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## Post print

### **Effects of Technostress in the Role Stress Context on Proximity Managers' Performance**

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# Effects of Technostress in the Role Stress Context on Proximity Managers' Performance

## ABSTRACT

*Managers are currently facing the challenge of information and communication technology (ICT) diversification from a managerial perspective and because of their role as an intermediary between employees and the organization. The purpose of our research is to examine the specificity of “technostress” experienced by proximity managers (PM). We develop the following research questions: What are the factors that create technostress and role stress among PMs? How do the creators of technostress influence the performance of PMs? The data were collected through questionnaires distributed to the PMs (managers or team managers) of organizations that extensively use ICT to perform their professional tasks. The return rate is almost 40%. We believe that what we consider to be the technostress creator, role stress, and PMs' performance are significantly linked. Therefore, role stress emphasizes that technostress creators negatively influence the performance of PMs when the level of role stress increases.*

Keywords: Technostress, Creator of Technostress, Role Stress, Performance, Proximity Manager

## INTRODUCTION

Since 2005, rapid growth in access to information and communication technologies (ICTs) has been observed<sup>1</sup>. According to the International Telecommunication Union<sup>2</sup>, this trend reflects that international institutions that “consider information and communication technologies as the integration of telecommunications, computer, multimedia, and audiovisual technologies.”

Opting for a new ICT, or NICT, is often a process of change and innovation (Bobillier-Chaumon, 2009). For two decades, this change has been permanent—that is, the growth of communication tools is exponential, indicating a state of a continuous change. Some companies are continuing this trend by developing and applying their own ICT portfolio.

Managers are currently facing the challenge of ICT diversification both from a managerial perspective and also because of their role as an intermediary between employees and the organization. On the other hand, we are interested in different ICTs, such as massagers (personal or corporate), software packages or application software, voice communication (e.g., Skype and WhatsApp), and digital social networks (e.g., Twitter and LinkedIn).

The purpose of our research is to examine the specificity of “techno-stress” experienced by proximity managers (PM)<sup>3</sup>. To better understand the problem, we develop the following research questions:

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<sup>1</sup> The report titled “Measuring the Information Society” was published at the World Telecommunication/ICT Indicators Symposium 2016.

<sup>2</sup> Union Internationale des Télécommunications

<sup>3</sup> PM are conventionally the first level of management to whom non-managerial employees report. Within this broad definition, there is controversy on whether first-line managers and supervisors are co-extensive or distinct (Hales, 2005).

*Research question I.* What are the factors that create techno-stress and role stress among PMs?

*Research question II.* How do the creators of techno-stress influence the performance of PMs?

First, we decipher the factors that influence the PM's techno-stress and role stress. Then, we examine the mechanism thereof by identifying the mediating effect of role stress between techno-stress creators and PMs' performance. To better reflect the research questions and establish our questionnaire, we begin by conducting a preliminary survey of telecommunications carriers in Canada<sup>4</sup>.

## LITERATURE REVIEW AND THEORY

### Phenomenon of Techno-Stress

ICT "designates tools for which the processing capabilities of computer processors are coupled with communication technologies" (e.g., telematics, electronic messaging, groupware, communicating office automation, Internet, and intranet) (Autissier et al., 1997). In reality, a large number of companies deviate from this original vision of ICT. Autissier and Lahlou (1999) call this phenomenon the "[i]nformational inflation of information and communication technologies." We can observe this phenomenon through temporal notions (Metzger, 2004), urgency (Aubert, 2004), and techno-stress (Tarafdar et al., 2007) if the information overload is a quantitative measure to define a mass mobilization of ICT that aims to perform tasks. The mixing effects of several modes of communication lead to the *millefeuille effect* (Kalika et al., 2007). As Steward Brand<sup>5</sup> notes, "Once a new technology rolls over you, if you're not part of the steamroller, you're part of the road."

Ayyagari et al. (2011) claim that the characteristics of ICT create stress, which, in turn, has an effect on health costs and productivity. Emerging academic research is beginning to focus on several areas that characterize this negative aspect of ICT use. The elements that can be linked to techno-stress include the stress associated with the use of information technology, dependence, misuse, overwork, and interruption (Tarafdar et al., 2015). Techno-stress is linked to adverse effects such as decreased job satisfaction, engagement, and productivity as well as an increase in work overload and labor disputes (Tarafdar et al., 2007).

Thus, we pose the question: Are you unable to go on vacation without a computer? Do you check your messages on your mobile phone every five minutes? Are you typing on the table

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<sup>4</sup> We conducted a survey within Bell, Nordia Inc. (Bell subcontractor), Sherbrooke, and Rogers Montreal. The survey participants included managers and managers of the service. The survey was done by email and telephone exchange on the subject of information overload in general. In a specific case concerning specific offers that have been communicated to PMs of the remote and face-to-face sales services, we find that the sales department's PMs were overwhelmed by notifications and emails on promotional offers. They were unable to communicate to their subordinates the main promotional offer that was to generate the bulk of the figures two weeks ahead.

<sup>5</sup> Brand is an American writer who has founded a number of organizations including The WELL, Global Business Network, and Long Now Foundation.

because your Internet is idle or not working anymore? If you answer in the affirmative to any of these questions, you may be suffering from techno-stress.

## **Techno-Stress**

There exist recent high-quality studies on techno-stress in the literature. These studies provide valuable insights into techno-stress, such as the main factors that contribute to its development (Lei & Ngai, 2014). Scholars also emphasize the link between techno-stress and job satisfaction and performance, while others believe that techno-stress generates a job–family conflict. Although ICTs can improve flexibility and work–life balance, it can facilitate the reversal of work in the family domain (Weil & Rosen, 1997).

