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► To cite this version:

Jean-François Stich, Monideepa Tarafdar, Patrick Stacey, Cary Cooper. Appraisal of Email Use as a Source of Workplace Stress: A Person-Environment Fit Approach. *Journal of the Association for Information Systems*, 2019, 20 (2), pp.132-160. 10.17705/1jais.00531 . hal-02056063

HAL Id: hal-02056063

<https://hal.science/hal-02056063>

Submitted on 20 Dec 2023

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Appraisal of Email Use as A Source of Workplace Stress: A Person-Environment Fit Approach

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Abstract

The paper develops and tests theory that explains under what conditions the extent of email use is appraised as a stressor. Integrating concepts from information acquisition and person-environment fit theories, we hypothesize that individuals appraise their extent of email use as stressful based on the mismatch between their current and desired extents of email use. We define the mismatch as *email misfit* and the match as *email fit*. We first develop a conceptual framework that associates email misfit with the individual's experience of three key workplace stressors—work relationships stressor, job control stressor, and job conditions stressor. We then develop hypotheses framing the relationship between email fit and misfit, and these stressors. We test our hypotheses by applying quadratic polynomial regressions and surface-response analysis to survey data obtained from 118 working individuals. The paper makes three theoretical contributions. First, in reporting a theoretical and empirical construction of email fit and misfit and their relationship to workplace stressors, it shows that email misfit is appraised as stress-creating. That is, both too much email and too little, compared to what the individual desires, are associated with stressors. Secondly, it shows that IT use (in this case, email) is appraised as stressful both when it exceeds (i.e., associated with overload) and fails to meet (i.e., associated with underload), the user's expectation and preference. Thirdly, this paper suggests the person-environment approach as a theoretically novel way to conceptualize the cognitive appraisal and judgement associated with information underacquisition and overacquisition and shows workplace stressors as potentially new effects associated with them.

Keywords: Email Use Excess, Email Use Deficit, Email Overload, Email Underload, Workplace Stress, Technostress, Appraisal, Information Acquisition, Person-Environment Fit, Response-Surface Methods, Polynomial Regression

Glenn Browne was the accepting senior editor. This research article was submitted on May 4, 2016 and went through three revisions.

1 Introduction

Email is the most widely used and enduring medium of electronic communication in organizations. Multiyear surveys (in 2002, 2008, and 2014) indicate that, on 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 the extent of email use has impacts beyond just communication, particularly on workplace stressors (e.g., Barber & Santuzzi, 2015; Barley, Meyerson, & Grodal, 2011; Mano & Mesch, 2010).

Research on the consequences of email use on employees reports contradictory results. While some studies suggest that a higher extent of email use is associated with higher levels of workplace stress-related effects (e.g., Barley et al., 2011), others show it is associated with positive outcomes, such as improved supervisor-subordinate relationships (de la Rupelle, Fray, & Kalika, 2014) and greater work effectiveness (Mano & Mesch, 2010). Interestingly, not having enough email can also have adverse consequences, such as increased uncertainty due to lack of information (Brown, Duck, & Jimmieson, 2014), and perceived lack of social support (Mikal, Rice, Abeyta, & DeVilbiss, 2013). These examples suggest that the effect of email use on workplace stress is subjectively perceived and appraised by the individual. The most common manifestation of this subjectivity is “email overload” (Whittaker & Sidner, 1996), which is the individual’s perception of being inundated with emails that he or she considers too numerous or frequent or difficult to handle (Dabbish & Kraut, 2006). Thus, subjectivity is involved in individuals’ appraisals of the demands from email load (Karr-Wisniewski & Lu, 2010; Stich, Tarafdar, Cooper, & Stacey, 2017).

In view of the above, we discern two key gaps in the literature. The first is that studies do not explain how such appraisal takes place. The second is that they focus primarily on the effects of too much email use (overload) and not on those of too little or inadequate email use. Complementing these theoretical gaps, is the problem that 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; for instance, Volkswagen’s after-hours lockdown of email servers for specific employees (Williams, 2011). Such solutions do not consider individuals’ preferences regarding the use of email. The objective of this paper is to address these knowledge gaps by examining the research question: *Under what conditions is the extent of email use appraised as a source of workplace stress?*

To tackle the research question, we draw on and integrate two theoretical perspectives. First, we draw from studies on information acquisition (e.g., Browne & Pitts, 2004; Connolly & Thorn, 1987) to argue why both overacquisition and underacquisition of information can potentially occur in organizational information processing, and lead to negative outcomes. Second, drawing on the person-environment fit theory (Edwards, Cable, Williamson, Lambert, & Shipp, 2006), we define “email fit” as the condition in which the individual’s extent of email use equals their desired extent of email use, and “email misfit” as the condition of an individual’s extent of email use being greater or less than their desired extent. We hypothesize that, compared to the condition of email fit, the condition of email misfit is associated with higher levels of three

key workplace stressors (Faragher, Cooper, & Cartwright, 2004)—*work relationships stressor, job control stressor, and job conditions stressor*. We test our hypotheses by applying quadratic polynomial regressions and surface-response methodology (Klein, Jiang, & Cheney, 2009) to survey data obtained from 118 working individuals in the U.S.

The paper effects a conceptual integration between the information acquisition (Connolly & Gilani, 1982; Connolly & Thorn, 1987) and person-environment fit (Edwards, 1996; French, Caplan, & Van Harrison, 1982) literatures by suggesting the former as an explanation for email fit and misfit, and the latter as a new theoretical and empirical framing to understand the effects of overacquisition and underacquisition of information. It introduces the concepts of email fit and misfit to the literature on stress from email use, which explains why, or why not, individuals subjectively appraise and judge their extent of email use as being a stress creator. It further introduces two concepts, both of which are associated with high levels of workplace stressors—that of “email use excess” and “email use deficit”. These conditions respectively describe situations under which individuals perceive their extent of email use to be more and less than what they desire. It thus theoretically broadens the literature, which has so far considered only email “overload,” by incorporating the fuller spectrum of email use excess and email use deficit. Further, it contributes to the broader literature on stress from IT use (technostress) by considering the notion that not only too much but also too little demand from IT use—in comparison to to what the individual desires—is a potential cause of stress.

In the next section, we present our literature review and theoretical framing. In Section 3, we develop our theoretical model of why individuals appraise their extent of email use to be a stress creator. We frame our research hypotheses in Section 4. Section 5 describes the methods adopted in this study—the data, its analysis and results—along with its limitations. Section 6 discusses the paper’s contributions to theory and practice.

2 Literature Review and Theoretical Framing

We first review prior research on workplace email use and articulate research gaps in current understanding concerning the stress-creating effects of email. We then present perspectives from the information acquisition literature to understand how individuals cognitively judge overacquisition and underacquisition of information, which we use as a theoretical framing to explain why email use excess and email use deficit may be problematic. Finally, we draw from person-environment fit concepts from the organizational stress literature to explain how the

concepts of fit and misfit can be used to frame overacquisition and underacquisition of information. In so doing, we explain the appraisal of email use excess and email use deficit as stress creators.

2.1 Workplace Stressors Associated with Email Use

Studies examining individuals' email load focus on a number of aspects such as the amount of email sent, read, and received (e.g., Mano & Mesch, 2010), the time spent dealing with email (Barley et al., 2011; Sumecki et al., 2011), the frequency and intensity at which emails arrive and create interruptions (Wajcman & Rose, 2011; Whittaker & Sidner, 1996), and the effort spent in interpreting email content (Friedman & Currall, 2003). These aspects taken together are regarded as being key contributors to the individual's overall email load. They signify the extent of the individual's email use (Byron, 2008). The focus in the literature has been primarily on "too much" email or email "overload", defined as email users' perceptions that their email use is out of control because they have to deal with a greater extent of email than they can process effectively (Dabbish & Kraut, 2006). A technology feature contributing to this is the ease with which one-to-many communication can occur in email applications, as demonstrated by the extensive use of the "carbon copy" (cc) function (Barron & Yechiam, 2002). Taken together, these amplify the extent to which email is used. The literature on workplace stress from the use of IT (technostress) provides a similar focus, wherein technology attributes such as usefulness and reliability (Ayyagari, Grover, & Purvis, 2011), and stress creating conditions such as techno-overload (e.g., Tarafdar, Qiang Tu, Ragu-Nathan, & Ragu-Nathan, 2007) are examined in the qualitative characterization of demanding too much from the individual.

Email overload has been associated with increased workplace stressors such as unfavorable job conditions (Barley et al., 2011; Reinke & Chamorro-Premuzic, 2014), work overload (Barley et al., 2011), and reduced job control (Sumecki et al., 2011). It can lead to the individual experiencing higher workload in the form of more time spent handling email and a longer and faster-paced workday (Barley et al., 2011). More time spent handling 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).

Certain qualitative aspects of email use can also be perceived as workplace stress creators. Email content can be disturbing or demanding. Aggressive email content (i.e., email flaming) can lead to conflict escalation and poor work relationships (Baruch, 2005; Friedman & Currall, 2003). Email received from

superiors (e.g., Byron, 2008) or received at particular times (Derks, van Duin, Tims, & Bakker, 2015) can be perceived as causing stress. However, these qualitative aspects depend on specific situations, and thus need to be investigated on an email-by-email basis.

2.2 Research Gaps

The above discussion leads us to note a number of research gaps. First, the primary negative condition examined with respect to email use has to do with too much email that is overwhelming and overloading. Studies have examined email overload, 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 look at individuals' perceptions of having "too much" email and characterize this condition as email overload. Studies have not previously considered the condition of individuals having "not enough" email and why this may be stressful.

Second, while studies acknowledge that the extent of email use is associated with workplace stressors, they do not explain why that may be the case. From the literature (e.g., Lazarus, 1990), we know that individuals judge the presence of stressors by subjectively appraising whether or not a condition in the environment is stressful. This process, known as "appraisal", is defined as a process in which an individual interprets an environmental condition to be a stress creator (Cooper, Dewe, & O'Driscoll, 2001; McGrath, 1976). Applying this to the case of email, individuals subjectively appraise the extent of email use as a stress creator. As such, it is important to consider individual preferences in email use. The same extent of email use may be appraised differently by different individuals, depending on their preferences (Karr-Wisniewski & Lu, 2010). Although there is recognition of this in the literature, there is no explanation of how appraisal takes place. Theoretical articulation of appraisal—lacking in this literature—is thus needed for understanding why individuals experience workplace stressors related to email use.

