent, CEOs or HR directors implementing email policies, even politics passing laws on email use, or entrepreneurs inventing and implementing new email features. These protagonists have in common that they all try to impose onto others what they believe is the correct and beneficial use of email.

This thesis has shown, however, that there may not be such thing as a shared sense of appropriate use, as individuals hold their own attitudes for infinity of reasons. Email is not a neutral medium. It is an important part of office workers’ lives and most of them have clear opinions and desires in terms of email use. As social beings, our email use is not entirely up to us. This thesis has shown that a more positive and less stressful email culture could emerge if individuals were to express their own desired ways of use and to respect those of others, and if organizations were to take heed of such individual desires.

## 8. BIBLIOGRAPHY

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## 9. APPENDICES

### *Appendix 9.1. Agreement to use the ASSET instrument*

#### **ASSET Research Use**

#### **Terms and Conditions**

We allow ASSET to be used for research on the condition that:

1. A short research proposal should be presented to Robertson Cooper Ltd (RCL) stating project objectives
2. The intention of the researcher should be to publish the findings in reputable scientific journals, conferences, etc.
3. On publication, the research article must have a reference to 'ASSET' as published by RobertsonCooper Ltd' within the body of the text.
4. The ASSET tool should then be referenced as 'Cartwright, S., & Cooper, C. L. (2002). ASSET: Management guide. RobertsonCooper Ltd, UK'.
5. The principal should provide sufficient information about their research experience to satisfy RCL that they have the capabilities to conduct the proposed research. This requirement is waived when the proposed project is funded by a recognized funding body (e.g. government research council such as ESRC) or part of a recognised postgraduate degree course.
6. The purpose of the research should be to enhance scientific knowledge and not to provide stress audits or consultancy advice to organizations. For this reason only overview reporting of results will be appropriate.
7. To safeguard RCL's professional standards RCL reserve the right to have view of any reporting documents prior to publication.
8. Should the collaborating companies require more detailed analysis of the data, this will be provided by RCL at commercial fee rates.
9. RCL must be allowed to refer to research publications and survey results as ASSET case studies and marketing material, including publishing on RCL web site.
10. RCL must be provided with the research data to add to the ASSET normative database.
11. The researcher must sign this agreement to the conditions before ASSET can be used in a publication.
12. Should any of the conditions not be met RCL reserves the right to re-estimate use of ASSET at commercial prices.

Signed

Jean-Francois  
STICH  
2014.02.28  
16:02:37 Z

Date

*Appendix 9.2. Pilot survey instrument***Consent form****The present research is about happiness and virtual interactions at work.**

If you wish to take part in it, you will be asked to answer a 15 minute questionnaire. Participation is entirely voluntary and non-participation will not incur any adverse effects or consequences for you, your job, your branch, your department, or your organization. The first part of this questionnaire asks you about your virtual interactions at work. The second part of this questionnaire measures well-being. The third and final part asks you for general biographical information.

Your answers are completely anonymous and confidential. Data will be handled by the independent researchers at Lancaster University who are conducting the project. Data will be stored securely on servers managed by Qualtrics (more information is available online) and accessed only by the researchers, who may download this data to their password-protected workstations in Lancaster, UK, for analytical purposes.

**Please note that you will not be able to withdraw from this study once you completed the questionnaire. After this point, your confidential and anonymous data will remain in the study.**

The research is conducted by Jean-François STICH from Lancaster University Management School, who can be contacted by mail at j.stich@lancaster.ac.uk or by phone at +44 777 464 7809 for any enquiry. Dr Patrick Stacey and Professor Cary L. Cooper are also involved in this research.

This study has been reviewed by Dr Patrick Stacey, Prof Cary Cooper and Dr Caroline Gatrell. It has also been approved by Lancaster University Research Ethics Committee. If you have any complaints please contact Dr Caroline Gatrell (by phone: +44 1524 510972, by email: c.gatrell@lancaster.ac.uk, or by post: Charles Carter Building, Lancaster University, Bailrigg, Lancaster LA1 4YX, United Kingdom).

