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XX Ph.D. in Management Information System

Impacts of ICTs on the temporal dimension of organizational culture: a literature review and a case study

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1. Introduction

In the existing literature about ICTs and the organization of work, organizational dimensions like distribution of authority and control, standardization, centralization, specialization of labour, organizational size have received great attention, both in the perspective of the technological imperative, in the organizational imperative model and in the structuration theory perspective (Ravagnani, 2000).

Much less attention has been given to the study of the relationship between ICTs and the temporal dimension of the organization of work, in spite of the fact that we can consider the time dimension as one of the fundamental variables in organizational analysis since the early scientific management movement (i.e. Taylor, 1903; 1911).

Today it is generally accepted that information technology, when implemented in organizations, speeds up business processes at an enormous rate and thereby saves the adopting organizations a great amount of time. Nevertheless, in spite of its significance in temporality, research on temporal impacts of information technology in organizations is still limited (Lee and Whitley 2002).

Empirical studies on this topic have started to appear regularly during the last decade (Sahay 1997, 1998; Lee 1999; Lee and Liebenau 2000; Sawyer and Southwick 2002; Scott and Wagner 2003; Kvassov 2003; Sarker and Sahay 2004; Prasopoulou et al. 2006), gaining a stable attention which has lead in 2002 to the publication of a special issue of *The Information Society* on “Time and IT”.

Speeding up the pace of work activities, foster workers’ polychronicity, promote shifts from “batch” logic to “flow” logic, improve synchronization among organizational units are just a few examples of some important objectives pursued by firms when they adopt systems like Workflows or ERPs.

Such objectives are related to potential changes in the temporal organization of processes and activities, but also to potential changes in mental attitudes people have towards time and time use in the workplace.

Organization studies have long acknowledged time as a fundamental dimension of organizational culture (Schein 1985, Hofstede 1991) and it has been underlined that, besides being a condition for the coordination of activities and the production of organizational outputs, the temporal organization of work activities, processes, routines constitutes a "pattern" which plays a fundamental role also as a template for organizing behavior: a cognitive and cultural framework which helps people make sense of actions and events in the workplace (Barley, 1988).
It has also been pointed out that temporal patterns and assumptions are as well an expression of the specific culture of different organizational units and professional groups within a firm (Gherardi and Strati 1988; Dubinskas 1988, Butler 1995), thus conveying a strong symbolic value for both individual workers and groups.

Both these cognitive and cultural functions of temporal patterns contribute to their strength and permanence in organizational units and work groups, suggesting that changes in the temporal dimensions of organizational culture potentially conveyed by information systems are not to be taken for granted – on the contrary, they might affect, positively or negatively, the achievement of the expected temporal performance of the system.

Based on the above considerations, the work we propose intends to give a contribution to this area of studies, through the following objectives:

- Presenting a review of the literature on time as social and cultural construct, with a focus on how the temporal dimension has conceptualized in organizational literature.
- Presenting a review of the state of the art of theoretical and empirical scientific contributions on the temporal impacts of ICTs in organizations
- Presenting the results of a case study which investigates the impacts of the introduction of a workflow system on the temporal assumptions of three

organizational units within a company and tests the hypothesis that the temporal assumptions existing in organizational units before the introduction of the system can affect it's the way it is used, thus facilitating/hindering the achievement of the expected performance conveyed by the system.

The case study presented here has been conducted in the Italian branch of a multinational manufacturing Company, where a Workflow System has been introduced in order to improve Customer Service processes.

The work is organized in nine sections including this Introduction:

- In Section 2 a review of the literature on time as social and cultural construct is presented, with a focus on how the temporal dimension has been conceptualized in Organizational literature.
- In Section 3 the cognitive and cultural functions of temporal patterns are analyzed and a review of frameworks for the analysis of the temporal dimension in organizations constitutes the first step in order to select the framework for the empirical study.
- Focusing on the specific literature on the temporal impacts of ICTs in organizations, Section 4 analyzes contributions from the IS and Organization disciplines on the topic and which examines what kind of technologies have been taken in consideration in these studies, what theoretical frameworks adopted and what epistemological standing and methodologies, in order to proposes a critical review on the state of the art of research on this topic.
- The empirical part of the research is proposed in Section 5 which describes the aim and motivation of the study, its theoretical framework, the design of the research and the methodological option.
- In Section 6 the results of the study are presented and discussed, together with its limitations.

- Section 7 draws the conclusion of the thesis.
- Section 8 includes the references .
- Section 9 presents the attachments.

2. Time as a social and cultural construct and conceptualizations of organizational time

Sociological (Durkheim, 1965 Merton and Sorokin, 1937; Gurvitch, 1964; Zerubavel, 1981; Giddens, 1984;), anthropological (Hall, 1959, 1983) and organizational literature (Lawrence and Lorsch, 1967; Clark, 1985; Schein 1985; Bluedorn and Denhardt 1988; Gerschick, 1988; Gherardi and Strati, 1988; Hofstede 1991; Butler; 1995; Trompenaars, 1998; Orlikowski and Yates 2002) have contributed to conceptualize time as a social and cultural construction, opening the way to a view of time as plural, multifaceted, relative, culturally determined, embedded in contexts and practices.
Anthropological and sociological studies point out that our notions of time and temporal routines are deeply entrenched and directly related to the way we see the world (Zerubavel, 1981; Dubinskas 1988) and the presence of a known, reliable temporal structure is considered central to the way we interpret objects and events.

As far as organization theory is concerned, there has been a shift from a view of time as objective, external, universal (i.e. in Taylor) to the consideration of the internal, particular time of single organizations. The cultural perspective on organization has acknowledged time as a fundamental dimension of organizational culture (Hofstede, 1991 Schein, 1988, Schriber and Gutek, 1987), and in the last two decades conceptualizations of 'Organizational time' have driven attention to the co-existence of a plurality of internal and particular times and temporal patterns within each organization (Schriber and Gutek, 1987; Gherardi and Strati, 1988; Butler,1995).

2.1 Time as a constant and time as a variable in social studies

The first sociologist to treat the notion of time considering its social and conventional nature was Durkheim (1965) who, in his work on religious forms, distinguished between "sacred time" and "profane time" and introduced the notion of time as collective, thus

social phenomenon, contrasting implicitly subjective theories on time developed in other disciplines (i.e. psychology). Durkheim maintained that the notion of time has a social origin: “what the category of time expresses is a time common to the group, a social time, so to speak” (p.23), thus constituting a social fact.

His intuition was further developed by Merton & Sorokin in their seminal work of 1937, who promoted the introduction of social time as a methodological category in sociological analysis, arguing that time is essential to it because it is a necessary variable in social change.

They claimed that in the domain of sociology very little attention had been dedicated to this fundamental category so far, with the exception of Durkheim’s school. Moreover, they claimed that “most social scientists have proceeded on the tacit assumption that no system of time other than those of astronomy or the imperfectly related calendar is possible or, if possible, useful” (p. 615), the characteristics of astronomical, objective Newtonian time being :

- Unicity: there is only one time
- Infinitely divisible: its parts being comparable
- Uniform: it is quantitative and possesses no qualitative aspects
- Countinuous: it permits no “lacunae”

The objective of the authors was to demonstrate that in the field of social dynamics such restriction to a single conception of time involved several fundamental shortcomings, and they acknowledged a delay in sociology discipline, if compared to the more articulated concepts of time already developed by other disciplines like philosophy, psychology, economics (Marshall, 1925) and astronomy itself through the theory of relativity.

In order to introduce the notion of social time, they demonstrate that both indications of points in time and indication of duration, social events are taken as points of reference rather then astronomical or calendric frames of reference : in the course of daily activities, people “express the change or movement of social phenomena in terms of other social phenomena taken as point of reference” (p. 618), that is to say, in order to indicate points in time, people use expressions like: “I’ll meet you after the concert” or “Shortly after the World War” rather then astronomical or calendric frames of reference, and to indicate

duration, they use expressions like “for a semester”, “for a working day”. Without any mention of objective, astronomical time, “the time expressions are in reference to social activities or group achievements” and “the calendric reference itself becomes significant only when it is transformed in social time”. (p.619). The authors point out that “each group, with its intimate nexus of a common and mutually understood rhythm of social activities, sets its time to fit the round of its behaviour” (p.619): consequently, every system of time reckoning reflects the social activities of the group and is a product of social interaction, “perpetuated by the need for social co-ordination” (p.620) The authors conclude that “time reckoning is basically dependent upon the organization and functions of the group….the system of time varies with the social structure” (p. 621).

The implications of their notion of time as social time, are that, compared to the Newtonian concept:

- Social time is not one, but plural: there are as many time systems as social groups/organizations. Moreover, the multiplicity of time systems has to be taken in consideration when individuals from different backgrounds come together and a common temporal scheme is required to co-ordinate their activities.
- It is not purely quantitative but it also has qualitative variations: periods of time (i.e. work days, holydays) acquire specific qualities by virtue of association with the activities or events peculiar to them .
- Its parts are not perfectly comparable, as in the infinitely divisible Newtonian notion: quantitatively equal periods of time are made unequal from a social point of view and vice versa
- It is in no way continuous: according to the authors, some beginning must be set in order to initiate any system of time reckoning, and in all cases the point of departure is social or imbued with profound social implications, for example the founding of Rome for roman calendar or the birth of Christ for western calendar (p. 623). Moreover, critical social events and dates disrupt continuity.

The authors conclude that “time reckoning is basically dependent upon the organization and functions of the group….the system of time varies with the social structure” (p. 621).

That is to say, they open the way to the consideration that time is not to be conceived as a constant but can be conceived as a variable, that is to say, it has a conventional nature.

In the same perspective, Gurvitch, in The Spectrum of Social Time (1964), maintains that various groups, organizations or societies manifest different time perspectives, that they situate themselves differently with respect to their history and development, and that the resulting variations of temporal perspective present an extremely difficult problem in terms of social integration.
For example he describes social time in terms of the movements of a number of social phenomena, and outlines eight types of time based upon the relation of past, present and future, along with the degree of continuity and duration of events (p.30).

Another milestone in the so called "sociology of time" is the work by Zerubavel *Patterns of time in hospital life* (1979), which we will describe more in detail for the purpose of this study, because some of his findings have subsequently often been adopted as analytical instruments in studies on the temporal dimension in organizations in relation to information technology (Barley 1988, Lee and Liebenau 2000, Prasopoulou et al. 2006) The author presents "an analytical description of the way social life is temporally structured" (p. XII). The author here introduces the notion of "socially based temporal order", which he unveils by identifying the "sociotemporal structure" of an organization (Ibidem).

Sociotemporal order is defined by Zerubavel as a collective phenomenon: "This order, in accordance with which much of social life is structured and regulated, is essentially the functional analogue of the physiotemporal and biotemporal orders which regulate the motion of celestial bodies and the lives of living organisms, respectively. It is undoubtedly one of the cornerstones of social life". (p.104). "Individuals' temporal patterns are inseparable parts of a larger whole, they are essentially organized within some social context", so "the structural components of the sociotemporal order are collectivities, and its major institutionalized representations – the schedule, the calendar, the timetable - are essentially of a collective nature" (p.106).

In his ethnography of hospital life, he described the components of the sociotemporal structure he observed: first of all, many institutional activities were structured in accordance with some rhythmic patterns, which he called 'Social cycles' and defined as "the time intervals during which sequences of recurring successions of social activities are completed" (p.2). Zerubavel questions the adequacy of the common conception of time as a continuous dimension: the cycles which constitute the components of the temporal structure of hospital life are perceived and dealt with as discrete segments of time as if they were quantum units. Their beginnings and ends are treated as rigid boundaries, which are "untrespassable" (p.2).

Secondly, in order to assure temporal coordination among physicians and among nurses, indispensable for continuous coverage, three "patterns of temporal coordination" were an essential component of the sociotemporal order in the hospital: temporal symmetry, temporal complementarity, staggered coverage. The author found that sharing a common schedule (symmetry) is a powerful basis for mechanical solidarity (based on co-presence, similitude among members, identification in groups sentiments, and boundaries towards the outsiders), while sharing a complementary schedule (complementarity) is a powerful basis for organic solidarity (based on interdependency, on complementarity of resources and differences) The author remarkes that scheduling is in itself a mechanism for establishing and consolidating social boundaries between groups and maintaining an "ordered segmentation" within the organization.

Zerubavel points out that Sociotemporal order not only provides a highly structured organizational order but also a highly reliable *cognitive order*: it provides staff with a sort of "repertoire" of what is expected, likely or unlikely to occur within certain temporal boundaries: "The Sociotemporal order of the hospital also functions to provide a solid and reliable cognitive context within which the meaning of social situations is anchored, and the temporal regularity which underlies it is among the major "background expectancies" which are the basis of the "normalcy" of everyday life in the hospital"(p.127).

He also demonstrates that the Sociotemporal order functions as a *moral order* as well. Why? Scheduling represented the temporal structure of responsibility: it was an

expression of some fundamental organizational values like responsibility towards the patients, fairness towards staff members, and it was also a criterion to judge the appropriateness of personnel's behaviour: some actions were considered "legitimate", for example, only at the end of a shift, but not at the beginning. In this view, the temporal dimension appeared central for the definition of the "boundaries of norms".
Anthropologists as well have examined the variability of time from culture to culture: we will describe in particular, for the purpose of this study, Hall's (1959) examination of cultural differences about time orientation and use at the level of national culture, because, as for Zerubavel, some of his findings have subsequently often been adopted as analytical instruments in studies on the temporal dimension in organizations (Barley 1988; Bluedorn et al. 1999; Lee 1999; Onken, 1999).

Hall observed that time is a "silent", implicit language handled differently in different cultures : the author wrote that "time talks" (p.2, Anchor books edition, 1973), to signify that "time systems" (p.2, ibidem) have a structure which conveys meanings and expresses features of the specific culture. Hall found, for example, that the notion of scheduling, very important to north Americans, was almost absent in Pueblo Indians culture, where events used to begin "when the time is ripe and no sooner" (p. 9, ibidem).
Comparing the extension of view of the future, he found that "the white civilised westerner has a shallow view of the future compared to the Oriental" and that "Navajo time is like space – only the here and now is quite real. The future has little reality to it" (p.11 ibidem).

The best known analytical distinction proposed by Hall is probably the one among polychronic and monochronic time systems (1959, 1983, pp.45-46): in polychronic cultures people prefer to be engaged in two or more tasks or events simultaneously, and believe their preference is the best way to do things; in monochronic cultures people prefer scheduling one thing at a time and think this is the best way to do things ("Time with us is handled much like a material; we earn it, spend it, save it, waste it. To us it is somewhat immoral to have two things going on at the same time" he says referring to north Americans - p. 7, ibidem).

Hall described as having relatively polychronic cultures: the Pueblo Indians in Arizona, Latin Americans, and Middle Easterners, while he observed monochronic features being predominant in North American and Northern European cultures. He also compared polychronic time to monochronic time systems stating that they are opposite approaches, which can produce misunderstanding and conflict among people belonging to the two different cultures.

2.2 Time in organizational literature and the concept of 'organizational time'.

As far as organization theory is concerned, there has been a shift from a view of time as objective, external, universal (i.e. in Taylor) to the consideration of the internal, particular time of single organizations. The cultural perspective on organization has acknowledged time as a fundamental dimension of organizational culture (Hofstede, 1991 Schein, 1985, Schriber and Gutek, 1987, Trompenaars 1998), and in the last two decades conceptualizations of 'Organizational time' have driven attention to the co-existence of a plurality of internal and particular times and temporal patterns within each organization (Gherardi and Strati, 1988; Barley, 1988, Butler,1995).

