

December 2006

Evolutions of the Work Environment and Work Practices in a Post ERP Implementation Context

Christophe Elie-dit-cosaque
University of Paris Dauphine

Michel Kalika
University of Paris Dauphine

Detmar Straub
Georgia State University

Follow this and additional works at: <http://aisel.aisnet.org/amcis2006>

Recommended Citation

Elie-dit-cosaque, Christophe; Kalika, Michel; and Straub, Detmar, "Evolutions of the Work Environment and Work Practices in a Post ERP Implementation Context" (2006). *AMCIS 2006 Proceedings*. 306.
<http://aisel.aisnet.org/amcis2006/306>

This material is brought to you by the Americas Conference on Information Systems (AMCIS) at AIS Electronic Library (AISEL). It has been accepted for inclusion in AMCIS 2006 Proceedings by an authorized administrator of AIS Electronic Library (AISEL). For more information, please contact elibrary@aisnet.org.

Evolutions of the Work Environment and Work Practices in a Post ERP Implementation Context

Christophe Elie-Dit-Cosaque

CREPA, Center for Research in Management &
Organization

DRM-CNRS UMR7088

University of Paris Dauphine

Email: edc_christophe@yahoo.fr

Michel Kalika

CREPA, Center for Research in Management &
Organization

DRM-CNRS UMR7088

University of Paris Dauphine

Email: Michel.kalika@dauphine.fr

Detmar W. Straub

Department of Computer Information Systems

J. Mack Robinson College of Business Administration

Georgia State University

Email: dstraub@gsu.edu

ABSTRACT

In this study we analyze the changes that occur in the workplace following the implementation of Information and Communication Technologies (ICTs) and explore how perceived individual performance is influenced by a number of perceived changes in work environments. We suggested a model we tested with a structural equation modeling (SEM) approach with PLS. This study shows that work overload, information overload, and empowerment are interrelated and influence employees work performance in a ICT post-implementation context. A comparison of two samples of 302 and 907 respondents also highlight differences between perceptions depending on the presence or absence of an ERP but overall show that this single criterion is not the only determinant for explaining the hypothesized relationships.

Keywords

Work overload, Information overload, Individual Performance ICT-Post-implementation, ERP Post-implementation

INTRODUCTION

Information and communication technologies (ICTs) lead to profound changes in the ways workers perform their tasks. Companies using ICT for strategic purposes are said to be better enabled to compete in the marketplace (Henderson and Venkatraman 1999). Some authors suggest through various approaches that the better the alignment of IS with the organization's strategic vision, the better the organizational performance (Tushman and Nadler 1978; Henderson and Venkatraman 1999; Wang 2003). In order to maintain the efficiency of the system, it should be constantly adapted to the needs of the workers (Daft, Lengel et al. 1987; Wetherbe 1991) and their cognitive style should be taken into account (Robey and Taggart 1982). In the absence of such an adjustment, some unsatisfied needs may remain, such as information overload or an insufficiency of relevant information provided by the system (O'Reilly 1980; Schultze and Vandenbosh 1998). The organization that considers ICTs as strategic assets should thus try to enhance the volume and quality of the information flow in order to improve productivity and decision making (Porter and Millar 1985), and provide the workers with tools that make organizing and processing information easier. In recent years, standardized, integrated ERP systems have appeared as a potential solutions to the needs of information processing in organizations.

We investigate the perceptions of individuals on the way their work practices have evolved after an ICT implementation. It has been argued that utilization and perceptions of the technology by the individual can affect individual performance (DeLone and McLean 1992; Goodhue and Thompson 1995). The subject of reshaping work design appears particularly important as information processing is one of the major activities in computerized organizations. Managers in particular spend most of their time gathering and processing information from various sources such as information systems, meetings, or informal conversations (Mintzberg 1972; Wetherbe 1991), and try to reduce uncertainty and ambiguity (Daft and Lengel 1986; Daft, Lengel et al. 1987). ICTs and ERPs more specifically are said to overwhelm an organization (Hammer 1990; Davenport and Stoddard 1994) and provide powerful responses to these concerns. During an ICT's initial implementation and usage, workers are empowered in more constraining contexts sometimes characterized by information and work overload.

In the context of ICTs post-implementation, what are the effects of work overload, information overload, and empowerment on individual employee performance? What are the effects of the presence or absence of an ERP on these relationships?

After presenting the relationships between work environment and personal performance we will analyze the results of a comparative study that shows the impact of the presence or absence of an ERP system on these relationships. Our empirical study includes the SEM analysis of two secondary data samples reporting respectively the absence and the presence of an ERP in their work environment.

THEORETICAL DEVELOPMENT

The Influence of Context

Context has been defined as “*situational opportunities and constraints that affect the occurrence and meaning of organizational behavior as well as functional relationships between variables*” (p.386) (Johns 2006). Context may have important influences on the explanation of some organizational behaviors and may explain variations in research findings. Johns (2006) identified two major dimensions of context. The omnibus context refers to the context in general, while discrete context refers to specific contextual variables. The author considered that discrete contextual variables are nested within the omnibus context and are media for the effects of omnibus context. Discrete context variables influence behavior directly or have the potential for moderating relationships between variables. In this study ERPs as well as empowerment, information overload, and work overload are contextual variables. Interactions between contextual elements with technical initiatives involve different consequences in different organizational contexts (Barley 1986; Markus and Robey 1988; Orlikowski 1993; Robey and Sahay 1996). Among generally accepted key factors of ERP success, factors such as top management involvement, strategic vision of ICTs, change management approach, user involvement, and training approach are frequently cited. However, these factors focus mainly on ICTs selection and implementation, and not on the post-implementation stage that may also be impacted in following stages (Gattiker and Goodhue 2005). Ahuja et al (2005) also suggested that individuals interact differently with the technology depending on work environment influence or gender.