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**By proceeding, I understand that I am agreeing to take part in the present research.**

## Computer-Mediated Communication

**Please answer the following questions.**

	At work, to what extent do you...	At work, to what extent would you like to...
... interact face-to-face with others?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with others (ie not face-to-face)?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with others you have never met face-to-face?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with others while having a sense of being there with them?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with others in different time zones?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with others you could have reached or who could have reached you in person?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with other employees while outside the office (eg. at home)?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact virtually with other employees outside your working hours?	<input type="button" value="▼"/>	<input type="button" value="▼"/>

**Please answer the following questions.**

	At work, to what extent do you...	At work, to what extent would you like to...
... interact with others using e-mail?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using video conferencing?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using audio conferencing or phone calls?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using instant messaging?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using Enterprise Social Network?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using collaborative spaces (Intranet, Sharepoint, Lotus Note)?	<input type="button" value="▼"/>	<input type="button" value="▼"/>

	To what extent do you have the ability to...	At work, to what extent do you have to...
... interact face-to-face with others		
... interact virtually with others (ie not face-to-face)	Not at all	
... control how others perceive you in virtual settings	To a very small extent	
... be keenly aware of how you are perceived by others in virtual settings	To a small extent	
... make yourself visible in virtual settings with influential people	To a moderate extent	
... put yourself in other people's positions to understand their point of view while in virtual settings	To a fairly great extent	
... know what to say to others in virtual situations	To a great extent	
... sense the motivations and hidden agendas of others in virtual settings	To a very great extent	
... give and receive timely feedbacks in virtual interactions		
... convey multiple types of information in virtual interactions (e.g., factual information, emotional information)		
... transmit varied symbols in virtual interactions (e.g., words, numbers, and pictures)		
... tailor the message to fit other parties' requirements in virtual interactions		
... express yourself during online meetings		

**Please answer the following questions.**

	To what extent do you have the ability to...	At work, to what extent do you have to...
... interact with others using e-mail?	<input type="text"/>	<input type="text"/>
... interact with others using video conferencing?	Not at all	<input type="text"/>
... interact with others using audio conferencing or phone calls?	To a very small extent	<input type="text"/>
... interact with others using instant messaging?	To a small extent	<input type="text"/>
... interact with others using Enterprise Social Network?	To a moderate extent	<input type="text"/>
... interact with others using collaborative spaces (Intranet, Sharepoint, Lotus Note)?	To a fairly great extent	<input type="text"/>
	To a great extent	<input type="text"/>
	To a very great extent	<input type="text"/>

To what extent is it important to you personally to interact face-to-face at work? By important is meant the extent to which it describes your idea of the "perfect" job.

Not at all      To a very small extent      To a small extent      To a moderate extent      To a fairly great extent      To a great extent      To a very great extent

**To what extent is it important to you personally to interact virtually at work? By important is meant the extent to which it describes your idea of the "perfect" job.**

Not at all	To a very small extent	To a small extent	To a moderate extent	To a fairly great extent	To a great extent	To a very great extent
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

**Select one of the five categories from Strongly disagree to Strongly agree for each statement as it applies to you.**

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
I look forward to the opportunity to interact with others on the computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that I am more skilled than most others when interacting with people online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I would enjoy giving a presentation to others online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I look forward to expressing myself during online meetings	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I like to get involved in computer-based group discussion	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have a lot of experience interacting with others online	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident that I could learn computer skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am unsure of my ability to learn a computer programming language	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am sure of my ability to interpret a computer output	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will be able to keep up with the important technological advances of computers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have difficulty understanding most technological matters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel apprehensive about using a computer terminal	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If given the opportunity to use a computer, I'm afraid I might damage it in some way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computer terminology sounds like confusing jargon to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have avoided computers because they are unfamiliar to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I hesitate to use a computer for fear of making mistakes that I cannot correct	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Workplace stress

*The following items belong to the instrument ASSET by Robertson Cooper Ltd. They were printed with permission. The items below are only a sample of the full questionnaire.*

**Select one of the six categories from Strongly disagree to Strongly agree for each statement as it applies to you.**

### I am troubled that...

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
I work longer hours than I choose or want to	<input type="radio"/>					
I work unsociable hours e.g. weekends, shift work etc	<input type="radio"/>					
I spend too much time travelling in my job	<input type="radio"/>					
I have little control over many aspects of my job	<input type="radio"/>					
My work interferes with my home and personal life	<input type="radio"/>					
I may be doing the same job for the next 5 to 10 years	<input type="radio"/>					