Third, in the absence of an understanding of the conditions under which email is appraised as stressful, the measurements of email overload and stressors due to email use have often been mixed together. For instance, email has been assessed as being stressful through items such as "I find dealing with the amount of emails I receive stressful" (Brown et al., 2014, p. 335) or "emails are a cause of personal stress" (Sumecki et al., 2011, p. 409). Such measurements conflate the extent of email use with the perception of stress within the same measurement item, without getting at why or when email use is appraised as stressful.

These research gaps point to the need to develop a conceptual model to explain under what conditions the

extent of email use is appraised as being a stress creator, in order to understand the relationships between email use and workplace stressors. To do this, we next turn to concepts from information acquisition to explain why individuals could face the conditions of overacquisition and underacquisition of information.

2.3 Information Acquisition

Individuals heuristically judge the information they need for organizational tasks. As such they find it difficult to evaluate the exact amount of information required. Studies show two types of information acquisition conditions that individuals are subject to: overacquisition and underacquisition (Ackoff, 1967; Connolly & Gilani, 1982; Connolly & Thorn, 1987). The former involves gathering more information than is needed, causing excess information. The latter is a condition of potential deficiency in acquired information.

Individuals try to assess information acquired through the application of stopping rules (Browne & Pitts, 2004). These rules focus on the completeness or sufficiency of information obtained for a particular decision situation. There are two kinds of stopping rules, based on an “absolute standard” and on “difference” respectively (Browne & Pitts, 2004). In the first kind, the individual continues to gather information until an absolute level of information is attained. This level could be based on a predetermined information threshold (Gettys & Fisher, 1979) or a mental list of criteria of needed information (Schank & Abelson, 1977). When the information acquired crosses the threshold in terms of the specified conditions, the individual stops further acquisition. The second kind—namely, stopping rules based on difference—are generally applied according to the difference between a “desired” and a “current” level of information, or the representational stability of the problem being tackled that the information enables (Browne & Pitts, 2004). In other words, the individual has a mental representation of how much information is desired, and cognitively judges when the incoming information is not sufficiently different, in that it fails to provide new understanding, and uses this as a criterion for stopping (Gettys & Fisher, 1979). Such stopping rules have been examined in the context of information systems development, financial investment, and online search (e.g. Browne and Pitts 2004, Pennington & Kelton, 2016).

Difference stopping rules are applicable when the decision-making situation involves a general rather than a specific task; does not require specialized expertise or experience; is characterized by a low likelihood of the individual having an idea of how much absolute information they would need; and is not necessarily well defined (e.g., Browne & Pitts, 2004). These conditions generally apply to email use because email use is a general purpose information processing

and communication activity rather than a specific technical task (Ducheneaut & Watts, 2005); it is not possible for individuals to identify how many emails they need; email use does not entail specialized expertise; email use is a general activity occurring throughout the workday (Renaud, Ramsay, & Hair, 2006); and there are no universally defined procedures for using email.

Through a similar logic in Prospect Theory, Kahneman and Tversky (1979) state that individuals are better able to subjectively assess the significance of a difference in an attribute rather than its absolute value. That is, they find gains and losses (i.e., changes) in the attribute more salient than its actual value. This is because the individual’s perceptual apparatus is attuned to the evaluation of differences rather than absolute magnitudes. In the social sciences, this principle has been found to be applicable to a large variety of attributes, including prestige and wealth (Kahneman & Tversky, 1979). The carriers of salience are thus changes in the value of the attribute. This notion is compatible with principles of perception and judgment, wherein the individual compares the information gathered to a subjective reference point for the chosen attribute (Pennington & Kelton, 2016). “Congruence” (Chandra & Krovi, 1999) occurs when the information gathered “fits” the individual’s information processing need. A lack of congruence or “fit” negatively affects decision outcomes (Pennington & Kelton, 2016). We note that a lack of fit can happen when the information needed is either greater or less than the actual information. That is, both overacquisition and underacquisition of information can lead to lack of fit. We further observe that individuals rely on their judgment and cognitive appraisal regarding whether they have the information they need and whether they would benefit from further information or not. Stopping rules are thus based on judgement and cognitive appraisal.

The assessment of difference can, in principle, be based on a single or on multiple criteria. However, in reality, individuals find it difficult to simultaneously assess the differential validity of multiple criteria because information overload tests the limits of cognition (Jennings, Amabile, & Ross, 1982). Thus, for the sake of simplicity and to avoid having to cope with too much information, individuals may implicitly use a single or overall criterion as a satisficing strategy (Browne, Pitts, & Wetherbe, 2007).

To recapitulate then, in this subsection we explained that both underacquisition and overacquisition of information can signify a lack of fit and may be problematic, and that stopping rules provide a conceptual framing for judging when an individual in a given decision situation should stop gathering more information. The person-environment fit approach provides a comparative judgement framework that

subjectively examines information about what a person wants and what their environment provides and analytically examines the difference (Edwards et al., 2006; Kristof-Brown, Zimmerman, & Johnson, 2005). It could thus provide a conceptual framing for understanding how overacquisition and underacquisition, or lack of fit, is appraised by the individual. We therefore next turn to the person-environment fit theory.

2.4 Person-Environment Fit Approach to Understanding Appraisal

Appraisal is the process by which an environmental condition is interpreted by an individual as a stress creator (Cooper et al., 2001; McGrath, 1976).¹ We noted in Section 2.2 that there is a lack of understanding of how individuals appraise their extent of email use as a stress creator. The person-environment fit theory (Edwards, 1996; French et al., 1982) provides a conceptual and methodological framework for understanding how individuals appraise an environmental attribute to be a stress creator or stressor, depending on the extent to which it “fits” their desired levels of the attribute. It suggests that in order to do this, individuals cognitively appraise the extent to which they perceive the attribute *to be present*, and the extent to which they would *like it to be present* (Van Harrison, 1978). This approach is conceptually related to the matter of both stress from email use (because it provides a framework to appraise the extent of email use as a stressor) and to information acquisition (because it provides a framework to cognitively judge the extent of information the individual has acquired and qualify it as overacquisition or underacquisition).

Supplies (*S*) are described as the extent to which the particular attribute is *currently* perceived to be present in the environment. Values (*V*) represent the extent to which the attribute is *desired* by the person (Edwards, 1996). The difference (match) between the two is classified as misfit (fit). The person judges the current and desired extents of the attribute (Edwards, 1996), and the result of their comparison is defined as a fit or misfit. When the current and desired extents of the attribute diverge, a supplies-values misfit (S-V misfit) exists. The greater this divergence, the more the S-V misfit. In general, the greater the S-V misfit, the greater the experienced level of a particular stressor perceived by the individual (Kristof-Brown et al., 2005). This is true both when supplies exceed values and when they

fall short of values. When the supply exceeds the value, the individual experiences an “excess” condition in which the level of the attribute goes “over” what he or she wants. When supply falls short of values, the individual experiences a “deficit” condition in which the level of the attribute is “under” what he or she wants. Key works in stress (e.g., Lazarus, 1990; McGrath, 1976; Selye, 1956) conceptualize the relationship between the level of misfit and the level of the stressor as a nonlinear one.

Conceptually integrating the information acquisition and person-environment fit perspectives enables us to suggest that overacquisition and underacquisition of information can be appraised as being stressful. It helps us address the inadequacies in the current literature on stress-creating attributes of email use, which does not take into account that email use can be stressful, both when it is in excess and when it is in deficit of what the person would like it to be. In existing studies, measurement items such as “I get too much email” (Hogan & Fisher, 2006, p. 1) do not differentiate between the extent to which the individual uses email (supplies) and the extent to which the individual would like to use email (values). This presents the problem that only one side of the relationship (i.e., email overload) is considered by looking at “too much email”, thus overlooking the condition of “not enough email” (i.e., potential email underload). Such measures are thus one-sided (Edwards et al., 2006) and do not provide a complete assessment of misfit from both sides.

For studies on technostress, we note two deficiencies. First, there is no empirical evidence of a supplies-values misfit or any indication that this potential misfit may be associated with workplace stressors. Ayyagari et al. (2011) provide a conceptual deliberation of how IT characteristics such as complexity or pace of change, can be potentially associated with misfit, but do not consider use of an IT application. Second, studies have developed indicators of stress-creating conditions that exclusively address the condition of “too much”. Technology-related overload is measured by indicators such as “I am forced by the technology to do more work than I can handle” (Tarafdar et al., 2007). Technology attributes are measured with indicators such as “I feel that there are frequent changes in the features of ICTs” (Ayyagari et al., 2011). These indicators are not able to empirically investigate the relationship between fit or misfit and

¹ Appraisal occurs at two points of the stress process. Primary appraisal occurs when individuals perceive environmental demands as stress creating. Secondary appraisal is activated after the individual has appraised the presence of a stressor and evaluates possible coping behaviors. The objective of this study is to understand under what conditions email use is appraised as stress creating. The

focus is thus on primary appraisal. Person-environment fit theory is particularly appropriate for studying primary appraisal (Cooper, Dewe, & O’Driscoll, 2001; Lazarus & Folkman, 1984). For the sake of readability, we refer to it as simply “appraisal”.

stress-creating conditions due to IT, nor do they get at why individuals appraise stressors due to IT.

3 Conceptual Model: How Email Use Is Appraised as A Stressor

The information acquisition literature covered in Section 2.3 considers both overacquisition and underacquisition of information as potentially problematic. The person-environment fit literature in Section 2.4 regards that individuals cognitively appraise the environment by judging the levels of supplies (what they currently have) and values (what they would like to have) of attributes in the environment. When the two levels do not match, a condition of misfit occurs which can lead to the perception of a high level of stressors. The person-environment approach thus explains that misfit may be a way to theoretically qualify overacquisition and underacquisition of information. Integrating the two perspectives, we consider email use excess (email use deficit) as a situation of information overacquisition (underacquisition). We further consider both situations

as examples of “misfit”. We next develop a conceptual model where we draw from this framing to explain the relationships between the extent of email used by the individual and the level of work stressors perceived by him or her.

