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Vladimir Kvassov  
*Åbo Akademi University*

Franck Tetard  
*Åbo Akademi University*

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# IMPACTS OF OFFICE INFORMATION TECHNOLOGY ON MANAGERIAL WORK'S TEMPORAL DIMENSIONS AND PRODUCTIVITY: A DESCRIPTIVE STUDY

**Vladimir Kvassov**

Turku Centre for Computer Science  
Åbo Akademi University  
vkvassov@abo.fi

**Franck Tétard**

Turku Centre for Computer Science  
Åbo Akademi University  
ftetard@abo.fi

## Abstract

*In our paper we aim to research the impacts of office information technology (IT) on managerial productivity through the change of the temporal dimensions of managerial work. We explore this relationship by demonstrating two causal links: first, IT impacts on managerial work's temporal dimensions and, second, the impacts of temporal dimensions on managerial work productivity. We argue that temporal dimensions such as schedules and deadlines, autonomy of time use, pace, coordination and allocation of time are crucial and shape managerial work. This paper presents the results of a descriptive study, where data has been collected through questionnaires sent to managers of a number of Finnish companies. Our results identify differences among senior/middle managers in the way they perceive impacts of IT and temporal dimensions on their work.*

**Keywords:** Managerial work, productivity, office information technology, temporal dimensions

## Introduction

Time and temporal dimensions are crucial dimensions in all economic-related disciplines, and also in IS: in the past 15 years, we have encountered time-based concepts such as just-in-time management, time-based competition, fast cycle, and time compression. Temporal dimensions are norms of time that can be used in various contexts to explore individuals' temporal behaviour or work processes in organizations (Schriber & Gutek, 1987). Lee suggests that the growing role of Information Technology (IT) in our society and organizations and its impact on work temporal dimensions should be taken into account when studying organizations and individuals' work practices (Lee, 1999). Barley's study reported that introduction of IT brought up changes to the temporal dimensions of work processes. It actually changed the temporal aspects of radiologists' work by enabling them to improve coordination with their colleagues (technicians) (Barley, 1988). Indeed, speed and reduced time gaps are among the main benefits that we try to achieve through implementation of IT. Also, recent management concepts such as Business Process Reengineering (BPR) and Knowledge Management promote the use of IT as an enabler to speed up processes, allow multi-tasking, and share information and knowledge much faster (Hammer, 1995). There are numerous evidences of increasing efficiency from industry due to IT implementation, particularly in well-structured operational processes (see e.g. Jelassi, 1994). However, while operational efficiency benefits straightforwardly from time reduction, more complex tasks, such as managerial and knowledge-intensive activities, require more sophisticated elaboration (Drucker, 1999).

As an alternative to traditional methods for evaluating the impacts of office IT on managerial work's productivity at the individual level, we propose to use several temporal dimensions as a measurement instrument. These temporal dimensions have been validated and used as research instruments in other research fields: behavioural research (Schriber and Gutek, 1987), managerial psychology (Benabou, 1999) and anthropology (Hall, 1976). We propose to use temporal dimensions to test how they fit in IS research and to uncover the possibly existing relationships between IT, temporal dimensions and managerial work productivity. Thus, the nature of the study presented below is explorative and descriptive. Data has been collected through questionnaires; analysis has been conducted using descriptive statistics and results are presented accordingly.

In section 2, we review the current literature on the notion of time and temporal dimensions, nature of managerial work, office information technology and the links that we want to establish between these concepts. In section 3, we present the research approach and design, describe the method for data collection and present the obtained results.

## Research Background

### *Time and Temporal Dimensions*

Time is a rich concept, which has been studied in various research fields (psychology, economics, sociology etc.). Cultural aspects of time, at the national level, have been widely investigated by Hall (Hall, 1976) and more recently by Usunier (1991). Also, from an individual perspective, it has been observed that perception of time varies among cultures and nationalities: The way in which individuals value time within cultures depends on such factors as (i) professional groups (Barley, 1988), (ii) level of education (Kaufman, Lane and Lindquist, 1991) and (iii) individual preferences (Bluedorn, Kaufman and Lane, 1992).

In order to analyse time and its impacts, a number of temporal dimensions have been developed and used in previous research work (Schriber & Gutek, 1987). These dimensions are norms of time that we can use to explore cultural differences, organizational culture, individual temporal behaviour or work processes.