**Over the last 3 months, have you experienced any of the following symptoms or changes in behaviour?**

	Never	Rarely	Sometimes	Often
Lack of appetite or over eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indigestion or heartburn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insomnia - sleep loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

*End of the ASSET sample items.*

**This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is, how you feel on the average. Use the following scale to record your answers.**

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enthusiastic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Extra questions and demographics

**Is there anything else you would like to add that has not come up already on the questionnaire regarding well-being and virtual interactions at work? If yes, please state below.**

### Gender

Male

Female

### Age

18-25 years

36-40 years

51-55 years

26-30 years

41-45 years

56-60 years

31-35 years

46-50 years

More than 60 years

### What is the highest level of education you completed or the highest degree you have received?

Completed Some High School

Completed Some Postgraduate

High School Graduate

Master's Degree

Completed Some College

Doctorate, Law or Professional Degree

College Degree

### Which group of staff do you belong to?

Owner / Partner

Senior Management (CEO / VP / Managing Director)

Middle Management (Director / Divisional / Department Head)

Front Line Management

Experienced: Professional or Non-Management

Entry Level

Home Based Business Owner

Other

**Including yourself, how many people are employed at your organization approximately?**

- 1 - 49
- 50 - 499
- 500 - 999
- 1,000 - 4,999
- 5,000 or more
- Don't know

**What is the principal industry of your organization?**

- Agriculture, forestry, fishing, and hunting
- Financial activities
- Mining, quarrying, and oil and gas extraction
- Professional and business services
- Construction
- Education and health services
- Manufacturing
- Leisure and hospitality
- Wholesale and retail trade
- Other services
- Transportation and utilities
- Public administration
- Information

**On average, how much time a day do you spend commuting to and from the workplace?**

- Less than 1 hour
- 3-4 hours
- 1-2 hours
- More than 5 hours

### *Appendix 9.3. Pilot interviews instrument*

#### **Consent form**

The present research is about happiness and virtual interactions at work. How can virtual interactions with colleagues make us happier? Do these interactions contribute to happiness in different or complementary ways than face-to-face interactions?

To answer these questions and many more, [NAME OF THE COMPANY] teamed up with researchers in work psychology from Lancaster University. Their pioneering research will look into the impacts of face-to-face and computer-mediated interactions on the psychological well-being and stress of employees. **You can be part of this research too!**

If you wish to take part in this research, you could be interviewed for 30 minutes approximately by a researcher from Lancaster University. This interview will be recorded, transcribed and translated into English. Participation is entirely voluntary and non-participation will not incur any adverse effects or consequences for you or your organisation. You are free to withdraw from the interview at any point. If you wish to do so, the recording and all notes from the interview will be destroyed immediately, and no data from the interview will be used in the final research. Due to time constraints, you can withdraw up to one month after your interview. After this point, the data will remain in the study.

Your answers are completely anonymous and confidential. Recordings and transcripts will not be handled by your manager at any stage of the research, but by the independent researchers at Lancaster University who are conducting the project. They will be stored securely on encrypted hard drives and accessed only by the researchers. You will be able to consult the transcripts and erase any element you do not wish to be published in the final research. The results of this study will then contribute to worldwide knowledge with academic papers and conferences. [NAME OF THE COMPANY] is at the forefront of this research and will thereby be the very first to benefit from it.

The research is conducted by Jean-François STICH from Lancaster University Management School, who can be contacted by mail at [j.stich@lancaster.ac.uk](mailto:j.stich@lancaster.ac.uk) or by phone at +44 777 464 7809 for any enquiry. Dr Patrick Stacey and Professor Cary L. Cooper are also involved in this research.

This study has been reviewed by Dr Patrick Stacey, Prof Cary Cooper and Dr Caroline Gatrell. It has also been approved by Lancaster University Research Ethics Committee. If you have any complaints please contact Dr Caroline Gatrell (by phone: +44 1524 510972, by email: c.gatrell@lancaster.ac.uk, or by post: Charles Carter Building, Lancaster University. Bailrigg, Lancaster LA1 4YX. United Kingdom).

By taking part in this interview, I understand that I am agreeing to take part in the present research.