For Taylor (1903) and the scientific management movement the introduction of scientific principles of management implied a major informational problem: to reach a complete knowledge about the exact timing of activities and processes, and required as well a huge effort to modify and control the timing of productive processes. The underlying concept of time had the characteristics of what has been defined a "Newtonian" view of time, as external, objective, quantitative and indefinitely divisible. Another underlying assumption is that time is a scarce resource, related to organizational productivity, and that it has to be carefully managed in order to reach the organizational objectives.

According to Bluedorn and Denhardt (1988) this particular concept of time has long been dominant in management and organization studies because "Western culture has come largely to depend upon one particular time perspective, even to the point that alternative views are difficult to recognize. As a society, we tend to agree on an objective concept of

time, one that is unitary (subject to only one interpretation), linear (progressing steadily forward from past to present to future), and mechanical (containing discrete moments subject to precise measurement). This view of time, which has also been called "clocktime," "chronological time," or "even time" is, however, an interpretation of time that has evolved historically.

A key development in the establishment of objective time was what Marx called the "commoditization" of labor (Marx, 1867/1978), Capitalism was distinguished,Marx felt, by its claim that labor, as a function of time, could be bought and sold. What occurred with the rise of capitalism was that the time of the worker came to be seen as not only valuable to others but also to the worker as well, Labor in this way became a commodity, an object or a thing to be bought and sold…. Mumford (1963) pursued similar themes, noting especially the importance of the clock and the emergence of mechanical time as the key to these developments. The clock made possible the measurement of time, especially work time, and also made possible a clearer distinction between work and play. Time outside work increasingly became defined in terms of work time. Mumford describes this development as follows: 'Time, in short, was a commodity in the sense that money had become a commodity. Time as pure duration, time dedicated to contemplation and reverie, time divorced from mechanical operations, was treated as a heinous waste'" (p. 302).

As the authors point out, this approach to time in studies of management and organizations is so deeply rooted that even authors who examined its culturally based nature concluded that it was somewhat inevitable to adopt it: "Gulick (1987) examined the question of organized time, acknowledging the cultural influences on our concept of time, but concluding that "in management these are the basic elements: time as an input, time as an output, time as an assembly line, time as a gap, and timing as a strategy" (p. 116). Similarly, one of the latest academic discussions of time, that by McGrath and Rotchford, (1983) describes time, as it is socially constructed in industrialized societies, as an objective resource, holding that "if time is a valuable commodity, then it must be put to use economically and rationally" (p. 69).

This view of time, "clocktime," has been criticized by Clark in a seminal paper of 1985, where he claimed that researchers should "penetrate behind the metaphor of clock time"

(p.36), arguing that consideration of time in organizations should move beyond measurement provided by the clock or other chronometer. The central view of time he develops in his paper is the notion that time is “in the events” (p.40), and the rhythm of these events doesn’t necessarily overlap with clock time.

He claims that time is a socially constructed, organizing device by which one set, or trajectory of events is used as a point of reference for understanding, anticipating and attempting to control other sets of events. Time is *in* the events and events are defined by organizational members.

In order to explain the notion of event time, Clark distinguishes "even time" from "event time." Even time is characterized by divisibility into equalized, cumulating units, non-evaluative acceptance by large geographically dispersed populations, openness to unlimited extension and no particular concern for the past, present or future. Event time has the opposite characteristics, requiring a far more heterogeneous pattern of differentiation than even time. Here life is framed by meaningful events, including those that are related to seasonal variations.

For example, Clark examines the can making industry as one that experiences "contingent periodicities" in its organizational system, based on the fact that there are uncertain demands arising from the rates at which crops ripen during different growing seasons. Similarly, his study of sugar beet processing indicates vast differences during the campaign season and the off season. Clark argues that evidence of event-based temporal differentiation provides a counter to the argument that industrial capitalism is totally dominated by mechanical clock time.

The importance of cycles of organizational work is also emphasized by Zerubavel (1979), as described in the previous section, and by Schriber (1986), who argues that many jobs evidence recurring or cyclical characteristics and that one can examine not only individual job cycles, but the way in which various job cycles relate to one another and support the work flow of an organization. Specifically, Schriber argues that central managerial tasks are to set deadlines within the work unit (cycle speed and frequency, for example), negotiate interdependent deadlines with other work units (cycle interconnectedness), set and modify schedules (cycle speed, frequency and interconnectedness), configure task sets

into jobs, and allocate temporal resources to them (cycle variety). Another managerial function is the modulation of input and output, as well as the management of the throughput process (cycle discretion and autonomy) (p. 47).

As Bluedorn points out (1988): “whether the study of event-based temporal structures or the study of integrated work cycles within organizations represents a departure from the Marx-Mumford-Thompson argument that modem industrial organizations are dominated by clock time or objective time is a matter for further discussion. In all likelihood, some tension between even time and event time, or between linear and cyclical temporal orientations, is likely to be present in most organizations; this distinction may even be related to class and group differences in temporal orientations. However, it seems clear that organizational elites will continue to employ time as an organizational resource” (p. 305).

One of the first organizational studies where we can envisage a “qualitative” and “internal” perspective on time, even if it is not the main focus of the study, is the work by Lawrence and Lorsch (1967).
Discussing the process of internal differentiation within the organization from a contingency perspective, they pointed out that the attitudes and orientations of managers belonging to departments dealing with distinct environmental sectors differed significantly from each other. Among these differences, they posited that also temporal orientations of managers (expressed in terms of time horizons) should vary among deparments according to the characteristics of the environmental sector they dealt with.

The authors empirically tested factors thought to be related to temporal orientations (time horizons) in different organizational departments, discovering that the temporal orientations of department managers were directly related to the time span of definite feedback from the environment (information about the results of an action taken). Lawrence and Lorsch found that the shorter a department's time span of definite feedback, the shorter the time horizons of that department's managers tended to be.

Not only did they acknowledge the importance of temporal orientation in the process of decision making, but they also opened the way to further studies on the existence of different attitudes towards time within a single organization.

Studies on organizational culture have fully acknowledged time as multiple, qualitative, and socially constructed, integrating the time dimension as a fundamental dimension of organizational culture (Schein, 1985, Schriber and Gutek, 1987, Hofstede, 1991 Trompenaars 1998).

Schein (1981, 1983, 1984, 1985) was especially influential because, more than others, articulated a conceptual framework for analyzing and intervening in the culture of organizations.
Based on previous studies on groups differences and national culture differences, he proposes a well known formal definition of culture as "the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration and that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to these problems" (Schein 1985, p. 9).
Schein states that this definition can be applied to human groups at different levels (civilizations, nations, occupational or professional communities, single organizations). According to him, culture exists simultaneously at three levels: on the surface we can observe artifacts, underneath lie values and the deepest roots are constitute by assumptions, which represent the taken for granted and implicit beliefs about the way reality must be perceived, thought of and felt.

Among the assumptions he includes in his framework, are what he calls assumptions on time. He includes some assumptions derived by previous studies and adjusted them based on his own experience: monochronic and polychronic assumptions (derived from Hall, 1959), to which he adds cyclical (derived from Redding and Martin-Jones, 1979); pointing out that these assumptions not only characterize different national cultures but as well different professions and organizations within the same national culture.

For example he posits that monochronic assumptions are more common in large organizations and polychronic assumptions are frequently associated to small dimension and early stages of organizational lifecycle.
He includes in his analysis as well the concept of time horizon, defined by Kluckhohn and Strodtbeck (1961) as orientation to past, present and future, and the concept of time span derived by Jacques (1982).

Hofstede (1991) includes the temporal dimension as a fifth factor in his well known (previously four factor) analytical framework for national and organizational cultures. Building on Bond's concept of 'Confucian dynamism'(Hofstede and Bond, 1984; The Chinese Culture connection, 1989), Hofstede included in his model the dichotomy between long-term oriented and short- term oriented cultures, long term orientation implying: perseverance towards slow results; willingness to subordinate oneself for a purpose; adaptation of traditions to modern context; thrift, being sparing with resources; large savings quotes, funds available for investments; respect for social and status obligations with limits; concern with respecting the demands of virtue. On the contrary, short term orientation implies: quick results expected; concern with 'face'; respect for traditions; social pressure to 'keep up with the Joneses' even if it means overspending; small savings quotes, little money for investments; concern with possessing the Truth.

More recently Trompenaars (1998) in his extensive work on cross culture and corporate culture in global business, treat time as one cultural dimension having important implications for management. He includes in his model the dimension of 'Time horizon' which he derives from Kluckhohn and Strodtbeck's orientation to past, present and future (1961), and proposes as well a methodology to measure perceptions about this dimension based on Cottle's Circle test (1967). He describes how the configuration of this underlying dimension of organizational culture influences human relations, authority relations, policies of promotion and assessment within the firm, extending the analysis to an interdepartmental level as well, though cross-cultural issues remain the focus of the work.

Schriber (1986) and Schriber & Gutek (1987), in their study on time dimensions as an underlying aspect of organizational culture leave aside cross-cultural purposes, stating that

their departure point is the “current U.S. concept of time” (Schriber & Gutek, 1987p. 643) viewed as a scarce, non-renewable resource and reflecting the managerial tradition of conceiving time as objective, measurable, linear (Newtonian concept).
Within this specific cultural context, the authors examined the existence of norms about time, and developed instruments to measure “the perceptions of temporal rules and customs governing behaviour in work organization” (Ibid., p. 644)
Their aim was to develop quantitative measures of this cultural dimension, in order to be able to “compare different organizations and groups on this aspect of culture” (Ibid., p. 644).

They tested for differences in temporal norms among organizations, work group types and occupations. Results showed, for example, that work group types differed in their perceptions of the length of work cycles and work rhythm patterns. Organization types differed in the importance of schedules and deadlines and the efficient use of time. Schriber and Gutek reached a conclusion that norms about time are indeed an underlying aspect of organization culture which “can be thought of as a shared set of assumptions, beliefs, and values” (Schriber, 1986, p. 52).
This study is important for many reasons: first of all because it is one of the few attempts to operationalize cultural dimensions about time in order to allow quantitative studies, secondly because the explicit purpose of the authors is to compare organizations on this aspect of culture, assuming (and testing empirically) that organizations differ in their temporal cultures, since they “manage time and reduce temporal uncertainty differently…these differences can be used to distinguish one organization or individual from another” (Schriber and Gutek , 1987, p. 643).
Finally, they test differences among groups within organizations, pointing out that important issues to be explored concern “temporal homogeneity versus heterogeneity within organizations” (Ibid., p. 648), whether referred to departments, work groups, hierarchical levels, individuals.
This suggests that temporal norms can be considered a feature characterizing different subcultures within organizations.

Gherardi and Strati (1988) claim for the existence of a plurality of different times within organizations, introducing the concept "Organizational time", defined as "A plurality of internal and particular times within each individual organization" (p.149).

The two authors propose that there exists a diversity of times pertaining to each organization, and that time is one of the elements that constitute the 'uniqueness of an organization' (p.153) and demonstrate their thesis through the analysis of two cases of technological innovation in two different companies, focusing on decision making process. The two studies illustrate the existence of a plurality of internal and particular times of each of the two organization, that they describe as: a corporate time characterized by the dissolution of the present in the past; a corporate time characterized by the dissolution of the present in the future; an indefinite and supernatural time within a department; a time characterized by evolutionism within a department; a time characterized by immortality within a department; a collective historical time within a department

The authors maintain that the particular configuration of ways to conceive time(s) within the organization influenced the decision making process, which was the focus of their analysis. As they point out: "an event occurring in external time – the availability of a new technology, and the introduction of new technological equipment – made sense to the decision-makers once it was plotted in their internal time. This process of plotting the external event into internal time enabled the organizational actors to identify and articulate the thematic structure of their decision and to choose their course of action.Their decisions were characterized by the co-presence of a variety of times: the choices were related to time-horizons, conventionally ordered, bounded in rites and ceremonies, shaped in organizational stories" p. 158.

Butler as well (1995) proposes a conceptualization of "Organizational time" in his attempt to build a "theory of organizational time" (p. 925), based on the notion of *timeframe* which is referred to the way past, present and future are experienced within the organization.
In this contribution, time is seen as a dependent variable, as an outcome of the organizational and institutional context within which a timeframe is located.

Time is also seen as an independent variable, in the sense of enabling us to understand various organizational processes, in particular those of decision making and learning. For example, during decision making, organizational participants intentionally attempt, in the present, to connect the past to the future, while learning involves some change in conceptions about the past and their relevance to the future. (p. 926).

The notion of timeframe is built around three components: the interpretation and experience in the present, the knowledge derived form the past, and the envisioning of possible futures.
These three components of timeframes are expressed in terms of a series of variables: as far as ways to experience the present are concerned, the variables considered are linearity, novelty, regularity, movability, concurrence and pace.
Regarding knowledge of the past, its components are codes and memories; regarding the view of the future, the variables are congruence over the desired future and time horizon of the planning.
Combining the possible states of these variables, a classification of four clusters of time experiences (timeframes) is proposed: Clock time, Organic time, Strategic time and Spasmodic time.
These different clusters are seen as outcomes of organizational and institutional settings, but, in the author's analysis, also lead to modes of decision making and learning.

What is interesting to underline about Butler's contribution is that, as he points out, different organizations can produce different timeframes, and that within a single organization, there can be a variety of different timeframes (p.937), which, in turn, influence the peculiar modes of decision making and learning within the organization.

Another interesting aspect of this model is that Butler takes in consideration, from an institutional prespective, that timeframes are also influenced by the external institutional context which imposes performance norms which are relevant to timeframes (p.938).
Organizational timeframes thus originate, in this view, from the dialectic between an internal process of social construction and normative pressure from the environment.

Researchers adopting a structuration perspective (Giddens, 1984), like Barley (1988) and Orlikowski and Yates (2002) also focused on the specific way time is conceived in single organizations.

In his classical study on technological innovation in radiological departments of two hospitals, Barley adopts the concept of "temporal order" and a set of temporal dimensions derived from the studies by Zerubavel (1979, 1981), thus focusing on the peculiar way in which a temporal order is socially constructed within the organization: "Every work world carries the brand of a socio-temporal order" (p. 126).

He and points out as well that within a single organization many different temporal orders can coexist: "Most contemporary workplaces are complex organizations populated by multiple groups that operate with different temporal frameworks. This diversity in temporal orientation reinforces social differentiation and poses problems of integration" (p. 127). In this work, he identifies in particular differences between sociotemporal orders of two professional groups, radiologists and technicians, analyzing both 'structural' and 'interpretive' dimensions of their orders, and describing the consequences of different, asymmetrical temporal orders on social relations and cooperation among the groups.

Adopting a structuration perspective as well, Orlikowski and Yates (2002) in their study on the temporal organization of virtual teams consider time as socially constituted and as *enacted phenomenon*. The authors propose the notion of *temporal structures* pointing out that such structures are enacted through the daily practices of the members of an organization and reproduced through routines. According to the authors, their notion of time as social structure enacted through social practices allows to overcome the subjective-objective dichotomy that underlies much of the existing research on time in organizations . While "An objectivist perspective places most emphasis on an *external entity* or force, a subjectivist perspective is chiefly concerned with *cultural meanings*, and a practice perspective focuses principally on *human activities"* (p.688).

This practice based view "recognizes that time may appear to be objective or external because people treat it as such in their ongoing action—objectifying and reifying the

temporal structures they enact in their practices by treating clocks, schedules, milestones, etc., as if they were "out there" and independent of human action…… Similarly, a practice-based perspective recognizes that time may appear to be subjective because people knowledgeably produce and occasionally change the temporal structures they enact in their practices—treating schedules and deadlines as provisional, relative, and alterable. Recognizing this duality allows us to see how in the process of temporal structuring, every human action constitutes, is constituted by, and can potentially reconstitute the temporal structures being enacted" (p. 689).