We consider the extent² of email the individual currently uses as an indicator of email load (e.g., Dabbish & Kraut, 2006; Soucek & Moser, 2010; Sumecki et al., 2011). As shown in Figure 1, we define *email supplies* (S) as the individual’s subjectively assessed current extent of email use, and *email values* (V) as the extent to which the individual would like his or her email use to be. For individuals to experience *email fit*, they should use email to the extent they want to. Otherwise, they would experience *email misfit* when their extent of email use is either in excess (i.e., *email use excess*—right side of Figure 1 where S exceeds V) or in deficit (i.e., *email use deficit*—left side of Figure 1 where S is less than V). The more the current extent of email use deviates from the desired (i.e., misfit on both sides of the $S=V$ position in Figure 1), the higher the level of stressors appraised by the individual.

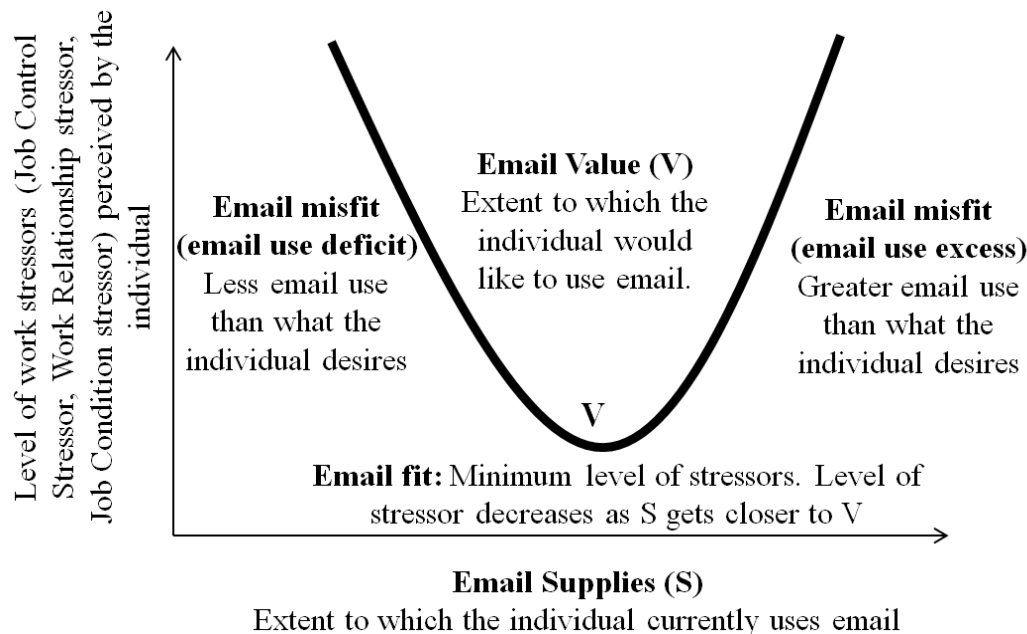


Figure 1. Conceptual Model for Understanding Appraisal of Email Load

We examine the impact of email fit and email misfit on the perceived levels of three workplace stressors;

namely, work relationships stressor, job control stressor, and job conditions stressor (Cooper et al.,

² As explained in Section 2.1, the extent of email use is regarded as an overall assessment of the individual’s email load, including different aspects such as volume, frequency, intensity etc., all of which contribute to the level of the individual’s email use. As further explained from information acquisition concepts in Section 2.3, individuals

consider simple attributes when assessing adequacy of information for work tasks, so as not to experience cognitive overload. Thus, it is possible to suggest that the individual considers a simplified criterion signifying the overall extent of email use, when assessing email load.

2001). We selected these workplace stressors because they have the potential to be affected by the extent of email use and because they have been highlighted as strong predictors of long standing workplace well-being issues such as burnout, depression and reduced mental health (Bond & Bunce, 2003; Faragher, Cass, & Cooper, 2005; Sutherland & Cooper, 2000). *Work relationships stressor* is defined as conditions of poor, unsupportive, or damaging relationships with colleagues experienced by the individual (Leiter & Maslach, 1988; McGrath, 1970). The importance of this stressor is highlighted because “having to live and work with others can be one of the most stressful aspects of life” (Sutherland & Cooper, 2000, p. 98). *The job control stressor* is defined as a lack of control or influence that the individual perceives over his or her job (Karasek, 1979). Research has identified this as an important stressor because it can lead to low mental health, job satisfaction, and job performance (Bond & Bunce, 2003). An individual’s use of email is dependent on email use by his or her colleagues (Renaud et al., 2006), and is especially subject to potential control by supervisors. Thus, both the work relationships stressor and the job control stressor can potentially be associated with email use. *The job conditions stressor* describes overall difficult working conditions perceived by the individual. This stressor is important because unpleasant working conditions create an undesirable working climate (Faragher et al., 2005). It is salient with regard to email use in multiple ways, such as through the lengthening of the workday due to email load (Barley et al., 2011) or through the potential of email use to convey harassing and abusive workplace behaviors (Baruch, 2005). For each stressor, we hypothesize that email misfit (“too much” and “too little” email use) will be associated with higher levels of the stressor. Conversely, we anticipate that email fit (“enough” email use) will be associated with lower levels of the stressors. Individuals may experience email fit with any level of email supply.

Before proceeding to the formal hypotheses, it is important to note three things regarding the nature of email use excess, email use deficit, email fit, and email misfit. First, excess and deficit occur on two sides of the same attribute—according to both the information acquisition view and the organizational stress and person-environment fit literatures. From the information acquisition perspective, people either acquire more information or less information, but their

assessments of “more” or “less” are commensurate along the same attribute. The organizational stress literature shows that individuals evaluate supplies and values by making self-assessments of the desired and current levels of the same attribute for which fit and misfit are studied (e.g., Caplan, 1987; Van Harrison, 1978), in this case, extent of email use. The person-environment fit perspective makes the same argument of excess and deficit conditions being evaluated using the same attribute. Thus, attributes for which fit and misfit are measured have been treated as commensurate in these literatures. We extend the same logic to extent of email use. Second, email load is subjectively perceived. The stress literature emphasizes that attributes in the environment are subjectively appraised by individuals in order to be perceived as stressors (Lazarus, 1990). Thus, although objective email-related data such as the number of emails received as counted by servers can be measured (e.g., Jackson, Dawson, & Wilson, 2003), such data are unlikely to influence fit and misfit. Third, as we noted in Section 2.2, the literature uses indicators that ask respondents to report their perceived email overload. Known as molecular measures, they suffer from the drawback that individuals may confound the evaluation of the condition (i.e., email fit or misfit) with the attribute of comparison (i.e., extent of email use).³ In this study, we adopt an “atomistic” approach that consists of appraising the environment by subjectively assessing email supplies and email values separately. Each is a cognitively assessed judgment of the extent of email the individual currently has and wants, respectively. We then compare these elements analytically to assess fit and misfit. This approach makes it possible to separately assess the excess and deficit conditions of email use (i.e., email misfit), and also enables the assessment of email fit (Edwards et al., 2006).

4 Research Hypotheses

Based on the preceding background, we develop two sets of hypotheses as follows. The first set of hypotheses examines the relationship between email misfit and the three workplace stressors—work relationships stressor, job control stressor, and job conditions stressor. The second set investigates if the level of the three stressors experienced by the individual at email fit increases as the extent of email use increases. Table 1 describes the hypotheses.

³ For instance, the items “I use email more than I want” and “I want to use email less than I do” are both measures of email misfit (email overload). However, the former condition

may be perceived as being less preferable than the latter because of the way the items are worded.

Table 1: Summary of Definitions and Hypotheses

Email misfit		Email fit
Misfit occurs when the current extent of email use deviates from the desired extent. This misfit can occur in any direction (e.g., “too little” or “too much” email use) (Edwards, 1996).		Fit occurs when the current extent of email use equals the desired extent. (Edwards, 1996).
Definition	Hypotheses	Hypotheses
Work relationships stressor: Stress creating conditions due to poor, damaging, absent or unsupportive relationships with coworkers (Leiter & Maslach, 1988; McGrath, 1970).	H1a: The higher the degree of email misfit that individuals experience (i.e., when the current extent of email use deviates from the desired extent), the greater their perceptions of the work relationships stressor.	H2a: The level of the work relationships stressor will not increase when the extent of email use increases as long as email fit is maintained (i.e., when the current extent of email use equals the desired extent).
Job control stressor: Stress creating conditions due to lack of control over or influence in the job (Karasek, 1979).	H1b: The higher the degree of email misfit that individuals experience (i.e., when the current extent of email use deviates from the desired extent), the greater their perceptions of the job control stressor.	H2b: The level of the job control stressor will not increase when the extent of email use increases as long as email fit is maintained (i.e., when the current extent of email use equals the desired extent).
Job conditions stressor: Stress creating conditions due to overall difficult working conditions (Faragher et al., 2005).	H1c: The higher the degree of email misfit that individuals experience (i.e., when the current extent of email use deviates from the desired extent), the greater their perceptions of the job conditions stressor.	H2c: The level of the job conditions stressor will not increase when the extent of email use increases as long as email fit is maintained (i.e., when the current extent of email use equals the desired extent).

4.1 Relationship Between Email Misfit and The Three Work Stressors—Work Relationships Stressor, Job Conditions Stressor, and Job Control Stressor

From the information acquisition theory, we know that both overacquisition and underacquisition of information can have negative impacts for the individual. From the point of view of fit-based appraisal mechanisms from the stress literature, such misfits can lead to the perception of stressors. We draw from this logic to frame this set of research hypotheses. Email misfit occurs when the current extent of email use diverges from the desired extent.

Email misfit can cause individuals to experience high levels of work relationships stressors in a number of ways. First if the extent of email use is greater than the desired extent, they may feel irritated or annoyed with colleagues for sending too many emails and/or for having to respond to them (Derks & Bakker, 2010). They may also feel that excessive email use comes at the cost of face-to-face work communication and the accompanying immediacy (Golden & Veiga, 2005), or

that it places undue demands on their time (Barley et al., 2011). Perceiving one’s email use to be too frequent may also lead to information overload or increased negative affect about email. This can increase risks of perceiving email content unduly negatively (Byron, 2008), which could potentially create or escalate conflicts or diminish the quality of work relationships (Friedman & Currall, 2003). When the current extent of email use is less than the desired extent, individuals may feel that they are not getting enough social support (Mikal et al., 2013), especially when emails are left unanswered or responses are delayed. This context also introduces an increased opportunity for misunderstandings due to lack of adequate information (Brown et al., 2014; de la Rupelle et al., 2014), leading to poorer work relationships (Friedman & Currall, 2003). A perceived paucity of email might also lead to increased perceptions of isolation, especially among virtual teams or teleworking situations which rely heavily on regular email for socialization (Golden & Veiga, 2005). Finally, lower than desired extent of email use might cause an individual to feel that work colleagues are not pulling their weight (Chidambaram & Tung, 2005), potentially leading to soured workplace

relationships. In general, therefore, as email communication involves several participants, email misfit may be associated with individuals perceiving that relationships with workplace colleagues are poor.