Under temporal dimensions of work, we understand the following dimensions (Benabou, 1999):

- *schedules and deadlines* are the time limits by which work has to be done;
- *punctuality* is the degree of rigidity to which deadlines are adhered;
- *awareness of time use* describes how people evaluate the time they use to complete work. It involves the trade-off between speed of completion and quality of work;
- *pace* represents the degree by which activities occur in a repetitive regular manner;
- *work overload* represents inability to achieve goals within a defined time frame;
- *work constraints* correspond to the number of activities that have to be completed within a certain amount of time;
- *autonomy of time use* represents the degree to which people have control over their own time planning and its actual use;
- *co-ordination and synchronization* assume specific ordering of activities, in particular when many people are involved;
- *separation of work and non-work* time draws a distinction between use of time for work or other purposes.
- *Allocation of time* represents the amount of time devoted to an activity.

More dimensions have been identified and used in other research contexts (e.g. Schriber and Gutek, 1987). But, in our study we use only five dimensions (schedules and deadlines, autonomy of time use, coordination, allocation of time and pace), which are in our opinion the most essential to managerial work and probably the easiest to handle by the respondents of our questionnaire. This also allows us to reduce the complexity of the research design.

### *Managerial Work*

Many studies have been done about the nature of managerial work (Carlson, 1991, Kotter, 1999, Mintzberg, 1973), and these studies are still relevant in the actual world ("managerial work does not really change over time", Mintzberg, in Carlson, 1991). Panko (1992) refers to more than 50 studies of the "use of time" of lower, middle, top managers and knowledge workers using various techniques (agendas, observations, estimates etc.) and methodologies for the last 50 years. What is striking about the field of study is that we have now a broad understanding of what managers do (leading authors have identified several categories of managerial activities), but there is an evident lack of theory of managerial work.

Mintzberg (1973) identified 3 types of managerial roles (interpersonal, informational and decisional roles). Those roles involve different types of activities (e.g. environmental scanning and sharing dissemination of the information on the informational role, disturbance handling and resource allocation for decisional role, conflict resolving for interpersonal role).

All the authors that we have mentioned in this section refer to managerial work as a stream of disjointed, fragmented activities occurring at an unrelenting pace. Despite changes in the business environment, it seems that managerial work does not change over time (Mintzberg in Carlson, 1991). Mintzberg identifies 6 characteristics of managerial work: (i) quantity and pace of work, (ii) pattern in activities, (iii) relationship between action and reflection, (iv) use of different media, (v) relationship to a variety of contacts, (vi) interplay between rights and duties. These characteristics lead us to consider the importance of managerial work's

temporal dimensions: especially in today's world, as we often hear managers complaining about time pressure, time famine, short cycle times and fragmentation of their working time. It is particularly interesting to see how the implementation of new technological applications (mobile computing, e-mail, Internet and large database access to end-users) will affect managerial work's temporal dimensions (e.g. e-mail is seen as an application which reduces communication time and cost, but it also gives a sense of urgency) and, hence, productivity. We show further in section 2.3 in which respect we can evaluate the impacts if IT on managerial work's temporal dimensions and productivity.

### ***Impacts of Office IT on Managerial Work's Temporal Dimensions and Productivity***

One of the key concepts that we need to define in this paper is productivity. At the macro-economic level, productivity can be simply defined as the amount of output divided by the amount of input. Despite its simplicity, this definition encompasses a broad range of both tangible and intangible factors which contribute to productivity: focus on the customer, quality, customisation, cycle time competitiveness, capital, worker training – just to name a few.

However, at the micro-economic level, and especially when measuring the impact of office IT on managerial productivity, considering productivity only from an investment perspective brings relatively few insights on how IT affects managerial work. Several authors argue that it is more appropriate to examine the relationship between IT and the nature of work (Pinsonneault and Rivard, 1998). The reason for such a view is that productivity improvement can be one of several objectives pursued by IT investment: other complementary goals include quality, increase of flexibility, responsiveness and/or operational efficiency.

Assessing managerial productivity is a very complex task. In fact, a dilemma of managerial productivity assessment is how to measure productivity as a trade-off between efficiency ("to do the things right") and effectiveness ("to do the right things"). One method, which can be used to assess productivity, is to survey managers about their self-perception of their productivity considering a number of factors. The factors that we use in our study are temporal dimensions in respect with each managerial role (for example, assess how meeting deadlines impact on decision-making role).