## **Interview guide**

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### **1. Demographics**

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Gender: Male/Female

Age: (in years)

Job role: Senior Management, Middle Management, Front Line Management,

Experienced: Professional or Non-Management, Entry Level

Commuting time: return (in hours)

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### **2. Actual CMC use**

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Media used by the interviewee (mail, video, audio, instant messaging ...)

Frequency and volume of the interviewee's CMC use (actual and desired)

Skills related to CMC use possessed by the interviewee or required by the interviewee's job

Daily routines of the interviewee regarding CMC use

Interviewee's use of remote access to CMC

Persons with whom the interviewee has regular interactions

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### **3. Desired CMC use**

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Interviewee's opinions and previous experiences regarding remote access to CMC

Interviewee's attitudes and apprehensions toward CMC use

Interviewee's most and least preferred media

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### **4. CMC use and workplace stress**

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Interviewee's experience of workplace stress due to CMC use

Specific examples and contexts describing the interviewee's experience of workplace stress due to CMC use

Influence of each medium on the interviewee's experience of workplace stress

Influence of each workplace stressor (work relationships, work-life balance, workload, control, security, job conditions) on the interviewee's experience of workplace stress

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#### Appendix 9.4. Main survey instrument

##### Consent form



English ▾

**The present research is about well-being and virtual interactions at work.** It is conducted by researchers in work psychology from Lancaster University. You and your organisation will be the very first to benefit from the results of their research.

If you wish to take part in this study, you will be asked to answer a 20 minute questionnaire. **Participation is entirely voluntary and non-participation will not incur any adverse effects or consequences for you, your department, or your organisation.** This questionnaire uses a standardised instrument called [ASSET](#) to measure your psychological well-being. This instrument has been used in all sorts of organisation over 9 years. **Over 40,000 employees worldwide have already answered** to this instrument having measured their psychological well-being and stress.

Your answers are completely anonymous and confidential. Data will not be handled by your employer at any stage of the research, but by the independent researchers at Lancaster University who are conducting the project. Neither your identity nor your employer's name will be revealed at any point of this research. Data will be stored securely on servers managed by Qualtrics (more information is [available online](#)) and accessed only by the researchers, who may download this data to their password-protected workstations in Lancaster, UK, for analytical purposes.

The research is conducted by Jean-François STICH from Lancaster University Management School, who can be contacted by mail at [j.stich@lancaster.ac.uk](mailto:j.stich@lancaster.ac.uk) or by phone at +44 777 464 7809 for any enquiry. Dr Patrick Stacey and Professor Cary L. Cooper are also involved in this research.

If you wish to withdraw from the study at any time and want your data to be destroyed and not used in the research, please contact Jean-François STICH (details above) within two weeks. After this point, your confidential and anonymous data will remain in the study.

This study has been reviewed by Dr Patrick Stacey, Prof Cary Cooper and Dr Caroline Gatrell. It has also been approved by Lancaster University Research Ethics Committee. If you have any complaints please contact Dr Caroline Gatrell (by phone: +44 1524 510972, by email: [c.gatrell@lancaster.ac.uk](mailto:c.gatrell@lancaster.ac.uk), or by post: Charles Carter Building, Lancaster University, Bailrigg, Lancaster LA1 4YX, United Kingdom).

## Computer-Mediated Communication

In the last 24 hours, how many new work e-mails have you ...

... received?

... sent?

... read?

Please answer the following questions about your use of work-related e-mails.

On a daily average, how many  
work e-mails do you ...

... receive?

On a daily average, how many  
work e-mails would you like to ...

... send?

... read?

Please answer the following questions about your use of work-related e-mails.

	At work, to what extent do you...	At work, to what extent would you like to...
... interact with others using e-mail?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... check your work e-mails?	Not at all To a very small extent To a small extent To a moderate extent To a fairly great extent To a great extent To a very great extent	<input type="button" value="▼"/>
... receive work e-mails?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... receive quick replies to the work e-mails you sent?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... receive work e-mails not as the primary recipient but as someone put in copy (Cc)?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... read work e-mails?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... send, forward or reply to work e-mails?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... spend time handling work e-mails? (reading, sending, forwarding, replying...)	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... spend time managing your professional inbox? (eg sorting, deleting, archiving, filtering e-mails...)	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... check, read, send or reply to your e-mails outside of office hours?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... check, read, send, or reply to your e-mails whilst on holidays?	<input type="button" value="▼"/>	<input type="button" value="▼"/>

Please answer the following questions about your use of work-related e-mails.

