M@RSOUIN
Môle Armoricain de Recherche sur la SOciété de l'information et des Usages d'INternet

CAHIER DE RECHERCHE.
April 2007 N° 8-2007

Are employees really satisfied with ICT?

Nathalie Colombier
Ludivine Martin
Thierry Pénard[1]

CREM, M@rsouin-University Rennes 1-CNRS.

1: contacts for this article.

Thierry.Penard@univ-rennes1.fr

ludivine.martin@univ-rennes1.fr

nathalie.colombier@univ-rennes1.fr

http://www.marsouin.org

We would like to thank the INSEE for providing us with data from the EPCV 2005. We would also like to thank the organizers and participants of the *Doctoriales du GDR TIC and Société 2007* for their suggestions.

ABSTRACT

The diffusion of Information and Communication Technologies (ICT) within firms induces organizational changes which modify employee perceptions of working conditions. This article aims to evaluate the effects of the use of cell phones, computers and the Internet on job satisfaction, and especially to distinguish between direct effects (due to ICT) and indirect effects (due to ICT combined with organizational changes). We have used a survey conducted by the INSEE (French national statistic institute) in October 2005 on standards of living in French households. Econometric results show that these three technologies have complementary and globally positive impacts on job satisfaction, especially the computer. As for the cell phone, it has ambivalent effects, as it is also a source of stress for the employee. Finally, our results show the existence of direct and indirect effects of ICT, effects which can sometimes cancel out or reinforce each other.

KEY WORDS: ICT, JOB SATISFACTION, ORGANIZATIONAL CHANGES.

INTRODUCTION.

The diffusion of information and communication technologies (ICT) in firms over recent years has been accompanied by numerous organizational changes (just in time production, total quality management, job rotation, team work &). Investments in ICT often trigger or speed up the reorganization process. ICT as a tool for processing information and managing organizations contributes to the performance of the firm. Several empirical studies have shown that the use of ICT combined with more decentralized organization can lead to gains in productivity (Brynjolfsson and Hitt, 2000; Black and Lynch, 2001; Bresnahan, Brynjolfsson and Hitt, 2002; Bertschek and Kaiser, 2004).

The diffusion of ICT and the organizational changes that they induce also modify the perception employees have of their working conditions. By transforming the content and organization of work, ICT have repercussions on employee motivation and monitoring and incentives schemes available to the employer. Do employees who use ICT benefit from greater job satisfaction?

Salary is often considered the determining factor of job satisfaction. However, job satisfaction depends on other elements such as interest for work (intrinsic motivation), promotion opportunities or identification with the firm (Clark, 2005, Akerlof and Kranton, 2005). From this standpoint, ICT has ambivalent effects: the employee can see ICT as a means of improving work (more autonomy, more interesting work), but technologies can also increase pressure and stress.

The aim of this article is precisely to measure the impact of ICT on several aspects of job satisfaction (job enrichment, work under pressure, responsibility for handling incidents, promotion opportunities), while distinguishing, on the one hand, between the effects of using a computer, the Internet or a cell phone, and, on the other hand, breaking down the direct (inherent in these technologies) and indirect effects (ICT combined with organizational changes). To do this, we used a study by the INSEE (French national statistics institute) on the living conditions of French households carried out in October 2005. Our results demonstrate that these three technologies have complementary positive effects on job satisfaction, especially the use of computers. Cell phones are, however, also a source of stress for employees. Furthermore, our results clearly show the existence of direct and indirect effects of ICT. By breaking down these effects we can demonstrate that, for example in the case of cell phones, stress factors are exclusively caused by indirect effects (use of a cell phone combined with flexible hours). Our study completes existing literature on the impact of ICT on working conditions (Askenazy and Caroli, 2006). Its originality consists in seeking to distinguish between inherent effects and effects combining the organization of work with the use of a cell phone, computer and the Internet on job satisfaction.

In the first part we will discuss the potential effects of ICT on working conditions. In the second part we will present the conceptual framework used to separate the inherent effects of ICT and those linked to organizational changes. We will describe, in the third part, the methodology used. Our results are presented in a fourth part. The final part summarizes key results and lists opportunities for future research.

1 PREVIOUS STUDIES ON ICT AND ORGANIZATIONAL CHANGES.

Existing empirical studies diverge as to the effects of corporate investments in ICT on working conditions. Part of this work points to job enrichment, while other research insists on the increased pace of work and stress endured by employees.

Some studies underline, in fact, that ICT provide firms with greater organizational flexibility and facilitate the delegation of decision-making to lower levels in the hierarchy (Aghion and Tirole, 1997, Brynjolfsson and Hitt, 2000). The evolution towards more

horizontal organizations requires, but also enables, better qualification and versatility of the workforce (Lindbeck and Snower, 1996, 2000, Behaghel, Caroli and Walkowiak, 2007). Employees who use ICT should, in theory, be given less repetitive tasks.

ICT and the organizational changes they induce also tend to provide employees with greater autonomy and responsibilities (Caroli, Greenan and Guellec, 2001). Employees have more latitude in organizing their work. These transformations can make their work more enriching in that they are not subject to permanent monitoring by a hierarchical superior and can more easily select their hours and tasks& (Gant, Ichniowski and Shaw, 2002).

Other studies, on the contrary, insist on the fact that new technologies, and in particular computers, can be used to more precisely codify tasks, automate certain production or management processes and lead to greater work standardization or Taylorism (Autor, Levy, and Murnane, 2003, Spitz-Oener, 2006). In this case, the effect of ICT is to restrict professional competencies (Askenazy and Caroli, 2002).

Moreover, ICT, by giving employees more responsibilities and autonomy, can cause stress and, in this way, reduce the quality of working life. A more independent employee must manage his tasks alone, with even more pressure to meet deadlines or quality standards. He also risks becoming more isolated when it comes to dealing with incidents or unexpected problems in his work.

Furthermore, the freedom to choose working hours can have the perverse effect of blurring the boundaries between professional and private life. The employee can be reached by his firm at any time via his cell phone or the Internet. ICT therefore create new forms of indirect monitoring or control (by being reachable at all times) of employees that replace traditional monitoring by a hierarchical superior (Acemoglu and Newman, 2002)[1].

ICT can also lead to modifications in the contractual relations between employee and employer. The diffusion of ICT, by facilitating employee s multitasking and flexibility, makes contracts more incomplete. Indeed, since ICT make work more autonomous and flexible, contracts no longer need to specify precisely the employee s hours, the exact nature of his job or his possibilities of promotion. This increased contractual incompleteness could lead to opportunistic behaviour on either the part of the employer or the employee and could have ambiguous effects on job satisfaction. Moral hazard should be in favour of the employee if he has significant negotiation leverage (which is the case of the most skilled workers). If the opposite is true, the employer could take advantage of all the gains linked to the use of ICT within the firm. In this case, the employee would not receive any benefits in exchange (regardless of any initial promises).