According to Tarafdar (2011), the creators of techno-stress and the associated results are the main findings that define techno-stresses such as “[a] manifestation of an undesirable phenomenon generated by the use of IS in the place working” (Tarafdar et al., 2015). The authors note that three key aspects of techno-stress are:

- Creators of techno-stress (factors that create stress)
- Consequences of techno-stress (unfavorable conditions manifested by the individual in response to the stress process)
- Techno-stress inhibitors (factors that moderate stress)

We thus review the literature on the different concepts of techno-stress. This section will allow us to not only provide a theoretical foundation for the term, but also facilitate an understanding of the link between the mechanism (creator of techno-stress and mitigation) and consequences of techno-stress (satisfaction/performance role of stress and productivity/innovation).

Extant research examines the influence of the creators of techno-stress on work—that is, it studies the link between creators of techno-stress and job satisfaction or performance, such as by Tarafdar et al. (2010, 2011, 2015). Further, Rizzo et al. (1970) derive the elements of role stress from the constructs of role ambiguity, role overload, and role conflicts. Srivastava, Chandra, and Shirish (2015) claim that certain personality traits combined with the creators of techno-stress can lead to positive results in work. Alam (2016), on the other hand, links the creators of techno-stress and productivity to develop three factors of techno-stress: techno-complexity, techno-uncertainty, and techno-overload. The author also finds that their relationship is negative on the productivity of the crew.

According to the literature, there are different currents concerning techno-stress. This distinction is made mainly through the double-edged (Lei & Ngai, 2014) and neutral aspects of techno-stress from a global perspective. Selye (1979) suggests that stress creator distinctions should be based on the type of stress and not on the level of stress. Because it is not any techno-stress that yields a negative result, different types of techno-stress should be evaluated differently. For example, the stress factors related to the company policy—the role stress—is qualified as a type of negative stress because the managers consider these stresses constraining effects on employees’ professional careers. Such stresses offer no room for the realization of quotas, and is, thus, a *bad stress*.

According to Lei and Ngai (2014), techno-stress is described as a working accelerator; it allows the employee to work faster and be more motivated while waiting for a reward or

moral recognition from the manager. Lei and Ngai, thus, base their claim on the techno-stress factor of Ayyagari et al. (2011)—“work overload, work-family conflict, invasion of privacy, role ambiguity and job insecurity”—to explain that ICT users may offer different assessments of different techno-stresses. Thus, techno-stress factors are identified as a challenge that often includes “measures of work/role demands, pressure, urgency of time and workload” (LePine et al., 2005).

Thus, Lei and Ngai (2014) claim that work overload is a neutral creator of techno-stress (i.e., with positive and negative effects) because it can stimulate employees’ work efficiency by allowing them to perform different tasks simultaneously and quickly. On the other hand, it is a vital link between performance and evaluation thereof by the manager. Hence, it does not contribute as a favorable techno-stress, since it is likely to be evaluated as a threat. One (or more) creator of techno-stress allows us to better understand the different factors of techno-stress; this way, ICT users can collectively determine their level of techno-stress (Tarafdar et al., 2007). Tarafdar et al. (2007) cite five creators of techno-stress: techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty. These are characteristic factors of technology that could generate stress for users.

### **Creator of Techno-Stress in Five Frames**

The five factors associated with the creators of techno-stress (techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty) reduce the efficiency with which ICT users can improve their performance at work (Tarafdar et al., 2010). Thus, these effects are related to individual characteristics of personality and interpersonal relationships (Kahn et al., 1964). We identify the factors that produce techno-stress in the following five frameworks: PM tasks, role of PM, organization, professional career, and private life.

***Techno-overload*** and the manager’s task frame: In this case, there is increased workload because of technology. According to Davis (2002), ease of access to information has led managers to communicate more information than necessary and receive more information than they can process and use.

***Techno-complexity*** and the role of the manager: This describes situations wherein the complexity associated with ICT renders the skills of managers inadequate and forces them to devote time and effort to learning and understanding various aspects of ICT (Tarafdar, 2008). An individual experiences a role conflict when exposed to conflicting or incompatible role demands (Tarafdar et al., 2007). Managers often play several roles within the organization. Apart from their daily tasks of managing, they must also oversee the tasks of their team. In this case, a managerial role conflict is inevitable.

***Techno-uncertainty*** and the organizational framework: Techno-uncertainty refers to contexts wherein persistent changes and upgrades in an ICT are distracting users and creating uncertainty for them—they must constantly learn new ICTs (Tarafdar, 2008). This phenomenon often has an organizational and interpersonal effect. Thus, this uncertainty is oriented not only toward employees, but also toward managers (team leader), which can create an interpersonal conflict.

***Techno-insecurity*** in the professional carrier context: This concerns the threat of job loss associated with techno-insecurity (Fuglseth & Sørø, 2014).

**Techno-invasion** in privacy: Techno-invasion describes the invasive effect of ICTs in creating situations wherein users are reachable at all times and places, as managers feel the need to be constantly connected (Gaudio et al., 2017). Techno-invasion mainly refers to the overflow of professional life into the private sphere of the manager. The five creators of techno-stress classified into five different frameworks makes our understanding of the causes of techno-stress in the managerial context easier.

### **Role Stress for Proximity Managers**

Roles are naturally linked to a set of expectations based on the prescriptions of others who interact with the organizational system in which they play a central role (Wincent & Örtqvist, 2009). Glazer and Beehr (2005) state that organizational stressors include role overload, role conflict, role ambiguity, and role proximity. A conceptual analysis of role stress can reveal it to be an important mediator and a key construct between techno-stress creators and individuals' performance. We first propose to distinguish between the two types of managers: intermediate managers (IMs) and PMs. They are then "designated rightly or wrongly as guarantors of social support in organizations" (Codo & Soparnot, 2013).