Empowerment

ICT implementation permits the empowerment of individuals in several areas what is an important factor of success in business process reengineering (Bashein and Markus 1994). Empowerment has often been defined as both a relational construct and a motivational construct. The relational construct consists of the delegation of authority to the lowest level of the organization where a good decision can be taken. The motivational construct involves increased employee motivation in the workplace through the satisfaction of the desire of having more self-determination and self-efficacy (Conger and Kanungo 1988). It has also been suggested the notion of “psychological empowerment”, a four dimensions motivational construct including meaning, competence, self-determination and impact (Spreitzer 1995). Empowerment has also been defined more broadly as “*any increase in worker power (through for example, increased formal authority or greater access to more useful information) that enables workers (and collectively, the organization) to achieve institutional objectives with greater efficiency and effectiveness*”(p.5) (Elmes, Strong et al. 2005). While these approaches are mainly interested in empowerment at an individual level, Seibert et al (2004) suggested a work-unit level definition of empowerment, the “empowerment climate,” a “*shared perception regarding the extent to which an organization makes use of structures, policies, and practices supporting employee empowerment*”(p.334) (Seibert, Silver et al. 2004). Elmes et al (2005) suggested that workers are empowered mainly because they have more information which gives them more control over the factors that affect the way they execute their jobs. Information visibility plays a mediating effect affecting the simultaneous increase in control and empowerment. They thus suggest that an organization may empower its workforce without transferring power to employees, considering power as a property of the whole system, according to a Foucauldian perspective. They introduce the notion of panoptic empowerment in order to capture the combination of empowerment and “*simultaneous, multidirectional visibility*”. With the concept of reflective conformity the authors suggest that the rules and procedures for organizational processes embedded in the system lead to more employees discipline and require simultaneously from them to be highly effective in order to achieve the organizational benefits of the system.

Work Overload

Overload is defined as “*an individual’s perception that they cannot perform a task because they lack critical resources*”(p.435) (Ahuja and Thatcher 2005). Following Sales (1970), Ahuja and Thatcher (2005) distinguish a quantitative and a qualitative dimension of overload. The quantitative dimension of refers to what the individuals cannot do because of limitations linked to their environment. The qualitative dimension of overload refers to the perceptions of the individuals that their tasks require more skills and capacities in their work than they currently possess (Ahuja and Thatcher 2005). Peterson (1995) considered role overload as the lack of personal resources that would permit the individuals to fulfill their commitments, obligations, and requirements (Peterson, Smith et al. 1995). Work overload has several consequences on employees like work exhaustion or turnover. The implementation of ICTs in the workplace may make easier some work activities but at the same time contribute to the intensification of the overall workload and increase professional constraints (Metzger and Cléach 2004). Ahuja et al (2005) showed that individuals perceive autonomy and overload as components of the work environment that influences the way they interact with IT.

Information Overload

Information overload has been defined as a situation in which the load of information is greater than the individual's ability to process it (Hiltz and Turoff 1985; Schultze and Vandenbosh 1998). Other authors conceptualize information overload as a situation in which an individual receives too much useless information rather than merely too much information (Sproull 1985; Wetherbe 1991). Other studies find no relationship between information load increase and information overload and that the control the individual has on information load mediates the relationship between information load and information overload (Schultze and Vandenbosh 1998). Rather than becoming overloaded with information, an individual develops both human and technical filtering mechanisms that allows her/him to avoid information overload. However, there is no association between the level of experience of an individual with the technology and the level of information overload. When overloaded with information, individuals tend for example to answer to simpler messages and generate simpler response (Jones, Ravid et al. 2004). Overall, information overload is said to negatively impact satisfaction and performance at work. If an individual feels cognitively saturated while processing unimportant information, critical decision making information may be missed.

Perceived Individual Performance

Individual performance perceived by an individual may be conceptualized around the notions of "effectiveness" and "efficiency". It has been suggested that higher performance in performing tasks implies "some mix of improved efficiency, improved effectiveness, and/or higher quality" (Goodhue and Thompson 1995). Effectiveness refers to how well the work or tasks of the individual are performed (a qualitative aspect of individual performance) while efficiency refers more to the quantity of work output of the individual relative to the time and resources involved (Dillon and Moris 2001). Goodhue and Thompson (1995) suggest that the technology can positive impacts on individual performance when it is utilized and when it has good fit with the tasks to be performed.

RESEARCH MODEL

The Influence of Work Overload in ICTs in a Post-implementation Context

The professional constraints an individual faces with the introduction and the use of ICTs are likely to involve information overload. Additionally, if an individual is work-overloaded, that individual tends to process more information and to require further important information which may in turn create information overload. For example a load of too much communication can be an important predictor of information overload (Jones, Ravid et al. 2004).

H1: Work overload has a positive influence on information overload

Because work overload constrains workers to intensify the pace of work, we expect that this pressure will have positive consequences on workers personal efficiency. However, we expect that people are more likely to be less satisfied when overloaded and perceive a decrease in personal effectiveness.