In situations of fit however, using email to the extent that it is desired may activate stopping rules with regard to the need for more email and could lead to perceptions of adequate social support and satisfactory work communication and to an overall perception that work relationships are not stress creators. We hypothesize the following:

H1a: The higher the degree of email misfit that individuals experience (i.e., when the current extent of email use deviates from the desired extent), the greater their perceptions of the work relationships stressor.

Email misfit can be linked to the job control stressor in the following ways. In the context of email use after working hours for example, using email more 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 as individuals find it more difficult to disengage from work (Cavazotte, Heloisa Lemos, & Villadsen, 2014). One's own email use is partly the result of others' decisions to send email (Waller & Ragsdell, 2012). Using email more than desired may lead to the perception that others are in control of one's email use (Renaud et al., 2006; Sumecki et al., 2011), resulting email use that one may consider excessive or too frequent (Dabbish & Kraut, 2006). Increased difficulties managing email use that is higher than desired can thus lead to a higher appraisal of the job control stressor. On the other hand, when using email less than desired, individuals might feel out of the loop and excluded from important email threads and (Hemp 2009), and they might not have access to information necessary to their jobs (Mazmanian, Orlikowski, & Yates, 2005). These sorts of conditions may lead to a perception of lower job control.

If individuals judge their current email use to be what they want, they may feel that they have access to the information they want and are in control of their work communication (Mano & Mesch, 2010; Mazmanian et al., 2005; Sumecki et al., 2011). They may feel that they are able to use email to sufficiently have their say in matters and decisions important to their jobs such as their performance targets. They are thus likely to experience greater control over key aspects of their jobs, and thus lower levels of the job control stressor. They would seek a greater extent of email use, implicitly applying stopping rules. We thus hypothesize the following:

H1b: The higher the degree of email misfit that individuals experience (i.e., when the current extent of email use deviates from the desired

extent), the greater their perceptions of the job control stressor.

Individuals who use email more than they desire might perceive greater workload in managing it. Techno-overload, which denotes excessive work in managing the use of technology, has been shown to be an aspect of technostress-creating conditions (Tarafdar et al., 2007). Similarly, excessive email use leads to feelings of email overload (e.g., Brown et al., 2014; Dabbish & Kraut, 2006) and a general lengthening of workdays (Barley et al., 2011). Email can also be a source of stressful disruptions throughout the workday and a potential source of work life conflict (Mazmanian et al., 2005; Renaud et al., 2006). If dealing with clients and customers is an inherent part of the job, too much email coming from customers or clients could increase the perceptions of not being able to cope with communication demands from key stakeholders (Barley et al., 2011). Given the surveillance potential of electronic communication, individuals using email more than they are comfortable with may also be subject to the perception of being monitored (Smith & Tabak, 2009). Too much email may leave the individual vulnerable because ignoring emails sent by coworkers may not be considered acceptable (Park, Fritz, & Jex, 2018). All of these situations may give rise to a perception of difficult job conditions.

Findings from the information load literature suggest that individuals experiencing information deficit can be stressed by their job conditions largely because of frustration associated with the lack of necessary information for doing their jobs (O'Reilly, 1980). In the case of email use deficit, they may feel that they do not receive sufficiently adequate or useful information for the purposes of doing their work effectively (Mano & Mesch, 2010; Mazmanian et al., 2005; Sumecki et al., 2011). Individuals may also feel that they do not have enough information to process, such that the available information is processed too quickly with respect to the time available (Schultz & Vandenbosch, 1998). In such situations, they can become bored or find their work dull and repetitive. They may resort to compulsive and constant monitoring of their email inbox, often in hope of receiving useful or interesting email relevant for the task at hand (Mazmanian et al., 2005; Renaud et al., 2006). Email use deficit may thus affect the job conditions stressor by making work less interesting and enjoyable or harder to accomplish due to a lack of necessary information.

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

H1c: The higher the degree of email misfit that individuals experience (i.e., when the current extent of email use deviates from the desired extent), the greater their perceptions of the job conditions stressor.

4.2 The Relationship Between Email Fit and the Three Work Stressors—Work Relationships Stressor, Job Conditions Stressor, and Job Control Stressor

Email fit occurs when the current extent of email use is equal to the desired extent. Users do not appraise email use as a stress creator as long as the current and desired extents of email use are the same. According to Tversky & Kahneman, (1978) a difference in the value of an attribute is the reason for a perceived change in an outcome variable, rather than the absolute level of the attribute itself. In our case, the difference is that between current and desired extent of email use. In situations of email fit, using email to the extent that is desired would imply that the individual stops looking for more email. As we argued in the previous subsection, email fit is associated with perceptions of -adequate social support and work communication (relevant to work relationships stressor), adequate access to information needed for work and say in key aspects of the job (relevant to job control stressor), and relative absence of high workload or a sense of being monitored or potential incivility (relevant to job conditions stressor). These perceptions are likely to hold irrespective of the current extent of email use. Moreover, their level/intensity is unlikely to change, whatever the current extent of email use, because they depend on the deviation of the current extent of email use from the desired extent of use, rather than on the current extent of email use. Thus, when arguing from the point of view of the relationship between email fit and work-related stressors, it is possible to suggest that as long as email fit is maintained, there will be no significant change in the perceived levels of the three workplace stressors, regardless of the value of current email use at which fit occurs. From the person-environment fit literature as well, fit can occur at any level of an environmental attribute, and the level of the outcome will be perceived to remain the same, as long as fit is maintained (e.g., Edwards & Parry, 1993). We thus frame the following hypotheses:

H2a: The level of the work relationships stressor will not increase when the extent of email use increases as long as email fit is maintained (i.e.,

when the current extent of email use equals the desired extent).

H2b: The level of the job control stressor will not increase when the extent of email use increases as long as email fit is maintained (i.e., when the current extent of email use equals the desired extent).

H2c: The level of the job conditions stressor will not increase when the extent of email use increases as long as email fit is maintained (i.e., when the current extent of email use equals the desired extent).

5 Methods

We used the survey method to test our research hypotheses. We collected data on the independent variables (email supplies and email values) 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 U.S. The data were 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.

5.1 Survey Questionnaire Development

5.1.1 Independent Variables: Email Supplies and Email Values

We recall three things from Section 3—one, that email use excess and email use deficit are on two sides of a continuum; two, that email load is subjectively appraised; and three, that the literature focuses on measuring email overload only. Accordingly, the measurement for supplies and values that we selected for this study allows for commensurate measurement, subjectivity, and measurement of both email use excess and email use deficit, as follows. First, methodological considerations of commensurate measurement from person-environment fit research (Klein et al., 2009) suggest the use of items that incorporate simple and comparable content and wording along the same attribute dimension.⁴ We therefore used items that employ comparable wording for individuals' current and desired extents of email use. Second, rather than the absolute volume of email, subjective impressions of supplies and values are more important (Edwards et al., 2006). If someone believes that he or she is interacting through email a great deal

⁴ Such commensurate item indicators have been 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) (e.g., Edwards & Van Harrison, 1993, p. 632).

at work, then that may be more important than the number of emails the system report.⁵ Third, as discussed in Section 2.1, several aspects of email (e.g. volume, frequency/intensity, length, time spent) contribute to an individual's email load. To minimize the cognitive overload associated with information acquisition (Browne et al., 2007), when considering their email load, individuals are more likely to be able to assess their overall extent of email use along a single criterion rather than according to multiple criteria. Fourth, single item measures are recommended when such items are easily understood and capture the measured construct, whereas multiple items would be semantically redundant (Diamantopoulos, Sarstedt, Fuchs, Wilczynski, & Kaiser, 2012). In the case of email use, multiple aspects, such as amount of email sent, read and received, time spent in handling email, and frequency of email, may be incorporated into a single-item scale due to their high levels of homogeneity (Dabbish & Kraut, 2006).

Based on the above, we evaluated *email supplies* and *email values* by asking respondents to report respectively, the extents to which they (1) were interacting at work using email, and (2) would like to interact at work using email. The indicator items 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?" Each item was assessed using a 7-point Likert scale ranging from "1 = not at all" to "7 = to a very great extent". The above discussions established the appropriateness of these measures for our study.

5.1.2 Dependent Variables: Work Relationships Stressor, Job Control Stressor, and Job Conditions Stressor

The three dependent variables—work relationships stressor, job control stressor, and job conditions stressor—were measured using psychometrically reliable scales adapted from previous studies on workplace stress (e.g., Donald et al., 2005; Faragher et al., 2004; Johnson & Cooper, 2003). *Work relationships stressor* was assessed with six items addressing the extent to which individuals are troubled

that (1) they have poor relationships at work, (2) they feel isolated, (3) they lack support, (4) they are unsure about what is expected from them, (5) their superiors are constantly criticizing their work, (6) their superiors are intimidating them. *Job control stressor* was assessed with four items measuring the extent to which individuals are troubled that they have little control over (1) their jobs, (2) their performance targets, and (3) decisions impacting their jobs, and that (4) their suggestions about their jobs are not taken into account. *Job conditions stressor* was assessed with four items that measured the extent to which individuals are troubled that (1) they find their jobs repetitive, (2) their job performance is monitored, (3) their working conditions are difficult, (4) their customers are difficult to deal with. Each item was assessed on a 6-point Likert scale from "strongly disagree" to "strongly agree", and each construct was computed as the average of its items, based on previous studies using these constructs (Donald et al., 2005; Faragher et al., 2004; Johnson & Cooper, 2003) and other similar constructs in the stress literature (Lyne, Barrett, Williams, & Coaley, 2000).