**Role overload:** Role overload occurs when the perceived expectations of stakeholders are impossible to achieve within given limits (Wincent & Örtqvist, 2009). In other words, the extent to which the time and organizational resources available to the person are insufficient to meet the expectations of the defined role (Latack, 1981). On the other hand, there is role overload when managers have multiple roles (Tarafdar, 2007). According to Delaye and Boudrandi (2010), the MP is gradually becoming a facilitator who must listen to her or his colleagues and seek consensus and harmony in the team.

**Role conflict:** Role conflicts occur when a lack of expectations is associated with a role. The latter often concerns a conflict between the individual's time, resources, or abilities (Rizzo, 1970). Moreover, several managers may have contradictory expectations (Veloutsou & Panigyrakis, 2004). In our preliminary case, some PMs in the telecommunications field suffered from discrepancies only because of different habits or modes of use of certain customer service software. Finally, there exists role conflict between requirements and role expectations (Souder, 1981).

**Role ambiguity:** Role ambiguity is the degree of lack of clear information about the expectation associated with a role, method for fulfilling known role expectations, consequences of role performance (Kahn, 1964). Studies identify role conflicts and ambiguity as relevant predators, employee absenteeism, role demands (Schaufeli et al., 2009), and a history of burnout (Olivares-Faúndez et al., 2014). Thus, role conflicts and ambiguity appear to lead to a decline in productivity, tension, dissatisfaction, and psychological withdrawal from work (Van Sell et al., 1981).

**Role proximity:** The PM organizes the collective of work and makes the decisions closer to the employees; this represents an essential relay with the hierarchy of the company (Scotto, 2014). According to Peretti (2006), any PM combines the rationality of the turnover and the corporate strategy, but also occupies the mission of human resource of her or his team. Thus, the manager should be the "transmission belt" between the strategy and the technical area (Mélèze, 1972). For this, she or he must demonstrate an ever-increasing ability to take responsibility (Delaye & Boudrandi, 2010). These role proximity characteristics allow

managers to be the first (in the best case) to detect stress in the employment relationship (Mansour & Commeiras, 2015).

Finally, we consider that the PM obeys a double techno-stress, that is, she or he undergoes stressful situations like any other individual and suffers the indirect effect of the team's techno-stress (*see* Figure 1).

[Figure 1 here]

## METHODOLOGY

### Model Development

We describe the research design in Figure 2 below: The focus of technostress is on the technostress creator, role stress, and performance of the PM in the context of ICT use.

[Figure 2 here]

First, we highlight the set of assumptions that give meaning to the five creators of techno-stress in the specific context of a managerial role in order to understand how managers feel the stress associated with the use of ICT (**H1**). Then, we consider the theme of the role of an individual as a PM in the organization combined with techno-stress in order to determine if the role overload (**H2a**), role conflict (**H2b**), ambiguity of role (**H2c**), and role proximity (**H2d**) are positively related to role stress. This way, we are able to understand how creators of techno-stress can increase role stress (**H3**). Job performance indicates that management is executed through the performance of work in the role prescribed by an organization as well as innovative and more spontaneous work behaviors (Katz, 1964). In our case, the work performance of the PMs is related to the activity and function of the PM and her or his team. This varies by department. We thus distinguish the performance of the PM by individual performance (*IP*) and group performance (*GP*) (**H4**). Finally, we consider role stress—that is, the hypothesis of role stress as a mediator between the creator of techno-stress and the PM's performance (**H5**).

### Hypotheses

From the literature, we highlight the set of propositions that give meaning to the five creators of techno-stress in the specific context of a PM role in order to understand how PMs feel about the associated stress from ICT use. We propose the following hypotheses:

**H1:** The five frames of techno-stress creators positively generate techno-stress.

We consider the theme of the role of an individual as the PM in the organization, along with techno-stress, and, thus, seek to determine if role overload (*RO*), role conflict (*RC*), role ambiguity (*RA*), and proximity of role (*RP*) are positively related to role stress. Thus,

**H2a:** Role overload by the PM is positively related to role stress.

**H2b:** Role conflict by the PM is positively related to role stress.

**H2c:** Role ambiguity by the PM is positively related to role stress.

**H2d:** Role proximity by the PM is positively related to role stress.

To understand how creators of techno-stress can increase role stress, we formulate the following hypothesis:

**H3:** The creator of techno-stress is positively related to role stress.

Finally, as stated earlier in this section regarding job performance, we distinguish the performance of PMs by *IP* and *GP*. We thus hypothesize:

**H4:** The creator of techno-stress is negatively related to the PM's performance.

Finally, regarding role stress, we hypothesize that

**H5:** Role stress is negatively related to the PM's performance.

Our research model, described in figure 3, proposes that consistent with the relations between *technostress creator*, *role stress*, and *performance of proximity manager* described in figure 2

## **Method and Data Collection**

We used the questionnaire methodology to collect data and test our research model. The data were collected through questionnaires distributed to the PMs (managers or team managers) of organizations that extensively use ICT to perform their professional tasks. In our questionnaire, we asked all respondents what types of ICT they use. To maintain anonymity of respondents' information, we asked respondents questions on company size and type of business sector but avoided asking questions on their name and the name of the company (we make exceptions wherein people have accepted that we quote their company and the position occupied).