3. Temporality as a dimension of organizational culture

3.1 A plurality of terms and definitions.

In the literature on time as a social and organizational construction, we can find a plurality of terms to define the ways in which groups and organizations give shape to the temporal organization of their activities.

Merton and Sorokin (1937) described how social groups create their own "*time systems*" according to the specific needs to coordinate their functions and achievements.

Zerubavel (1979) in his studies on the temporal organization in hospitals describes "*sociotemporal reference frameworks"* as collectively shared *temporal patterns*, which constitutes, as a whole, a "Sociotemporal order", working as "organizing schemes" relevant in a specific organizational context, while Barley(1988) in his study on the effects of the introduction of CT scanners in radiological departments uses the term "*Temporal order*" to indicate both quantitative and qualitative (interpretive) aspects of the temporal organization of the work of radiologists and technicians.

Schein (1985) in his study on organizational culture, maintains that organizational culture has groups' dominant *assumptions of time and space* embedded within it and describes several "assumptions on time" that characterize different national and organizational cultures.
He was especially influential because, more than others, articulated a conceptual framework for analyzing and intervening in the culture of organizations.
Based on previous studies on groups differences and national culture differences, he proposed a well known formal definition of culture as "the pattern of basic assumptions that a given group has invented, discovered, or developed in learning to cope with its problems of external adaptation and internal integration and that have worked well enough to be considered valid, and, therefore, to be taught to new members as the correct way to perceive, think, and feel in relation to these problems" (Schein 1985, p. 9).

Schein states that this definition can be applied to human groups at different levels (civilizations, nations, occupational or professional communities, single organizations). According to him, culture exists simultaneously at three levels: on the surface we can observe artifacts, underneath lie values and the deepest roots are constitute by assumptions, which represent the taken for granted and implicit beliefs about the way reality must be perceived, thought of and felt.

Among the assumptions he includes in his framework, are what he calls assumptions on time. He includes some assumptions derived by previous studies and adjusted them based on his own experience: monochronic and polychronic assumptions (derived from Hall, 1959), to which he adds cyclical (derived from Redding and Martin-Jones, 1979); pointing out that these assumptions not only characterize different national cultures but as well different professions and organizations within the same national culture.

Schriber and Gutek (1987) describe "*norms about time*" as specific "*dimensions of organizational culture*", proposing scales to measure these dimensions. Their work is one of the few proposing, besides definitions of temporal dimensions, a way to operationalize them as well

Butler (1995) in his conceptualization of "Organizational timeframes" describes temporal dimensions as ways to experience time in the organization which derives from its specific context: *timeframe* is referred to the way past, present and future are experienced within the organization.
In this view, time is seen as a dependent variable, as an outcome of the organizational and institutional context within which a timeframe is located.

Orlikowski &Yates (2002) in their study on the temporal organization of a virtual team introduce the term of "*temporal structures*", which are enacted through every day practices and reproduced through routines.

3.2 Cognitive and cultural functions of temporal patterns

Besides being a fundamental condition for the coordination of activities and the production of organizational outputs, the temporal organization of work processes, as pointed out by Barley(1988) plays a fundamental role also as “an interpretive framework for rendering action in the setting meaningful” [p. 125]. In other words, organizational actors evaluate and make sense of events occurring during their own activity or other people’s activity using the temporal framework as a scheme of expectations to judge whether results and behaviours are appropriate.
Zerubavel (1979) in his study on temporal patterns in the organization of activities in hospitals found that various types of schedules worked as “cognitive maps”, used by hospital’s personnel, providing a background, a “repertoire of what is expected, likely or unlikely to occur within certain temporal boundaries” [p.125].

Temporal patterns represent thus an expression of the specific organizational and professional culture which produces them, conveying a symbolic value, for the individual worker and the group of workers: according to Dubinskas (1988), the socially constructed character of time is such that all “times” existing within the high technology organizations of his study could be considered as “symbolic nexes around which coalesce issues of order, power, self definition and knowledge”.

As an example, in Barley’s study (1988) the different temporal organization of work of two professional groups, radiologists and radiological technicians, was also a representation of the different hierarchical status of the two groups: given the “temporally unpredictable world” (p. 145) of the radiologists, the technicians never knew when radiologists would be available and had to hunt for them whenever they needed one, while on the contrary the radiologists, given the predictable and highly scheduled ”tempo” of technicians, always knew when they could summon up one of them.

Again, Zerubavel found that a major aspect of the socio-temporal order expressed by the "schedule" of coverage in the hospital was that it functioned "as a moral order", an expression of some fundamental organizational values like responsibility towards the patients, fairness towards staff members, and it was also a criterion to judge the appropriateness of personnel's behaviour: some actions were considered "legitimate", for example, only at the end of a shift, but not at the beginning. In this view, the temporal dimension appeared central for the definition of the "boundaries of norms".

The above mentioned cognitive and cultural functions of temporal patterns can be considered as a factor which contributes to their strength and permanence within a given organizational context; consequently, the introduction of technologies which have the potential for changing temporal patterns intails a challenge to a multiplicity of cognitive frameworks and cultural values on which organizational actors rely.
On the other side, like all other social structures, temporal patterns have a provisional nature and change over time (Bluedorn and Denhardt 1988; Lee & Liebenau, 1999; Ancona et al. 2001), also in association with technological innovations .

Nevertheless, as Orlikowski &Yates point out (2002), such changes are not to be considered as "inherent properties" of technology, nor as "an inevitable consequence of technology use, but as an enacted temporal structure, reflecting the decisions people have made about how they wish to structure their activities".

3.3 Frameworks for the analysis of temporal patterns

Drawing from the literature examined, we propose a review of the frameworks that have been developed in research on time dimensions of organizational culture. Most studies rely on qualitative approaches, consistently with the concepts' roots in anthropology. A major effort to apply a quantitative approach to the study of the temporal dimensions has been made by Schriber and Gutek (1987) and Bluedorn et al.(1999), whose models we'll describe in detail in chapter 6.

Monochronic-polychronic time systems	(Hall, 1959)
Social cycles	(Zerubavel, 1979)
Temporal symmetry /Temporal asymmetry	(Zerubavel, 1979) (Barley, 1988)
Structural attributes • Sequency of events • Duration of events • Temporal location • Rates of recurrency	(Barley, 1988)
Interpretive attributes • Meanings of events • Judgments on activities and events	(Barley, 1988)
Norms about time • Scheduling • Deadlines • Awareness of time • Autonomy of time use • Work Pace • Quality vs. speed • Punctuality • Future orientation • Time boundaries between work and non work • Synchronization	(Schriber 1985; Schriber and Gutek 1987)

• Intraorganizational time boundaries • Variety vs. Routine	
Open-ended/closed ended temporal frames	(Dubinskas, 1988)
Long term orientation/short term orientation	(Hofstede, 1991)
Inventory of Polychronic values	(Bluedorn et al, 1999)

Table 1: Frameworks for the analysis of temporal dimensions

Hall (1959,1983) distinguishes between two different cultural attitudes towards the organization of time, *monochronic and polychronic* cultures. Within monochronic cultures events are scheduled as separate items, so that at each time unit corresponds one task, and specific slots of time are allocated to each activity in an orderly planned way, which allows to concentrate attention on one thing at a time. In polychronic cultures individuals engage in multiple activities at the same time, so that "matters in a polychronic culture seem in a constant state of flux. Nothing is solid or firm, particularly plans for the future." [p. 47] These two orientations, though very different, can coexist within a single context: as pointed out by the author "All cultures with high technologies seem to incorporate both polychronic as well as monochronic functions" [p. 58].

Viewing time from a cyclical perspective, Zerubavel (1979), calls *social cycles*: regularly recurrent patterns of activities and events, which are defined by the author as "the time intervals during which sequences of recurring successions of social activities are completed". Many organizational activities may be structured in accordance with such rhythmic patterns, and the introduction of a technology can challenge the configuration of such cycles.

With regard to coordination between the activities of individuals or groups Barley, building on the notions of temporal symmetry/ complementarity/ staggered coverage by

Zerubavel, introduces the notions of *temporal symmetry* and *temporal asymmetry* . The first type of temporal coordination implies that individuals or groups share a common pattern of temporal conditions (they share the same schedules and their working activities are synchronized). In the case of temporal asymmetry, individuals or groups operate according to different temporal patterns. The two authors point out that a condition of temporal symmetry constitute a powerful basis of mechanical solidarity among individuals and groups, while temporal asymmetry requires the development of organic solidarity.
Barley (1988) defines as *structural attributes* the"external aspects of a temporal world that can be described more or less reliably by an independent observer", which consent to measure and describe the duration of activities, their rates of recurrency, sequency and temporal location.

The measurement of these attributes allows to map the temporal organization of work in a specific context and to track the changes in such structural attributes following the introduction of a specific ICT artefact.
As pointed out above, temporal patterns also have the function to provide organizational actors with a template to interpret and judge events, activities, results during the working day. In order to examine this aspect, Barley (1988) distinguished structural attributes of temporal patterns from "*interpretive*" attributes: internal parameters, which are not immediately accessible by an external observer, related to a continuous activity of sensemaking which takes place while people "evaluate events that occur in the course of their work "against a shared scheme of expected sequences, durations, temporal locations, and rate of recurrence" . As the structural attributes of a temporal order is challenged by the introduction of a technology, the template for evaluation and interpretations is also challenged.
In the literature we find some classic dichotomies as far as culturally determined ways to perceive and experience time are concerned.

In his study of genetic engineering firms, Dubinskas (1988) points out the presence of different professional subcultures showing different temporal orientations, defined by the author as *closed-ended* and *open-ended systems:* the first one characterized by a focus on definite deadlines clearly precised in the present and proximate future, the second one

characterized by a prospective attitude in practice and planning where there is “no fixed end in view”.

Another classic culturally based distinction in time orientation is the one introduced by Hofstede (1991) between *short term orientation* and *long term orientation*, which he highlighted in his study on differences between asian and western managers.
He includes the temporal dimension as a fifth factor in his well known (previously four factor) analytical framework for national and organizational cultures. Building on Bond’s concept of ‘Confucian dynamism’(Hofstede and Bond, 1984; The Chinese Culture connection, 1989), Hofstede included in his model the dichotomy between long-term oriented and short- term oriented cultures, long term orientation implying: perseverance towards slow results; willingness to subordinate oneself for a purpose; adaptation of traditions to modern context; thrift, being sparing with resources; large savings quotes, funds available for investments; respect for social and status obligations with limits; concern with respecting the demands of virtue. On the contrary, short term orientation implies: quick results expected; concern with ‘face’; respect for traditions; social pressure to ‘keep up with the Joneses’ even if it means overspending; small savings quotes, little money for investments; concern with possessing the Truth.

4. Studies on the temporal implications of ICTs in organizations

Research on the temporal implications of information technology in organizations, though still limited, has started to gain a stable attention during the last decade, during which empirical studies on the topic have started to appear in top ranked and medium ranked Journals of Information Systems and Organization disciplines, leading in 2002 to a special issue of *The Information Society* entitled "Time and IT", dedicated to this area of investigation.

We propose in this chapter a literature review of these studies, in order to examine what concepts of time and theoretical frameworks have been used to analyze the temporal dimension; what typologies of IT have been taken in consideration as relevant from a temporal point of view, what epistemological perspectives and methodologies have been adopted in empirical studies on the topic so far.

The literature examined includes sixteen papers (one theoretical and fifteen empirical papers) covering in particular the last decade, with the exception of the seminal study by Barley (1988) which is examined here because his approach and the theoretical framework he proposed has represented a milestone for many subsequent contributions.
The papers included in this review come from both journals of Organization discipline and IS discipline: Organization Science, Organization Studies, Academy of Management Journal, European Journal of Information Systems, Information and Organization, Accounting, Management and IT, Journal of Management Information Systems, Information and management, The Information Society.

In order to present a synthesis and a critical analysis of the literature examined, we will address the three following questions:

- What are the concepts of time and the theoretical frameworks adopted to analyze the temporal dimension, and are there any prevalent ones?
- What epistemological perspectives and research methods have been adopted, and are there any prevalent ones?

- What typologies of IT have been taken in consideration as relevant from a temporal point of view?

4.1 Concepts of time and theoretical frameworks adopted

The literature examined shows that studies on the temporal implications of information technology in organizations have fully acknowledged the perspective of time as a social and cultural construction and that the conceptualizations of time and theoretical frameworks used for empirical research derive from cultural anthropology and sociological studies, and from studies on organizational culture.

We will start from the pioneering study by Barley (1988), that we propose here even if it dates back almost twenty years because his approach and the theoretical framework he proposed represented a milestone for many subsequent contributions.
In his classical study on the effects of the introduction of CT scanners in the temporal organization of radiological departments introduces indeed a framework based on concepts derived from anthropological studies: the author adopts the concept of "temporal order" and a set of temporal dimensions derived from the studies by Zerubavel (1979, 1981) and acknowledges his distinction between temporal symmetry and temporal asymmetry among organizational actors as well as the distinction between monochronic and polychronic temporal cultures derived from the work of the anthropologist Hall (1959,1983)

Time is conceptualized as a dimension of ***organizational culture*** by Lee and Liebenau (2000) who, in their study on the temporal effects of an EDI System on business processes, employ a set of temporal variables derived from the work on organizational culture by Schriber and Gutek (1987). When describing what they call "temporal profiles" of business processes, they adopt a set of temporal dimensions which Schriber & Gutek define as "the perceptions of temporal rules and customs governing behaviour in work organization" (1987, p. 644), reaching the conclusion that norms about time are an

underlying aspect of organizational culture which can be thought of as a shared set of assumptions, beliefs, and values" (Schriber, 1986, p.52) .

The authors integrate their framework with a set of dimensions derived from Zerubavel's work (1981): sequential structure, duration, temporal location and rate of recurrence, pointing out that, even if these dimensions are aimed at describing "structural aspects" of the temporal order, "Zerubavel emphasized the conventionality of the four dimensions (1981, pp. 2–11). As for the sequential structure, some irreversibilities are determined by nature or are inevitable from a logical or technical standpoint. In a research process, for example, data collection precedes data analysis which is followed by writing a report. However, it is merely artificial convention that underlies most of our social customs such as serving soup before, rather than after, serving meat. Similarly the sequences of many bureaucratic procedures are by no means natural and inevitable, although they may have good organizational rationales. Under various circumstances, for example, office automation, the sequential structure of these procedures may be altered. In general, many socially based irreversibilities are conventional and symbolic in nature. This is also true of duration. The durational rigidity is often technologicallyor biologically determined. However, it is also conventional as seen in, for example, working hours (8 hours), tea time (about 20 minutes), classes at school (50 minutes) and so on" (Lee and Liebenau, 2000, pp159-160).

The cultural perspective is also stressed when the authors state that they have tried to show the temporal profile of the work examined other than by simply depicting 'when', 'how long' and 'how fast', Though admitting that notions related to clock time were unavoidable because embedded in both the subjects and the investigators, in their research " the temporalities were not described using the standard unit of the second, minute and hour. They were presented by the subjects' own language. If they used the hour in describing their work, we followed. If they told of their time using such terms as "after lunch time","in the morning" and "half a day", we employed them" (p.183).
In a previous article on the same case study, Lee (1999) also included in his framework the notions of monochronic and polychronic cultures and of temporal symmetry/asymmetry, derived from Hall (1959).