While studies diverge as to the impact of the use of ICT on working conditions, this is because it is often difficult to distinguish between the inherent effects of ICT and those linked to organizational changes that accompany investments in ICT[2]. This problem is easy to discern in the work of Askenazy and Caroli (2006). They have tried to measure the impact of new practices in the organization of work (work flexibility, quality management, job rotation, creation of discussion groups) and the use of ICT on working conditions, particularly mental strains perceived by workers and the risk of work-related accidents. They show that new ways of working, which often require the use of ICT, lead to deterioration in working conditions and, in particular, to higher risks of accidents. On the other hand, the use of ICT in itself seems to counterbalance these effects by reducing employee isolation and improving safety conditions. The authors therefore conclude that

the development of ICT may at least partly offset the negative effects of innovative workplace practices on working conditions and health and safety at work .

[1] ICT therefore tend to replace means of monitoring employees based on input (physical presence in the firm, direct or visual supervision by a superior) with means based on output (meeting objectives and deadlines, response to a request&).

[2] These effects are all the more difficult to distinguish as the link between technological and organizational changes differs according to the sector and size of the firm.

In the following section, we will present the conceptual framework that we propose to use in order to empirically identify the direct and indirect effects of ICT on job satisfaction.

2 THEORETICAL FRAMEWORK.

Each employee has a position or job whose characteristics depend, among other things, on his firm s investments in ICT (computer equipment, Internet access, cell phones&), as well as organizational changes implemented in recent years. Figure 1 illustrates the relationship between the characteristics of the job, on the one hand, and decisions leading to organizational changes and investments in ICT, on the other hand. Furthermore, these two types of decisions, as we have seen earlier, interact with each other. Therefore, effective use of ICT often requires rethinking the organization of the firm and, in return, these reorganizations stimulate the use of ICT.

According to Figure 1, ICT will have both direct effects on job satisfaction, but also indirect effects (through the organization of work and the characteristics of the employee s job). Let us first consider the direct effects. The more the firm invests in ICT, the more the employees are encouraged to use these technologies to get information or communicate with others[3]. These technologies help save time when searching or transmitting information. They can therefore improve working conditions (better access to information, greater autonomy&). However, these means of communication replace face-to-face communication and reduce social interaction between employees and colleagues, superiors or contacts outside the firm (Nie, Hilligus and Erbring, 2002). Therefore the effects are perhaps ambivalent concerning perceived job satisfaction. Moreover, these technologies can represent an intrusion in the employee s private life (work performed at home, in the evening or on weekends).

Besides the direct effect of ICT on job satisfaction (linked essentially to changes induced in means of communication and access to information by employees), Figure 1 enables us to figure out the indirect effect of ICT through the organization and characteristics of the employee s position (which are linked to organizational and technological changes adopted in the firm). If, for example, the use of ICT can make employees more autonomous, then the firm can decide to set up more team work and more flexible organization of work, which will have repercussions on employee satisfaction. This is an indirect effect. The challenge of this study lies in isolating these direct and indirect effects.

In the following section, we will present the data and empirical methodology used to measure the different effects of ICT on job satisfaction.

3 DATA AND METHODOLOGY.

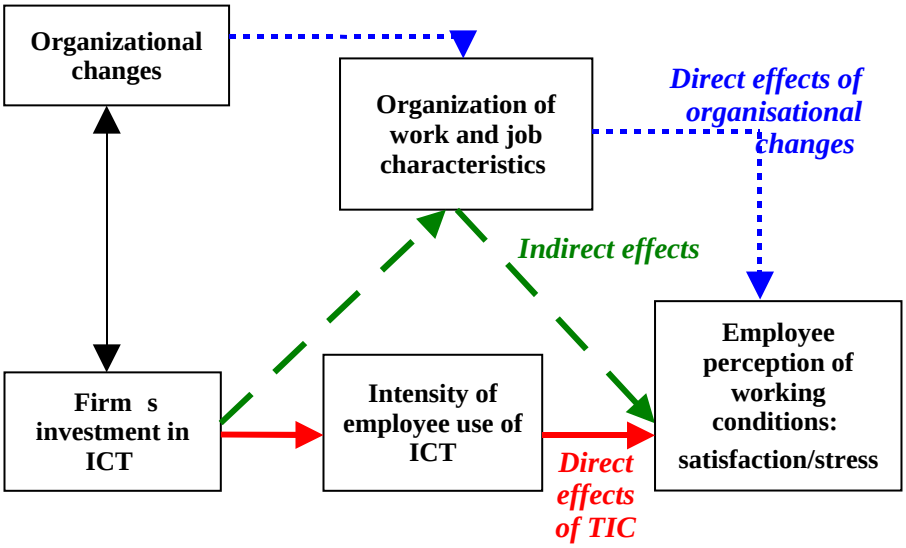
1.1 Data.

The database used is from the *Enquête Permanente sur les Conditions de Vie des ménages*, a study on French living conditions conducted by the INSEE since 1995 and, more specifically, the part carried out in October 2005. This permanent study system (referred to as EPCV) consists in 3 annual surveys that are used to obtain social indicators on three themes: housing conditions, income conditions, working conditions. These surveys are carried out using a sample of 5,000 representative households in continental France.

Each survey has a fixed section referred to as social indicators and a variable part used to occasionally study a specific social issue linked to living conditions.

[3] However, one can belong to a firm deeply involved in ICT without being a regular user, or be an intensive user in a firm that has only rudimentary ICT equipment. But, we can expect a positive correlation between corporate investment in ICT and intensity of ICT use by employees.

Figure 1 : Direct and indirect impacts of the dissemination of ICT on job satisfaction.



A series of questions devoted to information and communication technologies constituted the variable part of the October 2005 survey. Its aim was to study the dissemination and use of computers, cell phones and the Internet in households and the workplace. Since our goal was to analyze the impact of ICT on job satisfaction, we focused on the working population aged 16 to 65 and, more specifically, on private and public sector employees for whom we had information on working conditions[4]. The sample thus defined was made up of 2,456 individuals, the characteristics of which are presented in Table 1.

The sample includes as many men as women (48.3 %/51.7 %). The employees are on average 40 years old and almost half are married (48.7 %). Concerning human capital, 33% of employees have a graduate or a post-graduate degree against 51.7% with a qualification lower or equivalent to the one obtained at secondary school. In terms of socio-professional group, 23.8% of the employees surveyed are blue collar workers, 60.5% are white collar workers and technicians and 15.6% are engineers and managers. Moreover, Table 1 describes the characteristics of the ICT users in a professional context. We consider that the employee is an ICT user at the workplace if he has declared at least using a computer, a cell phone or the Internet (73.2% of the sample). ICT users at work differ from non users on various individual characteristics. ICT users are younger and have, on average, a higher level of qualification. 20.6% of employees in the sample have a post-graduate degree, but 26% for the ICT users (and 35% for the Internet users). Table 1 exhibits significant differences between ICT users and non users with respect to occupational jobs: 20.2% of ICT users are managers or engineers (28.7% for Internet users). Finally, concerning the firms' characteristics, 18% and 37% of the whole sample works in services or in education, health and administration, but these proportions are higher on the sample of Internet users.

[4]Because self-employed workers could not answer part of the questionnaire concerning working conditions they were excluded from the sample. Moreover, in light of their weak representation and specific working conditions, farm workers (5 individuals) were not included in this study.