Incomplete responses were removed from the sample—for example, we reject questionnaires with missing important information (e.g., type of business sector, gender, or seniority). We asked respondents that “In general, do you feel a form of burnout at work? If so, is this exhaustion related to ICT?” Responses from individuals who did not fit the criteria in the sample were excluded, that is, responses that do not include the reference to the link between work exhaustion and ICT use, since we are working on the harmful side of techno-stress associated with the use of ICT. All items were measured on a five-point Likert scale, where “1” means “I totally disagree” and 5 means “I totally agree.”

Based on the reviewed literature and hypotheses, we established the elements for the construction of items. Following Tarafdar (2008), we develop the techno-stress creator items based on 27 items. Role stress items were derived from Tarafdar's (2011) concepts of role ambiguity, role overload, and role conflict. PM performance items were based on the amount of work (Gilboa et al., 2008), quality of work (Ones et al., 1996), presence, interpersonal relationship (Lu et al., 2010), and knowledge sharing (Tarafdar, 2007).

An online link to the questionnaire was attached to the e-mail invitation, reminding participants of anonymity and voluntary participation. A reminder email was sent a few days after the initial invitation in order to increase the response rate.

Our database included French, Canadian, Moroccan, and Chinese respondents. The questionnaire in French was submitted to different managers in France, Canada, and Morocco. Among the respondents, we included audit managers from the People's Bank in Morocco, insurance managers at the MMA in France, and a manager at the Atomic Energy Commission in Canada. We received answers from managers in the legal field as well (senior partner in law firms.) and telecommunications. The form in English was submitted to various Chinese managers in the fields of trade, banking, and tourism. Table 1 shows the respondents' data.

[Table 1 here]

## ANALYSIS AND RESULTS

First, we consider the identification of the reliability and the validity of the variables (items) by the factor analysis method. "Factor analysis is appropriate from an exploratory point of view (exploratory factor analysis or AFE)" (Carricano et al., 2010). This method is used to describe the data in an aggregate number of factors; it also provides discriminant validity for the factors (Tarafdar et al., 2007). We estimate the reliability with Cronbach's alpha coefficient, where the objective is to check if "the statements share common notions, and if they are coherent between them" (Carricano et al., 2010). Table 2 presents the results of the factor analysis and Table 3 shows the item outcomes as well as the reliability of each variable, which is at an acceptable threshold between 0.7 and 0.9. Finally, to keep a correlated and reliable set of items, Table 4 shows the correlation matrix among different components.

[Tables 2 to 4 here]

We used the partial least squares regression approach on AMOS to test our hypothetical relationships. The T-tests for the "path" coefficients were obtained by bootstrapping, generated by 343 samples of which 318 are valid. This re-sampling, by default, allows us to provide reasonable standard estimates (Chin, 1998).

Figure 4 shows the partial least squares model and the coefficients with significance levels. To respond to the relationships between technostress creator, role stress, and PM's performance described in Figure 2, we consider that the technostress creator, role stress, and PM's performance are significantly linked. Then, role stress emphasizes that techno-stress creators influence the performance of PMs negatively when the level of role stress increases.

[Figure 4 here]

We performed a partial least squares regression model on H1, H2, H3, H4, and H5. We find that the variables techno-invasion (*CTS\_INV*), techno-complexity (*CTS\_COM*), techno-insecurity (*CTS\_INS*), and technology uncertainty (*CTS\_UNC*) have direct effects on the creator of techno-stress. On the other hand, techno-overload (*CTS\_OV*) does not directly generate techno-stress on PMs.

There exists a significant relationship between role ambiguity (*RA*) and role proximity (*RP*) on role stress; by contrast, role overload (*RO*) and role conflict (*RC*) do not directly influence

role stress. Thus, when the creator of techno-stress increases, the role stress increases. Further, relationship between the creator of techno-stress and PM's performance is not significant.

Finally, role stress is negatively related to the performance of the PM. That is, when role stress increases, the PM's performance decreases. We summarize the results in Figure 5.

[Figure 5 here]

## DISCUSSION & CONCLUSION

This study contributes to the theoretical and empirical development of techno-stress in the literature on information systems and in the business world. Theoretically, it enriches the literature on information overload while focusing on the role of PMs. We conclude that techno-stress can aggravate role stress and, thus, negatively affect PMs' performance. Empirically, an online survey was employed to test the proposed model. The validated scales in extant literature were adapted herein to formulate the questionnaire. The questionnaire comprised three main concepts: creator of techno-stress, role stress, and performance of the PM. Each of these aspects reflects a) the relationship between techno-stress factors and PM role stress and 2) the mediating effect of role stress between techno-stress and PM performance. More specifically, a thorough understanding of these two notions allows us to recognize how the factors of techno-stress manifest into negative effects on PMs. Our work is important given the lack of study on challenges faced by lower-level managers. We discuss the notion of role stress on PMs under role ambiguity and proximity. Thus, we develop the concept of role stress to highlight that creators of techno-stress negatively influence PMs' performance when the level of role stress increases. This clarification gives rise to the choice of *coping strategy*, an adaptive managerial behavior.

### *Discussion*

First, the results show us that our variables and items are useful, and the quantitative analysis allows us to test the essential assumptions.

Second, the role overload and role conflict variables have no direct link to the role stress of the PMs, perhaps because managers are individuals with responsibilities; their moderate autonomy (Kitayama & Markus, 1994) allows them more room for maneuver and fewer conflicts between time, resources, or abilities.