5.1.3 Control Variables

We controlled for six variables—(1) age, (2) sex, (3) education, (4) company size, (5) industry sector of the firm in which the employees worked, and (6) hierarchical level (e.g., entry level, middle management etc.)—as typical for studies on email overload (Mano & Mesch, 2010) and stress (Faragher et al., 2004). This set of control variables embodies a large variety in individual and organizational factors that could have a bearing on the relationships studied. Selecting these thus enabled us to take into account the possible effects of a number of individual and organizational differences.

5.2 Data

We collected data from a sample 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. This sample was recruited from an online panel provided by Qualtrics.

⁵ Research shows that individuals' perceptions of their IT use (e.g., length and count of phone calls or smartphone use) are not correlated to their system-generated use (Andrews, Ellis, Shaw, & Piwek, 2015; Higgins, McClean, & Conrath, 1985). Likewise, there is little correspondence between the system-

generated use of email, the reported use of email, and whether that is perceived as being high or low (Andrews, Ellis, Shaw, & Piwek, 2015; Karr-Wisniewski & Lu, 2010; Higgins, McClean, & Conrath, 1985).

Table 2: Sample Characteristics

	Count	Percentage
Sex		
Male	42	36%
Female	76	64%
Total	118	100%
Industry (North American Industry Classification System)		
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%
Age		
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%
Education		
High school or less	13	11%
Undergraduate	82	69%
Postgraduate	19	16%
Doctorate, Law or Professional Degree	4	3%

Table 2: Sample Characteristics

Total	118	100%
Number of employees in the organization		
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%

Such panels are used in research on email and computer-mediated communication for two reasons. One, users of such applications are also Internet users and can therefore be reached through online panels. Two, it is possible to secure the participation of employees of multiple organizations (Brandon, Long, Loraas, Mueller-Phillips, & Vansant, 2014; Lowry, D'Arcy, Hammer, & Moody, 2016). For our sample, 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 at least four times faster than the average answering time (Lowry et al., 2016). Thus, 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 U.S. Sample characteristics are shown in Table 2, and include sex, age, education, organization size, and industry of employment of the respondents.

To assess its representativeness, we compared our sample to the overall U.S. population along two aspects—*demographically* and along *general indicators of well-being*. Demographically, we compared the sex 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 found that our sample is largely representative, by sex and sector of employment, of the working population of individuals in the U.S. The details are presented in Table A1 of the Appendix. Regarding indicators of well-being, we compared our sample's values of self-reported physical and psychological well-being, to that of a reference database of these parameters obtained from a business-psychology well-being research firm. The database contained values of these parameters, over the past 10 years, for 38,240 employees from 27 organizations from the U.S., U.K. and Western Europe. Physical well-being was (reversely) measured through self-reported conditions such as muscular tension, insomnia, or headaches, and psychological well-being through self-reported conditions such as irritability, mood swings, or anxiety. These parameters are indicators of general/behavioral (not clinical) well-being and have been used in the stress literature as such (Faragher et al., 2004).⁶ 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 overall physical well-being, 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 overall psychological well-being the details were ($Mean_{sample} = 21.45$, $Standard Deviation_{sample} = 7.22$, $Mean_{population} = 22.56$, $Standard Deviation_{population} = 7.32$, $t = 1.67$).

⁶ It may be that well-being affects the three stressors and may be empirically considered a control variable. In the stress literature however, it is widely considered as an outcome of work stressors such as the ones we studied (Danna & Griffin, 1999; Edwards & Van Harrison, 1993; Faragher, Cooper, & Cartwright, 2004) and thus its theoretical nature is not that of

a control variable, given the objective of our study. That said, we ran alternate models incorporating physical and psychological well-being as control variables, with no qualitative changes in the hypotheses' results. We thank one of the reviewers for suggesting this.

Table 3: Construct Reliability, Mean, Standard Deviation, and Factor Loadings.

	Mean	Standard deviation	Factor loading
Current extent of email use (i.e., Email Supplies)	5.42	1.57	
the extent to which one interacts with others using email			
Desired extent of email use (i.e., Email Values)	5.11	1.43	
the extent to which one would like to interact with others using email			
Work relationships stressor ($\alpha = .878$; CR = .908)	2.34	1.10	
(1) having poor relationships at work	2.01	1.41	0.79
(2) feeling isolated	2.67	1.56	0.82
(3) lacking support	2.51	1.41	0.84
(4) unsure about what is expected from oneself	2.34	1.46	0.79
(5) constantly criticized by one's superiors	2.42	1.38	0.80
(6) intimidated by one's superiors	2.08	1.09	0.69
Job control stressor ($\alpha = .878$; CR = .917)	2.80	1.25	
(1) having little control over one's job	3.1	1.45	0.84
(2) having little control over one's performance targets	2.86	1.51	0.85
(3) having little control over one's decisions impacting one's job	2.54	1.39	0.90
(4) decisions impacting one's job do not take into account one's inputs	2.69	1.49	0.85
Job conditions stressor ($\alpha = .736$; CR = .839)	2.67	1.08	
(1) finding one's job repetitive	2.09	1.24	0.79
(2) one's job performance is monitored	3.08	1.52	0.63
(3) one's working conditions are difficult	2.97	1.50	0.84
(4) one's customers are difficult to deal with	2.53	1.50	0.75
<i>Notes: α refers to Cronbach's alpha and CR to the composite reliability.</i>			

These comparisons show that our sample is a good representation of the population of working individuals in the U.S. in terms of demography and employment sector, and of employees in the U.S., U.K. and Western Europe in terms of general well-being.

We tested for the possibility of common method bias in our data, for supplies, values, and each stressor. The Harman's single-factor test for common method bias found that a single factor incorporating all three variables respectively explained, 44%, 42%, and 30% of the variance, in the case of supplies, values, and each

one of the three stressors—job control stressors, job relationships stressor, and job conditions stressor. These results are within acceptable thresholds (Malhotra, Kim, & Patil, 2006; Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), which indicates that common methods bias is not likely a significant concern in our data.

5.3 Hypotheses Testing

Table 3 shows the means, standard deviations, factor loadings and reliabilities (Cronbach alpha [α], and composite reliability [CR]) for each construct. For the

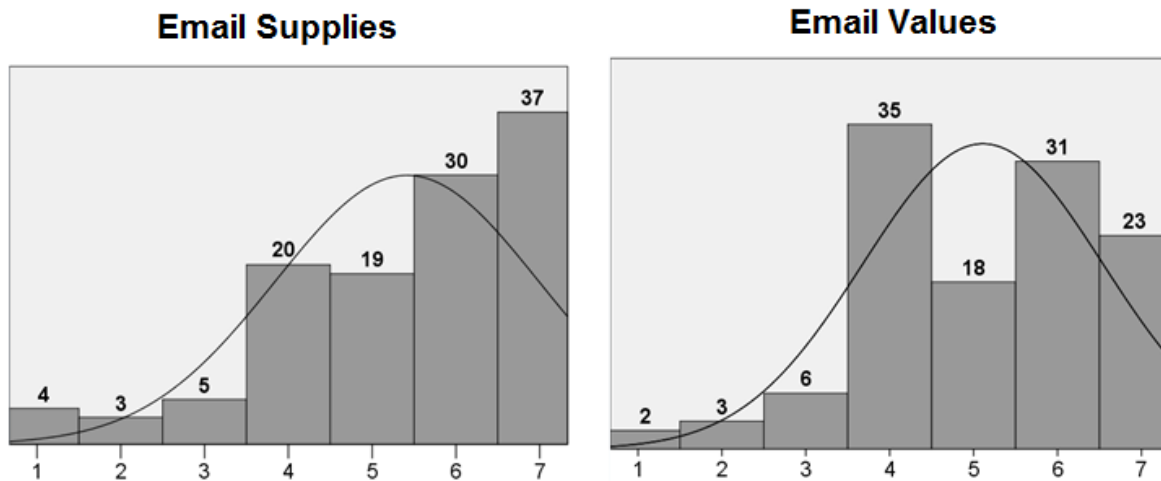
work relationships stressor ($\alpha = .878$; $CR = .908$), the six items mapped on a single factor, all with loadings above .69. For the job control stressor ($\alpha = .878$; $CR = .917$), the 4 items mapped on a single factor with loadings above .83. For the job conditions stressor ($\alpha = .736$; $CR = .839$), the 4 items mapped on a single factor with loadings above .63. We note that the all factor loadings and Cronbach alpha values are greater than the respective thresholds of 0.6 and 0.7 (Nunnally, 1978), indicating high construct reliability. Table 4

shows the interconstruct correlations and square root of the average variance extracted (AVE). We note that for each work stressor, the square root of the AVE is greater than its correlations with the other work stressors, indicating convergent validity for each work stressor and discriminant validity among them (Wetzels, Odekerken-Schröder, & Van Oppen, 2009). The distribution of email supplies and email values, their means and standard deviations are detailed in Figure 2.⁷

Table 4: Construct Correlations and Average Variance Extracted

	S	V	REL	CTRL	JOB
Email supplies (S)					
Email values (V)	0.76**				
Work relationships stressor (REL)	-0.15	-0.19*	0.79		
Job control stressor (CTRL)	-0.08	-0.22*	0.76***	0.86	
Job conditions stressor (JOB)	-0.12	-0.19*	0.74**	0.73***	0.75

Notes: Numbers in bold indicate the square root of the average variance extracted (AVE) for each work stressor. * $p < .05$; ** $p < .01$; *** $p < .001$



Notes: Email Supplies has a mean of 5.42 and a standard deviation of 1.57. Email Values has a mean of 5.11 and a standard deviation of 1.43.

Figure 2. Distribution of Email Supplies and Email Values.

⁷ We note the high average value of email supplies. There are potentially two reasons for this. One, email may be extensively used in the organizations where our respondents worked. Indeed, office workers face ever-increasing email use (e.g., Dabbish & Kraut, 2006; Sumecki et al, 2011; Whittaker & Sidner, 1996). Two, information acquisition

literature suggests that individuals take in more rather than less information, especially in situations in which information is easy to obtain (e.g., Ackoff, 1967; Levine, Samet, & Brahlek, 1975), which is the case with email, given its ubiquity.

Following studies on person-environment fit, we used quadratic polynomial regressions (Klein et al., 2009) to test our hypotheses.⁸ The following equation was analyzed, using S for email supplies (i.e., the current extent of email use) and V for email values (i.e., the desired extent of email use) and “stressor” for either work relationships stressor, job control stressor, or job conditions stressor. We thus analyzed three equations, one for each stressor.