By office information technology, we refer to the usage of technologies that are available to managers when carrying out their daily activities. These technologies include: communications systems, desktop systems, decision support systems and enterprise resource planning systems.

Using temporal dimensions as a common "denominator" in our study, we assess how (i) IT impacts on managerial work's temporal dimensions, and in their turn, (ii) how temporal dimensions impact on the self-perceived productivity of managers. We then explore how temporal dimensions mediate between IT and perceived productivity and identify direct relationships about the impacts of IT on perceived productivity.

## **Study on the Impacts of IT on Managerial Work's Temporal Dimensions and Productivity**

In the previous section, we have exposed our current state of knowledge about time, managerial work, IT and productivity. Our purpose now is to identify the relationships, which may exist between these concepts. In this section, we formulate the research questions relevant to our study objective, and we show how they interrelate with each other. We also present the research design, the data collection method, and elaborate on the results obtained through our questionnaire.

### ***Research Approach***

The research approach used for this study is descriptive. We justify it by the fact that there is no single theory that would encompass all the concepts - IT, managerial work's temporal dimensions and productivity together. Though there are a number of studies conducted on these concepts singled out (see section 2). The role of this descriptive study is therefore to find out potentially existing relationships between our concepts, which could be elaborated and tested in further explanatory studies (Pinsonneault and Kraemer, 1993). For this purpose, we have used a questionnaire to collect data (See 3.3).

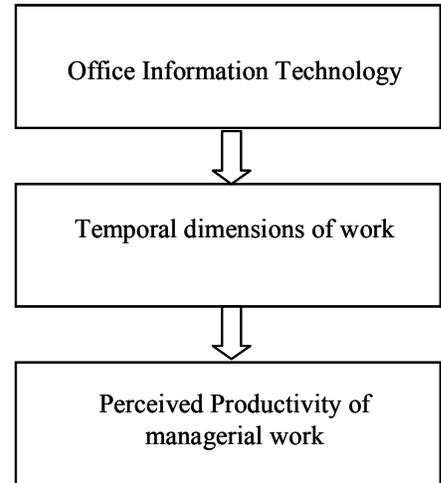
**Research Design and Questions**

We are interested in the link between IT and managerial work’s productivity, which could be explained through the use of temporal dimensions, as shown in Figure 1. We want to answer the two following questions:

- What are the impacts of IT on managerial work’s temporal dimensions?
- *What are the work’s temporal dimensions associated with managerial work’s productivity?*

In order to answer these two questions, we use the set of Temporal Dimensions mentioned in 2.3 as a research instrument. In our study, we aim to show in which respect IT has influenced these temporal dimensions. Then we observe how the temporal changes, due to implementation of IT, influence managerial work’s productivity. Our third research question resides in building the bridge between IT and productivity:

- *Has IT positive/negative impacts on managerial productivity?*



**Figure 1. Research Design**

**Data Collection and Questionnaire Building**

Data collection is operated through a mail questionnaire. The questionnaire has been distributed between 300 senior and middle managers working in 32 private and public, large, medium and small organizations operating in Finland.

The questionnaire consists of the following parts: demographics, office IT usage, impact of IT on temporal dimensions of managerial work and impact of temporal dimensions on productivity of managers.

Office IT usage is an aggregate from the use of a range of office applications (from phone to ERP systems). Impact of IT on temporal dimensions of managerial work is assessed as the respondent’s perceived impact of IT on 5 temporal dimensions of 3 main managerial roles (as defined in Mintzberg’s taxonomy of managerial roles). In a similar manner we assess the impact of temporal dimensions on managerial work’s productivity. The line of questions is exemplified in Fig.2. Questions are answered on a 5-point Likert-scale ranging from “Never” (1) to “Always” (5).

<p><i>Temporal dimensions (e.g., deadline)</i> Most of my work is done under deadline</p> <p><i>Impacts of IT on temporal dimension</i> IT helps me to gather information by specific deadline</p> <p><i>Impact of temporal dimension on perceived productivity</i> Timely gathering of information lets me to achieve more targets</p>
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**Figure 2. Exemplified Questions for Each Construct**

**Results**

**Demographics**

The response rate for the questionnaire is 17.3%. Such a relatively low rate can be explained by the way of distribution of questionnaire—10 per company, independently on the company size. The responses are distributed between senior (34%) and middle (66%) managers. The respondents belonged respectively to small (33%), medium (42%) and large (25%) companies.