Finally, to answer our question "How does the creator of techno-stress influence the performance of the PM?", we seek a causal link between the creator of techno-stress and PMs' performance. The result shows that this relationship is not significant contrary to our predictions. When the creator of techno-stress increases, performance, in fact, does not necessarily decline. This result seems to confirm the double-edged feature expounded by Lei and Ngai (2014), who states that techno-stress is a work accelerator. It allows the individual to work faster and be more motivated while waiting for a reward or moral recognition. That is, not all techno-stresses are negative. Hence, each techno-stress should be evaluated differently. In our case, the creator of techno-stress did not directly influence PMs' performance, but role stress did mediate the influence of the creator of techno-stress on the PM.

## Conclusion

ICTs trigger unexpected organizational and individual lifestyle changes. Our survey shows that techno-stress is a manifestation of an undesirable phenomenon caused by the excessive use of ICT in the workplace. Identifying the five creators of techno-stress associated with PMs shows that the management of the ICT portfolio is increasingly temporal, urgent, and stressful. We examined this phenomenon to understand the harmful side of ICT. Such analyses allow us to propose solutions as well to counter these negative effects. Our quantitative study, therefore, has both theoretical and empirical contributions that expand the scope for more qualitative studies.

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Table 1. Demographic samples.

Panel A : Genre

|       | Workforce | Pourcentage Valide |
|-------|-----------|--------------------|
| Man   | 171       | 55,7               |
| woman | 141       | 44,3               |
| Total | 318       | 100,0              |

Panel B: Age of respondent

|                         | Workforce | Pourcentage Valide |
|-------------------------|-----------|--------------------|
| - 25 years              | 41        | 12,9               |
| Between 25 years and 35 | 70        | 22,0               |
| Between 35 years and 50 | 144       | 45,3               |
| + 50 years              | 63        | 19,8               |
| Total                   | 318       | 100,0              |

Panel C: Respondent's level of education

|                      | Workforce | Pourcentage Valide |
|----------------------|-----------|--------------------|
| No diploma           | 44        | 13,8               |
| Bachelor's / College | 106       | 33,3               |
| BTS/IUT              | 121       | 38,1               |
| /Certificat/Licence  | 47        | 14,8               |
| Master and more      | 318       | 100,0              |
| Total                |           |                    |

Panel D: Seniority of the respondent

|  | Workforce | Pourcentage Valide |
|--|-----------|--------------------|
|  |           |                    |

|                             |     |       |
|-----------------------------|-----|-------|
| -1 year                     | 73  | 23,0  |
| Between 1 year and 2 years  | 129 | 40,5  |
| Between 2 years and 5 years | 73  | 23,0  |
| + 5 years                   | 43  | 13,5  |
| Total                       | 318 | 100,0 |

Panel E : Respondent's activity area

|                                       | Workforce | Pourcentage Valide |
|---------------------------------------|-----------|--------------------|
| Industry                              | 114       | 35,8               |
| Trade                                 | 15        | 4,7                |
| Telecommunication                     | 68        | 21,4               |
| Bank / Insurance / Financial Services | 20        | 6,3                |
| data processing                       | 15        | 4,7                |
| Hospitality and Tourism               | 35        | 11,0               |
| Transport and logistics               | 24        | 7,5                |
| Juridic                               | 20        | 6,4                |
| Other sectors                         | 7         | 2,2                |
| Total                                 | 318       | 100,0              |

Panel F : Respondent's country

|         | Workforce | Pourcentage Valide |
|---------|-----------|--------------------|
| France  | 91        | 28,6               |
| Canada  | 70        | 22,0               |
| Morocco | 84        | 26,4               |
| China   | 73        | 23,0               |
| Total   | 318       | 100,0              |

Table 2. Component matrix.

|             |   | CTS-<br>OV | CTS-<br>INV | CTS-<br>COM | CTS-<br>INS | CTS-<br>INC | RO | RC | RA | RC | IP | TP |
|-------------|---|------------|-------------|-------------|-------------|-------------|----|----|----|----|----|----|
| CTS-<br>OV  | 1 | 0.653      |             |             |             |             |    |    |    |    |    |    |
|             | 2 | 0.621      |             |             |             |             |    |    |    |    |    |    |
|             | 3 | 0.699      |             |             |             |             |    |    |    |    |    |    |
|             | 4 | 0.746      |             |             |             |             |    |    |    |    |    |    |
|             | 5 | 0.768      |             |             |             |             |    |    |    |    |    |    |
|             | 6 | 0.616      |             |             |             |             |    |    |    |    |    |    |
| CTS-<br>INV | 7 |            | 0.608       |             |             |             |    |    |    |    |    |    |
|             | 8 |            | 0.774       |             |             |             |    |    |    |    |    |    |
|             | 9 |            | 0.759       |             |             |             |    |    |    |    |    |    |
|             | 1 |            | 0.733       |             |             |             |    |    |    |    |    |    |
|             | 0 |            | 0.622       |             |             |             |    |    |    |    |    |    |
|             | 1 |            |             |             |             |             |    |    |    |    |    |    |
| CTS-<br>COM | 1 |            |             | 0.773       |             |             |    |    |    |    |    |    |
|             | 2 |            |             | 0.569       |             |             |    |    |    |    |    |    |
|             | 1 |            |             | 0.704       |             |             |    |    |    |    |    |    |
|             | 3 |            |             | 0.742       |             |             |    |    |    |    |    |    |
|             | 1 |            |             | 0.597       |             |             |    |    |    |    |    |    |
|             | 4 |            |             | 0.607       |             |             |    |    |    |    |    |    |
|             | 1 |            |             |             |             |             |    |    |    |    |    |    |
|             | 5 |            |             |             |             |             |    |    |    |    |    |    |
|             | 1 |            |             |             |             |             |    |    |    |    |    |    |
| 6           |   |            |             |             |             |             |    |    |    |    |    |    |
| 1           |   |            |             |             |             |             |    |    |    |    |    |    |
| 7           |   |            |             |             |             |             |    |    |    |    |    |    |