Table 1. Employee characteristics[i]

Variable	Global sample		ICT users		Computer users		Internet users		Cell phone users	
Gender (Male)	48.33%	(0.50)	49.36%	(0.50)	46.33%	(0.50)	48.34%	(0.50)	65.53%	(0.48)
Age	40.27	(10.8)	39.75	(10.6)	39.81	(10.6)	39.28	(10.7)	39.78	(10)
Marital status										
Single	38.76%	(0.49)	39.97%	(0.49)	40.34%	(0.49)	42.45%	(0.49)	36.71%	(0.48)
Married	48.74%	(0.50)	47.86%	(0.50)	47.81%	(0.50)	45.67%	(0.50)	51.58%	(0.50)
Widowed	2.00%	(0.14)	1.72%	(0.13)	1.61%	(0.13)	1.57%	(0.12)	1.32%	(0.11)
Divorced	10.50%	(0.31)	10.45%	(0.31)	10.24%	(0.30)	10.31%	(0.30)	10.39%	(0.31)
Education										
No diploma	2.89%	(0.17)	0.94%	(0.10)	0.32%	(0.06)	0.09%	(0.03)	1.84%	(0.13)
Secondary school	48.86%	(0.50)	40.69%	(0.49)	36.34%	(0.48)	29.28%	(0.46)	45.26%	(0.50)
High school	15.27%	(0.36)	16.95%	(0.38)	17.40%	(0.38)	16.85%	(0.37)	14.34%	(0.35)
Graduate degree	12.34%	(0.33)	15.29%	(0.36)	16.62%	(0.37)	17.96%	(0.38)	11.58%	(0.32)
Post-graduate degree	20.64%	(0.40)	26.13%	(0.44)	29.32%	(0.46)	35.82%	(0.48)	26.97%	(0.44)
Income										
Monthly income[ii]	6.48	(2.48)	6.97	(2.41)	7.14	(2.40)	7.48	(2.49)	7.41	(2.67)
Socio-professional group										
Blue collar Worker	23.86%	(0.43)	16.51%	(0.37)	11.79%	(0.32)	7.00%	(0.26)	22.11%	(0.42)
White collar workers and technicians	60.51%	(0.49)	63.26%	(0.48)	65.98%	(0.47)	64.27%	(0.48)	51.58%	(0.50)
Engineers and managers	15.63%	(0.36)	20.23%	(0.40)	22.23%	(0.42)	28.73%	(0.45)	26.32%	(0.44)
Characteristics of work										
Seniority (in years)	10.46	(10.1)	10.45	(10.1)	10.81	(10.4)	10.32	(10.2)	9.72	(9.26)
Hours worked per week	36.38	(9.69)	37.30	(9.62)	37.41	(9.32)	37.98	(9.55)	40.21	(11.2)
Characteristics of the firm										
Size of the firm[iii]	3.98	(1.71)	4.10	(1.70)	4.23	(1.70)	4.24	(1.70)	3.88	(1.68)
Industry	26.46%	(0.44)	25,33%	(0.43)	24,19%	(0.43)	23,06%	(0.42)	30,08%	(0.44)
Retailing	18.34%	(0.39)	18,99%	(0.39)	18,39%	(0.39)	16,51%	(0.37)	21,37%	(0.41)
Services	17.99%	(0.38)	17,32%	(0.38)	17,23%	(0.38)	20,21%	(0.40)	19,66%	(0.40)
Education, health, administration	37.26%	(0.48)	38,36%	(0.49)	40,19%	(0.49)	40,22%	(0.49)	28,89%	(0.45)

Notes : [i] Standard deviations in parentheses ; [ii] Monthly income in Euros in classes : 1) 0-399; 2) 400-599; 3) 600-799; 4) 800-999; 5) 1000-1199; 6) 1200-1499; 7) 1500-1799; 8) 1800-1999; 9) 2000-2499; 10) 2500-2999; 11) 3000-3999; 12) 4000-5999; 13) 6000-9999; 14) 10000 or + ; [iii] Number of persons working in the employee s firm: 1) 1 to 9 employees; 2) 10 to 49; 3) 50 to 99; 4) 100 to 499; 5) 500 and +.

1.2 Methodology.

The survey does not include explicit questions concerning job satisfaction or employee perception of working conditions. However, several questions touch on aspects of working conditions that can be directly perceived as factors of satisfaction or dissatisfaction. We have selected five that can influence positively or negatively job satisfaction (*cf.* Appendix 1 for a detailed description of the variables). First, **factors of satisfaction** include having an interesting job that enables to learn new things (*enriching job*) and having possibilities for promotion in the firm (*promotion opportunities)*. As for aspects of work that *a priori* have a negative effect on job satisfaction and therefore are **stress factors**, we have selected tensions caused by conflicts between quality standards and deadlines (*deadline-quality conflict*) and the need to speed up work *(need to rush)*.

A final factor was taken into consideration, but its influence remains ambiguous. This was the degree of employee autonomy, or the fact that he/she has to deal personally with incidents (*must handle incidents alone*). This factor can increase, as well as diminish, job satisfaction. Indeed, while more responsibility and autonomy can be a source of pride, it can also produce pressure in that the employee is more isolated.

Notes : [i] Standard deviations in parentheses ; [ii] Monthly income in Euros in classes : 1) 0-399; 2) 400-599; 3) 600-799; 4) 800-999; 5) 1000-1199; 6) 1200-1499; 7) 1500-1799; 8) 1800-1999; 9) 2000-2499; 10) 2500-2999; 11) 3000-3999; 12) 4000-5999; 13) 6000-9999; 14) 10000 or + ; [iii] Number of persons working in the employee s firm: 1) 1 to 9 employees; 2) 10 to 49; 3) 50 to 99; 4) 100 to 499; 5) 500 and +.

In a first phase we will try to determine if there are differences in satisfaction and stress factors between ICT users and non-users. This is in fact a naïve comparison of employee perceptions of working conditions according to whether or not they use these technologies. This comparison has its limitations as it does not take into account the heterogeneity of employees and does not enable us to monitor the environment (i.e. size of firm, its professional sector or organization) or to control for the complementary feature of these technologies (computer and Internet). To do this, we decided, in a second phase, to use Probit models with controls on the characteristics of the employee and the firm.

In the following subsection we are going to present the variables that will enable us to measure the effects of ICT and organizational changes on our five factors of satisfaction and stress.

1.3 Explanatory variables.

Although we do not have any information on the organization of the firms and any organizational changes implemented over recent years, we do have several variables concerning the characteristics of the job occupied. We have information on whether the job is repetitive or not *(non-repetitive job)* which gives us an idea of the working organization (job rotation, team work, multitasking). The survey also provides information on flexibility of working hours, which gives an idea of the flexibility of production *(flexible hours)*.

Concerning the use of ICT, we examined two measurements. The first is a simple binary measurement that indicates whether the employee uses a computer, a cell phone or the Internet for his job or not. A second, more refined, measurement concerns intensity of use of computers, email (one of the most common Internet usage in a professional context) and cell phones. These different measurements enable us to isolate the impact of different types of ICT (the computer can have a different effect than the cell phone or email) and the different types of ICT users (intensive or non-intensive ICT users).