	To what extent <b>do you have the ability to...</b>	At work, to what extent <b>do you have to...</b>
... refrain from checking every incoming e-mail?	<input type="text"/>	<input type="text"/>
... find back important e-mails when needed?	<input type="text"/>	<input type="text"/>
... sort, filter, archive or delete e-mails to keep a tidy inbox?	<input type="text"/>	<input type="text"/>
... answer work e-mails quickly as they arrive?	<input type="text"/>	<input type="text"/>
... this is an attention filter, please answer "not at all" in both columns?	<input type="text"/>	<input type="text"/>
... use e-mails to give and receive timely feedbacks?	<input type="text"/>	<input type="text"/>
... use e-mails to convey multiple types of information (e.g., factual information, emotional information)?	<input type="text"/>	<input type="text"/>
... use e-mails to transmit varied symbols (e.g., words, numbers, and pictures)?	<input type="text"/>	<input type="text"/>
... use e-mails to tailor the message to fit other parties' requirements?	<input type="text"/>	<input type="text"/>

What do you think of work e-mails and of their impact on your well-being or stress?

Please answer the following questions about your virtual interactions at work.

	At work, to what extent <b>do you...</b>	At work, to what extent <b>would you like to...</b>
... interact with others face-to-face?	<input type="button" value="▼"/> <div style="background-color: #e0f2fd; border: 1px solid #0070C0; padding: 5px; width: 150px; height: 150px; display: none;"> Not at all  To a very small extent  To a small extent  To a moderate extent  To a fairly great extent  To a great extent  <b>To a very great extent</b> </div>	<input type="button" value="▼"/>
... interact with others using video conferencing?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using audio conferencing or phone calls?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using instant messaging?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using Enterprise Social Network?	<input type="button" value="▼"/>	<input type="button" value="▼"/>
... interact with others using collaborative spaces (Intranet, Sharepoint, Lotus Note)?	<input type="button" value="▼"/>	<input type="button" value="▼"/>

With how many people do you have regular exchange of e-mail with?

Employers can offer a variety of programs to help employees deal with their e-mail messages. Please rate each program or policy listed below in terms of the extent to which it is already offered by your employer and the extent to which you would like to be offered it.

	To what extent does your employer...	To what extent would you like your employer to...
... restrict the use of e-mails outside working hours or whilst on holiday?	<input type="text"/> Not at all To a very small extent To a small extent To a moderate extent To a fairly great extent To a great extent To a very great extent	<input type="text"/>
... encourage a culture in which e-mails have to be answered quickly as they arrive?	<input type="text"/>	<input type="text"/>
... restrict telecommuting?	<input type="text"/>	<input type="text"/>
... circulate e-mail etiquette rules?	<input type="text"/>	<input type="text"/>
... introduce other media to reduce the amount of e-mails (eg collaborative tools, ticketing tools, Enterprise Social Network...)?	<input type="text"/>	<input type="text"/>
... provide e-mail training interventions?	<input type="text"/>	<input type="text"/>
... provide computer or software training interventions?	<input type="text"/>	<input type="text"/>

Which e-mail software do you use mainly in your job?

- |                                       |                               |
|---------------------------------------|-------------------------------|
| Microsoft Outlook 2000, 2003, Express | Apple Mail 6                  |
| Microsoft Outlook 2007                | Apple Mail 5                  |
| Microsoft Outlook 2010                | Apple Mail 4                  |
| Outlook.com                           | Android                       |
| Gmail                                 | iOS Devices (iPhone, iPad...) |
| Yahoo! Mail                           | Blackberry                    |
| Mozilla Thunderbird                   | Other                         |
|                                       | <input type="text"/>          |

Select one of the five categories from Strongly disagree to Strongly agree for each statement as it applies to you.