The cultural perspective is also adopted by Sahay (1998), who proposes a framework based on *national cultural assumptions* about time, in a work which examines the implications of national cultural differences in the implementation of a GIS system. As the author puts it, “time is not prior to social life, but to be constantly reproduced through social action, and thus inseparable with prevailing culture” (p. 148). The author proposes a framework based on three assumptions about time which characterize Indian culture: transcendental versus empirical time (where “transcendental time is understood in relation to large cosmological cycles, where each cycle is many millions of years. Transcendental time tends to dominate immediate or empirical time where it is often the deed, the human or divine action, which determines the structure of time” p. 160,161) greater spiritual significance to space and place as compared to time; preference towards plurality as compared to unity (which is compared by the author to the concept of polychronicity: “In Edward Hall’s terminology, Indian society represents a polychronic culture in which individuals play less value on temporal order, tend to accept events as they arise, and engage in multiple activities simultaneously like jugglers”.

Sahay confronts cultural assumptions about time and space with western-based assumptions “embedded within GIS technology” (p.162) developed in the USA, and describes as well Indian attitudes to time in relation to the project management process. According to the author, cultural assumptions on time have significant implications on how IT is implemented in organizations.

Concepts derived from the work of cultural anthropologists (Hall, 1950) and studies on organizational culture (Schriber and Gutek, 1987) are adopted again in Kvassov’s (2003) study on the relationship between information technology (MIS), “time personality” and managerial productivity. The concepts of time personality, poly-/monochronicity are represented by a set of temporal dimensions derived from Schriber and Gutek’s work. In this paper a descriptive study in a form of survey is presented, in which the temporal dimensions serve as mediators between IT and productivity of managerial work.

Concepts derived from the work of cultural anthropologists have been re-proposed in two recent studies on mobile technology ,: SØrensen and Pica (2005) analyzing police officer's rhythms of interaction with different mobile technologies, use Hall's distinction between mono and polychronic cultural frames, and finally, the concept of temporal order and the analytical framework proposed by Zerubavel are adopted by Prasopoulou et al.(2006) in their study on how the use of mobile phone by managers influence the temporal boundaries of work-non work activities.
A recent work on virtual teams by Sarker and Sahay (2004) recalls the dialectic between the opposite concepts of clock time -objective, quantitative and conceived as a material commodity (Jacques 1982, Adam 1994, Hassard 1999) and subjective time (where the notion of 'subjective' here is very broad, including both cultural differences, multiplicity of social norms, and individual subjectivity like physiological clock and individual needs and habits) analyzing the mismatches and opposing interpretations of time which arise from distributed work in countries with different time zones and suggesting that "objective as well as subjective interpretations of time need to be considered in dealing with the many complexities of virtual teamwork" (p.15).

In a previous theoretical contribution on the time-space perspective in IT implementation, Sundeep Sahay (1997) points out the contribution that can be given by sociological perspectives which take explicitly into account the fundamental dimensions of time and space. According to the author, time and space are society's meanings embedded within social structure. In his view, "Existing social structure influences how human actors interact with technology and their conceptions about time-space, thus helping to create change and stability with respect to prevalent social structure. Changes in social structure have consequences on further social interactions which shape the impacts of IT" (p.238).

As constitutive elements of the social structure, according to the author time and space should be integrated into social studies of IT: "While research studies have identified many different elements which contribute to a variety of social interpretations around IT, these studies have been largely silent about the role that time and space may play in creating these differences. I argue that the different assumptions these people have about

time and space, and also the time and space context within which technology is implemented also contribute to these interpretive flexibilities around IT" (p.234).

In order to foster the integration of time-space analysis into IS research, Sahay proposes a framework based on the concept of social *spatial-temporal practice*, drawn from the notion and description of spatial practices in the work of the sociologist Harvey (1989).
The framework is based on the idea that a study of IT in organizations has to be grounded within an analytical scheme which includes time-space, IT and social structure. "In the course of itsimplementation and use, IT as a consequence of its material and symbolic characteristics, interacts with individuals' notions of time-space, and the material ordering of their social interactions. Changes in this material ordering can lead to changes in structure and the consequences of IT which result from them. The reordering of material practices arises from IT's capability to create new conditions for social interactions"(p. 248).
Based on Harvey's work, the proposed framework is described in three sub-sections: IT and the *experience* of material practices (time-space practices); IT and the *perception* of material practices (representations of time-space); and IT and the *imagination* of material practices (times and spaces of representation). These social processes are discussed in terms of four elements of temporal-spatial practices: accessibility and distanciation; appropriation and use; domination and control; and production.

A sociological perspective on time, considered as socially constituted and as *enacted phenomenon* is adopted by Orlikowski and Yates (2002) in their study on the temporal organization of virtual teams, where, drawing from Gidden's structuration theory (1984), the authors propose the notion of *temporal structures* pointing out that such structures are enacted through the daily practices of the members of a community and reproduced through routines. Temporal structures, like social structures in general, constrain and enable social action, and, "being constituted in ongoing practices, can also be changed through such practices" (p.687). According to the authors, their notion of time as social structure enacted through social practices allows to overcome the subjective-objective dichotomy that underlies much of the existing research on time in organizations .

While "An objectivist perspective places most emphasis on an *external entity* or force, a subjectivist perspective is chiefly concerned with *cultural meanings,* and a practice perspective focuses principally on *human activities"* (p.688).

This practice based view "recognizes that time may appear to be objective or external because people treat it as such in their ongoing action—objectifying and reifying the temporal structures they enact in their practices by treating clocks, schedules, milestones, etc., as if they were "out there" and independent of human action…… Similarly, a practice-based perspective recognizes that time may appear to be subjective because people knowledgeably produce and occasionally change the temporal structures they enact in their practices—treating schedules and deadlines as provisional, relative, and alterable. Recognizing this duality allows us to see how in the process of temporal structuring, every human action constitutes, is constituted by, and can potentially reconstitute the temporal structures being enacted" (p. 689).

An approach based on Structuration theory was also adopted by Maznevski and Chudoba (2000) who, building a framework based on Adaptive Structuration Theory (De Sanctis and Poole, 1994), describe different "temporal rhythms" among virtual teams, defining this concept as "repeated temporal patterns" (p.486) which emerge from social interaction and are context-specific, and illustrate how these rhythms influence both how technologies are used by the work groups and how, through the use of technology, the rhythms of teams are redefined.

A sociological perspective is also adopted by Scott and Wagner (2003) in their study on the implementation of an ERP system in a University, and, based on Latour's Actor Network Theory, consider time as multiple, subjective and negotiated among organizational actors. Latour (1988) defines time and space as products of processes of meaning construction and negotiations: "Time is the distant consequence of actors as they seek to create a fait accompli on their own behalf that cannot be reversed. Time does not pass. Times are what are at stake between forces" (p. 105).

Events surrounding the implementation of technology are described in relation to the period and location within which they occur. The negotiated understanding between groups about when event transitions occur can often be crucial in defining patterns of implementation. For example, for financial reasons, managers may want to show that technology was implemented in a particular budgetary period, while users who fear loss of jobs may oppose it. These conflicting interests can lead to extensive negotiations between the two groups and the outcomes are important in determining 'when' and 'where' the event has taken place. In Latour's words: "Of course, one force may overtake the others, but this can only be local and temporary because permanence costs too much and requires too many actors" (p. 105).

Accordingly, in this paper the focus is on subjective views of time and the temporal perceptions of actors, and how these are negotiated during the implementation project.

Time is conceived in terms of *social norm* in two contributions by Montoya et al. and Massey et al. (2001; 2003), which studied time issues related to communication in computer mediated environments: temporal coordination and conflict management.
The authors argue that the use of asynchronous, lean communication media interfere with the process of emergence of social norms about temporal coordination in the team, and define the construct of *temporal patterning* as "the rhythms by which teams synchronize or coordinate their activities" (2003, p.132).

Following Mc Grath's TIP (time, interaction and performance) theory of groups (1991) they build a framework which includes three "patterning problems" inherent in every group activity: temporal ambiguity, conflicting temporal interests and requirements, scarcity of temporal resources. In a functionalist perspective, they test the hypothesis that asynchronous and lean communication environments may require deliberate creation of social norms, and test the effect of deliberate introduction of a temporal patterning mechanisms on conflict management behaviour.

4.2 Epistemological perspectives and methodologies adopted

The literature examined has fully acknowledged, as pointed out before, the conceptualization of time as social construct, adopting theoretical frameworks derived from anthropological and sociological studies and organizational culture research.
As far as epistemological perspectives are concerned, in the group of papers examined there is so far a prevalence of constructivist and interpretivist perspectives (ten papers out of fifteen) compared to positivist approaches, which is not in line with the overall tendency in IS research, which tends to privilege a positivist standing.

In particular, constructivist and interpretivist perspectives are adopted in the works by Barley (1988), Sahay (1997), Sahay (1998), Maznevski and Chudoba (2000),Orlikowsky and Yates (2002), Sawyer and Southwick(2002), Scott and Wagner (2003), Sarker and Sahay (2004), Sorensen and Pica (2005), Prasopoulou et al. (2006)
A positivist approach is adopted in the studies by Lee (1999), Lee and Liebenau (2000), , Montoya Weiss et al (2001), Lee (2003) Kvassov (2003), Massey et al. (2003).
Coherently with the prevalence of interpretivist perspectives, from a methodological point of view, the empirical studies examined privilege qualitative methods: the majority of papers present case studies and longitudinal case studies (nine papers), showing a prevalence of ethnographic techniques for data gathering (observation, participant observation, open ended and semi-structured interviews).

Positivist papers present in two cases the results of descriptive surveys based on questionnaires, one paper is based on a positivist case study and two papers present results from a field experiment where data were gathered from the communication transactions registered by the system.

As far as the research design is concerned, coherently with the theoretical frameworks adopted, interpretivist studies and studies mutuating structuration perspectives are focused on the interplay between ICT's and the social context of its implementation and use, thus considering the temporal dimension an important feature of the social context which

contributes to shape the processes of implementation and use but is in its turn dialectically involved in changes occasioned by the introduction of ICTs.
This circular scheme is evident in papers adopting Structuration theory (Orlikowski and Yates; Maznevski and Chudoba), ANT (Scott and Wagner), in Sawyer and Sothwick's contribution and Prasopoulo et al.'s contribution.

An exception to the previous considerations is the study by Barley (1988): though his point of departure is a structuration perspective, in this study he focused, as he stated, on the *technically induced change* of computer-based radiology equipment on temporal order and social relations, and in describing his findings he underlined the effects the introduction of CT scanners produced on the temporal order, treating the latter, in a way, more as a dependent variable.

In other interpretivist contributions (Sahay 1997, 1998; Sarker and Sahay 2004, Sorensen and Pica 2005) the attention is even more focused on the social context, in the effort to analyze its influence on technology implementation and use, mostly investigating the opposite verso (if compared to Barley) of the relationship between ICTs and temporal dimensions of social context and work.
On the other hand, the reverse direction of the relationship is investigated in positivist papers, where research design is conceived so as to point out the effects or impacts of ICTs use on the temporal dimension in organizations - whether referred to business processes, as in Lee or Lee and Liebenau, to worker's attitudes and productivity as in Kvassov, communication processes and group dynamics as in Montoya-Weiss et al. and Massey et al. -.
That is to say, the temporal dimension is treated here as a dependent variable, with the exception of Lee (2003) who, in his paper on the use of group calendric systems, concludes underlying that the social aspects influence the use of the system and that developers of GCS should become "more knowledgeable about phenomena surrounding the use of GCS in organizations than relying on the simple concept of time, clock time". (p. 163).

These considerations about epistemological perspective and research design in the papers examined lead us to remark that still limited attention is paid to the topic from a positivist perspective, with particular regard to contributions which examine if and to what extent assumptions on time and temporal structures/orders existing in organizations and workgroups affect the implementation, use, and outcomes of ICTs.

4.3 Types of ICTs examined in empirical studies

Though very limited, empirical research on temporal implications of information technology in organizations has in the last two decades covered a wide range of different information systems and technologies.

A classification proposed by Failla and Bagnara (1992) described different implications of IT on temporality distinguishing 3 classes based on the stage of evolution of IT (*automation; decision support, virtual reality technologies*). The authors propose that automation of routine activities by mainframe computers, decision support technologies by personal computers and the recent development of virtual reality technologies, have different meanings in terms of time.
Following Failla and Bagnara, for the purpose of this literature review, we will distinguish information and communication technologies based on their purpose : automation of routine activities and business processes, decision support technologies, communication and groupware technologies.

Automation of routine activities and business processes has been explored in the pioneering study by Barley on the introduction of CT scanners in radiological departments. Barley (1988) investigated the impacts of computer-based radiology equipment on temporality and social relations in hospital radiology departments. Employing Hall's dichotomy of ways of organizing time- monochronic and polychronic -, Barley found that the new computer-based equipment increased the monochronicity of radiologists' work by restructuring the structural aspects of the "temporal order" of radiologists'work: duration, sequence, temporal location and rate of recurrence of events. It also led to the symmetry of

temporal organization between radiologists' and technicians' work. Furthermore, he explains how technology affects social relations at workplaces through temporal parameters: the increased symmetry contributed to a decreased conflict between radiologists and technicians. The new relationships were marked by greater equanimity and less conflict between the two professional groups than existed previously under the previous x-ray systems.

Following his example, automation of business processes has been explored by Lee (1999) and in a subsequent paper by Lee and Liebenau (2000).
Their study investigates how information systems affect the temporality of business processes in organizations, describing and analysing temporal changes which resulted from the implementation of an Electronic Data Interchange (EDI) in two case companies.

Through the case study, they show the configuration of six the temporal dimensions of an export process before and after the introduction of the system and how they have changed.
Following Barley, Lee and Liebenau also assessed changes in social relations triggered by the new EDI system; in their words, "the less rigid deadline in the procedures of local L/C has affected inter-personal or inter-departmental interaction. When the deadline was rigid, workers in the two teams were hostile to each other. While workers in business departments
often lagged behind the deadline, the assisting team urged them to meet the deadline. Now they are not hostile to each other, but cooperative. The workers in the assisting team try to help rather than urge. It is difficult, however, to conclude at this stage of our research that changes in temporality always bring such changes in social relations among the parties concerned. Similar occasions were not found in the three other domains investigated. The issue of temporality and social relationships requires further inquiry." (p.183)

Another group of researchers focused their interest on systems supporting decisions like GIS, ERP, MIS.
These studies are focused on implementation processes (Sahay, 1998; Sawyer and Southwick, 2002; Scott and Wagner, 2003) and on the mediation of temporal dimensions of the managerial use of decision support systems (Kvassov, 2003).

Sahay investigates the implications that time and space issues have for the implementation of a GIS System in India.

Based on previous research, he considers that the design and development of technical systems often take place in a social context that may significantly differ from where they are used, and he makes the hypothesis that in particular "discontinuities in social context caused by these differences in temporal and spatial parameters…… have significant implications in how IT is implemented in organizations"(p.183).
He analyzes some of these differences in time and space assumptions in Indian culture and GIS technology and their role in shaping the implementation project, concluding that "Various problems in project management, for example related to the development of systems that are not considered relevant by users; the lack of continuity in project management practices; and inappropriate co-ordination between the various agencies, have been analysed in the context of these time and space differences. Such an analytical approach, enables us to go beyond the surface level descriptions of project management problems, to more deeper explanations of questions related to 'why do these problems occur?'" (p.184).

Through a longitudinal case study of an enterprise-wide ERP system implementation in a University, Sawyer and Southwick explore temporal effects in ICT-enabled organizational change. The authors provide a description of the particular characteristics of the act of implementation and the features of the enterprise system technologies that highlight the importance of understanding temporality's role in such technology-enabled changes.

They point out that "At least three characteristics of enterprise systems implementation efforts heighten the differential effects of time: involvement of multiple parties, consequences due to multiple effects seen at multiple levels, and environmental (context) pressures. The increased number of involved parties (stakeholders) implies the need for increased communication and coordination among these groups. Since each group builds its own perception of time based on aspects of the implementation effort it deems most important, differences in the perceptions of time among these groups are common. For instance, during implementation, there are at least three sets of relations in which

perceptions of time and timing are likely to differ. The .first set of relations is those among the vendors (the developers of software) and the technologists (members of the organization's information systems group). The second set of relations exists between the technology vendors and the organizational users of the enterprise system. The third set of relations exists among the technologists and the users" (p. 266).
The authors found that the implementation process exacerbates two major temporal effects: temporal asymmetries among groups and polychronicity of work.