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

Equation (1) allows us to examine how email supplies and values will impact each stressor, as required by our hypotheses. The quadratic regressions allow us to examine curvilinear relationships between misfit and the three work stressors (Edwards & Parry, 1993).

S and V were scale centered by subtracting 4 (i.e., midpoint of the 1-7 Likert scale), which is the scale midpoint, in order to facilitate interpretation of the intercept and to reduce multicollinearity as commonly done in person-environment fit studies (e.g., Edwards & Parry, 1993). We also added in this equation our mean-centered control variables of age, sex, education, organization size, industry, and managerial level. To explore the effect of email fit and email misfit on the three stressors, we represented the equations in three-dimensions (Figures 3, 4, 5—“respective stressor” in the z-axis, “email supplies” in the x-axis and “email 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. 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 3, 4, 5 and in Tables 5, 6 and 7.

5.3.1 Misfit Hypotheses (H1a, H1b, H1c)

The three misfit hypotheses predicted that the higher the degree of email misfit experienced by individuals (i.e., when the current extent of email use deviates from the desired extent), the higher the degree to which they experience the workplace stressors. These hypotheses are tested by looking at the shape of the $S=-V$ curve (Edwards & Parry, 1993), which is the curve

on the surface representing when the current extent of email use is diametrically opposed to the desired extent of email use (See Table 5).

For these hypotheses to be supported, this curve should be concave upward and the $S=V=0$ point should be located on its axis of symmetry (Edwards & Parry, 1993). Setting V equals $-S$ in Equation (1) to capture this curve of email misfit, and solving for coefficients (see Table 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 tangent at the $S=V=0$ point. Thus for the $S=-V$ curve to be concave upward across the $S=V=0$ point, the tangent at this point must have a positive curvature, meaning that $b_3 - b_4 + b_5$ would need to be significantly positive (Edwards & Parry, 1993). Additionally, for the particular stressor to have the lowest value at the point of email fit, the $S=V=0$ point should be located on the axis of symmetry of this U-shaped curve. According to the person-environment fit literature (Edwards & Parry, 1993), this is tested by looking at the curve of email misfit ($S=-V$) and the slope of the tangent at the point $S=V=0$ (i.e., the coefficient $b_1 - b_2$) (See Table 5) (Edwards & Parry, 1993). The $S=V=0$ point is located on the axis of symmetry of the U-shaped curve when the slope of the tangent at this point is zero (i.e., when the coefficient $b_1 - b_2$ is not significantly different from zero).

The hypotheses were supported for all the three stressors (See Tables 6, 7 and Figures 3, 4, and 5). Looking at Table 7 we first see that the surfaces were indeed concave upward across the $S=V=0$ point for the work relationships stressor (curvature = $b_3 - b_4 + b_5 = 0.443$, $p < .05$), job control stressor (curvature = $b_3 - b_4 + b_5 = 0.574$, $p < .01$), and job conditions stressor (curvature = $b_3 - b_4 + b_5 = 0.553$, $p < .01$). We then see that the slopes of the tangent at the $S=V=0$ point were not significantly different from zero for the work relationships stressor (slope = $b_1 - b_2 = 0.211$, $p > .05$), job control stressor (slope = $b_1 - b_2 = 0.590$, $p > .05$) and job conditions stressor (slope = $b_1 - b_2 = 0.453$, $p > .05$). That is, for each U-shaped curve, the $S=V=0$ point was located on the axis of symmetry. These are illustrated in the left side graphs of Figures 3, 4, and 5, where we clearly see the curvilinear shape of the diagonal running from the back-left corner to the front-right corner. We also see in the bottom right-side graphs ($S=-V$) that the misfit curves are clearly concave upward. Therefore, H1a, H1b and H1c are supported. In other words, the higher the degree to which individuals experienced email misfit, the higher

⁸ We used quadratic polynomial regressions (Klein, Jiang, & Cheney, 2009) to calculate the value of email use excess or use deficit in testing our hypotheses. We calculated the coefficients of the first and second derivatives of Equation (1) for $S=V$ and $S=-V$, to assess the effect of email misfit (i.e., email use excess and email use deficit) and email fit on the three work stressors, as described in detail in Section 5.3. We

did not use difference scores (i.e., $S-V$). Difference scores are not appropriate for our study because they (1) assume that supplies and values have the same magnitude of influence on the work stressors; and (2) have concerns over their reliability and validity in person-environment fit research (Edwards & Parry, 1993; Klein et al., 2009).

their perceptions of the workplace stressors. Furthermore, the effects are curvilinear.

5.3.2 Fit Hypotheses (H2a, H2b, H2c)

The three fit hypotheses theorized that the level of the stressors will not increase when the extent of email use increases as long as email fit is maintained (i.e., when the current extent of email use equals the desired extent). To investigate these hypotheses, we examined the $S=V$ curve, representing the cases where the current and desired extents of email use are equal (e.g., it contains the points $S=3, V=3$ or $S=-3, V=-3$). It is

therefore the curve on which email fit is maximized (i.e., the curve of email fit).

Setting S is equal to V in Equation (1) to capture this curve of email fit and solving for coefficients (see Table 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 $S=V=0$ (Edwards & Parry, 1993). For the fit hypotheses to be supported, the curve of email fit should be a straight horizontal line (i.e., no curvature and a zero slope), meaning that both $b_1 + b_2$ and $b_3 + b_4 + b_5$ must not significantly differ from zero (See Table 5).

Table 5: Hypothesis Testing Using Response Surface Methods

	Curve of email misfit	Curve of email fit
Curve of interest	<i>Supplies = -Values</i> curve, which is the curve representing the cases where the current extent of email use is diametrically opposite to the desired extent of email use (e.g., it contains the point $S=3, V=-3, S=2, V=-2$ etc).	<i>Supplies = Values</i> curve, which is the curve representing the cases where the current and desired extents of email use are equal (e.g., it contains the points $S=3, V=3$). It is therefore the curve on which email fit is maximized.
Equation for this curve	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
Coefficient representing the slope of this curve at the point $S=V=0$.	$b_1 - b_2$ (first derivative)	$b_1 + b_2$ (first derivative)
Coefficient representing the curvature of this curve at the point $S=V=0$.	$b_3 - b_4 + b_5$ (second derivative)	$b_3 + b_4 + b_5$ (second derivative)
Results needed to support the misfit hypotheses (H1a, H1b, H1c)	The curve must be concave upward (i.e., U-shaped) across the point $S=V=0$, implying that the coefficient $b_3 - b_4 + b_5$ is <i>significantly positive</i> (Edwards & Parry, 1993). AND The tangent of the U-shaped curve must have a zero slope at the $S=V=0$ point implying that the value of the stressor at the $S=V=0$ point is the lowest. This is the case when the coefficient $b_1 - b_2$ is <i>not significantly different than zero</i> (Edwards & Parry, 1993)	
Results needed to support the fit hypotheses (H2a, H2b, H2c).		The curve must be a straight horizontal line (i.e., no curvature and a zero slope), implying that <i>both</i> $(b_1 + b_2)$ and $(b_3 + b_4 + b_5)$ <i>must not significantly differ from zero</i> (Edwards & Parry, 1993).

Table 6: Polynomial Quadratic Regressions of the Stressors on Email Supplies and Email Values

	Results from quadratic regression in Equation 1						
Outcome	b_0	$b_1 (S)$	$b_2 (V)$	$b_3 (S^2)$	$b_4 (SV)$	$b_5 (V^2)$	R^2
Work relationships stressor	2.547	0.109	-0.102	0.018	-0.263*	0.163	0.096**
Job control stressor	2.967	0.286*	-0.303*	0.028	-0.328**	0.218	0.158***
Job conditions stressor	2.855	0.211*	-0.242*	-0.016	-0.306**	0.262**	0.201***

Notes: Controlled for Age, Sex, Education, Organization size, Industry and Managerial Level. R^2 is adjusted. S refers to the current extent of email use, and V to the desired extent of email use. b_1 , b_2 , b_3 , b_4 , and b_5 are the coefficients on S , V , S^2 , SV , and V^2 , respectively; b_0 is the intercept and is significant. * $p < .05$; ** $p < .01$; *** $p < .001$

Table 7: Slopes and Curvatures Along the Curves of Interest

Outcome variable	Shape along the curve of email fit ($S=V$)		Shape along the curve of email misfit ($S=-V$)	
	Slope $b_1 + b_2$	Curvature $b_3 + b_4 + b_5$	Slope $b_1 - b_2$	Curvature $b_3 - b_4 + b_5$
Work relationships stressor	0.006	-0.082*	0.211	0.443*
Job control stressor	-0.017	-0.082	0.59	0.574**
Job conditions stressor	-0.03	-0.06	0.453	0.553**

Notes: Controlled for Age, Sex, Education, Organization size, Industry and Managerial Level. S refers to the current extent of email use, and V to the desired extent of email use. b_1 , b_2 , b_3 , b_4 , and b_5 are the coefficients on S , V , S^2 , SV , and V^2 , respectively. * $p < .05$; ** $p < .01$; *** $p < .001$ indicate significance of difference from zero.

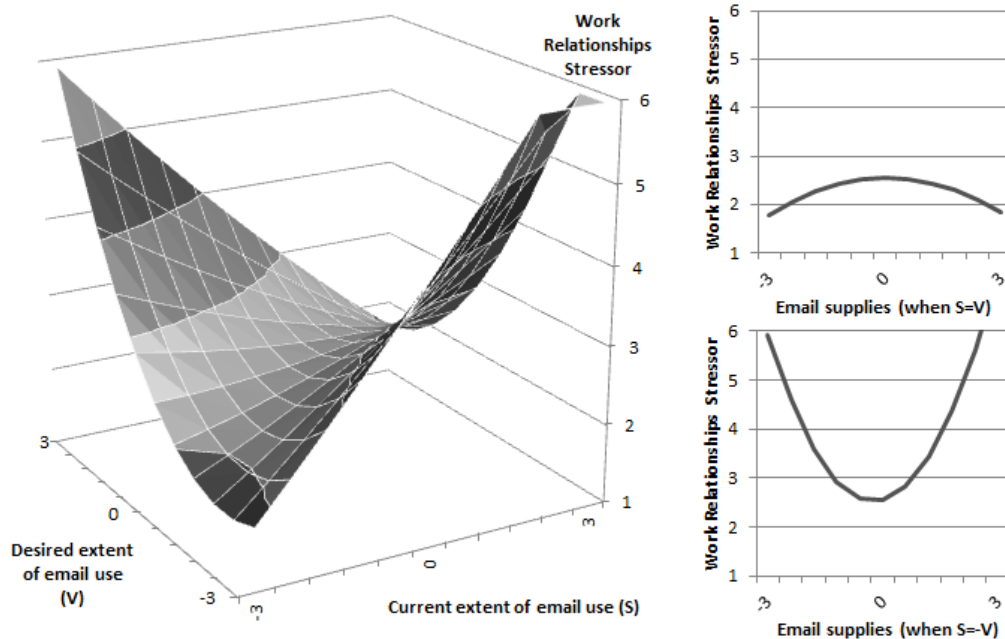


Figure 3. Estimated Surfaces Relating Email Fit and Misfit to Work Relationships Stressor.