H2.0: Work overload has a positive influence on efficiency

H2.1: Work overload has a negative influence on effectiveness

The Influence of Information Overload in ICTs Post-implementation Context

People may be more satisfied with more information if they do not know what information they need (O'Reilly 1980) or when they want to control its flow. In such cases individuals may develop sorting mechanisms in order to avoid being overloaded (Schultze and Vandenbosh 1998). Workers may also feel empowered because they have more information that in turn gives them more control over the factors that affect the way they execute their jobs (Elmes, Strong et al. 2005).

H3: Information overload has a positive influence on empowerment perceptions

Information overload may be considered as a problem if overloaded individuals—particularly managers who generally receive much more information than they can process—cannot use effectively any additional information provided by the system (Ackoff 1967). Thus, information overload may act as a burden that dampens both personal efficiency and effectiveness at work.

H4.0: Information overload has a negative influence on efficiency

H4.1: Information overload has a negative influence on effectiveness

The Influence of Empowerment in ICTs Post-implementation Context

Spreitzer (1995) highlighted both antecedents and consequences of psychological empowerment. Antecedents of psychological empowerment include locus of control, self esteem, access to information (mission and performance) and rewards. The consequences of psychological empowerment include managerial effectiveness and innovation. Empowerment climate refers to the work environment of the individual and has three dimensions, information sharing,

autonomy through boundaries, and team accountability (Seibert, Silver et al. 2004). Empowerment, when supported by ICTs, permits greater management of employee productivity and comparison of productivity among peers. Together, these advances in productivity management may reinforce time-related pressures (Metzger and Cléach 2004). It has also been suggested that the link between IT implementation and empowerment is likely due to the struggle of the worker, rather than to business process reengineering initiatives (Boudreau and Robey 1996). As a consequence, we expect the empowerment to increase the pressure on the workers who eventually work more and may feel work-overload.

H5: Empowerment has a positive influence on work overload

The consequences of psychological empowerment include managerial effectiveness and innovation (Spreitzer 1995). Empowerment climate is also believed to increase work unit performance, and psychological empowerment has been shown to mediate the influence of empowerment climate on individual performance and satisfaction (Seibert, Silver et al. 2004). Thus, we expect empowerment to increase both efficiency and effectiveness.

H6.0 Empowerment has a positive influence on efficiency

H6.1: Empowerment has a positive influence on effectiveness

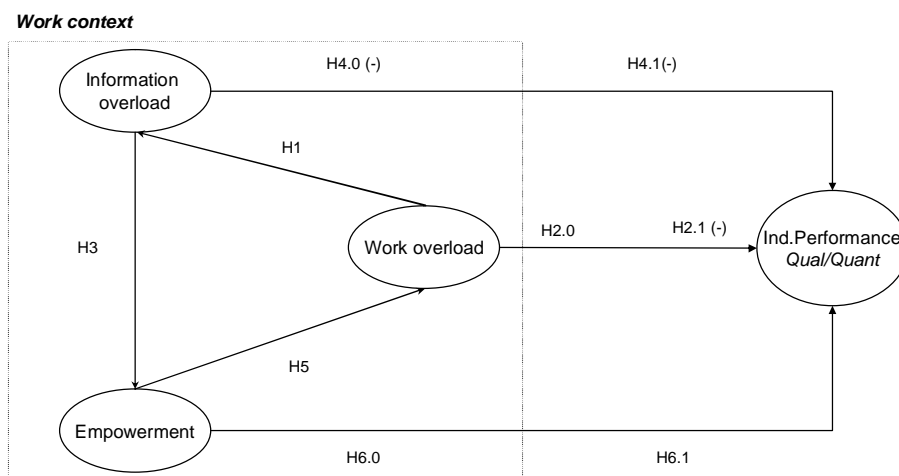


Figure 1. Conceptual model

METHODOLOGY

Secondary data were collected in France in spring 2005 with an auto administrated questionnaire given to professionals after training courses. This survey was conducted within the frame of a larger study conducted for research and communication purposes at a national level in France by one of the largest European professional training companies, and supervised by both academic researchers and practitioners. This study aimed at investigating the influence of ICT on the work of the individuals from a longitudinal perspective from 2001 to 2005.

Respondents

We investigated two environments, characterized by the presence or absence of an ERP. We selected two subsamples of workers. The first subsample consisted of 302 people who had no ERP system implemented in their company (Sample 1). Conversely, the second sample consisted of 903 people (Sample2) who worked at a company where an ERP system was implemented. These two subsamples were extracted from a total sample of 3,041 respondents. All missing or inconsistent values were dropped. While the variety of respondents tapped into most functions germane to organizations, people with managerial responsibilities were well represented in each sample. We chose the ERP system to differentiate the two work environments, given the extent of the impacts of such a system on the whole organization, and on the informational aspects of work. Demographic information is shown in Table 1, Table 2, and Table 3 below.

Sample	NO ERP	ERP
Age		
<25 years	3%	2%
26 to 35	46%	43%
36 to 50	45%	47%
>50 years	6%	8%
Gender		
Male	55%	58%
Female	45%	42%
Education		
graduate	42%	41%
Years using ICT		
Less than 1 year	1%	1%
1-3 years	10%	8%
4-5 years	17%	14%
More than 5 years	71%	77%
do not use	0%	0%
Years on the same job		
No change of job	9%	7%
all 1 to 3 years	30%	27%
all 3 to 5 years	36%	39%
all 5 to 10 years	22%	22%
all 10 years and more	4%	5%
When did you begin working?		
Less than 5 years ago	15%	10%
5 to 10 years ago	27%	29%
11 to 20 years ago	33%	36%
More than 20 years ago	25%	25%
Number of subordinate		
0	31%	37%
01-oct	49%	45%
nov-50	13%	15%
>50	7%	4%