To dissociate the direct and indirect effects of ICT linked to organizational changes on job satisfaction, we created interaction variables characteristic of the job * use of ICT . We have therefore crossed the repetitive (or non-repetitive) nature of the job and flexible hours with, on the one hand, ICT use and, on the other hand, intensity of use. These interaction variables enable us to capture the combined effect of ICT use and organization of work.

Table 2 presents the expected effects by breaking down the direct and indirect effects of ICT use and organizational changes.

Table 2: Direct and indirect effects of organizational changes and ICT.

	Variables	Description	Expected effects on job satisfaction
Direct effects	***Organization of work***	• Flexibility of working hours	Positive
		• Non-repetitive work	Positive
	ICT	• Use of ICT • Intensity of ICT use	Positive
Indirect effects	***Interaction variables***	• Flexible hours and use of ICT • Flexible hours and intensity of ICT use • Non-repetitive work and use of ICT • Non-repetitive work and intensity of ICT use	Undetermined

4 Results.

After comparing satisfaction among ICT users and non-users, we will present the results of the Probit models used to measure and dissociate the direct and indirect effects of ICT.

1.4 Naïve comparison between ICT users and non-users.

Table 3 shows differences in working conditions according to whether employees have access or not to new technologies (cell phones, computers and/or Internet), distinguishing between factors having a positive influence on satisfaction and factors that *a priori* cause mental strain and therefore dissatisfaction. The results of statistical tests highlight that access to ICT is associated with more satisfying working conditions. For example, concerning computers, the results reveal that users are on average more satisfied (85.5% of computer users feel they have an enriching job compared to 61% of non-users) and feel less stress on their job (52% of computer users say they have to rush compared to 56.3% of non-users).

While the computer and Internet tend to increase satisfaction and reduce stress, thus improving working conditions, the effect of the cell phone appears ambivalent since, although its use significantly increases satisfaction, it also increases the level of stress experienced by employees (56.3% of users feel the need to rush compared to 52.4% of non-users).

Table 3: Test of differences in averages [i]

		Global sample	Users	Non-users	Differences in averages
Computer	**Need to rush**	53.62% (0.4988)	52.06% (0.4997)	56.31% (0.4963)	-4.24%**
	Deadline-quality conflict	18.75% (0.3904)	18.27% (0.3865)	19.58% (0.3970)	-1.31%
	Must handle incidents alone	60.74% (0.4884)	67.06% (0.4702)	49.89% (0.5003)	17.17%***
	Enriching job	76.52% (0.424)	85.50% (0.3522)	61.04% (0.4879)	24.46%***
	Promotion opportunities	47.02% (0.4992)	56.10% (0.4964)	31.34% (0.4641)	24.76%***
Internet	**Need to rush**	53.62% (0.4988)	50.74% (0.5002)	55.91% (0.4967)	-5.18%**
	Deadline-quality conflict	18.75% (0.3904)	18.10% (0.3852)	19.27% (0.3945)	-1.17%
	Must handle incidents alone	60.74% (0.4884)	70.15% (0.4578)	53.27% (0.4991)	16.88%***
	Enriching job	76.52% (0.424)	89.12% (0.3115)	66.52% (0.4721)	22.60%***
	Promotion opportunities	47.02% (0.4992)	58.71% (0.4926)	37.71% (0.4848)	21%***
Cell phone	**Need to rush**	53.62% (0.4988)	56.32% (0.4963)	52.42% (0.4996)	3.9%*
	Deadline-quality conflict	18.75% (0.3904)	20.74% (0.4057)	17.86% (0.3831)	2.88%*
	Must handle incidents alone	60.74% (0.4884)	73.09% (0.4438)	55.19% (0.4974)	17.89%***
	Enriching job	76.52% (0.424)	84.34% (0.3636)	73.01% (0.4441)	11.34%***
	Promotion opportunities	47.02% (0.4992)	57.54% (0.4946)	42.25% (0.4941)	15.29%***

[i] Note: ***,**,* Difference significant between the two groups of employees at a threshold of 1%, 5% and 10%. Standard deviation provided in parentheses.

1.5 Probit models of job satisfaction and stress.

We use a Probit model that is characterized by the underlying model $U^*_i = b_i X + \varepsilon_i$, with U^*_i as the latent utility of the individual i that depends on several independent variables X and ε_i being an error distributed normally with an average of 0 and variance equal to 1. In the context of our study, U^*_i represents employee satisfaction. We cannot directly observe the satisfaction experienced. However, for each of the factors under consideration, we have a binary variable taking on the value of 1 if the individual declares his work has a given characteristic or 0 if this is not the case. Given the qualitative nature of the variables, we estimated for each factor a Probit model of maximum likelihood that enables us to explain the satisfaction experienced by the employee in his job.

1.5.1 Analysis of the global effect of ICT.

Table 4 presents the signs of the effect of ICT and organizational characteristics on the satisfaction and stress factors. Specification (1) measures the basic effect of using ICT whereas specification (2) takes into consideration the intensity of ICT uses. Both specifications do not consider the joined effects of ICT use and organizational changes (interaction variables). The complete table of econometric results is presented in Appendix 2. These two requirements enable us to capture the effect of ICT and organizational changes on job satisfaction without taking into account potential interactions between these two effects.

Table 4 : Effects of ICT and organizational changes on job satisfaction and stress factors.

	Stress						Satisfaction			
	Need to rush		Deadline-quality conflict		Must handle incidents alone		Enriching job		Promotion	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Use of computer	-		ns		ns		+		+	
Use of Internet	ns		ns		ns		+		ns	
Use of cell phone	+		ns		+		+		+	
Intensity of computer use		-		ns		ns		+		+
Intensity of email use		ns		ns		ns		ns		ns
Intensity of cell phone use		+		+		+		+		+
Flexible hours	-	-	ns	ns	+	+	+	+	+	ns
Non-repetitive job	-	-	-	-	ns	ns	+	+	ns	ns

Variables concerning the organization of work (flexible hours and non-repetitive work) measure the effects of organizational changes. Our results emphasize that these variables are globally associated with better working conditions. In fact, executing non-repetitive tasks and/or benefiting from flexible hours tends to increase the likelihood of having an enriching job and to diminish the probability of having to rush. These organizational characteristics do not, however, produce uniform effects. Thus, having flexible hours significantly increases the probability of having to handle incidents alone, whereas non-repetitive work does not have significant impact on this factor. Conversely, the non-repetitive nature of work diminishes significantly the likelihood of having to choose between meeting deadlines or quality standards whereas flexible hours have no impact.

Concerning the use of ICT, the overall impact on job satisfaction is both positive and significant. In fact, use, as well as intensity of use, of ICT significantly increases the likelihood of having an enriching job. This result is in accordance with the predictions of Lindbeck and Snower (1996, 2000). The authors compared levels of productivity linked to employee specialization in one task with those linked to complementary tasks. They demonstrated that the adoption of ICT enables increased productivity for complementary tasks and promotes employee's versatility. Furthermore, while the use of cell phones or computers tends to significantly increase

promotion opportunities, additional use of the Internet does not.

Concerning stress factors, the results indicate that ICT have no effect on choosing between meeting quality standards or deadlines. However, the use of a computer decreases the likelihood of having to rush. It means that computerization enables to save time in the execution of tasks. This reduced pressure on the employee also explains why use of a computer makes work more enriching (saving time on certain tasks enables him to access other, more interesting, ones).