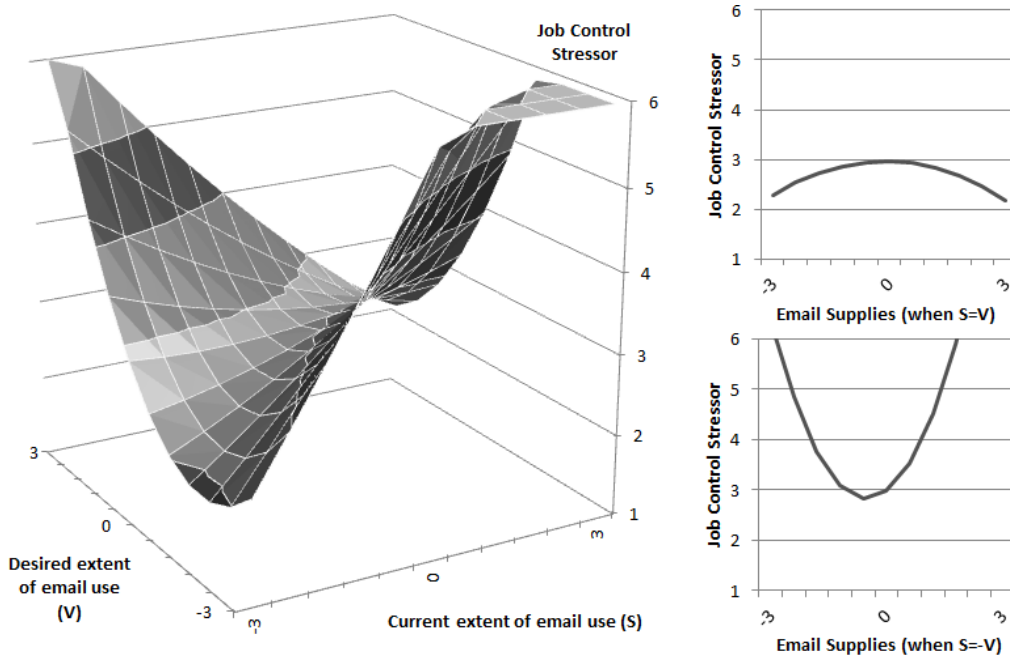


Figure 4. Estimated Surfaces Relating Email Fit and Misfit to Job Control Stressor

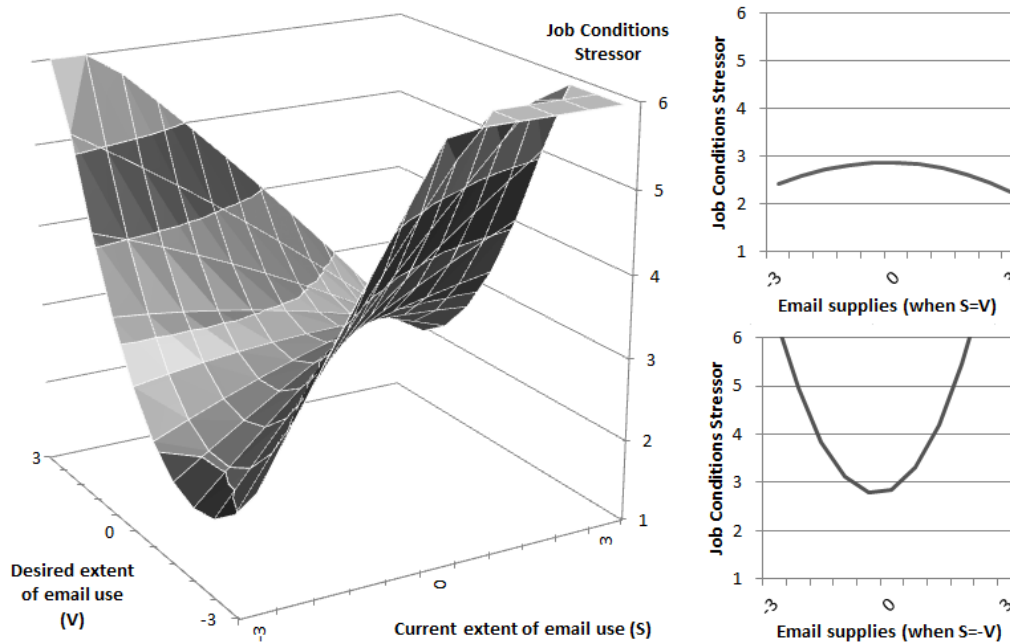


Figure 5. Estimated Surfaces Relating Email Fit and Misfit to Job Conditions Stressor

Consistent with the above, the $S=V$ curve showed no slope and no significant curvature for the job control stressor (curvature = $b_3 + b_4 + b_5 = -0.082, p > .05$; slope = $b_1 + b_2 = -0.017, p > .05$) and the job conditions stressor (curvature = $b_3 + b_4 + b_5 = -0.06, p > .05$; slope = $b_1 + b_2 = -0.03, p > .05$) (see Tables 6 and 7). This is also shown in the top-right graphs of Figures 4 and 5 where the curvatures of the $S=V$ curves are not statistically significant. Thus, H2b and H2c are supported. In other words, the perceived levels of these two stressors were the same at all values of the current extent of email use, as long as email fit was maintained.

Regarding the work relationships stressor (H2a), the coefficient $b_3 + b_4 + b_5$ was significantly negative but $b_1 + b_2$, was not significantly positive. This means that the $S=V$ curve was flat at the origin, but convex (curvature = $b_3 + b_4 + b_5 = -0.082, p < .05$; slope = $b_1 + b_2 = 0.006, p > .05$) (See Figure 3). This shows that when the current extent of email use matches the desired extent, the work relationships stressor is perceived at a lower level when the current extent of email use is high or low, and at a higher level when the current extent of email use was moderate. That is, achieving email fit with either high or low current extents of email use is less stressful in terms of work relationships than achieving fit with a moderate extent.

5.4 Limitations

Before describing the study's contributions, we make a note of its limitations. First, notwithstanding the advantages of the online panel that we discussed in Section 5.2, this approach to data collection has limitations. Online panels restrict the range of participants to Internet users. Furthermore, sampling is nonrandom given that participants self-enroll—thus there may be biases that are not clearly understood. We note, however, that most studies on email use also use nonrandom sampling techniques, such as focusing on employees of particular organizations or even on students. To mitigate potential concerns, we applied a number of controls and also compared our sample to the larger population from which the sample was drawn. Our results hold for a sample that is generally representative of the overall U.S. population of working adults, controlled for age, sex, education, organization size, industry, and managerial/hierarchical position, and is representative in its general behavioral well-being, of employees in organizations from the U.S., U.K. and Western Europe. However, conducting the study on a set of respondents recruited through a different method may increase the confidence of the results.

Secondly, the measurement of current and desired extent of email use provided a basis for the survey's respondents to report them in line with the three desired criteria—commensurability, subjectivity, and simplicity. While email use implies a number of

aspects (volume, frequency, intensity etc.), they all contribute to the email load the individual deals with. An overall assessment of the “extent of email” helped us to keep the assessment attribute simple and enabled us to focus on the *difference* of that attribute rather than the absolute values, for evaluating email fit and misfit. Such a measure was appropriate, given that our objective was to explain, as a first step, how the extent of email use is appraised as stressful by individuals. Future studies can take this as a departure point and adopt multiple attributes of email use as measurement criteria. These could include self-reported number of emails received and sent per day, average email length, time spent using email, email complexity, email urgency, etc., or open ended scales. This could also enable the parsing of the individual experiencing email use excess and email use deficit along different criteria. For instance, an individual may appreciate a low extent of email use, regardless of whether they think they are missing important messages. In such a case, that individual may experience email fit with respect to *volume* of email, but misfit with respect to *message importance*. Given the number of different aspects and possible contexts of email use, the matter of measuring email use is not a simple one; measures should be selected in line with the objective of the study. Future research could adopt an email-by-email analysis or controlled laboratory experiments to get at the effects of the more qualitative characteristics of email. Furthermore, in addition to considering supplies-values fit, future research could also examine fit between the abilities of the individual to write, filter, and archive email (Soucek & Moser, 2010), and the demands for such abilities required by the job.

Third, as with all survey research, the cross-sectional nature of the study along with self-reported data can be imbued with the problem of establishing causality. For instance, it could be argued that stress in the workplace, such as bad job conditions, leads to desire to achieve email fit (through less or more acquisition of information), or that stressful work environments and poor relationships with colleagues lead to problematic use of email. Future longitudinal or qualitative studies could investigate these sorts of issues.

6 Discussion

We set out in this research to explain why the extent of email use is appraised as a source of workplace stress. In order to do this, we drew from information acquisition and person-environment fit theories to theoretically and empirically understand the appraisal process. We found that: (1) As email misfit increases from the point of email fit on both the email use excess and the email use deficit sides, individuals experience a higher level of workplace stressors; (2) the change in the increase of stressors with the increase in misfit is nonlinear and symmetric for both email use excess and

email use deficit; and (3) the level of stressors perceived at email fit does not vary significantly with increase in the current extent of email use. We next evaluate the study's contributions to theory and practice.