Temporal asymmetries among technologists, vendors and users increased during the project: as the authors point out, information systems staff "Struggles to comprehend the new technologies. Vendors, who have embraced the client/server as the architecture for their enterprise products, are positioned to respond to these technological developments more easily than the information system's staff at MSU. Users are the least able to keep pace with these technological changes, and this creates the potential for intergroup conflicts that arise from temporal asymmetries." (p. 274).
The temporal asymmetry also had implications on the power relations between developers and users, where developers had a degree of control over users which was not customary before. The implementation process also increased the polychronicity of technologists' work, who had to increase the number of their tasks, face increased interdependency of the tasks, and needed to constantly connect to many more people than before, thus experiencing a "chaotic" working day. The authors point out the effects of a dual nature of time: objective and subjective; pointing out that project management tools are based on a linear view of time, while the case shows that also subjective aspects must be taken in consideration, and they conclude that project management scheduling demands that perceived progress should be measured along with calendar/task progress.

Scott and Wagner's contribution is also based on a case study of an ERP implementation process within a University, but their analysis adopts an actor-network theory framework. From an ANT perspective, the authors are interested in analyzing the way in which multiple times, in particular subjective temporal perceptions of the different organizational actors interested in the project, may shape an IT-enabled program of organizational change.

The authors remark that the implementation of ERP systems is particularly vulnerable to becoming entangled in multiple project times because they traverse multiple communities attempting to connect up previously discrete silos business activity into an enterprise view.

As a consequence of these different interests and orientations they show for example that "The determination of the VP's actor network to integrate 'global times' into Ivy's local social present was highly significant as was his claim that 'now is the time' to implement ERP. From among the multiple temporal zones mingling with the Ivy social form, we chose to cluster particular subjective temporal perceptions and construct the notion of 'project times'. We maintain that multiple project times came to bear upon the ERP implementation process simultaneously each articulating different interpretations of priorities, interests and rationales. The manifestation of a distinctive project time at Ivy was shaped by the efforts of an actor–network to influence the ordering of issues such as: whose priorities should be taken into account when deciding the project deadlines? When should users be involved? What is the timeframe for acceptable levels of Oracle involvement?" (p.308).

The authors show that the distinctive features and consequences of the ERP in the specific context of this University have been strongly influenced by the negotiations among the different actors'views of what the "project time" should be, underlying the existence of a multiplicity of "project times" in the course of an implementation project and how the resulting "project time" is the consequence of repeated negotiations among the actors : "The ERP that has emerged affects the progressive trials of strength that occurred over such issues during the 3-year project at Ivy. These processes of negotiations were not discrete events, but were deeply embedded in the respective organizational contexts of Ivy and Oracle; each actor network called upon allies based upon their understanding of the past, their perception of the present, and their projection of the future in an effort to persuade others to subscribe to their definition of what project time should mean to Ivy. Compromises crafted during these times about what goes forward and what gets left behind account for the distinctive consequences of the ERP at Ivy and influenced the quality of order achieved." (308).

The authors draw the conclusion that in ERP implementation projects which follow a participatory approach, practitioners should extend the standard consideration of who and what to enroll and engage with the more subtle question of when to involve. In this project for example they enrolled the faculty in the early phases of the project, but later they made the mistake to "silencing them once their interest became apparent" (p.310), which led the medical school to abandon the project and create its own taylor made system at a high cost. The lack of temporal insight about when to enroll and inscribe the interests of actors diminished their initial attempts at a participatory approach.

Kvassov's paper, through a survey, tests the hypothesis that temporal dimensions can serve as mediators between IT and productivity. In this case the focus is on Management Information Systems and the productivity of managers using the system is supposed to be affected by their time orientations. The hypothesis is that " manager's productivity depends also on how well the information system suits his personality type: managers who get a system corresponding to their personal preferences are likely to benefit from using that system; others, whose personality is at odds with the way the system provides support for them get annoyed and distracted. As a result, these managers tend to procrastinate or ignore the system support. Thus, the same system can enhance the performance of one type of managers and have little or no impact on the performance of others" (p. 2).

The survey, submitted to 52 managers from 32 Finnish companies, was designed to test the impact of IT on a set of temporal dimensions of work and the impact of temporal dimensions on the perceived productivity. The authors found that the majority of respondents evaluated the impact of IT on the temporal dimensions positively, and that, in their turn, a set of temporal dimensions (four dimensions out of the five included in the study: "pace of activities", "allocation of time", "coordination", "autonomy of time use").are perceived my managers as increasing their productivity. The second mediation effect had a different intensity according to the managerial level: senior managers seemed to show a different "temporal profile" from middle managers.

A second wave of contributions has focused on virtual cooperation supported by groupware technologies. These contributions investigate the process of temporal

coordination and the emergence of a temporal order in mediated communication environments (Orlikowski and Yates, 2000; Maznevski and Chudoba , 2000; Montoya-Weiss et al.; 2001; Massey et al. 2003; Sarker and Sahay, 2004) and in one case the temporal perspective provides insights for the understanding of groupware calendar systems use (Lee, 2003).

The contribution by Orlikowski and Yates, starting from a Structuration approach, proposes a practice-based perspective for the study of temporal structuring in organizations and applies this approach to the case of a virtual team of artificial intelligence language designers communicating through e-mail in order to complete a common project. The focus of the study is on the process of temporal structuring, and the output of the paper is a description of how the members of the project temporally structured their activities over the course of the project.
Each member of the group belonged to a different organization with its own temporal structures.
During the project, group members initiated several temporal structures, which the group then adopted and enacted as a community wide temporal structure. First of all, the process showed two levels of structuring: an explicit level, conducted by the project leader, and an implicit level, occurred when members adopted behaviors that hadn't been decided/agreed upon explicitly. The group followed open-ended and event-based temporal structures at the beginning, switching to more close-ended and deadline-based structures towards the end. The authors observe that a primary draft-based temporal structure was built implicitly around the subsequent issues of drafts of the language manual they were producing. On the other hand, the coordinator introduced explicitly a deadline and clock based temporal structure when he introduced en electronic balloting process in order to resolve with a common decision some endless discussions in the group. This second structure interacted with the draft-based one, producing a more deadline-based orientation in the group, which eventually established a final deadline for the issue of the final version of the manual. The authors observe that both explicit and implicit action, when ratified by other members of the group, may reinforce or modify temporal structures, and that the enactment of temporal structures at the same time constrained and enabled the ongoing action.

They also point out that it is through temporal structuring that time is made meaningful and consequential in organizations, and that "while an objective view overlooks the role of human action in shaping people's experiences of time in organizations, a subjective view downplays how human action is shaped by objectified expectations of time in organizations. In contrast, a practice-based perspective seeks to show how the recurrent practices of social actors shape temporal structures that are experienced as "time" in everyday life, and how these practices in turn are shaped by previously established temporal structures that influence expectations of time in organizations" (p. 695).

In the same year 2000, and adopting a structuration perspective as well, Maznevski and Chudoba studying virtual team dynamics and effectiveness adopting Adaptive structuration theory for a multiple case study. Studying the social processes in the teams, they found that effective teams were distinguished by a strong, repeating "temporal pattern" (p.486), set by the alternation between coordination meetings and distant interaction, which had different rhythms in different teams. The presence of this pattern distinguished effective teams from ineffective ones. The authors observed that one important function of these patterns was that thay prevented inadverted transitions from happening and maintained effective interaction equilibrium patterns, and conclude that "global virtual teams must schedule rhythms rather then allow them to emerge spontaneolusly……..in virtual teams a scheduled rhythm should be structured around the most difficult performance challenge for the entity involved" (p. 488).

A similar conclusion about the importance to introduce explicit norms about time structuring coms from two papers which adopt a positivist perspective: its two papers by Montoya-Weiss and Massey, who conducted an experiment on 35 virtual teams using Lotus Notes in order to analyze the effect of temporal coordination on group conflict. Among their findings, they point out that temporal coordination had some important moderating effects on internal conflict.

As the authors point out "Asynchronous virtual teams operate without the usual temporal modulators that coordinate the ebb and flow of interactions so that teams can manage their activities and resolve conflicts. In this study, we explored one way to address the temporal

coordination challenges facing virtual teams. Introducing a process by design appears to change the way teams manage conflicts, with observable performance consequences. We argued and found that conflict theory that is applicable to synchronous groups may not be wholly transferable to asynchronous groups owing to the fundamental differences in the communication environments. Specifically, we found that competition and compromise conflict management behaviors have effects on team performance that are counter to predictions guided by existent theory. In addition, we found that the presence of a temporal coordination mechanism, process structure, mitigated the negative effects of avoidance and compromise conflict management behaviour on performance…Lean, asynchronous communication environments like that presented by Lotus Notes thus may require deliberate creation of the social norms that regulate communication and work …We developed a temporal coordination mechanism based on the traditional notions of temporal flow and synchronization of group interaction and examined its moderating effect on conflict management in virtual teams" (p. 1259).

Time –related challenges for virtual teamwork and suggestions about strategies to cope with them are described by Sarker and Sahay in their interpretive study of eight virtual teams of students from Norwegian and USA Universities.

In particular, four main time-related problems emerged from the study: first, different biological and social rhythms among the participants of the two nations, which were very difficult to change, led to perceived lack of sympathy and created difficulties in developing relationships; secondly clock times were set at different times, so time adjustment needed to be done but lack of vigilance in this regard led to unattended synchronous meetings or missed deadlines, and this, in turn, got interpreted as a lack of seriousness or commitment. Again, significant time differences among virtual team members made it difficult to work in parallel, and further, members of several teams experienced unproductive waits before the other sides responded to their questions. Finally, silence or unexpected delays in replying by remote members tended to be interpreted negatively, with attributions of incompetence and a lack of commitment.
The authors provide suggestions about possible strategies to manage these time-related problems, pointing out that "Just as mature individuals 'learn to organize temporal

experience in accordance with particular social and cultural processes,' competent teams use ICTs along with 'social ingenuity' to deal with delays in response and clock time differences (Hassard, 1999), and in some cases, turn them into an advantage" (p. 16).
Some strategies experimented as successful by teams during the study consented the authors to select six effective strategies to cope with time related challenges in global virtual teams: managing time translations, reclaiming time, relocating time, routinizing interaction, developing norms of messaging, physical relocation, functioning in a polychronic manner.

In recent contributions the issue of temporality has started to be investigated also in relation to mobile technologies, due to the widespread diffusion of mobile information and communication technologies within organizational settings.
Two papers addressed very recently this topic, in one case with a focus on technology use and considering a variety of devices (Sorensen and Pica, 2005) and in the second case with a focus on the consequences of mobile phone use on the emergence of new temporal boundaries between work and non work activities (Prasopoulou et al., 2006).

The first contribution, by Sorensen and Pica, is a case study on the use of mobile technologies by police officers (whose work is 'time and safety critical work', p. 141) based on ethnographic techniques. Among the findings, the authors observe what they call "Rhythms of interaction" with the different technologies. The uses of mobile technologies were linked to particular activities. Changes from one activity type to another implied shifts in the rhythm of interaction since the physical conditions for interaction changes, as does the character of the work involved. This shift, according to the authors, represents rhythms of interaction: "this implies shifts from coordinating activities to documenting incidents, from relaxed scanning of the MDT to hectic negotiations on the radio and downloading of data to the MDT in order to manage the uncertainties of the incident approaching"(p. 140) According to the authors, this rsulted in a particular rhythm of interaction with technologies.
Another finding of the study is the presence of frequent shifts between monochronic and polychronic working patterns during the activity of police officers, and that these shifts implied coupling and decoupling of various mobile technologies.

Mobile phone use by professionals was investigated by Prasopoulou et al. in a paper that examined the impact of mobile phones on temporal order and especially on the temporal boundary segregating work from private time. According to the authors, the spatial flexibility and independence enabled by the use of mobile phones signifies the removal of the rigidity and fixity characterizing the aforementioned temporal boundaries.

This study focuses on a group of workers with properties quite distinct from what is documented in existing literature. The respondents are professionals working in business organizations, their jobs are performed in specific physical locations (i.e., their offices) not at home nor on the move. Thus, according to the authors, “Their working conditions enable and even reinforce a rigid temporal boundary, separating work from private life, whose symbolic value turns its deregulation to a very stressful experience” (p. 283).

The study, according to the authors, shows that the intrusive character of mobile phones and their ‘attachment’ to a single user make their temporal properties more evident. Professionals become conscious of the impact of mobile phones on their work-private life temporal boundary integrating accordingly, over time, their various activities.

The study suggests that this integrating strategy on the management of the respondents’ temporal boundary is a direct outcome of mobile phone use. Professionals fear that not answering their mobile phone after normal office hours, and thus maintain a rigid temporal boundary, would be interpreted as evading or not delivering on work responsibilities.

Consequently, they succumb to a blending of their work and private time without experiencing any transition towards more fluid or lax work habits that would justify such a change.

4.4 Conclusions

To summarize, the studies examined acknowledged the conceptualization of time as social construct, adopting theoretical frameworks derived from anthropological and sociological studies and from organizational culture research.
Among the frameworks adopted in empirical studies, those derived from sociological and anthropological studies (Zerubavel, 1979; Hall 1959, 1983) have revealed to be particularly fertile, especially in order to investigate the consequences of technology introduction and use on the temporal organization of business processes and work activities.

Empirical research on this topic, though still limited, has covered in the last decade a wide range of different information systems and technologies, which we classified based on their purpose as: automation of routine activities and business processes, decision support technologies, communication and groupware technologies. The contributions investigated EDI, GIS, ERP, MIS systems implementation and use; mobile technologies use, and groupware systems use and implications for distributed teams.

As far as the epistemological standing is concerned, in the group of empirical papers examined there is so far a prevalence of constructivist and interpretivist perspectives compared to positivist approaches, which is not in line with the overall tendency in IS research.
Coherently with the prevalence of interpretivist perspectives, from a methodological point of view, the empirical studies examined privilege qualitative methods: the majority of papers present case studies and longitudinal case studies (nine papers), showing a prevalence of ethnographic techniques for data gathering (observation, participant observation, open ended and semi-structured interviews).

As far as research design is concerned, coherently with the theoretical frameworks adopted, interpretivist studies and studies mutuating structuration perspectives are focused on the interplay between ICT's and the social context of its implementation and use, thus

considering the temporal dimension an important feature of the social context which contributes to shape the processes of implementation and use but is in its turn dialectically involved in changes occasioned by the introduction of ICTs.
This circular scheme is evident in papers adopting Structuration theory (Orlikowski and Yates 2002; Maznevski and Chudoba 2000), ANT (Scott and Wagner, 2003), in Sawyer and Sothwick's (2002) contribution and Prasopoulo et al.'s (2006)contribution.

An exception to the previous considerations is the study by Barley (1988): though his point of departure is a structuration perspective, in this study he focused, as he stated, on the *technically induced change* of computer-based radiology equipment on temporal order and social relations, and in describing his findings he underlined the effects the introduction of CT scanners produced on the temporal order, treating the latter, in a way, more as a dependent variable.
In other interpretivist contributions (Sahay 1997, 1998; Sarker and Sahay 2004, Sorensen and Pica 2005) the attention is even more focused on the social context, in the effort to analyze its influence on technology implementation and use, mostly investigating the opposite verso (if compared to Barley) of the relationship between ICTs and temporal dimensions of social context and work.