Table 1. Demographics

Sample	NO ERP	ERP
Company Size		
<50	17%	3%
51-500	45%	25%
501-5,000	24%	31%
5,001-10,000	3%	11%
> 10,000	10%	30%
Company industry		
Industry	25%	58%
Services (information and telecoms)	15%	11%
Services (to individuals and organizations)	29%	12%
Distribution	8%	8%
Others (construction, etc.)	23%	11%

Table 2. Companies information

Sample	NO ERP	ERP
Personal work Equipment		
Laptop	42%	65%
Mobile phone (provided by company)	40%	45%
Organizer	28%	31%
Access to Intranet in the organization		
Intranet information search engine	78%	95%
Shared agenda	65%	82%
Tools for file sharing	54%	68%
Tools for distance communication	80%	90%
Tools for adding documents to KM database	39%	58%
General information on the company	59%	70%
Information dedicated to the job	84%	93%
Online training modules	61%	69%
KM database	17%	38%
	55%	62%

Table 3. Equipment with ICT

Measures and Instrumentation

The questionnaire featured an eight-point Likert scale and ranged from “completely disagree” to “completely agree” plus one modality “does not apply to me” that allowed the respondents to be unconstrained in their answers. Those respondents who answered this modality for at least one measure of the constructs were dropped. Based on theoretical considerations, we highlighted four constructs consistent with our research purposes. The respondents had to answer the questions “What major changes did you experience since the introduction of ICT in your company?” and “Because of the introduction of ICT in you company...”. The details of the constructs are shown in table 4. We operationalized empowerment with the dimensions of empowerment climate that Seibert et al (2004) have defined as a set of four perceptions of the work environment by the individual, information sharing, team accountability, and autonomy. We also added three concepts among the most common aspects found in the literature on empowerment. These concepts refer to the greater consistency of the information received by the worker after ICTs implementation, which is said to be an aspect of empowerment for workers (Elmes, Strong et al. 2005), the perception of a decrease of the number of hierarchical levels, and the perception of having to apply more procedures. Several authors suggested that information sharing between the various functions of the company provides empowerment of workers, and facilitates higher quality decision making (Porter and Millar 1985; Wetherbe 1991; Bartlett and Ghoshal 1998). Workers feel more empowered mainly because they receive more information from the system that in turn enables them to exercise greater control over factors that influence the way they perform their work (Kenneth and Velthouse 1990). Based on previous studies, our two overload constructs integrate a quantitative and a qualitative dimension (Ahuja and Thatcher 2005). Quantitative overload refers to a situation in which an individual receives more information or work than his capacities allow to process or perform. Qualitative overload refers to the perception of an individual’s need for supplementary competences in order to cope with the flow of information to process or work to perform in the workplace. In their study, Metzger and Cleach (2004) suggested that what they called “overflow distance working” in the context of the use of ICTs. In this scenario the worker continues his activities at night, during the weekend or on holidays what is a manifestation of work overload leading to information overload (Metzger and Cléach 2004). They work at a distance in order to complete what they were not able to finish at the workplace. These aspects allowed us to define quantitative overload. The individual performance construct has been operationalized as two different constructs, namely efficiency and effectiveness, consistent with the differential effects of these two aspects we have previously hypothesized. Details of the constructs are shown in table 4.

#	Signification	Labels
<i>What major changes did you experience because of ICTs implementation? / Because of the introduction of new information and communication technologies...</i>		
Empowerment (Formative construct)		
EMP1	Information consistency	I receive more relevant information than before
EMP2	Information sharing	Information circulation has improved in my department with my collaborators
EMP3	Team accountability	I note that I work in groups more often than before
EMP4	Autonomy	I have more freedom in the personal organization of my work than before
EMP5	Procedures	I have to be more autonomous than before
EMP6	Procedures	I have to be more capable to apply procedures
EMP7	Hierarchy	The number of hierarchical levels has decreased in my company
Information overload (Formative construct)		
INFLOAD1	Quantitative overload	I receive too many emails that I do not have sufficient time to process
INFLOAD2		I spend more time classifying information than before
INFLOAD3	Qualitative overload	I have to know where to find information more than before
INFLOAD4		I have to be able to disseminate information more than before
INFLOAD5		I have to control the reliability of information more than before
Experienced Work overload (Formative construct)		
WLOAD1	Quantitative overload	I work more often while travelling
WLOAD2		I work more often on my personal time in addition to my work schedule
WLOAD3	Qualitative overload	My work is more controlled
WLOAD4		I have to show that I am capable of taking initiative
WLOAD5		I have to make decisions in shorter time than before
WLOAD6		I have to be more creative
Individual performance (Formative construct)		
PROD1	Effectiveness	I am more available for my collaborators
PROD2		The quality of my personal work has improved
PROD3	Efficiency	I process more files than before
PROD4		I process a more important volume of information than before