While the effect of the cell phone is the same as for other ICT concerning satisfaction, it differs for stress factors. Thus, the use, and intensity of use, of cell phones for professional purposes tends to increase the likelihood of having to rush and to handle incidents alone. This result is not surprising considering the ambivalent nature of this technology. Indeed, while the cell phone can be perceived as a sign of responsibility and recognition, it can also be seen by the employee as a means of monitoring or pressure by his superiors.

These results globally confirm those obtained through naïve comparisons, with the exception of the Internet which in our Probit models has little impact on job satisfaction factors. This is not, however, surprising since use of the Internet depends on use of a computer. Therefore, what is estimated by the Probit models is the marginal effect of using the Internet on an employee who is already a computer user. The econometric results only serve to underline that the Internet is one of the possible uses of a computer and that it contributes like other applications (nor more and no less) to improved working conditions.

We have measured the global effects of ICT and organizational changes on job satisfaction and stress factors. However, as we have indicated before, ICT and organizational changes have direct and indirect effects on job satisfaction and/or stress. We are now going to try and dissociate these two effects.

1.5.2 Breaking down the direct and indirect effects of ICT.

Table 5 sums up the results for specification (3) (ICT uses) and specification (4) (intensity of ICT uses) that both include the interaction variables enabling us to break down the effects of ICT (with respect to organizational changes) into direct and indirect effects. We have presented in this table the signs associated with these variables when they have a significant impact (Appendix 3 presents the complete econometric results).

We can observe for four of the five factors the presence of indirect effects (with the exception of enriching work) and direct effects of ICT (with the exception of deadline-quality conflict). The distinction between direct and indirect effects is therefore empirically relevant.

Concerning indirect effects, we can observe that employees are more likely to rush when cell phone use is combined with flexible hours (the cell phone does not have a significant direct effect). Similarly, conflicts between deadlines and quality standards are more frequent when work is non-repetitive and requires use of a cell phone. Finally, promotion opportunities are greater among employees with non-repetitive jobs requiring use of the Internet, whereas they are reduced for those with flexible hours and who use cell phones. We must note, however, the direct effect of cell phone use on promotion opportunities and enriching work is positive. So, the use of a cell phone is not, in itself, a factor of dissatisfaction, but rather its use combined with flexible working hours.

Furthermore, the likelihood of having to deal with incidents alone is greater for computer and cell phone users (direct effects), whereas the indirect effects are the opposite. Thus, intensive computer use (in particular the Internet) combined with flexible hours significantly diminishes the likelihood of having to handle incidents alone.

Table 5 also presents the direct effects of organizational characteristics (non-repetitive work and flexible hours) once indirect effects have been controlled (linked to ICT). Non-repetitive work and flexibility always have a positive effect on job satisfaction factors and a

negative effect on stress. Thus, the implementation of flexible hours reduces the likelihood of having to rush (direct effect) even though, when combined with the use of a cell phone, it increases pressure on the employee (indirect effect).

In the end, we can observe that the introduction of interaction variables modifies somewhat the effect of variables concerning ICT use, or intensity of use, on job satisfaction and stress factors (Table 4 *versus* Table 5). In fact, introducing interaction variables for ICT and organizational characteristics means breaking down the effect of ICT into two effects: the direct effect (inherent effect of ICT captured by variables of use or intensity of use) and the indirect effect (effect of ICT combined with organizational changes captured by interaction variables). Thus, variables of ICT use or intensity of use do not capture the global effect of ICT on satisfaction, but only part of this effect: the direct effect.

Table 5: Direct and indirect effects of ICT and organizational changes [i]

			Stress			Satisfaction	
			Need to rush	**Deadline/ quality conflict**	**Must handle incidents alone**	**Enriching work**	**Promotion**
Indirect effects	**Flexible hours**	**Computer**	ns/ns	ns/ns	ns/-	ns/ns	ns/ns
		Internet	ns/ns	ns/ns	-/ns	ns/ns	ns/ns
		Cell phone	+/+	ns/ns	+/ns	ns/ns	-/-
	Non-repetitive work	**Computer**	ns/ns	ns/ns	ns/-	ns/ns	ns/ns
		Internet	ns/ns	ns/ns	ns/ns	ns/ns	ns/+
		Cell phone	ns/ns	ns/+	ns/-	ns/ns	ns/ns
Direct effects	**Computer use/intensity**		ns/ns	ns/ns	ns/+	ns/+	ns/+
	Internet use/intensity		-/ns	ns/ns	ns/ns	ns/ns	ns/ns
	Cell phone use/intensity		ns/ns	ns/ns	+/+	+/+	+/+
	Flexible hours		-/-	ns/ns	+/+	ns/ns	ns/ns
	Non-repetitive work		-/-	-/-	+/+	+/+	ns/ns

[i] Note: ns: not significant; +: positive effect; -: negative effect. The first sign corresponds to the specification (3). The second sign corresponds to the specification (4). For example, if we consider the effect of the interaction variable of flexible hours and computer use on having to deal with incidents alone, the first result *ns* indicates a non significant impact of using a computer and benefiting from flexible hours whereas the second result - indicates a negative impact of intensive computer use combined with flexible hours on the likelihood of having to deal with incidents alone.

Table 6 summarizes the global effects obtained for each technology (see Table 4) and compares them with direct and indirect effects obtained using Probit models with interaction variables (see Table 5). To the extent the variables of use or intensity capture in one case the global effect of ICT (see Table 4) and in another case only the direct effect (see Table 5), their signs and thresholds of significance can present differences. Three different cases can be observed.

First, the inherent effect of ICT use can contribute marginally to the global effect. This is what we can observe in the effect of the computer on the need to rush. The global effect is both negative and significant, but the direct and indirect effects are not significant. These effects therefore reinforce each other to significantly reduce pressure on employees (the need to speed up work).

Second, the direct effect of ICT use or intensity of use can contribute substantially to the global effect. This is the case for the cell phone in relation to enriching work: the global effect is positive and significant, just like the direct effect, whereas the indirect effects are not significant.

Table 6: Summary of the effects of ICT [i]

			Stress			Satisfaction	
			Need to rush	**Deadline/quality conflict**	**Must handle incidents alone**	**Enriching work**	**Promotion**
Computer	**Direct effect**		ns/ns	ns/ns	ns/+	ns/+	ns/+
	Indirect effect	**Flexible hours**	ns/ns	ns/ns	ns/-	ns/ns	ns/ns
		Non-repetitive work	ns/ns	ns/ns	ns/-	ns/ns	ns/ns
	Global effect		-/-	ns/ns	ns/ns	+/+	+/+
Internet	**Direct**		-/ns	ns/ns	ns/ns	ns/ns	ns/ns
	Indirect effect	**Flexible hours**	ns/ns	ns/ns	-/ns	ns/ns	ns/ns
		Non-repetitive work	ns/ns	ns/ns	ns/ns	ns/ns	ns/+
	Global effect		ns/ns	ns/ns	ns/ns	+/ns	ns/ns
Cell phone	**Direct**		ns/ns	ns/ns	+/+	+/+	+/+
	Indirect effect	**Flexible hours**	+/+	ns/ns	+/ns	ns/ns	-/-
		Non-repetitive work	ns/ns	ns/+	ns/-	ns/ns	ns/ns
	Global effect		+/+	ns/+	+/+	+/+	+/+

[i] Note: Direct and indirect effect of ICT in Table 5 and global effect sign associated with variables of use/intensity of use in Table 4.