On the other hand, the reverse direction of the relationship is investigated in positivist papers, where research design is conceived so as to point out the effects or impacts of ICTs use on the temporal dimension in organizations - whether referred to business processes, as in Lee or Lee and Liebenau, to worker's attitudes and productivity as in Kvassov, communication processes and group dynamics as in Montoya-Weiss et al. and Massey et al. -.

That is to say, the temporal dimension is treated here as a dependent variable, with the exception of Lee (2003) who, in his paper on the use of group calendric systems, concludes underlying that the social aspects influence the use of the system and that developers of GCS should become "more knowledgeable about phenomena surrounding the use of GCS in organizations than relying on the simple concept of time, clock time". (p. 163).

These considerations about epistemological perspective and research design in the papers examined lead us to remark that still limited attention is paid to the topic from a positivist perspective, with particular regard to contributions which examine if and to what extent assumptions on time and temporal structures/orders existing in organizations and workgroups affect the implementation, use, and outcomes of ICTs.

5. The impact of a Workflow system on the temporal dimensions of organizational culture: a case study

5.1 Motivation, aim of the study and research questions

Speeding up business processes, time saving, shifts from “batch” logic to “flow” logic, polychronicity of workers, synchronization among organizational units are just a few examples of some important objectives pursued by firms when they adopt systems like, for example, Workflows or ERPs.

These objectives can be referred to as “temporal performance”, since they are related to potential changes in the temporal organization of processes and activities, but as well to potential changes in mental attitudes people have towards time and time use in the workplace, attitudes which, as pointed out in the previous chapters, are recognized by organization studies as features of organizational culture and also expression of the specific culture of different organizational units and professional groups within a firm.

Since organizational culture includes groups’ dominant assumptions of time (Schein 1985) and plays an important role in shaping the social consequences of technology (Robey and Azevedo 1994), a consequence of technology relates to how these assumptions may be redefined. Moreover, since organizational contexts have their own norms about time, we find that even around the same technology, the nature of linkages between context and process can be quite different, bringing about a variety of outcomes and consequences (Barley 1986, 1988; Robey and Rodriguez-Diaz 1989; Orlikowski 1991; Robey and Sahay 1996, Orlikowski and Yates 2002).

In spite of its significance for firms, the temporal transformation of work potentially conveyed by information technology is somehow ‘taken for granted’ and still remains little explored in information systems and organization research thus demanding more investigation

The literature examined in chapter four of this work shows that the contributions in this field, as far as epistemological standing and research design is concerned, can be classified in two main groups:

- interpretivist studies and studies mutuating structuration perspectives are focused on the interplay between ICT's and the social context of its implementation and use, thus considering the temporal dimension an important feature of the social context which contributes to shape the processes of implementation and use but is in its turn dialectically involved in changes occasioned by the introduction of ICTs. This is a circular scheme. In some interpretivist contributions the attention is even more focused on the social context, in the effort to analyze its influence on technology implementation and use.

- On the other hand in positivist papers research design is conceived so as to point out the effects or impacts of ICTs use on the temporal dimension in organizations - whether referred to business processes, to worker's attitudes and productivity , communication processes and group dynamics . That is to say, the temporal dimension is treated here as a dependent variable.

These considerations about epistemological perspective and research design in the existing literature lead us to remark that still limited attention is paid to the topic from a positivist perspective, with particular regard to contributions which examine if and to what extent assumptions on time and temporal structures/orders existing in organizations and workgroups influence the implementation, use, and outcomes of ICTs.

Coherently with these consideration on the state of the art on research on the topic, he purpose of the study is to investigate if and to what extent the introduction of a *Workflow System* transforms the temporal assumptions of the organizational units where it has been adopted, and to test the hypothesis that the temporal assumptions shared by people in organizational units before the introduction of the system can affect the way it is used, thus facilitating/hindering the achievement of the expected temporal performance conveyed by the system.

According to these purposes, the study intends to investigate two hypothesis:

1) The introduction of the workflow system transforms the temporal dimensions of organizational culture of the departments adopting it.
2) The temporal assumptions existing in departments before the introduction of the system affect the way it is used, thus facilitating/hindering the achievement of the expected temporal performance.

The case study presented here has been conducted in the Italian branch (employing 350 people) of a multinational manufacturing company, where a Workflow System (Lotus Notes) has been introduced in order to improve the Customer Service processes.

The case study was selected according to the following criteria:

- possibility to perform the study at a stage of the implementation of the system which was advanced enough to measure people's perceptions of the changes in the temporal dimensions.
- Type of system and organizational process: the workflow system was considered by the company as critical for its potential to achieve results in terms of temporal performance
- Type of organizational process: possibility to carry on the study on a process which required the cooperation of several different organizational units, all of them adopting the system.

The case of this Company was thus suitable for the study because, the workflow system had been introduced about eight months before the fieldwork started, contributing to change customer service processes and procedures in the company, a change whose objectives where highly related to temporal performance (as the director of the IT and Organization Department pointed out, "our aim was to give faster answers to customers ,speeding up the process; but we also wanted people to change their mentality and shift from a 'batch logic' to a 'one piece flow logic'").

Among Customer Service activities, one domain to which Notes has been applied was chosen for this research: the Complaint Management Service, because it is the most

prominent customer service activity in the Company, and because it requires the coordination of three different departments.

The units of analysis of the study were the three departments where Lotus Notes has been implemented in order to improve their cooperation and contribution to the Complaint Management Process: the so called “Customer Point”; the “Orders Management” unit within the Sales Department; the Storehouse and Logistics Department.

5.2 Research Design and Theoretical Framework

Research Design

The study investigates two hypothesis:

1) The introduction of the workflow system transforms the temporal dimensions of organizational culture of the departments adopting it.
2) The temporal assumptions existing in departments before the introduction of the system affect the way it is used, thus facilitating/hindering the achievement of the expected temporal performance.

The case study presented here has been conducted in the Italian branch (employing 350 people) of a multinational manufacturing company, where a Workflow System (Lotus Notes) has been introduced in order to improve the Customer Service processes..

The unit of analysis of the study were the 3 organizational departments where the system was introduced, thus the specific temporal dimensions of organizational culture we investigated are referred to these departments.

The research design, summarized as follows, was aimed at describing the temporal performance expected by the management and describing and measuring differences in temporal assumptions among units before the introduction of the system. The second objective was to measure changes in the temporal assumptions after the introduction of the system, testing the hypothesis 1 and 2.

The case study was developed in two phases, which we briefly describe as follows:

Phase 1

- Investigation of the *temporal performance expected* by the managers adopting the system.

Data source: individual semi-structured interviews**;** project documentation.

Interviews were addressed to managers who adopted and implemented the system, in order to investigate several dimensions of the temporal performance they expected from its introduction.

Phase 2

- Measurement of the temporal dimensions of culture existing in the four departments involved *before and after* the introduction of the system.

Data source: individual semi-structured interviews**;** questionnaires based on Likert scales

Questionnaires and interviews were addressed to both managers and employees working in the four departments where the system was introduced.

This phase of the research has two aims: first, describing and measuring differences in temporal patterns *among units* before the introduction of the system. The second objective was to measure to what extent the expected temporal performance had been actually achieved in different organizational units, and to test the hypothesis that the different temporal assumtions existing in the units affect in different ways the use of the system thus facilitating/hindering the achievement of the expected temporal performance.

Theoretical framework

The framework adopted in order to describe and measure the temporal dimensions of organizational culture is based on a set of concepts which have been operationalized and tested in previous research in psychology of work and organizational culture (Schriber 1985; Schriber and Gutek1987; Bluedorn et al. 1999), integrated with concepts drawn from the work by Zerubavel (1979), which have been adopted in order to assess more aspects of the temporal order within organizational departments which were not included in Schriber and Gutek's model.

Both Schriber's and Bluedorn's instruments and Zerubavel's dimensions have been subsequently adopted to study changes in the temporal dimensions of organization

occasioned by the introduction of information systems (Barley 1988; Lee 1999; Lee and Liebenau 2000 Kvassov 2003, Pouloudi et al. 2006).

Schriber's work, based on data collected from 529 respondents from 51 work groups in 23 organizations, has developed and tested 15 Likert scales measuring perceptions on norms about time that have become standard measurement tools in studies at the work group and organizational levels of analysis.

Bluedorn et al.'s work , based on data collection from 2 samples of 205 and 115 respondents from 2 organizations, has developed and tested a Likert scale instrument (Inventory of Polychronic Values) in order to measure the cultural dimension of polychronicity introduced by Hall in his ethnographic work (Hall, 1959; Hall, 1983).

For the purpose of this study, the conceptual framework, synthetically described in the following table, took in consideration the following dimensions, summarized in table 2.

	Temporal dimension	Definition	Author
	Scheduling	Perceived importance of scheduling, defined as an activity which "concerns location in the temporal realm and gives organizations a framework for constructing temporal boundaries"	(Schriber 1985; Schriber and Gutek1987)
	Deadlines	Perceived importance of meeting deadlines , defined as the temporal start and stop points, which can be	(Schriber 1985; Schriber

		external or internal to the task	and Gutek1987)
	Sequencing of tasks	The importance attributed to the order in which activities and tasks take place	(Schriber 1985; Schriber and Gutek1987)
	Punctuality	The degree of rigidity to which deadlines are adhered.	(Schriber 1985; Schriber and Gutek1987)
	Work Pace	Rate at which activities can be accomplished: it concerns the speed of work and people's expectation to work fast.	(Schriber 1985; Schriber and Gutek1987)
	Quality versus Speed	Norms to which people adhere regarding trade-offs between the quality of work and the speed of work over time	(Schriber 1985; Schriber and Gutek1987)
	Autonomy of time use	The amount of freedom the worker perceives he has in setting schedules for the completion of his tasks over time	(Schriber 1985; Schriber and Gutek1987)
	Synchronization and coordination	It measures the perceived degree to which people manage their performances simultaneously (synchronization) or they manage the performance of tasks in	(Schriber 1985; Schriber and Gutek1987)

		coordinated sequence.	
	Awareness of time use	People's awareness of how they use their time on the job and expectations that they know how long they take to perform activities	(Schriber 1985; Schriber and Gutek1987)
	Allocation	The perception that the amount of time devoted to tasks or activities is too tigh and not enough.	(Schriber 1985; Schriber and Gutek1987)
	Polychronicity (IPV)	the extent to which people prefer to be engaged in two or more tasks simultaneously and believe that is the best way to do things	Bluedorn et al., 1999)
	Temporal symmetry	the extent to which different groups/ organizational units share the same temporal order	Zerubavel, 1979, Barley, 1988
	Social cycles :	the regular recurrence of events and processes: it attempts to profile the cycles in work activities experienced over time.	Zerubavel, 1979

Table 2. Conceptual framework

Concepts

Scheduling and deadlines The items constructed by Schriber and Gutek measure the perceived importance of scheduling, defined as an activity which "concerns location in the

temporal realm (e.g. a 10:00 a.m. meeting) and gives organizations a framework for constructing temporal boundaries" Based on Mc Grath and Rotchford (1983), the authors state that scheduling allows the possibility of prediction and resolution of temporal uncertainty. The temporal boundaries defined by scheduling can be further defined in terms of the closely connected activity of setting deadlines, which are defined by Schriber and Gutek as "the temporal start and stop points, which can be external or internal to the task, or both. Deadlines for single-activity tasks are based on temporal constraints external to the task. Deadlines for interdependent tasks are based both on the temporal constraints external to the final task in the sequence or and on the temporal constraints internal to the task sequence itself" the scale of nine items built by the two authors measure the perceived importance of scheduling and meeting deadlines .

This dimension was relevant in the context of our study, and included in the framework because from the initial exploratory interviews of the case study it came out that one of the expected outcomes of the introduction of the system was that it would help introducing a more definite scheduling of the process, visualizing due deadlines for the deliver and dates of completion of different parts of the process, thus increasing perceptions of the importance of meeting deadlines.

Sequencing

The author distinguish this concept from scheduling stating that "scheduling is laying out a pattern of activities anchored to points in time within a specific time-measurement system, sequencing is the ordering of activities over time within that system" A specific order/sequence in time may be "inherent in the task, or prescribed by the individual who controls the process".

In our research this variable was relevant because the introduction of the system can interfere with the customary sequence workers adopt in carrying out the daily activities (if any), both interrupting the sequence with queries coming from other subjects or departments, or prescribing a new sequence, embedded in the automated process.

Punctuality

Though defined as “the degree of rigidity to which deadlines are adhered”, Schriber’s and Gutek scale measured indeed general importance of punctuality at work, with items like “People get upset when you’re late for work” and “if people arrive late for work, they will feel rushed all day”.

Even if not directly related to the object of the present study, we included it as a measure of the general attitudes towards punctuality in the work environment.

Pace

Is the rate at which activities can be accomplished (i.e. the speed of activity or the number of activities that can be done within a given interval). Allocation, scheduling, deadlines depend on pace. The concerns the perceived speed of work and people’s expectation to following their own rhythm, take breaks and so on rather then work fast. Each culture appears to have a pace that is considered appropriate for activity (Levine &Wolff, 1985).

This dimension was included in the framework because strictly related to speed: the introduction of ICTs, as pointed out before, is often associated to the objective of speeding up processes, which could result in increasing the work pace or, on the contrary, to slow it down because automation of phases of the process could facilitate worker’s activity, eliminate duplications of activities and so on.

Quality versus speed

The concept define the norms to which people adhere regarding trade offs between the quality of their work(i.e. doing things well; making good decisions) and the speed of work over time (i.e. doing things fast, making quick decisions).

We expect speed to be a relevant dimension to investigate in that the introduction of Information technologies is almost implicitly associated with expectations to speed up processes thus enhancing values associated to speed and urgency of tasks completing or decision making. Moreover, in the specific context of our case study, the workflow system was applied to customer service processes, that is to say activities directly connected to the

relationship with and satisfaction of clients, which makes the issue of trade off between quality of service and speed crucial.

Autonomy over the use of time and time boundaries

Autonomy is defined as the amount of freedom the job holder perceives he has in setting schedules for the completion of his or her tasks over time. This dimension is also related to scheduling, although it is not a direct characteristic of it. It's a secondary effects of scheduling, and reflects a more abstract level of the temporal environment.

Consequently the variable was included in our framework because variations in schedules and deadlines, sequencing, and work pace due to the introduction of the system could bring as a consequence workers' perceptions of enhancement or limitation of their autonomy over the way they use their time.

Synchronization and coordination of work with others trough time

When work requires that more than one task or activity is involved, and tasks may be performed by individuals or groups, It measures the degree to which people manage their performances simultaneously (synchronization) or they manage the performance of tasks in coordinated sequence with others.

The three item scale proposed by Schriber and Gutek presents indeed items which measure in general perceptions about the importance to cooperate with others and work in a coordinate way, or as a team.

For the specific purpose of our study, we changed the formulation of these items in order to measure this same perception but referred to cooperation, coordination and teamwork among different organizational units (which was the object of our study).

Awareness of time use

The concept is referred to the degree of attention and importance people pay to how they use their time at work (i.e., if they know and plan how long it will take them to accomplish a task or an activity, how worried they are about using their time well).

As in the case of autonomy, the variable was included in our framework because variations in schedules and deadlines, sequencing, work pace, or even tigher coordination with other organizational units due to the introduction of the system could bring as a consequence workers' perceptions of enhancement of their awareness over the way they use their time.

Allocation

It is the amount of time, whether planned or expended, devoted to an activity, regardless of when the amount occurs. It depends on the concept of duration. It can be considered a measure of work overload, in that it defines the degree to which schedules seem too tight for activities/jobs, the feeling people have that they have time enough to get things done.