Table 2. Constructs of the model

Validity of the Instrument

It appeared that empowerment, work overload, information overload, and the two individual performance constructs were formative as the items used to measure them caused them and are not interchangeable (Diamantopoulos and Winklhofer 2001). Control variables were single measure reflective constructs. We relied on the few guidelines available and on previous studies for specifying and validating on formative constructs (Storey, Straub et al. 2000; Diamantopoulos and Winklhofer 2001; Loch, Straub et al. 2003; Petter, Straub et al. 2005). Because of their characteristics, measures to ensure reliability (composite reliability, Cronbach's Alpha) and validity (AVE analysis) of reflective indicators are not appropriate for formative ones (Bollen and Lennox 1991; Diamantopoulos and Winklhofer 2001; Jarvis, Mackenzie et al. 2003; Petter, Straub et al. 2005). Based on the work of Jarvis et al (2003) four decision rules as well as strong theory basis can permit identifying the formative nature of a construct (Petter, Straub et al. 2005). Reflective constructs are not defined by measures. In contrast to formative constructs, reflective constructs do not need to be interchangeable, to covary, or to have the same antecedents. In the present study it is clear that our constructs are not reflective as each item taps into a different aspect of its construct. We selected Partial Least Squares (PLS), a component based structural equation modeling software in order to test our model. The objective of explaining variance of PLS is comparable with the objective of multiple regressions of showing high R^2 values and significant t-values, rejecting the null hypothesis of no effects (Gefen, Straub et al. 2000). Our main argument for using PLS is that it can handle both formative and reflective constructs, while covariance-based SEM are mainly reputed to the use of reflective constructs (Chin 1998b). Petter & al. (2005) suggested that formative measures should be validated from both a theoretical and empirical perspective. In order to test the measurement properties of the instrument we used a multitraits multi-method (MTMM) matrix (Loch, Straub et al. 2003), following a methodology suggested by (Campbell and Fiske 1959). We first multiplied the values of the measures by their individual PLS weights, creating a "weighted score" for each measure. We then summed these measures in order to make a composite score for each construct (Bagozzi and Fornell 1982). According to Loch et al (2003), significant correlations between weighted score of the measures and composite scores of the constructs are an indication of convergent validity. In the present study, all correlations of both samples were significant mostly at the .001 level, indicating very good *convergent validity*.

Discriminant validity can be assessed when items to constructs and inter-items correlations correlate more highly with each other than with other items or constructs. While there were few violations for items to constructs correlations for both samples, it appeared that items to items correlations were often low, showing overall poor discriminant validity with only the MTMM criterion. However, as argued by Loch et al (2003), the MTMM matrix to assess discriminant validity is not sufficient and therefore it is important for the constructs to be supported by literature, as in our case.

Another issue for formative constructs is the instability of the model that can be caused by multicollinearity among items of independent variables (Diamantopoulos & Winklhofer, 2001, Petter et al., 2005). To ensure that there is low collinearity among the items, we performed the Variance Inflation Factor (VIF) statistic. All measures were lower than the accepted threshold of 10.

PLS Structural Model Test

The model was tested using two samples of 302 respondents for the sample 1 (Figure 2) and 903 respondents for sample 2 (Figure 3). A bootstrap technique with 200 resample was performed in order to calculate t-values and significance levels. Our interest was focused on path coefficients, differences in path coefficients across subsamples, and R² differences for five constructs. In order to control the influence of demographic variables, we incorporated control variables as the number of subordinates, the gender, the experience with ICTs, and company size. Education was significantly related with empowerment for both samples but with a weak effect (PC1= .07, T=1.65*; PC2=-.06, T=2.32*), suggesting that the higher the education background of the worker, the lower the perceptions of being empowered. The other control variables tested did not significantly influence the constructs of interest.

Our *first research question*, aimed at identifying the relationships between work overload, information overload, empowerment, and their effect on two aspects of personal effectiveness in a post-ICT implementation context. Overall, as shown in Figure 2, Figure 3, table 5 and table 6, our model is at least partly supported by all samples.

#	Hypotheses	Validation of hypotheses		
		Total	NoERP	ERP
H1	Work overload has a positive influence on information overload	***	***	***
H2.0	Work overload has a positive influence on personal efficiency	***	***	***
H2.1	Work overload has a negative influence on personal effectiveness	Inv*** ¹	-	Inv**
H3	Information overload has a positive influence on empowerment perceptions	***	***	***
H4.0	Information overload has a negative influence on personal efficiency	Inv**	-	Inv*
H4.1	Information overload has a negative influence on personal effectiveness	**	-	**
H5	Empowerment has a positive influence on work overload	***	***	***
H6.0	Empowerment has a positive relationship on personal efficiency	**	-	**
H6.1	Empowerment has a positive relationship on personal effectiveness	***	***	***

¹ "Inv" means that we found an inverse significant relation compared to what was hypo

*p<.05, ** p<.025, *** p<.005

Table 6. Validation of hypotheses

The *second research question* of this study investigated the differences between relationships across models. We tested differences comparing both path coefficients and R² values. The analysis of R² values showed that there was 7 percent, 4 percent, 13 percent and 3 percent more explained variance respectively for information overload, empowerment, and work overload in sample 1 than in sample 2. Small (3 percent) and no differences were found for personal efficiency and personal effectiveness. Table 6 shows the levels of explained variance for all three models. Explained variance for personal efficiency and personal effectiveness ranged from 24 percent to 25 percent. Work overload variance is also very well explained by our model with explained variance ranging from 41 percent to 54 percent. We also have good levels of explained variance for empowerment (32 percent to 40 percent) and information overload (30 percent to 37 percent).