|         |      |  |        |  |
|---------|------|--|--------|--|
| CTS-INS | 1    |  | 0.441  |  |
|         | 8    |  | 0.587  |  |
|         | 1    |  | 0.581  |  |
|         | 9    |  | 0.503  |  |
|         | 2    |  | 0.642  |  |
|         | 0    |  |        |  |
|         | 2    |  |        |  |
|         | 1    |  |        |  |
|         | 2    |  |        |  |
|         | 2    |  |        |  |
| CTS-UNC | 2    |  | 0.600  |  |
|         | 3    |  | 0.410. |  |
|         | 2    |  | 0.764  |  |
|         | 4    |  | 0.807  |  |
|         | 2    |  | 0.751  |  |
|         | 5    |  |        |  |
|         | 2    |  |        |  |
|         | 6    |  |        |  |
| RO      | 2    |  | 0.86   |  |
|         | 8    |  | 5      |  |
|         | 2    |  | 0.84   |  |
|         | 9    |  | 7      |  |
|         | 3    |  | 0.91   |  |
|         | 0    |  | 8      |  |
|         | 3    |  | 0.84   |  |
|         | 1    |  | 3      |  |
|         | 3    |  | 0.86   |  |
|         | 2    |  | 5      |  |
| 3       | 0.84 |  |        |  |
| 3       | 1    |  |        |  |

|    |  |  |   |                         |
|----|--|--|---|-------------------------|
| RC | 3<br>3<br>3<br>4<br>3<br>5<br>3<br>6<br>3<br>7   |  | 0.81<br>5<br>0.85<br>8<br>0.81<br>7<br>0.89<br>1<br>0.89<br>1   |                         |
| RA | 3<br>8<br>3<br>9<br>4<br>0<br>4<br>1<br>4<br>2<br>4<br>3<br>4<br>4<br>4<br>5<br>4<br>6 |  | 0.60<br>0<br>0.83<br>3<br>0.82<br>9<br>0.86<br>0<br>0.83<br>8<br>0.75<br>2<br>0.75<br>9<br>0.74<br>9<br>0.80<br>5 |                         |
| RP | 4<br>7<br>4<br>8   |  |   | 0.83<br>5<br>0.87<br>9. |

|    |   |  |  |  |
|----|---|--|--|--|
|    | 4<br>9<br>5<br>0<br>5<br>1                                    |  | 0.83<br>8<br>0.82<br>6<br>0.83<br>6              |  |
| IP | 5<br>2<br>5<br>3<br>5<br>4<br>5<br>5                          |  | 0.83<br>9<br>0.84<br>6<br>0.85<br>1<br>0.83<br>0 |  |
| GP | 5<br>6<br>5<br>7<br>5<br>8<br>5<br>9<br>9<br>6<br>0<br>6<br>1 |  |  | 0.83<br>9<br>0.83<br>9<br>0.76<br>5<br>0.91<br>3<br>0.92<br>6<br>0.75<br>6 |

Table 3. Item development and evaluation of the reliability of the variables.

| Item                              | Item description   | Average | Standard deviation |
|-----------------------------------|--|---------|--------------------|
| Creator of techno-stress (Item 1) | Techno-overload (CTS-OV) (Tarafdar, 2008)<br>Reliability :0.907  | 25.242  | 2.860              |
|                                   | Techno-Invasion (CTS-INV) (Tarafdar, 2008)<br>Reliability :0.746 | 21.396  | 1.907              |
|                                   | Techno-Complex (CTS-COM) (Tarafdar, 2008)<br>Reliability :0.899  | 25.492  | 2.644              |

|                      |  |  |        |       |
|----------------------|--|--|--------|-------|
| Role stress (Item 2) | Techno-Insecurity (CTS-INS) (Tarafdar, 2008)<br>Reliability:0.790  | 18) I feel a constant threat to my job security because of new technologies.<br>19) I need to constantly update my skills to avoid being replaced.<br>20) I am threatened by colleagues with new technological skills.<br>21) I do not share my knowledge with my colleagues for fear of being replaced.<br>22) I think there is less sharing of knowledge between colleagues, for fear of being replaced.   | 21.037 | 2.704 |
|                      | Techno-Uncertainty (CTS-UNC) (Tarafdar, 2008)<br>Reliability:0.872 | 23) There are always new developments in the technologies we use in our organization.<br>24) There are constant changes in the software of our organization.<br>25) There are constant changes in the computer hardware of our organization.<br>26) There are frequent upgrades in the computer networks of our organization.<br>27) There is always a TIC malfunction constraint (the software or program does not work. *  | 20.653 | 3.298 |
|                      | Role overload (RO) (Rizzo, 1970)<br>Reliability:0.931              | 28) I have to take work at home at night or on weekends.<br>29) The requests for quality work done on me are unreasonable.<br>30) I spend too much time at unimportant meetings that keep me away from my job.<br>31) I am responsible for an almost unmanageable number of projects or missions at the same time.<br>32) I just have more work to do than can be done in an ordinary day.<br>33) I feel that I just do not have the time to take an occasional break. | 25.926 | 3.297 |
|                      | Role conflict (RC) (Rizzo, 1970)<br>Reliability:0.898              | 34) I am working on unnecessary tasks or projects.<br>35) I find myself in the middle of conflicts between my supervisors and my subordinates.<br>36) The formal chain of command is not respected.<br>37) I do things at work that are accepted by one person and not by others.<br>38) I receive conflicting requests from two or more people.   | 22.266 | 3.055 |