Finally, the breakdown can reveal opposite signs on the direct and indirect effects that cancel each other out in the global effect. Thus, let us consider the example of the impact of computer use on the likelihood of handling incidents alone. The indirect effect of this variable is negative to the extent that the variables "flexible hours*intensity of computer use" and "non-repetitive work*intensity of computer use" have negative signs, when the direct effect is positive. The indirect and direct effects therefore have opposite signs and cancel each other out in the end which explains why, without the introduction of interaction variables, the global impact is insignificant. Thanks to the breakdown of effects, we can better understand the complex interactions between ICT use and organizational changes. Therefore, intensive computer use is associated with more responsibilities (higher likelihood of handling incidents alone), but since ICT use is also accompanied by more flexible hours and less repetitive tasks and this combination reduces the likelihood of handling incidents alone, ICT globally have no effect on the handling of incidents. It is therefore crucial to examine the direct and indirect effects to analyze the impact of ICT on working conditions.

Let us consider another example: the cell phone in relation to stress factors such as having to rush and choose between meeting deadlines or quality standards. We can observe positive indirect effects, but no direct effects for the cell phone[5]. Thus the global positive effect of the cell phone on stress factors is essentially due to an indirect effect (linked to the organizational effects of the cell phone). Concerning satisfaction factors, the cell phone has a negative indirect effect on the likelihood of a promotion, but a direct positive effect. Since the global effect is positive (without introducing

[5] Indeed, variables for use and intensity of use of cell phones are not significant.

interaction variables) the direct effect overrides the indirect effect.

5 Conclusion.

The aim of this article was to examine the effects of ICT use (cell phone, computer and Internet) on job satisfaction by isolating direct and indirect effects. Satisfaction refers to employee perceptions of their working conditions, such as having an enriching job, promotion opportunities, being obliged to rush or choose between meeting deadlines or quality standards. Our results show that use and intensity of use of each of these technologies have globally complementary positive effects on job satisfaction. However, the cell phone has ambivalent effects in that it can be perceived as a tool associated with importance, recognition or responsibility, or, on the contrary, as a means of control or pressure.

We then tried to isolate the direct and indirect effects of ICT and organization of work on job satisfaction. The results revealed the differences between direct and indirect effects. Thus, we can observe that these two types of effects can, in certain cases, either reinforce or contradict each other.

One of the extensions envisaged for this study aims to estimate precisely the marginal impact of the effect of ICT on job satisfaction. To do this, a method based on matching is envisaged since this method aims to evaluate the marginal effect of a specific program on its beneficiaries.

In light of the positive correlations revealed by our analyses between cell phone use and stress factors that, therefore, could reduce employee satisfaction, it would be interesting to carry out an in-depth study of the intrusive effects of professional use of ICT on private life.

Bibliography.

Acemoglu D. and Newman A. F. (2002), The labor market and corporate structure ,*European Economic Review*, Vol. 46, p.1733-1756.

Aghion P. and Tirole J. (1997), Formal and Real Authority in Organizations ,*The Journal of Political Economy*, Vol. 105, N°1, p.1-29.

Akerlof G. and Kranton R. (2005) Identity and the Economics of Organizations, *Journal of Economic Perspectives*, Vol .19 (1), pp. 9-32.

Askenazy P. and Caroli E. (2002), New Organizational Practices and Working Conditions: Evidences from France in the 1990s ,*Louvain Economic Review*, Vol. 68, pp. 91-110.

Askenazy P. and Caroli E. (2006), Innovative Work Practices, Information Technologies and Working Conditions: Evidence for France , IZA Discussion Paper N°2321, 39p.

Autor, D. H.; Levy, F. and Murnane, R. J. (2003), The skill content of recent technological change: An empirical exploration ,*Quarterly Journal of Economics*, 2003, Vol. 118, p. 1279-1333.

Behaghel L., Caroli E. and Walkowiak E., (2007). Innovation and skill upgrading: The role of external vs internal labour markets, PSE Working Papers 2007-04.

Bertschek I. and Kaiser U. (2004), Productivity Effects of Organizational Change: Microeconometric Evidence , *Management Science*, Vol. 50, N°3, p. 394-404.

Black S. E. and Lynch L. M. (2001), How to compete: The impact of workplace practices and information technology on productivity , *Review of Economics and Statistics*, Vol. 83, N°3, p. 434-445.

Bresnahan T.F., Brynjolfsson E. and Hitt L.M. (2002), Information technology, workplace organization, and the demand for skilled labor: Firm-level evidence , *The Quarterly Journal of Economics*, Vol. 117, N°1, p.339-376.

Brynjolfsson E. and Hitt L. M. (2000), Beyond Computation: Information Technology, Organizational Transformation and Business Performance ,*The Journal of Economic Perspectives*, Vol. 14, N°4, p. 23-48.

Caroli E., Greenan N. and Guellec D. (2001), Organizational Change and Skill Accumulation , *Industrial and Corporate Change*, Vol. 10, N°2, p. 481-506.

Clark A. (2005), What makes a good job? Evidence from OECD countries , in*Job Quality and Employer Behaviour*, Bazen, S., Lucifora, C. and Salverda, W. (eds.), Palgrave, pp. 11-30

Gant J., Ichniowski C. and Shaw K. (2002), Social Capital and Organizational Change in High-Involvement and Traditional Work Organizations ,*Journal of Economics and Management Strategy*, Vol. 11, N°2, p. 289-328.

Lindbeck A. and Snower D.J. (1996), Reorganization Of Firms and Labor-Market Inequality , *The American Economic Review*, Vol. 86, N°2, p. 315-321.

Lindbeck A. and Snower D.J. (2000), Multitask Learning and the Reorganization of Work: From a Tayloristic to Holistic Organization ,*Journal of Labor Economics*, Vol. 18, N°3, p.353-376.

Nie, N. H., Hillygus D. S. and Erbring L. (2002), Internet use, interpersonal relations, and sociability In*The internet in everyday life*, B. Wellman and C. Haythornthwaite (eds). Oxford: Blackwell.

Spitz-Oener, A. (2006), Technical Change, Job Tasks, and Rising Educational Demands: Looking outside the Wage Structure , *Journal of Labor Economics*, Vol. 24, p. 235-270.

APPENDICES.

Appendix 1: Construction of variables for ICT use and working conditions

Professional use of ICT

ICT use

Computer

Q1. At work, have you used a Personal Computer?

- During the previous month and/or before that

Internet

Q2. At work, have you used the Internet?

- During the previous month and/or before that

Cell phone

Q3. Do you use a cell phone for professional purposes (even if it is your personal phone)? YES.

Intensity of ICT use

Computer

Q4. During the previous month, have you used a PC for professional purposes?

- 0. No use; 1. Not last month; 2. 1 to 3 times in the month; 3. At least once a week; 4. Every/almost every workday.