R2	Total	NoErp	Erp	Full-NoERP	Full-ERP	NoERP-ERP
Information overload	0.37	0.37	0.30	0.00	0.06	0.07
Empowerment	0.32	0.40	0.36	-0.08	-0.04	0.04
Work overload	0.45	0.54	0.41	-0.10	0.04	0.13
Efficiency (Quant)	0.25	0.25	0.22	-0.01	0.03	0.03
Effectiveness (Qual)	0.24	0.25	0.25	-0.01	-0.01	0.00

Table 7. R² Statistics

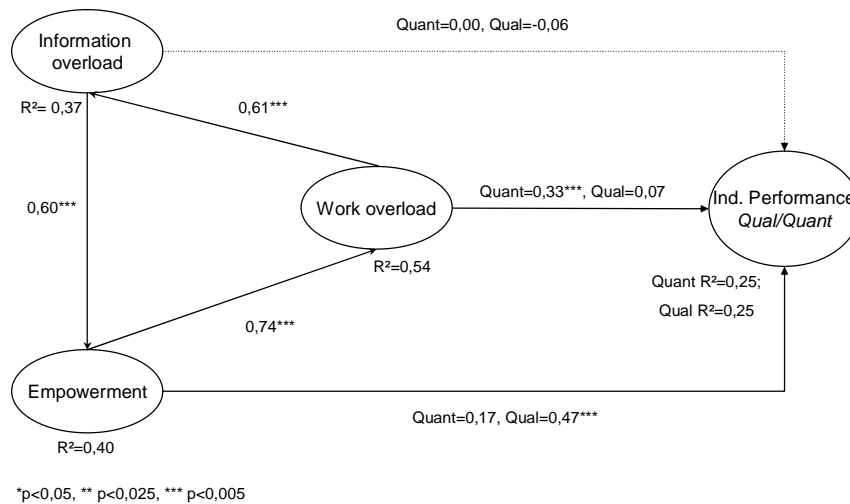


Figure 2. Model without ERP reported

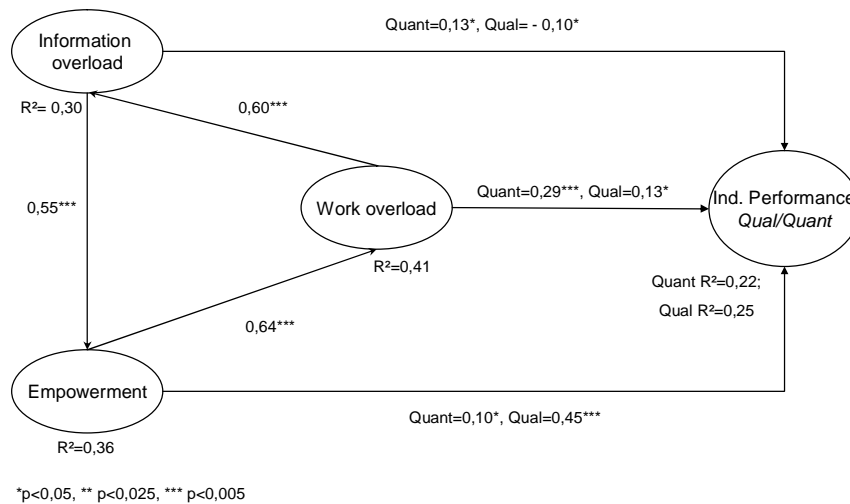


Figure 3. Model with ERP reported

In order to test the significance of the differences between the paths of the two samples, we used a methodology suggested by Chin et al. (Chin, Marcolin et al. 1996) and employed in several studies in IS (Keil 2000; Ahuja and Thatcher 2005). We calculated t-statistics for the differences between path coefficients, using the Pooled estimator of variance (Spooled). Our model permitted highlighting significant difference between the two samples for one paths and one control variable but with low significance and small difference. When there is no ERP in the company the influence of empowerment on work overload is higher. The results are summarized in table 6 below.

DISCUSSION AND CONCLUSION

This paper identified the relationships between work overload, information overload, and empowerment and their influence on individual performance in the ICT post-implementation context.

Our results showed that information overload significantly influences the perception of empowerment, supporting previous studies arguing that workers feel more empowered when they are provided with more information. While workers receive more information and may perceive this information as a burden, they may prefer having this information as this gives them more control over their work activities. Indeed, it appears that information overload has a small negative effect on effectiveness at work and also a small positive effect on personal efficiency. It is possible that people become less satisfied when overloaded, while their level of performance is not impacted.

Paths	Total Sample (N=1205)			NO ERP (N=302)			ERP (N=903)			Statistical Comparison of Paths		
	Path Coeff.	T-Value	SE	Path Coeff.	T-Value	SE	Path Coeff.	T-Value	SE	Full / NO ERP	Full / ERP	NO ERP / ERP
Work overload												
→Information overload	0.60	24.90***	0.02	0.61	12.49***	0.05	0.60	23.92***	0.03	0.29	-0.28	0.31
→Efficiency (Quant)	0.30	6.58***	0.05	0.33	2.72***	0.11	0.29	5.37***	0.06	0.19	-0.18	0.32
→Effectiveness (Qual)	0.12	2.53**	0.05	0.07	1.45	0.08	0.13	2.26**	0.05	-0.35	0.22	-0.62
Information overload												
→Empowerment	0.56	18.16***	0.03	0.6	10.06***	0.06	0.55	19.91***	0.03	0.73	-0.48	0.99
→Efficiency (Quant)	0.11	2.29**	0.05	0.00	1.39	0.08	0.13	1.95*	0.06	-0.74	0.28	-1.17
→Effectiveness (Qual)	-0.09	2.06**	0.04	-0.06	1.3	0.07	-0.10	1.98**	0.04	0.23	-0.12	0.39
Empowerment												
→Work overload	0.67	29.05***	0.02	0.74	17.23***	0.04	0.64	25.87***	0.03	2.12**	-1.65*	1.96**
→Efficiency (Quant)	0.12	2.34**	0.05	0.17	1.52	0.08	0.10	2.31**	0.05	0.34	-0.20	0.71
→Effectiveness (Qual)	0.45	10.08***	0.05	0.47	4.82***	0.09	0.45	8.68***	0.05	0.08	-0.08	0.15