|                                  |  |   |        |       |
|----------------------------------|--|---|--------|-------|
|                                  | Role ambiguity<br>(RA)<br>( <i>Tarafdar, 2011</i> )<br>Reliability:<br>0.920   | 39) My tasks and work goals are not clear to me.<br>40) My assigned tasks are sometimes too difficult and / or complex.<br>41) I do not have the authority to exercise my professional responsibilities.<br>42) The tasks seem to become increasingly complex.<br>43) I do not completely understand what is expected of me.<br>44) The organization expects more from me than what my abilities can provide.<br>45) I do not understand the role of my work in achieving overall organizational goals.<br>46) I do not have enough training and/or experience to properly perform my duties. | 37.585 | 4.113 |
|                                  | Role proximity<br>(RP)<br>( <i>Delaye, 2010</i> )<br>Reliability:<br>0.896   | 47) I need to be in touch all the time. *<br>48) I have permanent decision making. *<br>49) I play the role of transmission channel between the strategy and the technical area. *<br>50) I must be listening to people on my team and looking for the consensus and harmony of my team. *<br>51) I must always have a growing attitude to taking responsibility. *   | 19.873 | 3.497 |
| Performance du manager. (Item 3) | IP<br>( <i>Gilboa et al., 2008</i> )<br>( <i>Viswesvaran et al., 1996</i> )<br>( <i>Lu et al., 2010</i> )<br>Reliability:0.860 | 52) These new ICTs help improve my work productivity.<br>53) These new technologies give me the motivation to go to work every day.<br>54) This technology serves and maintains the technical core of my team's function.<br>55) These new ICTs help my team make fewer mistakes.   | 16.526 | 2.704 |

|  |   |   |        |       |
|--|---|---|--------|-------|
|  | <p>GP<br/>Reliability:0.915<br/>(<i>Gilboa et al., 2008</i>)<br/>(<i>Viswesvaran et al., 1996</i>)<br/>(<i>Lu et al., 2010</i>)<br/>(<i>Tarafdar, 2007</i>)</p> | <p>56) These new ICTs help improve the productivity of my team.<br/>57) This technology helps my team identify innovative ways to do my job.<br/>58) This technology serves and maintains the technical core of my team's function.<br/>59) These new ICTs help my team make fewer mistakes.<br/>60) These new technologies give my team members more motivation to go to work every day.<br/>61) These new technologies allow us more sharing of knowledge between colleagues.</p> | 25.136 | 3.685 |
|--|---|---|--------|-------|

Note: \* indicates that the factors adjust to the context of the PM.

Table 4. Correlation matrix between different components.

| CTS_OV  | CTS_INV | CTS_COM | CTS_INS | CTS_INC | RP     | RA     | RO     | RC     | PDG  | PI    |   |
|---------|---------|---------|---------|---------|--------|--------|--------|--------|------|-------|---|
| CTS_OV  | 1       |         |         |         |        |        |        |        |      |       |   |
| CTS_INV | .159**  | 1       |         |         |        |        |        |        |      |       |   |
| CTS_COM | .058    | .032    | 1       |         |        |        |        |        |      |       |   |
| CTS_INS | .102    | .177**  | .150**  | 1       |        |        |        |        |      |       |   |
| CTS_INC | .165**  | .178**  | -.004   | .072    | 1      |        |        |        |      |       |   |
| RP      | .904**  | .173**  | .148**  | .187**  | .211** | 1      |        |        |      |       |   |
| RA      | .785**  | .194**  | .118*   | .203**  | .176** | .802** | 1      |        |      |       |   |
| RO      | .084    | .046    | .180**  | .132*   | .193** | .222** | .159** | 1      |      |       |   |
| RC      | .060    | .051    | .039    | .130*   | .139** | .130*  | .121*  | .210** | 1    |       |   |
| GP      | -.011   | .014    | .012    | .063    | .040   | -.045  | -.056  | -.015  | .064 | 1     |   |
| IP      | .008    | -.002   | -.075   | .045    | .021   | -.013  | -.050  | -.041  | .032 | .136* | 1 |

Note: \*\*  $p < 0.05$ ; \*  $p < 0.10$ ; based on one-tailed  $t$ -test.

Table 5. Hypotheses results.

|                |      |                       | Coefficient | Hypothesis | Result  |
|----------------|------|-----------------------|-------------|------------|---------|
| Role stress    | <--- | Techno-stress creator | 1.510***    | H3         | Valid   |
| PM performance | <--- | Techno-stress creator | 3.035***    | H4         | Invalid |
| PM performance | <--- | Role stress           | -2.056***   | H5         | Valid   |
| CTS_OV         | <--- | Techno-stress creator |             | H1         | Invalid |
| CTS_INV        | <--- | Techno-stress creator | .893***     |            | Valid   |
| CTS_COM        | <--- | Techno-stress creator | .844***     |            | Valid   |
| CTS_INS        | <--- | Techno-stress creator | .901***     |            | Valid   |
| CTS_UNC        | <--- | Techno-stress creator | .891***     |            | Valid   |
| GP             | <--- | PM performance        |             |            |         |
| IP             | <--- | PM performance        |             |            |         |
| RA             | <--- | Role stress           | .872***     | H2c        | Valid   |
| RP             | <--- | Role stress           | .944***     | H2d        | Valid   |
| RO             | <--- | Role stress           |             | H2a        | Invalid |
| RC             | <--- | Role stress           |             | Hb2        | Invalid |

Note: Standardized path coefficients, factor loadings, and significance values are shown. \*\*\*  $p < 0.01$ ; \*\*  $p < 0.05$ .

Figure 1. Double effects of techno-stress on the PM.