Internet-Intensity of email use

Creation, from the following questions, of a variable for intensity of use:

- 0. No use; 1. Occasional use; 2. Frequent use; 3. Intensive use.

Q5. How many professional messages have you received over the last month (not including spam, viruses) on average per day?

- 1. Less than 5; 2. Between 5 and 10; 3. Between 10 and 20; 4. More than 20.

Q6. In the course of the previous month, how many messages have you sent, on average, per day:

- 1. Less than 5; 2. Between 5 and 10; 3. Between 10 and 20; 4. More than 20.

Cell phone

Creation, from the following questions, of a variable for intensity of use:

- 0. No use; 1. Occasional use; 2. Frequent use; 3. Intensive use.

Q7. During the previous month you have made professional calls with your cell phone(s):

- 1. Not last month; 2. 1 to 3 times in the month; 3. At least once a week; 4. Every/almost every day.

Q8. During the previous month you have received professional calls on your cell phone(s) on average per day:

- 1. Not last month; 2. 1 to 3 times in the month; 3. At least once a week; 4. Every/almost every day.

Working conditions

Characteristics of the job

Flexible working hours: the employee has a choice of working hours.

Q1. How are your working hours defined?

- You can choose between several timetables proposed by your employer;
- You can set your own hours from day to day within a broad range of available hours (*flextime*);
- You set your own hours.

Non-repetitive work

Q2. Does your work consist in continually repeating the same series of gestures or tasks? NO.

Job satisfaction and stress

Need to rush

Q3. In your work, do you need to rush? Sometimes, often.

Deadline/quality conflict

Q4. In your work, is it sometimes impossible to meet both deadlines and quality standards? Sometimes, often.

Autonomy: must handle incidents alone

Q5. When something abnormal happens during your work, do you handle the incident personally? Sometimes, often.

Enriching work

Q6. Does your job enable you to learn new things? YES.

Promotion opportunities

Q7. Do you personally have possibilities of promotion in your firm? YES.

2 Appendix 2: Effects of ICT and organizational changes on job satisfaction and stress factors [i]

	Stress						Satisfaction			
	Need to rush		Deadline-quality conflict		Must handle incidents alone		Enriching work		Promotion	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Computer use	-0.151 (0.075)**		-0.077 (0.086)		0.095 (0.076)		0.202 (0.082)**		0.289 (0.078)***	
Internet use	-0.107 (0.073)		-0.047 (0.085)		0.054 (0.075)		0.200 (0.087)**		-0.001 (0.075)	
Cell phone use	0.126 (0.063)**		0.104 (0.072)		0.285 (0.065)***		0.177 (0.076)**		0.207 (0.065)***	
Intensity of computer use		-0.034 (0.020)*		-0.028 (0.023)		0.025 (0.020)		0.110 (0.023)***		0.073 (0.020)***
Intensity of email use		0.026 (0.034)		0.029 (0.040)		-0.004 (0.036)		0.055 (0.045)		0.057 (0.035)
Intensity of cell phone use		0.075 (0.027)***		0.059 (0.031)*		0.144 (0.029)***		0.113 (0.035)***		0.091 (0.029)***
Flexible hours	-0.140 (0.061)**	-0.179 (0.062)***	-0.037 (0.071)	-0.059 (0.072)	0.125 (0.063)**	0.117 (0.064)*	0.268 (0.074)***	0.208 (0.076)***	0.151 (0.064)**	0.103 (0.065)
Non- repetitive work	-0.488 (0.063)***	-0.509 (0.063)***	-0.297 (0.071)***	-0.308 (0.071)***	0.090 (0.063)	0.093 (0.063)	0.278 (0.068)***	0.262 (0.069)***	0.039 (0.066)	0.021 (0.066)
Seniority in the firm	0.003 (0.004)	0.003 (0.004)	0.001 (0.004)	0.002 (0.004)	0.004 (0.004)	0.004 (0.004)	0.004 (0.004)	0.003 (0.004)	0.001 (0.004)	0.001 (0.004)
Blue collar	0.010 (0.082)	0.058 (0.083)	0.109 (0.094)	0.129 (0.094)	-0.265 (0.083)***	-0.275 (0.084)***	-0.285 (0.091)***	-0.222 (0.093)**	-0.247 (0.087)***	-0.206 (0.088)**
Hours worked per week	0.019 (0.003)***	0.018 (0.003)***	0.001 (0.004)	-0.000 (0.004)	0.005 (0.004)	0.005 (0.004)	0.005 (0.004)	0.003 (0.004)	0.001 (0.004)	-0.001 (0.004)
Size of firm	0.075 (0.017)***	0.074 (0.018)***	0.077 (0.020)***	0.075 (0.020)***	-0.050 (0.018)***	-0.048 (0.018)***	-0.044 (0.021)**	-0.053 (0.021)**	0.143 (0.018)***	0.137 (0.019)***
Retailing	0.053 (0.084)	0.055 (0.084)	-0.014 (0.096)	-0.012 (0.096)	0.168 (0.086)*	0.165 (0.086)*	-0.061 (0.097)	-0.055 (0.098)	0.061 (0.088)	0.071 (0.088)
Services	0.101 (0.089)	0.097 (0.089)	0.034 (0.102)	0.028 (0.102)	0.257 (0.092)***	0.265 (0.093)***	-0.340 (0.104)***	-0.306 (0.105)***	0.004 (0.095)	0.013 (0.096)
Education, health, administration	-0.092 (0.078)	-0.071 (0.079)	0.004 (0.090)	0.019 (0.091)	0.085 (0.081)	0.093 (0.082)	0.250 (0.097)**	0.324 (0.099)***	0.208 (0.082)**	0.254 (0.084)***
Gender (male)	-0.260 (0.064)***	-0.269 (0.064)***	0.014 (0.073)	0.006 (0.073)	0.154 (0.066)**	0.149 (0.066)**	0.070 (0.077)	0.085 (0.077)	0.243 (0.066)***	0.259 (0.066)***
Age	0.029 (0.019)	0.029 (0.019)	0.023 (0.022)	0.023 (0.022)	0.018 (0.019)	0.019 (0.019)	-0.069 (0.023)***	-0.076 (0.023)***	0.018 (0.020)	0.018 (0.020)
Age 2	-0.000 (0.000)**	-0.000 (0.000)**	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.000 (0.000)	0.001 (0.000)**	0.001 (0.000)**	-0.001 (0.000)**	-0.001 (0.000)**
Married	0.040 (0.058)	0.050 (0.057)	-0.115 (0.066)*	-0.110 (0.066)*	-0.015 (0.059)	-0.023 (0.059)	0.064 (0.068)	0.060 (0.068)	0.059 (0.061)	0.054 (0.060)
Graduate degree	0.185 (0.090)**	0.167 (0.089)*	-0.022 (0.104)	-0.030 (0.104)	0.194 (0.093)**	0.206 (0.093)**	0.552 (0.133)***	0.549 (0.134)***	0.023 (0.093)	0.016 (0.093)
Post-graduate degree	0.133 (0.082)	0.097 (0.081)	-0.009 (0.095)	-0.029 (0.094)	0.314 (0.087)***	0.325 (0.086)***	0.213 (0.107)**	0.209 (0.107)*	-0.158 (0.084)*	-0.171 (0.084)**
Monthly income	0.021 (0.016)	0.011 (0.016)	0.051 (0.019)***	0.047 (0.019)**	0.055 (0.017)***	0.054 (0.017)***	0.081 (0.020)***	0.071 (0.020)***	0.095 (0.017)***	0.087 (0.017)***
Constant	-0.840 (0.379)**	-0.842 (0.380)**	-1.783 (0.449)***	-1.747 (0.451)***	-1.126 (0.389)***	-1.090 (0.390)***	1.480 (0.454)***	1.649 (0.456)***	-1.464 (0.403)***	-1.377 (0.405)***
Observations	2334	2334	2327	2327	2324	2324	2331	2331	2302	2302

[i] Note: *, **, *** coefficients significant at a threshold of 10%, 5% and 1% respectively. The standard deviation is in parentheses.