	Strongly Disagree	Disagree	Neither Agree nor Disagree	Agree	Strongly Agree
E-mail is critical for getting my work done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I spend a lot of time waiting for replies from others to my email	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I use email a lot for my work	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It would be harder to do my work without email	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am confident that I could learn computer skills	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I am unsure of my ability to learn a computer programming language	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I will be able to keep up with the important technological advances of computers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have difficulty understanding most technological matters	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel apprehensive about using a computer	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
If given the opportunity to use a computer, I'm afraid I might damage it in some way	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Computer terminology sounds like confusing jargon to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have avoided computers because they are unfamiliar to me	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I hesitate to use a computer for fear of making mistakes that I cannot correct	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Workplace stress

*The following items belong to the instrument ASSET by Robertson Cooper Ltd. They were printed with permission. The items below are only a sample of the full questionnaire.*

Select one of the six categories from Strongly disagree to Strongly agree for each statement as it applies to you.

I am troubled that...

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
I am troubled that I work longer hours than I choose or want to	<input type="radio"/>					
I am troubled that I work unsociable hours e.g. weekends, shift work etc	<input type="radio"/>					
I am troubled that I spend too much time travelling in my job	<input type="radio"/>					
I have little control over many aspects of my job	<input type="radio"/>					

Over the last 3 months, have you experienced any of the following symptoms or changes in behaviour?

	Never	Rarely	Sometimes	Often
Lack of appetite or over eating	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Indigestion or heartburn	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Insomnia - sleep loss	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Headaches	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Select one of the six categories from Strongly disagree to Strongly agree for each statement as it applies to you.

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
Working in this organisation is motivating	<input type="radio"/>					
I feel that it is worthwhile to work hard for this organisation	<input type="radio"/>					
If necessary I am prepared to put myself out for this organisation	<input type="radio"/>					

*End of the ASSET sample items.*

This scale consists of a number of words that describe different feelings and emotions. Read each item and then mark the appropriate answer in the space next to that word. Indicate to what extent you generally feel this way, that is, how you feel on the average. Use the following scale to record your answers.

	Very slightly or not at all	A little	Moderately	Quite a bit	Extremely
Interested	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Distressed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Excited	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Upset	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Strong	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Guilty	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Scared	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Hostile	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Enthusiastic	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Proud	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Irritable	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Alert	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ashamed	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Inspired	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Nervous	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Determined	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Attentive	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Jittery	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Active	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Afraid	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

### Extra question and demographics

Is there anything else you would like to add that has not come up already on the questionnaire regarding well-being and virtual interactions at work? If yes, please state below.

Gender

What is your age? (in years)

Male

Female

How long have you been working in your current organisation?

Year(s)

Month(s)

How long have you been working in your current job?

Year(s)

Month(s)

How many persons are under your direct supervision?

What is the highest level of education you completed or the highest degree you have received?

Completed Some High School

Completed Some Postgraduate

High School Graduate

Master's Degree

Completed Some College

Doctorate, Law or Professional Degree

College Degree

Which group of staff do you belong to?

Owner / Partner

Senior Management (CEO / VP / Managing Director)

Middle Management (Director / Divisional / Department Head)

Front Line Management

Experienced: Professional or Non-Management

Entry Level

Home Based Business Owner

Other

What is your current occupation? If you are unsure, please refer to [the full list of occupations](#)

Management Occupations	Food Preparation and Serving Related Occupations
Business and Financial Operations Occupations	Building and Grounds Cleaning and Maintenance Occupations
Computer and Mathematical Occupations	Personal Care and Service Occupations
Architecture and Engineering Occupations	Sales and Related Occupations
Life, Physical, and Social Science Occupations	Office and Administrative Support Occupations
Community and Social Services Occupations	Farming, Fishing, and Forestry Occupations
Legal Occupations	Construction and Extraction Occupations
Education, Training, and Library Occupations	Installation, Maintenance, and Repair Occupations
Arts, Design, Entertainment, Sports, and Media Occupations	Production Occupations
Healthcare Practitioners and Technical Occupations	Transportation and Material Moving Occupations
Healthcare Support Occupations	Military Specific Occupations
Protective Service Occupations	

Including yourself, how many people are employed at your organization approximately?

What is the principal industry of your organization?

Agriculture, forestry, fishing, and hunting	Financial activities
Mining, quarrying, and oil and gas extraction	Professional and business services
Construction	Education and health services
Manufacturing	Leisure and hospitality
Wholesale and retail trade	Other services
Transportation and utilities	Public administration
Information	

On average, how much time a day do you spend commuting to and from the workplace?

Hour(s)

Minute(s)