*p<.05, **p<.025, ***p<.005

Table 5. Model Summary : Statistical Comparison of Paths

Work overload significantly impacts efficiency. Workers overloaded feel that they have more pressure because of the intensification of work with ICTs. They work more while traveling and on their personal time in order to cope with the changes involved by the intensification of work with ICTs. They also feel that they have to show more skills in the ICT post-implementation environments. Work overload also significantly impacts information overload. In our case, this shows that when overloaded with work, a worker tends to process more information in the information processing aspect of their work. If more tasks are assigned, workers process more information in order to complete them. Work overload also positively impacted work effectiveness. While the individuals feel there is more pressure on their work, their efficiency increases while their perceived individual effectiveness is hardly impacted.

In the context in which the workers are empowered with ICTs the intensity of work increases leading to work overload. This effect is even stronger when there is no ERP in the company. While we found a small relation between empowerment and the perceptions of an increased efficiency, people seem to be even more effective in their work as they are empowered. Thus empowered people have to perform more tasks whereas they do not necessarily perceive increased efficiency. However, the individuals feel more effective, that the way they perform their work with ICTs has improved and that they are more available for their collaborators.

Our study has some limitations that should be taken into account. We investigated the effects of the absence or the presence of an ERP in the organization, hypothesizing that given the extent of the impacts of ERP on organizations, the perceptions depending on the presence or the absence of an ERP system would differ. It should be even more interesting to test for the perceptions of workers on the criterion of whether they do or do not use ERP systems and to investigate the influence of the hypothesized factors on individual performance. We also did not take into account temporal precedence and interaction concerns.

We have made several theoretical contributions. In particular, we showed that in a ICT post-implementation environment, empowerment, information overload and work overload are tightly interrelated, and that they have differential impacts on perceived effectiveness at work. We also found that the presence or the absence of an ERP system does have impacts on these relationships. While there were few significant differences in path coefficients, we found overall more explained variance in the subsample without implemented ERP reported. While information overload has small effects on individual performance, our results suggest that while the individual feel more empowered after ICT implementation, they should be better equipped in order to avoid the negative effects that may occur with work overload. While we note that work overload positively affects individual performance, further investigation is required in the long run. At the managerial level, our study provides a model that permits understanding the dynamics of key aspects of work in a ICTs post-implementation context and the influence of the presence or absence of a particular system.

ACKNOWLEDGMENTS

We sincerely thank the anonymous reviewers for their helpful comments. We thank the Dauphine-Cegos Observatory of E-management who provided the data for this study, Alexandra Ciaccia, and Claire Beyou from CEGOS, R&D.

REFERENCES

1. Ackoff, R. L. (1967). "Management Misinformation Systems." Management Science **14**(No. 4): 147-156.
2. Ahuja, M. K. and J. B. Thatcher (2005). "Moving beyond intentions and toward the theory of trying: Effects of work environment and gender on post-adoption information technology use." MIS Quarterly **29**(No. 3): 427-459.
3. Bagozzi, R. P. and C. Fornell (1982). Theoretical Concepts, Measurement, and Meaning. A Second Generation of Multivariate Analysis. C. Fornell, Praeger. **2**: 5-23.
4. Barley, S. R. (1986). "Technology as an Occasion for Structuring: Evidence from Observations of CT Scanners and the Social Order of Radiology Departments." Administrative Science Quarterly **31**(1): 78-108.
5. Bartlett, C. A. and S. Ghoshal (1998). "L'entreprise Individualisée : Une nouvelle Logique de Management." Editions Maxima.
6. Bashein, B. and L. Markus (1994). "Preconditions for BPR success." Information Systems Management **11**(2).
7. Bollen, K. and R. Lennox (1991). "Conventional wisdom on measurement: A structural equation perspective." Psychological Bulletin **110**(2).
8. Boudreau, M.-C. and D. Robey (1996). "Coping with contradictions in business process re-engineering." Information Technology & People **9**: 40-57.
9. Campbell, D. T. and D. W. Fiske (1959). "Convergent and Discriminant Validation by the MultiTrait-MultiMethod Matrix." Psychological Bulletin **56**(2): 81-105.
10. Chin, W., B. Marcolin, et al. (1996). "A Partial Least Squares Latent Variable Modeling Approach for Measuring Interaction Effects: Results from a Monte Carlo Simulation Study and Voice Mail Emotion/Adoption Study". Seventeenth International Conference on Information Systems.
11. Chin, W. W. (1998b). The Partial Least Squares Approach to Structural Equation Modeling. Modern Methods for Business Research. G. A. Marcoulides. London: 295-336.
12. Conger, J. and R. Kanungo (1988). "The empowerment process: integrating theory and practice." Academy of Management Review **13**(3).
13. Daft, R. L. and R. H. Lengel (1986). "Organizational Information Requirements, Media Richness and Structural Design." Management Science **32**(No. 5).
14. Daft, R. L., R. H. Lengel, et al. (1987). "Message Equivocality, Media Selection, and Manager Performance : Implications for Information Systems." MIS quarterly.
15. Davenport, T. and D. Stoddard (1994). "Reengineering: Business change of mythic proportions?" MIS Quarterly **18**(2).
16. DeLone, W. H. and E. McLean (1992). "Information Systems Success: The Quest for the Dependent Variable." Information Systems Research **3**(1): 60-95.
17. Diamantopoulos, A. and H. M. Winklhofer (2001). "Index Construction with Formative Indicators: An Alternative to Scale Development." Journal of Marketing Research **38**(2): 269-277.
18. Dillon, A. and M. G. Moris (2001). "From "Can they?" to "Will they?" Extending usability to accommodate acceptance predictions." Proceedings of the Americas Conference on Information Systems: 957-959.
19. Elmes, M. B., D. M. Strong, et al. (2005). "Panoptic empowerment and reflective conformity in enterprise systems-enabled organizations." Information and Organization **15**(1): 1-37.
20. Gattiker, T. and D. Goodhue (2005). "What happens after ERP implementation: understanding the impact of inter-dependence and differentiation on plant-level outcomes" MIS Quarterly **29**(3).
21. Gefen, D., D. Straub, et al. (2000). "Structural Equation Modeling Techniques and Regression: Guidelines for Research Practice." Communication of AIS **7**(7): 1-78.
22. Goodhue, D. L. and R. L. Thompson (1995). "Task-Technology Fit and Individual Performance." MIS Quarterly **19**(2).
23. Hammer, M. (1990). "Reengineering: Don't automate, Obliterate." Harvard Business Review **68**(4).
24. Henderson, J. and N. Venkatraman (1999). "Strategic Alignment: Leveraging information technology for transforming organizations." IBM Systems Journal **38**(2/3).