6.1 Theoretical Contributions

Our first theoretical contribution is to effect a conceptual integration between the person-environment fit (e.g., Edwards et al., 2006) and information acquisition literatures (e.g., Browne & Pitts, 2004; Connolly & Gilani, 1982; Connolly & Thorn, 1987). Drawing on information acquisition concepts such as overacquisition and underacquisition and stopping rules as bases for examining email-related fit, provides a theoretical basis for studies that would further examine the excess and deficit sides of misfit by applying related concepts such as information acquisition costs (e.g., email processing time and resources) and decision costs associated with excess or deficit information (e.g., email overload and underload). Conversely, the application of the person-environment approach to qualify the cognitive appraisal and judgement associated with information underacquisition and overacquisition provides a new conceptual and empirical apparatus that future studies can further examine in studying outcomes associated with these two conditions. Information acquisition studies have considered the effects of overacquisition and underacquisition on parameters such as information quality, decision quality, and cost in the context of systems development, system design, and project management, and concerning experimental tasks involving consumer buying and production planning. Our results suggest that email use excess and email use deficit—to the extent that they represent respectively, overacquisition and underacquisition of information—when appraised through the lens of email fit/misfit, can be detrimental because of associated effects with workplace stressors. This is a new effect associated with underacquisition and overacquisition of information. These contributions provide interesting and novel theoretical links among the literatures on person-environment fit and information acquisition and provide a fertile conceptual and empirical ground for future research.

We further note, as a point of discussion, that had the $b_1 - b_2$ coefficients been significantly negative, the tangent at the $S=V=0$ point would have had a negative slope. This would imply that as the email misfit increased, the value of the stressor would exceed its value at email fit, at a lower value of misfit (i.e., sooner) on the email use deficit side, than on the email use excess side. That is, the rate of *change of the increase* in the stressor would be higher on the email use deficit side than on the email use excess side. There is an interesting potential connection here to the information acquisition literature. Prospect theory

suggests that individuals perceive differences due to the current condition being less than desired as more salient in their negative impacts than they consider similar differences due to the current condition being more than desired in their positive impacts. The former are cognitively more prominent for the individual and show a stronger relationship to the extent of outcomes (Kahneman & Miller, 1986). For instance, losses are considered more salient than gains even though they may be of the same magnitude because negative events require an individual's problem-solving and/or corrective action to ensure survival, in contrast to positive events. Information acquisition literature similarly argues that underacquisition is arguably a more significant concern (Browne & Pitts, 2004). In systems requirements for instance, underacquisition can lead to problems in design and implementation, and potential failure of the system, deemed more serious than the effects of overacquisition, which are primarily wasted time and resources (Browne & Pitts, 2004). However, we do not find this greater salience of the underacquisition side suggested by these studies, to be the case in our study. In this paper, we make an initial integration between the person-environment fit and information acquisition literatures by looking at the differences between email *misfit* and *fit*. We believe future research can take this forward to investigate if email use *excess* and email use *deficit* may be associated with stressors differently.

Our second contribution is to the *literature on the negative workplace effects of email use* (e.g., Barley et al., 2011; Dabbish & Kraut, 2006). In theoretically explaining the process of stressor appraisal from email use, we showed that email misfit is salient to the experience of high levels of job control, job conditions, and work relationships stressors. The *discrepancy between current and desired extent* of use is appraised as being associated with these stressors. This implies that not only too much but also too little email is associated with stressors. A given extent of email use can thus be associated with both a high and low level of stressors, depending on how close it is to his or her desired extent of email use. Further, the same individual can experience increasing email use to be less stressful in the email use deficit region and more stressful in the email use excess region. We thus highlight the significance of the individual's appraisal in assessing stress-related effects of email load, by theoretically introducing and empirically examining the concepts of email misfit and email fit to this literature. The concept of email overload should thus be revisited in order to capture email use ranging from email use deficit to email use excess. In this context, it is possible to suggest that email use excess as examined in this paper is associated with the perception of email overload examined in the literature. Email use deficit, on the other hand, is a condition of email use subpar to what the individual

wants. It can be associated with a perception of “not enough” email or what could be characterized as “email underload”. This notion of email underload is a new theoretical contribution to this literature; to the best of our knowledge, it has not been examined before.

Our third contribution is to the literature that *examines the stress creating effects of IT in the form of technostress* (e.g., Ayyagari et al., 2011; Tarafdar et al., 2007). Although this literature discusses various stressors due to use of IT (Tarafdar et al., 2007), the appraisal process that explains under what conditions the stressors are perceived as such has not received much attention (Tarafdar, Cooper, & Stich, 2019). In this regard, we report an analytical and empirical construction of fit and misfit with respect to extent of email use and demonstrate an empirical association between misfit and work stressors. In doing so, we shed novel light on the conditions under which the attributes relating to technology (in this case email) use, can be appraised as a stressor. We show that IT use is appraised as stressful when it *both exceeds and fails to meet* the user’s preference. To the best of our knowledge, this is the first study to theoretically conceptualize and empirically examine a relationship between a technology use-related attribute and perceived stressors. Further, this literature has primarily considered the “too much” aspect of IT (e.g., Ayyagari et al., 2011; Tarafdar et al., 2007) with the implicit assumption that it is associated with stressors. By introducing the concepts of fit and misfit as means of stressor appraisal, we suggest that the study of stressors associated with IT use should consider both excess-related and deficit-related aspects of attributes and use of technology. Finally, while this literature describes a number of IT related stressors (e.g., Ayyagari et al., 2011; Tarafdar et al., 2007), it does not examine the relationship between the use of IT and the three stressors we study in this paper.

As a *method-related contribution*, the paper tackles the assessment of the effects of email use by evaluating the effects of email fit and email misfit, based on insights from person-environment fit research (Klein et al., 2009). This method allowed us to separately assess the environment (i.e., current extent to which the individual uses email) and the person (i.e., extent to which the individual desires to use email). Such separation acknowledges the importance of individuals’ preferences by asking them about their values. Further, it allows us to investigate both email use excess and email use deficit. We are not aware of any study that has investigated the effects of email use in this manner. Email literature has primarily *combined* the individual’s perception (i.e., the *person* aspect) and the technology’s characterization (i.e., the *environment* aspect) into single items such as “I feel overwhelmed with my email”, without separating them out. The differentiation between measurement of supplies and

measurement of values makes it possible to analytically qualify email fit and misfit, and examine their relationships with stressors, instead of relying on the individual’s self-reported response of email overload being stressful.

This study opens up a number of new directions for future research. Other factors salient to the appraisal process, such as personality traits (Reinke & Chamorro-Premuzic, 2014), organizational norms and culture, and work-life situations could be examined. Second, stress research suggests that the level of misfit/fit could change over time as the individual becomes used to higher levels of demands (Lazarus, 1990). Longitudinal research designs that study email use and email fit/misfit over time could capture such a process. Third, future research might examine how individuals, once they have appraised their email fit and misfit, can cope with them through email management techniques. Fourth, the idea of why a mismatch of desired and current extents of email use happens, is an intriguing one that merits investigation. For instance, email use excess and email use deficit could be considered as potential consequences of, for example, poor conditions at work, such as a poorly managed workplace and bad communication habits among employees. Fifth, future studies could also examine appraisal of email use as an opportunity, with the potential for positive outcomes (Tarafdar et al., 2019). Sixth, for a more holistic understanding of potential stress from use of workplace communication technologies, email use could be examined together with use of other workplace communication technologies such as instant messaging and video conferencing. Finally, post hoc tests using piecewise linear regression (Edwards, 1994) revealed the overall linear rate of increase of the stressors to be slightly greater on the email use excess side than the email use deficit side. Future studies could further examine this finding through more refined hypotheses and analyses.

6.2 Practical Contributions

Emerging practical concerns are beginning to focus on the problems associated with one-size-fits-all solutions and interventions for dealing with phenomena such as technostress and information overload (Tarafdar, D’Arcy, Turel, & Gupta, 2015) with the key assumption being that everyone wants “less”. Our results provide implications for practice and policy that suggest differently.

First, our results direct managerial attention to the individual’s preferences in dealing with email load. They suggest that in addition to too much email, too little email can also be stressful. They show that not everyone wants less email than what they receive. If the individual appraises his or her email use to be satisfying, the levels of stressors are low, regardless of the extent itself. Organizational policies that institute one-size-fits-all solutions such as outright or after-

work email bans, as has recently been the case (Pillet & Carillo, 2016; Williams, 2011), are therefore not necessarily helpful because they assume that everyone receives more email than what they would like, and fail to give individual employees choice or flexibility in the matter of email use. It is not possible for such solutions to help individuals in the email use deficit condition because they do not acknowledge the existence of this condition.

Second, organizational policies could alert employees to individual differences in email use and encourage them to be mindful and empathetic about such differences. At the very least, such practices would make employees aware of the possibility of both email overload and underload among their colleagues. Employees should be encouraged to reflect on their own email use. While it is not possible to identify the “right” or a “sweet spot” of email use, employees could be encouraged to reflect on their preferences regarding email use. Relatedly, employees should be encouraged to be aware that *their email use might affect their colleagues*. While it is not possible to be certain about colleagues’ email fits and misfits, the realization that one’s own email could potentially create email excess for others may be an important step in addressing common email use behaviors such as mass Cc-ing. Conversely, the realization that one’s lack of email could lead to email deficit for colleagues may result in

more considered email responses from employees. To the best of our knowledge, few organizations consider these sorts of guidelines in their technology management initiatives, guidelines that could help managers and employees consider their email use habits more carefully.

To conclude, our paper develops theoretical understanding of conditions under which the individual’s extent of email use can be associated with certain workplace stressors through email misfit and email fit. Our study suggests that rather than looking at “too much” email use as being uniformly associated with higher levels of stress, it is more instructive to understand *under what conditions* individuals consider their email use to be stress-creating. Email use has both a misfit-related “dark” side and a fit-related “bright” side. Given the perennial importance of email in the workplace, these are interesting findings that future research can build on.

Acknowledgements

The authors thank the senior editor, Prof. Glenn J. Browne, for his keen guidance, and three anonymous reviewers for comments and suggestions—all of which helped us to significantly improve this paper.

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Appendix

Table A1: Observed and Expected Counts for Sex and Industry Characteristics

	Percentage Sample	Percentage U.S. population
Sex		
Male	36%	53%
Female	64%	47%
Total	100%	100%
Industry (North American Industry Classification System)		
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%

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