As for the case of work pace, this dimension was included in the framework because strictly related to speed: the introduction of ICTs, as pointed out before, is often associated to the objective of speeding up processes, which could result in increasing the perception that time to complete ctivities is tight or, on the contrary, that there is more time because automation of phases of the process could facilitate worker's activity, eliminate duplications of activities and so on.

A few dimensions included in Schriber and Gutek's model were not adopted for this study because not related to its object. They are: "time boundaries between work and non work", which is a measure of how much work related activities and problems trespass the boundary between work time and private life time. "future orientation", which is generally connected to perceptions about how much the firm invests in the future, "routine versus variety" related to the variation of job content in general, which was not relevant in our case since the system was applied to routine activities connected to customer service, and intraorganizational time boundaries because in Schiber and Gutek's formulation it was a measure of the duration of the work-day in different department, which, again, was not the focus of this research.

Polychronicity

The cultural dimension of monochronicity and polychronicity were firs introduced by Hall, (1959) at the level of national cultures, as described previously. At the level of organizational culture, a polychronic organization would value behaviors where individuals do several things at once, more activities are scheduled during a period of the day, with short periods of time spent on each of several activites and people dealing with a number of different problems simultaneously. (Bluedorn et al.,1999), who operationalized the concept, defined it as follows.

Polychronicity is the extent to which people in a culture:

1) prefer to be engaged in two or more tasks or events simultaneously; and

2) believe their preference is the best way to do things

In the case of introduction of a workflow system, we could expect polychronicity to be a relevant dimension to investigate since it allows to have access to a plurality of information at a time in a constant flux, and to be connected to the flux of information, schedules and activities of other people in departments working on the same processes,.

Temporal symmetry / asymmetry

We will briefly recall, from what reported in chapter 3, that this dimension is referred to coordination between the activities of individuals or groups by Barley (1988), who, building on the notions of temporal symmetry/ complementarity/ staggered coverage by Zerubavel, introduces the notions of *temporal symmetry* and *temporal asymmetry* .

According to Barley the first type of temporal coordination implies that individuals or groups share a common pattern of temporal conditions (they share the same schedules, recurrencies, and their working activities are synchronized). In the case of temporal asymmetry, individuals or groups operate according to different temporal patterns. The two authors point out that a condition of temporal symmetry constitute a powerful basis of mechanical solidarity among individuals and groups, while temporal asymmetry requires the development of organic solidarity. Moreover, in Barley's study the condition of temporal asymmetry among distinct groups led to conflictual attitudes and relationships, which was reduced when their temporal patterns became more symmetrical.

Though in our study we didn't focus on the punctual mapping of the structural aspects of temporal patterns, the concept is adopted in our study because we have different departments cooperating to one same process, thus temporal symmetries/asymmetries among departments might lead to cooperative/conflictual attitudes and be modified by the introduction of the system.

S*ocial cycle*

This concept has been defined by Zerubavel (1979) as regularly recurrent pattern of activities and events, "the time intervals during which sequences of recurring successions of social activities are completed". Zerubavel observed that the beginnings and ends of cycles are treated as discrete segments of time surrounded by rigid boundaries.

Many organizational activities may be structured in accordance with such rhythmic patterns, and the introduction of a technology can challenge the configuration of such cycles, for example allowing to work adopting a "flow", destructured logic rather than a "batch logic" where a cycle of activity is completed before another gets started, or potentially alter the way in which cycles of different organizational units are connected to each other.

Temporal performance

Finally, we define "temporal performance" the ensemble of the expectations expressed by managers who adopted and implemented the workflow system, with regard to speeding up the process, changes in people's time orientations, changes in temporal dimensions of departments culture.

5.3. Methodology

The research is designed as a positivist case study, coherently with the recommendations expressed by Benbasat et al (1987), Lee (1989a) Yin (2003).

The case study was selected according to the following criteria:

- possibility to perform the study at a stage of the implementation of the system which was advanced enough to measure people's perceptions of the changes in the temporal dimensions
- Type of system and organizational process: the workflow system was considered by the company as critical for its potential to achieve results in terms of temporal performance
- Type of organizational process: possibility to carry on the study on a process which required the cooperation of several different organizational units, all of them adopting the system.

Just like all research strategies, case research has its strength points and weaknesses (Galliers, 1985, Yin 2003). In terms of strengths, case research enables the capturing of 'reality' and detail studying a phenomenon in its natural context. It allows for the study of a number of variables and different aspects of a phenomenon, whether previously predetermined or not. Case research is valuable also in developing and refining concepts for further study.

Case research also has its weakness. i is not possible to generalize case findings statistically to a population. During case research one has no control over independent variables and this may limit the internal validity of any conclusions. Also, case research may establish relationship between variables, but cannot always indicate the direction of causation.

To sum up, the selection of a research strategy always entails a trade off. This has been a powerful argument in favour of the use of multiple research approaches during an investigation (Kaplan and Duchon, 1988, Gable 1994.

For the purpose of this study we chose to combine qualitative and quantitative methods of data collection, integrating two main strategies in research on organizational culture.
Several approaches can be taken to investigate aspects of organizational culture, depending on the perspective adopted. As pointed out in chapter 3 of this work, anthropologists and sociologists often take a qualitative approach, immersing themselves in the culture by participating and providing an ethnographic description of the organization. However, once specific dimensions of organizational culture have been identified, it is useful to measure them in order to quantify, like in our case, differences among organizational departments, or perceptions of changes over time.
Organization and management scholars quantified dimensions of organizational culture by employing questionnaires and content analysis of stories collected through open-ended interviews of organizational members (Ouchi and Johnson, 1978; Deal and Kennedy, 1983; Ouchi and Wilkins, 1985).

This approach is valid especially when culture dimensions have been specifically identified and operationalized and the objective of the study is to measure, like in our case, differences among organizational departments and perceptions of changes over time.

Combination of qualitative and quantitative methods for data collection

In order to conduct the study, we chose to combine qualitative and quantitative methods for data collection. As many authors remarked, these methods need not be viewed as polar opposites (Van Maanen, 1983b). In particular, integration of quantitative and qualitative methods has been adopted in case studies in IS (Kaplan and Duchon 1988, Markus 1994, Cavaye 1996)
As Kaplan and Duchon state, combining these methods introduces both testability and context into the research. Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study than would have been achieved otherwise.
Moreover, using multiple methods increases the robustness of results because findings can be strengthened through triangulation - the cross-validation achieved when different kinds and sources of data converge and are found congruent (Benbasat, et al., 1987; Jick, 1983;

Yin, 2003), or when an explanation is developed to account for all the data when they diverge (Trend, 1979; Kaplan and Duchon 1988).

Data Collection

Consistently with the principle of the combination of methods and data triangulation (Yin, 2003), data were collected from a multiplicity of sources:

- semi-structured interviews
- questionnaires based on validated Likert Scales
- company documents

The three sources of information were triangulated with each other to validate the process and the results.

Interviews were conceived as semistructured: a guideline including a number of main topics was replicated in all interviews, and questions formulated in an open ended form.
The purpose of the interviews in phase one was threefold: 1) to determine what interviewees expected from potential outcomes of the computer system on the customer complaint process, and on workers' temporal attitudes 2) to better focus the study; and 3) to screen and select questionnaire variables and items derived from Bluedorn's and Schriber and Gutek's scales for the investigation of the departments culture.
In phase two interviews were aimed at: 1) assess perceived differences in temporal dimensions within different departments before and after the introduction of the system 2) assess the role of the system in producing these changes, compared to other possible explanations and 3) assessing if and to what extent the department's culture influenced the achievement of the expected temporal performance.

Questionnaire

A survey instrument was developed for managers and operators of the departments.
The questionnaire consisted of measures from the standard Likert scales developed by Bluedorn et al. for polychronicity (1999), which was entirely adopted, and by Schiber and Gutek (1987), for the other dimensions where 10 items were selected out of the original 15.

Both Bluedorn and Schriber and Gutek scales were constructed following Nunnally's (1978) recommendation, regarding developing scales that consistently produced alpha coefficients in the 0.80 range or higher (Cronbach, 1951,1955).

Respondents answered the items on a seven-point response scale.
Two versions of the questionnaire were issued:

- The first one, was submitted to both direct users of the workflow information system and other workers of the department who were not directly involved in the customer complaint process, in order to measure the temporal dimensions of department's culture with a quantitative instrument.
- The second version of the questionnaire was submitted to users of the workflow information system, in order to measure perceptions of variations between today's temporal dimensions and before the introduction of the system.

Sample
All 37 managers and workers of the three departments have been administered the questionnaire and returned it (100%). Though a small sample, it represents the entire population of the study.

Data Analysis

Quantitative Data Analysis.
The quantitative data were analyzed using a standard statistical software package.
Due to the size of the sample, analysis of the results was limited to descriptive statistics, in the absence of conditions for applying more sophisticated techniques like regression and factor analysis.

Qualitative data analysis
Interview notes and transcriptions were analyzed by the process for qualitative text analysis suggested by Miles and Huberman (1994).

The method develops 4 steps to link data to meaningful information:

1- Coding (I coded based on both variables pre-defined in the theoretical framework of the research; and on emergent constructs from interviews)

2- Patterning (individuation of recurrent themes, metaphors, explanations, relationships issues, emerging constructs)

3- Memoing (I took notes of my considerations after the interviews, in order to develop concepts or possible associations or more general meanings of what I had just heard.; as Miles and Huberman remark, memos ”don’t just report data, they tie together different pieces of data into a recognizable cluster, often to show that those data are instances of a general concepts” (p.72)

4- Developing propositions .

Using this method, patterns reflecting computer system objectives and temporal issues important to managers and operators were derived systematically in order to come to the study findings and conclusions.

6. Case study results and discussion

6.1 Results

In the course of the research data were collected through 15 semi-structured interviews and 37 questionnaires, as reported in the following table:

Interviewees	**Number and duration of interviews**	**Type of interview**
IT and Organization manager	2 (2,5 hours each)	Semi-structured
Customer Service manager	1 (2 hours)	Semi-structured
Storehouse and Logistic manager	1 (1,5 hour)	Semi-structured
Orders Unit manager (Sales Department)	1(1,5 hours)	Semi-structured

Table 3. Data collection phase 1

Phase 2

Subjects	**N. of interviews**	**Type of interview**	**Questionnaire**
IT and Organization manager	1(2 hours)	Semi-structured	
Customer Service manager	1 (1,5 hours)	Semi-structured	1

Storehouse and Logistic manager	1(1,5 hours)	Semi-structured	1
Orders Department manager	1 (1,5 hours)	Semi-structured	1
Customer Service operators	4 (45 minutes each)	Semi-structured	9
Storehouse and Logistic operators	2 (45 minutes each)	Semi-structured	22

Table 4._ Data collection phase 2

Phase 1- Investigation of expected temporal performances

In the first phase of the research five semi-structured interviews were conducted with the IT and Organization manager and three department managers in order to assess their expectations on the system prior its introduction.

The analysis of the interviews showed first of all that managers' expectations had much in common and that the main objectives of the introduction were widely shared.

This was coherent with the premise that an internal workshop, involving the IT manager and the department managers, had been taking place during the design phase, in order to optimize the fit between the features of complaint service process and the new system.

Secondly, expectations were highly related to temporal issues (which we will call from now on expected temporal performance).

Four expectations, which can be considered relevant from a temporal point of view, turned out to be widely shared by all managers:

1. Speeding up the process of Complaint management :

   This meant accelerating single activities which are part of the process, like :

- the gathering of documentation (i.e. about the customer's order, customer's special pricing/payment conditions if any, transport documents, invoices)

- the gathering of information about the specific problem occurred in order to make decisions about how to "define the dossier", if refunding or not and how (i.e. errors in orders, subsequent modifications, delivering of wrong products or the wrong number of products, delivering of damaged packages; delivering at the wrong place and so on).

- monitoring single customer's "complaint dossier": a concern especially expressed by the Customer Point manager and by the IT and Organization manager was "finding where bottlenecks are" in the process, and the word "bottleneck" was used by other managers as well.

- It meant as well reduce the overall "lead time" of the process in order to give faster answers to customers. "Lead time" was a very common expression used, and the cross analysis with the Workshop documentation confirmed it was one of the main objectives of the project.

- It also meant reduction of duplications; reduction of time dedicated to produce and store physical documents: "less paper" was a common remark among all mangers.

2. Reducing temporal misalignment among different departments: Customer Point manager and operators felt day by day the customer's pressure and were much more aware of delays in giving answers to the customers ("defining the dossier"), compared to other departments, which had other priorities and followed their own cycles of activity. Before the introduction of the system and the workshop, a single dossier could be left "standing by" for days, waiting for an answer on the nature of the problem from the department who was in charge of checking the nature of the problem occurred, for example Storehouse, or Orders Unity within the sales department. The introduction of the workflow system, was expected to foster the

"alignment" of the departments on priorities, deadlines. This kind of objective can be better explained using Zerubavel's concept of temporal asymmetry: the different departments didn't share the same "temporal order", every department had its own priorities, cycle of activity, scheduling and this affected the process of complaints management.

3. Shifting from a "batch logic" to a "one piece flow logic": the system was expected to make it easier for people to deal with the activities instantly, as they showed up, without waiting to have a "pile of dossiers" on their desk. As the IT and Organization manager said: "people here used to wait until the "pile" was high enough, before deciding it was time, for example, to write letters to customers for a whole afternoon. or to check a heap of transport documents ...if you asked a manager what an employee of his was doing that day, he would answer: 'It's wednesday: today she writes the letters'. We want people to change their mentality, from a "batch logic" to a "one piece flow logic", which means dealing with problems and requests as soon as they show up".

   During interviews with the managers of other departments, when asked to describe the way the process was handled before the introduction of the system, the image of the "pile on the desk" came out as well. They said it's the customary way operators handle with complaints: "as soon as they have 5-6 dossiers to examine they will take some time to do that".

   These remarks refer to the tendency to organize this activity in recursive "cycles", occurring in some cases up to once a week (as an example, the storehouse operators were reported checking the queries on complaints coming from the customer service only once a week) and also to a preference in doing one type of activity at a time (monochronicity).

   Reduction/ elimination of such cycles and enhancement of polychronicity were the objectives in this case.

4. Adherence to defined “deadlines” for dossier definition and answers due to both internal and external clients:

- Managers remarks on this aspect were that the appreciation of the level of “urgency” of the answer to the customer was left to single operators, who, based on their experience and willingness, judged a complaint case more or less urgent.

- The first screening among complaint cases was responsibility of the customer service operators, who, based on various factors (i.e. the nature of the problem and the different level of ‘pressure’ by the customer) decided that a dossier required more or less tight deadline to be solved.

- Further on during the process, when the dossier created by the customer service operators passed on to other departments in charge of verifying the nature of the problem occurred (i.e., a wrong product was indeed delivered; the product arrived damaged to the customer; an order hadn’t been modified according to a new request and so on) no shared or codified system existed to put in evidence the level of urgency, and again, no specific deadline was assigned to the departments in order to give answers to the customer point on the specific complaint case.

- This resulted in a general feeling of uncertainty, well expressed by Customer point, Store house and Orders Unit mangers, when they stated that “everything is urgent”, and that “in general, as a rule…there has always been a rule that a complaint must me processed within 24 hours maximum”. During interviews, managers admitted that it could take up to one week in some cases.

Phase 2 -Changes in the temporal dimension of the organizational culture

The findings of phase 1 helped us focusing the data collection in phase two, where the results of questionnaires (see Attachment 1) consented to make a picture of the temporal dimensions of the culture of every department as it is configured after eleven months from the introduction of the system, which we illustrate in the following charts and describe one by one.

These data were triangulated with those resulting from ten in depth interviews (four with managers and six interviews with operators) of the different departments, aimed at investigating the perceptions of change in these dimensions before and after the introduction.