Appendix 3: Direct and indirect effects of ICT and organizational changes [i]

	Stress						Satisfaction			
	Need to rush		Deadline-quality conflict		Must handle incidents alone		Enriching work		Promotion	
	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)	(3)	(4)
Computer use	-0.118 (0.123)		-0.140 (0.132)		0.160 (0.120)		0.137 (0.125)		0.202 (0.125)	
Internet use	-0.271 (0.142)*		0.056 (0.155)		0.227 (0.142)		0.041 (0.154)		0.013 (0.144)	
Cell phone use	-0.172 (0.120)		-0.017 (0.128)		0.309 (0.120)**		0.217 (0.126)*		0.382 (0.122)***	
Intensity of computer use		-0.038 (0.034)		-0.011 (0.037)		0.096 (0.034)***		0.088 (0.036)**		0.088 (0.035)**
Intensity of email use		-0.047 (0.078)		0.044 (0.084)		-0.030 (0.078)		0.032 (0.089)		-0.071 (0.078)
Intensity of cell phone use		-0.018 (0.057)		0.006 (0.060)		0.194 (0.059)***		0.115 (0.061)*		0.219 (0.057)***
Flexible hours	-0.406 (0.120)***	-0.351 (0.112)***	-0.036 (0.140)	0.051 (0.129)	0.319 (0.123)***	0.328 (0.116)***	0.178 (0.129)	0.155 (0.121)	0.197 (0.129)	0.109 (0.122)
Non- repetitive work	-0.544 (0.097)***	-0.573 (0.090)***	-0.356 (0.109)***	-0.323 (0.102)***	0.187 (0.096)*	0.257 (0.091)***	0.202 (0.101)**	0.207 (0.094)**	0.003 (0.105)	0.043 (0.097)
Flexible hours *computer	0.144 (0.167)		0.146 (0.192)		-0.175 (0.172)		-0.003 (0.187)		0.063 (0.175)	
Flexible hours *Internet	0.108 (0.148)		-0.178 (0.170)		-0.258 (0.153)*		0.257 (0.181)		-0.026 (0.153)	
Flexible hours *cell phone	0.312 (0.123)**		-0.065 (0.140)		0.226 (0.130)*		-0.038 (0.158)		-0.238 (0.128)*	
Non- repetitive work* computer	-0.092 (0.148)		0.041 (0.165)		-0.078 (0.147)		0.142 (0.158)		0.124 (0.153)	
Non- repetitive work* Internet	0.148 (0.158)		-0.067 (0.176)		-0.081 (0.160)		0.091 (0.179)		-0.013 (0.162)	
Non- repetitive work* cell phone	0.224 (0.137)		0.219 (0.151)		-0.148 (0.140)		-0.055 (0.153)		-0.111 (0.140)	
Flexible hours* Intensity of computer use		0,020 (0,041)		-0,036 (0,048)		-0,097 (0,043)**		0,033 (0,050)		0,029 (0,043)
Flexible hours* Intensity of email use		0,048 (0,066)		0,032 (0,077)		-0,004 (0,069)		0,010 (0,090)		0,022 (0,069)
Flexible hours* Intensity of cell phone use		0,108 (0,052)**		-0,073 (0,058)		0,088 (0,057)		-0,047 (0,070)		-0,143 (0,055)***
Non- repetitive work* Intensity of computer use		0,007 (0,039)		-0,015 (0,044)		-0,081 (0,040)**		0,027 (0,044)		-0,027 (0,041)
Non- repetitive work* Intensity of email use		0,053 (0,081)		-0,036 (0,088)		0,067 (0,082)		0,009 (0,097)		0,143 (0,082)*
Non- repetitive work* Intensity of cell phone use		0,048 (0,062)		0,121 (0,068)*		-0,123 (0,066)*		0,026 (0,072)		-0,077 (0,063)

[i] Note: *, **, *** Coefficients significant at a threshold of 10%, 5% and 1% respectively. The standard deviation is in parentheses. Coefficients concerning the characteristics of the employee and the firm have not been included in order to make the table easier to read.

RECENT BULLETINS.

2007

7-2007. Tiemtoré W. Z. Les TIC dans l'éducation en Afrique sub-saharienne: espoir fondé de développement ou émergence d'une nouvelle utopie?

6-2007. Plantard P. TICE et nouvelles formations professionnelles à l université: approches anthropologiques.

5-2007. Bouder C., Charlier J.-M., Leray Y., Mével O. Enjeux et perspectives de la logistique des retours appliquée à la grande distribution : l exemple des D3E.

4-2007. Le Goff M., Lethiais V. TIC, besoins de coordination et d information et proximité géographique: une analyse sur des données bretonnes.

3-2007. Trémenbert J., Jullien N. L évaluation du rapport des TPE de l artisanat aux TIC. Le cas de la Bretagne.

2-2007. Le Borgne et al. Évaluation des usages du Dossier Patient Partagé au sein d un réseau d addictions. Analyse sociologique versus analyse des log files Application au réseau ADDICA, Champagne-Ardennes.

1-2007. Trellu H. Création des réseaux de santé et usages du dossier médical partagé.

2006

13-2006. Jullien N., Trémenbert J. Les PME bretonnes: leur équipement en technologies numériques, leurs usages et leurs attentes.

12-2006. Thierry D. Modalités de circulation de l information sur un territoire régional.

11-2006. Pénard T., Suire R. Le rôle des Interactions Sociales dans les modèles économiques de l Internet.

10-2006. Petr C., Guéguen N. Beginner Research on Tourism and the Tourist: Beware of Words and Caricatures!

9-2006. Dang Nguyen G., Mével O. Nouvelle et ancienne économie: vers une intégration réussie?

8-2006. Jullien N., Zimmermann J.-B. Free/Libre/Open Source Software (FLOSS) : lessons for intellectual property rights management in a knowledge-based economy.

7-2006. Demazière D., Horn F., Jullien N. How free software developers work. The mobilization of distant communities .

6-2006. Pénard T., Poussing N. Usage d'Internet et capital social.

5-2006. Masclet D., Pénard T. Pourquoi évaluer son partenaire lors d une transaction à la eBay? une approche expérimentale.

Editors: Godefroy Dang Nguyen, Nicolas Jullien.

Contact : Nicolas Jullien

M@rsouin
GET - ENST Bretagne
CS 83818, 29238 Brest CEDEX 3

Marsouin@infini.fr
+33 (0) 229 00 12 45