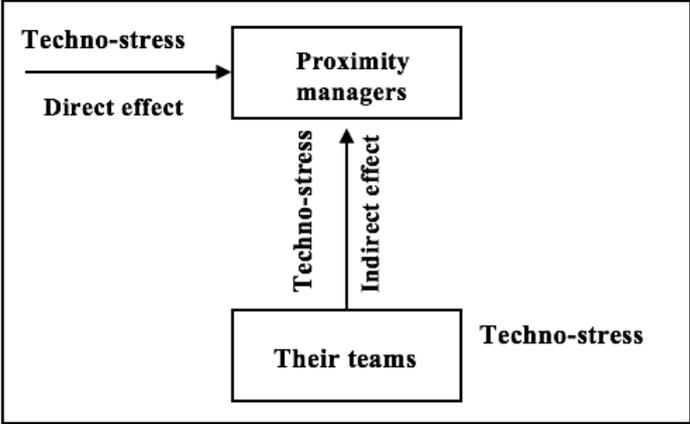


Figure 2. Research design: Technostress creator, role stress, and performance of proximity manager.

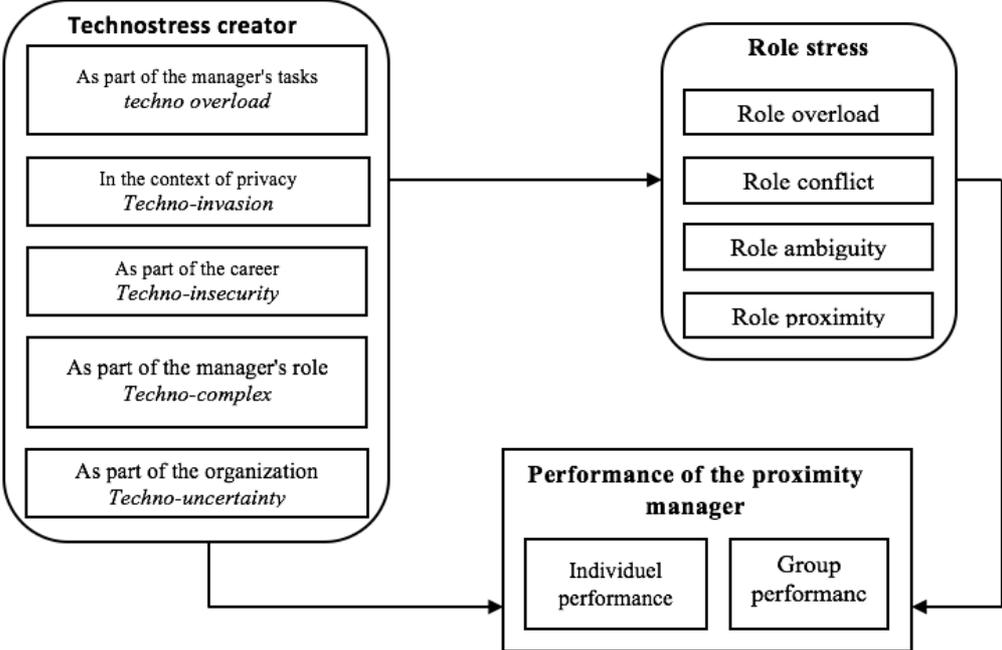
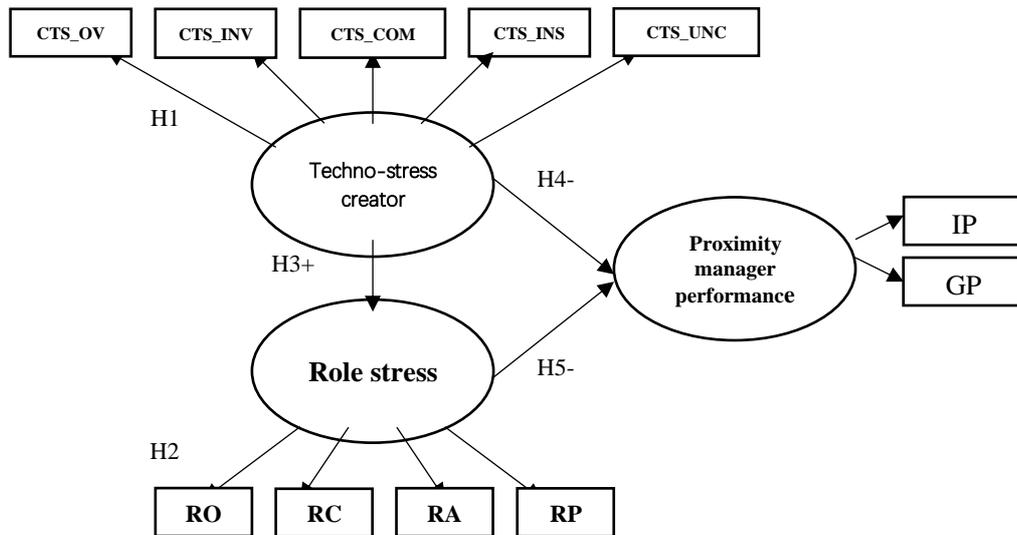


Figure 3. Research model.



Note: Techno-overload (*CTS\_OV*); Techno-invasion (*CTS\_INV*); Techno-complex (*CTS\_COM*); Techno-insecurity (*CTS\_INS*); Techno-uncertainty (*CTS\_UNC*); Role overload (*RO*); Role conflict (*RC*); Role ambiguity (*RA*); Role proximity (*RP*); Individual performance (*IP*); and Group performance (*GP*)

Figure 4. Result of the partial least squares regression analysis: Coefficients with levels of significance.