25. Hiltz, S. R. and M. Turoff (1985). "Structuring computer mediated communications systems to avoid information overload." Communication of the ACM **28**(7): 680-689.
26. Jarvis, C. B., S. Mackenzie, et al. (2003). "A critical review of construct indicators and measurement model misspecification in marketing and consumer research." Journals of Consumer Research **30**(2).
27. Johns, G. (2006). "The essential impact of context on organizational behavior." Academy of Management Review **31**(2): 386-408.
28. Jones, Q., G. Ravid, et al. (2004). "Information overload and the Message Dynamics of Online Interaction Spaces: A theoretical Model and Empirical Exploration." Information Systems Research **15**(2): 194-210.
29. Keil, M. (2000). "A cross cultural study on escalation of commitment behavior in software projects." MIS Quarterly **24**(2).
30. Kenneth, T. and B. Velthouse (1990). "Cognitive elements of empowerment: an "Interpretive" model of intrinsic task motivation." Academy of Management Review **15**(4).
31. Loch, K., D. Straub, et al. (2003). "Diffusing the Internet in the Arab World: The Role of Social Norms and Technological Culturation." IEEE Transactions on Engineering Management **50**(1): 45-63.
32. Markus, M. and D. Robey (1988). "Information Technology and Organizational Change: Causal Structure in Theory and Research." Management Science **34**(5): 583-598.
33. Metzger, J.-L. and O. Cléach (2004). "Le Télétravail des Cadres : entre suractivité et apprentissage de nouvelles temporalités." Sociologie du Travail **46**: 433-450.
34. Mintzberg, H. (1972). "The Myths of MIS." California Management Review **15**(No. 1): 92-98.
35. O'Reilly, C. (1980). "Individuals and information overload in organizations: is more necessarily better." Academy of Management Journal **23**(4).
36. Orlikowski, W. J. (1993). "Case Tools as Organizational Change: Investigating Incremental Changes In Systems Development." MIS Quarterly **17**(3): 309-340.
37. Peterson, M. F., P. B. Smith, et al. (1995). "Role Conflict, Ambiguity, and Overload: A 21 Nation Study." Academy of Management Journal **38**(2): 429.
38. Petter, S., D. Straub, et al. (2005). "Specification and Validation of Formative Constructs in IS Research." Working Paper, Georgia State University.
39. Porter, M. E. and V. E. Millar (1985). "How information gives you competitive advantage." Harvard Business Review: 149-160.
40. Robey, D. and S. Sahay (1996). "Transforming Work through Information Technology: A Comparative Case Study of Geographic Information Systems in County Government." Information Systems Research **7**(1): 93-110.
41. Robey, D. and W. Taggart (1982). "Human Information Processing in Information and Decision Support Systems." MIS Quarterly **6**(No. 2): 61-73.
42. Schultze, U. and B. Vandenbosh (1998). "Information Overload in a Groupware Environment: Now You See It, Now You Don't." Journal of Organizational Computing and Electronic Commerce **8**(No. 2): 127-148.
43. Seibert, S., S. Silver, et al. (2004). "Taking empowerment to the next level : a multiple-level model of empowerment, performance, and satisfaction." Academy of Management Journal **47**(3).
44. Spreitzer, G. M. (1995). "Psychological empowerment in the workplace: dimensions, measurement, and validation." Academy of Management Journal **38**(5): 1442-1465.
45. Sproull, L. S. (1985). "Using electronic mail for data collection in organizational research." Academy of Management Journal **29**: 159-169.
46. Storey, V., D. Straub, et al. (2000). "Conceptual investigation of the electronic commerce industry." Communication of the ACM **43**(7): 117-123.
47. Tushman, M. and D. Nadler (1978). "Information processing as an integrating concept in organizational design." Academy of Management Review **3**(3).
48. Wang, E. T. (2003). "Effect of the fit between information processing requirements and capacity on organizational performance." International Journal of Information Management **23**(3).
49. Wetherbe, J. C. (1991). "Executive Information Requirements: Getting It Right." MIS Quarterly: 51-65.