The majority of managers have M.Sc. (63%) and Ph.D. (17%) degrees. Around 90% of managers who have a PhD are in a senior management position, while 80% of M.Sc. belongs to middle management.

Middle managers exhibited heavier (40%) IT usage IT than senior ones (12%), this is consistent with the rest of data: 76% of senior and 55% of middle managers showed moderate or low IT usage. A similar relation exists between the level of education and IT usage. From these results, we can reasonably assume that the role of IT in the work of middle managers is more significant, we can also suggest that senior managers are low IT users because their support staff carries out IT-based tasks, although our data does not allow us to be conclusive on this point.

We have also found that the managers with higher education tend to prioritise task completion and longer working hours over following strict schedules and meet deadlines. Analysis of temporal dimensions against position of managers indicate that senior managers have more organized work settings that allow them to stick to schedules and meet deadlines (31% of senior managers vs. 15% of middle managers), maintain autonomy (37% vs. 16%) and allocate better their time (70% vs. 45%). Middle managers have more time pressure to stick to schedules, meet deadlines and less autonomy, therefore they demonstrate a higher capability to do several activities at once.

Other demographics that we have derived from the questionnaire are:

- Level of education vs. self-perceived IT experience: 55% of Ph.D. consider themselves as “amateur” users of IT, while 80% of M.Sc. consider themselves as “professional users”.
- Number of working hours vs. position: senior managers (47%) work more than 45 hours/week versus 27% for middle managers.

**Impact of IT on temporal dimensions of managerial work**

The majority of respondents positively evaluated the impact of IT on temporal dimensions of their work: the response “4”, which means “often” in a positive statement of our questionnaire was received with regards to “schedules and deadlines” in 71%, “coordination” --67%, “autonomy of time use” --63%, “pace” --65%, “allocation of time” --79%. We tend to explain the significant difference between allocation of time and the other temporal dimensions by the fact, that IT allows managers to carry out activities as they are planned to be performed.

**Impact of temporal dimensions on perceived productivity of managerial work**

In this section we try to answer the second research question, namely, which of the temporal dimensions affect the managerial perception of productivity the most. The results demonstrate that “pace” is seen to have the strongest impact on productivity (75% of all respondents). Value of the change in “pace” is more appreciated by senior managers (88%) against 66% of middle managers. We can come up with the similar conclusion regarding the perceived impact of “allocation of time”: 70% of senior managers view it the most affected against 57% of middle managers. Other dimensions, which are perceived by both types of managers as important factors of productivity improvement are “coordination” (69%) and “allocation of time” (63%).

To extend the scope of our analysis, we have run the correlation analysis between impacts of IT on each temporal dimension and impacts of each temporal dimensions on perceived productivity. We have found that they are positively correlated at the level of 0.01 (Table 1). However the range of correlation coefficients (0.2-0.6) is insufficient for drawing any final conclusion about the impact of IT on perceived productivity through any temporal dimension: this, in our opinion, can be explained by the fact that the sample is not large enough.

**Table 1. Correlations between Impacts of IT on Temporal Dimensions and Impacts of Temporal Dimensions on Productivity**

	<b>deadline on productivity</b>	<b>coordination on productivity</b>	<b>autonomy on productivity</b>	<b>pace on productivity</b>	<b>allocation on productivity</b>
IT on deadline	.216**				
IT on coordination		.475**			
IT on autonomy			.496**		
IT on pace				.532**	
IT on allocation					.482**

\*\* Correlation is significant at the 0.01 level (2-tailed).

## Conclusions and Further Work

This descriptive study attempts to explore the relationships between use of office information technology, managerial work and temporal dimensions.

This study has several limitations:

- Sample size is insufficient to allow us to generalize or draw significant conclusions.
- Use of perceptual measures of impacts of IT and managerial productivity instead of objective measures.

However, our results give us insights on the perception of the role of IT in managerial work, and, more specifically, the change in temporal settings of work influenced by IT. In our study we have identified significant differences between senior and middle management in perception of IT as a leverage to increase productivity. We see a strong potential in this kind of research, which has not been very extensive in the IS field.

Further work in this research includes to (i) complement our data through other data collection methods (semi-structured interviews and case studies), (ii) carry out a number of cross-cultural studies (perception of time is different across cultures), (iii) bring other temporal dimensions and (iv) use other dimensions such as temporal preferences (monochronicity/polychronicity).

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