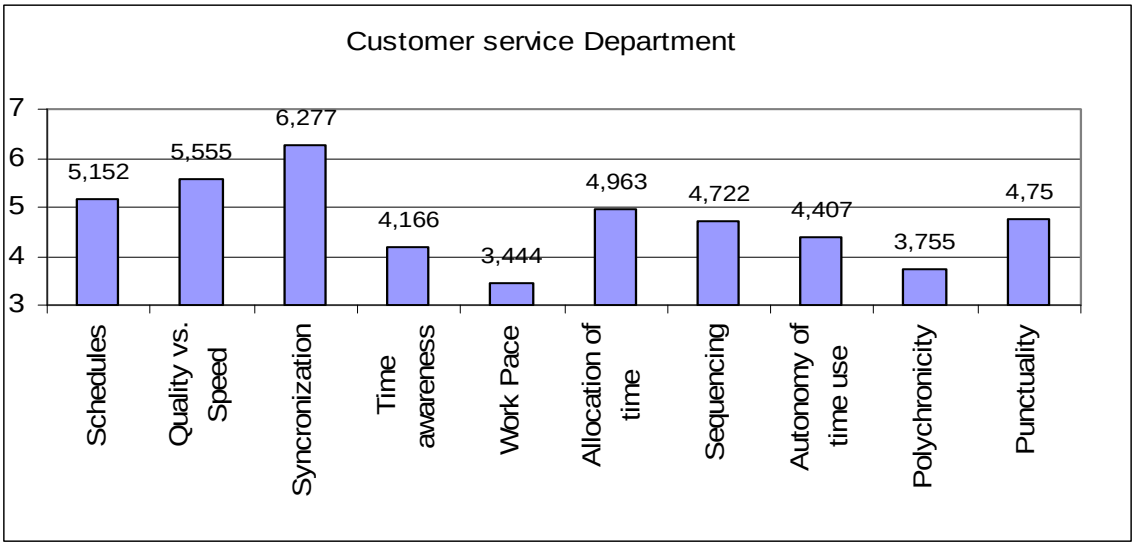

Table 5. Customer service department temporal profile

Customer service department temporal profile

The profile of this department after eleven months from the introduction of the system shows three values scoring over 5.0 (average scores). The most important value seems to be *synchronization and coordination*, which is referred to perceptions about the

importance to cooperate with others and work in a coordinate way (specifically referred to, coordination and cooperation among different departments).
This is a very important issue of the study because improving cooperation by reducing misalignment among departments was one of the four temporal performances expected.
This value scored high in all three departments (5.8 in Orders Unit and 5.45 in Storehouse and logictics) but here it is well higher then elsewhere.

When we triangulated this result with data from interviews conducted in this phase with manager and operators of the department to assess their perception of changes before and after the introduction of Lotus Notes, the triangulation showed that the value of synchronization and cooperation with other departments was very high today as well as in the past because essential to their work: they depended on other departments in order to get to define the dossiers. This dimension was perceived as further increased recently because the sense of "teamwork" with other departments had increased as well.

They reported as well that cooperation and temporal symmetry with other departments was very poor before the introduction of the system, and this was a reason for huge delays in the process: other departments were reported to "have their own time", "create bottlenecks", "be slow in giving answers". All members of the customer service interviewed shared the strong conviction that this situation had improved significantly with the introduction of the workflow system, "because now our request are immediately transmitted through Notes and the date and hour of request is registered, as well as their answer…" and because "it's more simple for them to gather and send us documents, databases are connected with the workflow system".

Quality versus speed was the second highest value. The high score means that quality is perceived as more important than speed. The interviews confirmed the finding, because, as many of them stated "speed is important, but to us giving the right answer to the customer is more important: it has to be one shot, the first answer must be the good one, you can't make a mistake over a mistake!". This value was reported not to have significantly changed after the introduction of the system. Quality was and remained a more important value than speed, in one case was reported to have increased.

Overall speed of the process was reported to have improved significantly (lead time reduced to an average of maximum 2 days), but because of the simplification provided by the system (less paper, all electronic documents on one database, quicker communications with other departments, deadlines displayed by the system and so on).

Scheduling and deadlines scored 5.152, the third higher value. Here the triangulation with interviews pointed out that this value was more connected to deadline rather then an accurate scheduling of activities. Deadlines were not so important before the introduction of the system. The interviewees reported that before there was rather a belief that "everything is urgent" and a general norm that "in general all complaints dossiers should be opened the day the complaint arrive". Others reported that "we didn't really think of deadlines, it was more indefinite", while the value was now very high.
The interviewees reported that what really made the difference was the introduction of a formalized classification of complaints based on the expected completion time, and the visualization of this "label" with colours (see Attachment 2).
This classification, proposed during the Workshop, was then implemented and the workflow system itself was designed in order to show requests and dossiers with a coloured tag attached, which was visible to the operators of all departments, thus reminding that a deadline was there and that it required alignment among departments.

The introduction of this system of deadlines represented a liaison among departments: to use Barley's concept of symmetry, now the three units share for the first time a common deadline system, and have to meet aligned deadlines, which has increased symmetry among them.

We will discuss now the two lowest values, *work pace and polycronicity*, because associated with the concepts of speed and working in a "flow logic" (doing many things at one time and handle matters as they arise are part of the definition of polychronicity) which were among the expected performance.
Work pace is a measure of the extent to which people work at their own rhythm, can easily find time to make new projects or for breaks (versus importance of velocity).

It scored 3.4, the lowest of all in this department, and lower if compared for example, to logistic department. Data from interviews confirmed that in the department velocity was highly valued, even because this is as well a front office with customers calls urging all day, with peaks twice a day. What contributed to this sense that quickness was important was that the "rhythm is quite 'unpredictable' here", because constantly interrupted by customers calls which have priority on all other activities. This dimension was reported not to have changed much, maybe rather increased since the system, had contributed to eliminate some activities, duplications, and physical movements from office to office to move paper documents.

Polychronicity scored low as well (3.75), which seemed contradictory with the description of the daily activities collected during the first round of interviews. Those descriptions depicted a highly polychronic environment, where operators were at the same time engaged with phone calls and many different administrative tasks at a time. When triangulated with data from interviews, the incongruence was explained in this way. During interviews, operators said that request for more polychronicity had increased significantly due to two factors.

The first one was a new organization of labour within the department, introduced slightly before the workflow system, which demanded to every operator become responsible for the dossiers he opened all along the process until the complaint was "closed"(sort of "process owner" role).

This demanded people to handle all issues connected to "their" dossiers, and to handle them as soon as they arose, while before, in a functional logic, operators used to work separately on different parts of the process (i.e., someone was in charge for phone calls for a whole morning, then switched to "letters" for another time-slot, then switched to "opening dossiers" which were accumulating in a pile and so on..).
This new organization had the objective, as for the introduction of workflow system, to change from a "batch logic" (as described above, working on one single activity based on the "piles of paper" until the batch was over and so on) to a "flow logic".

Secondly, the workflow could foster polychronicity because all data about phone calls, dossiers, communication with other departments, other administrative tasks were stored in a unique base of data and it "made it easier to open and close items related to different activities at the same time, you have links immediately available".
As another operator pointed out. "Lotus Notes keeps you in a constant flux of messages…mails arrive on the same Database I'm working on, and I can't help opening them". So how to explain the low score of this value in questionnaires? During interviews some remarks about the formulation of questionnaire items suggested an explanation: many items were tested "preference" for working in a polychronic way, and during interviews more than one person pointed out that they didn't like working this way.

Morover, when under pressure for overload, operators shifted back to batch logic: for example during phone calls peaks (twice a day) they stopped other activities to be concentrated mainly on answering the phone, admitting that "messages in Lotus are left in stand by"; another case was when they had a number of administrative tasks which required high concentration, they switched back to the old batch, monochronic logic and adjusted with colleagues in order to divide labour based on specialized activities.
Morover, when asked for "preference", some of them admitted that they would prefer working in a more monochronic and specialized logic.

This was an interesting result because it can indicate some sort of persistence of a temporal orientation – monochronicity- which influenced negatively the expected use of the system and the achievement of one important temporal performances (flow logic, polychronicity.

Coherently, the score of the value *Allocation of time* was the fourth highest (4.96), expressing a feeling of work overload, though there were contradictory remarks about this point: on one side, the pressure towards working in a more polychronic way contributed to this feeling.
On the other side, the introduction of the workflow system and the way customer complaint process had been redesigned had introduced, as pointed out before, a

simplification and facilitated several operations, thus decreasing the sensation that time was too tight for carrying out tasks.

It is interesting to remark that, as far as *Social Cycles* are concerned, the interviews showed that, though the pressure toward a "flow logic" had increased, operators still maintained traces of their previous cycles: still at present, the activity was temporally ordered around the phone peaks which took place twice a day from 9.30 to 11.30 in the morning and from 15.30 to 16.30 in the afternoon. Four main cyles were described: first morning (opening of new complaint dossiers)/phone peak/first afternoon (administrative tasks requiring concentration)/phone peak/complaint dossiers.
This influenced, as pointed out in the previous section, a use of the workflow system which is not yet in line with the expected "flow logic".
The score of the value *sequencing*, coherently, was not one of the lowest in this department, as one would expect (4.7)

Autonomy of time use dimension collected ambiguous remarks: on one side it was perceived as increased due to the personal responsibility on single complaint dossiers and due to the fact that "with workflow, I have the point of the situation, I can see what documents are there, which are missing, who sent answers and when"; on the other side, as remarked before, there was a feeling that the increased polycronicity demanded by the organization and fostered by the workflow's features decreased autonomy because operators felt "pulled" by many concurrent demands.

Finally, *Awareness of time* use dimension scored lower, though was reported to have slightly increased, mostly due to the higher responsibilities connected to the dossier management

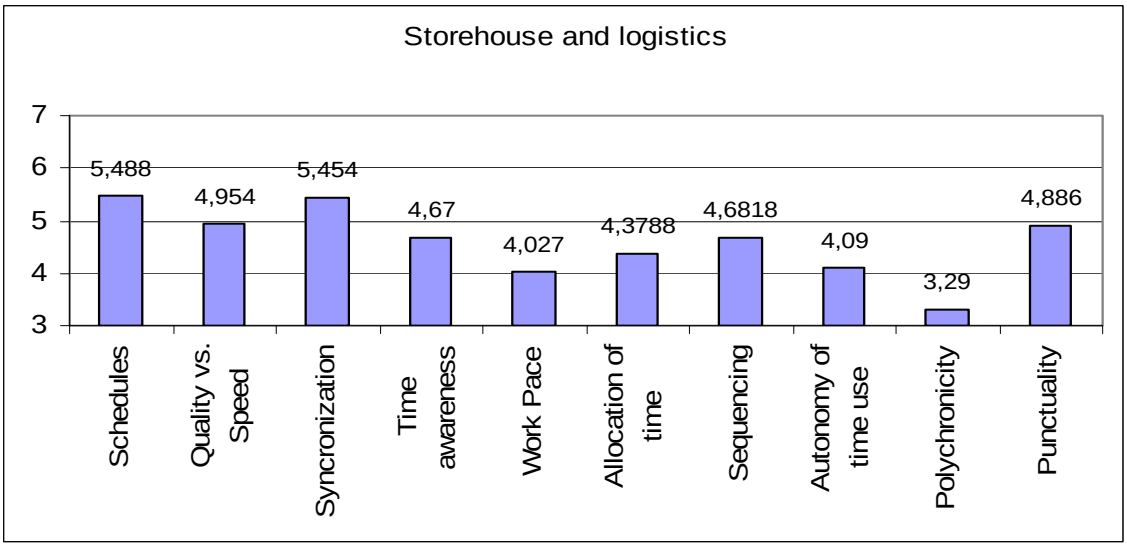

Table 6. Storehouse and logistics department temporal profile

Storehouse and logistics department temporal profile

This department was an important counterpart in the complaint management process, because in charge of checking the causes of a variety of complaints.

Scheduling and deadlines was the highest value here (5.48), and higher than in the Customer Service. This value was confirmed by qualitative interviews, reporting that their activity must be carefully planned and lead to on time delivers to customers. Very little of the "randomness" which partly characterize the activity of customer service can be found here. Nevertheless, interviews with operators in charge of customer complaints showed that in this department as well there had been a change from an attitude of "indefinite urgency" to an attention to definite deadlines. The artifact of "color tag" attached to Lotus messages incoming was often quoted as a symbol of this change "the color sets the priority" and as well, operators expressed curiosity towards messages arriving: "I'm curious to see what a red code is!".

Social Cycles: operators reported that this feature in particular had change a lot: before, they followed a cycle of five six days in complaint management activity: the "pile of paper" here was left growing and finally one whole day was dedicated to this specific

activity. The presence of this cycle was expression of the “batch logic” they followed. As they explained, this activity is time consuming because in this department they had to check not only documentation but the physical check in the storehouse, of products and packages which are supposed to have been delivered or supposed to have been delivered wrong or damaged and so on. That is why it was left aside and dealt with only once a week.

This created a noticeable *temporal asymmetry* with customer point operators, who were left waiting for answers up to a week.

There is another typical *cycle* in this department, the Morning/First afternoon cycle. In the morning ordinary activity takes place. At one o’clock p.m. the order planning for the afternoon starts and then than until five o’clock deliveries take place.

At present, complaint management ha been re-allocated accordingly to this second cycle: Lotus Notes is very often checked in the morning, and the check of complaints starts accordingly, in a more “flow oriented” logic.

This allocation of the complaint management activity in the morning /first afternoon cycle has introduced more symmetry with the customer point, where they also have cycles connected to the two daily peaks of phone calls: the morning peak starts about 9.30/10.00 in the morning, and the opening of complaints dossier accordingly. Around ten, the first queries start arriving via Notes to the Stockhouse department, where now they are checked as long as they arrive.

Synchronization and coordination with other department, was an important value today, even if significantly lower than in Customer point (scored 5.45). Triangulation with interview data showed that while before the introduction of the workflow the coordination with other subjects was highly valued, this was not so true for coordination with the customer point. Thus, as far as the relationship with Customer point was concerned, this dimension had increase noticeably. This was due, according to the operators, to two factors: the internal workshop, which increased attention on this topic on the part of the Storehouse manger and operators, and the system, which “made it simpler: it’s quicker to

manage complaints because it's easier to find and attach documents and we produce less paper then before".

In this case as well, as during interviews with customer point managers and operators, it was reported that the change was due to the combination of "the workshop" (an internal process of change management) and the introduction of the workflow, considered as "a facilitator".

Quality versus speed was the third highest value (4.95), though less important then in customer point.

This value was reported not to have changed much in relation to the introduction of the workflow system, but it was reported that in the company the emphasis on quality management and control had been increasing a lot, together with a share effort to track and reduce errors.

Polychronicity was the lowest value (3.29) and the lowest of the three departments. This was consistent with the high value given to scheduling and the already mentioned preference for 'batch logic'.

When asked whether the value had increased, the interviewees said that globally it didn't, in their department, since their basic activity hadn't changed.

People involved in the complaint management process, as pointed out before, indeed found a compromise solution, incorporating in their morning/ first afternoon cycle the demand for a more polychronic orientation, so theat their morning activity was now intertwined with customer complaint activities.

According with this result, the value of *sequencing* was the fourth higher (4.68)

Work pace was the second lowest value (4.02), but higher compared to customer point score.

The overall perception of following own rhythm and being able to take pause was low for different reasons, tied to the careful planning of activities and the schedule of delivering,

though allowing a less frantic rhythm than the "random pattern" of customer point activity, and no significant change was pointed out from the introduction of the workflow system.

Consistently with this result was the score of *allocation of time*, which is lower than in Customer service department (4,37), and reported to have slightly diminished because "Notes simplified checking the complaints".

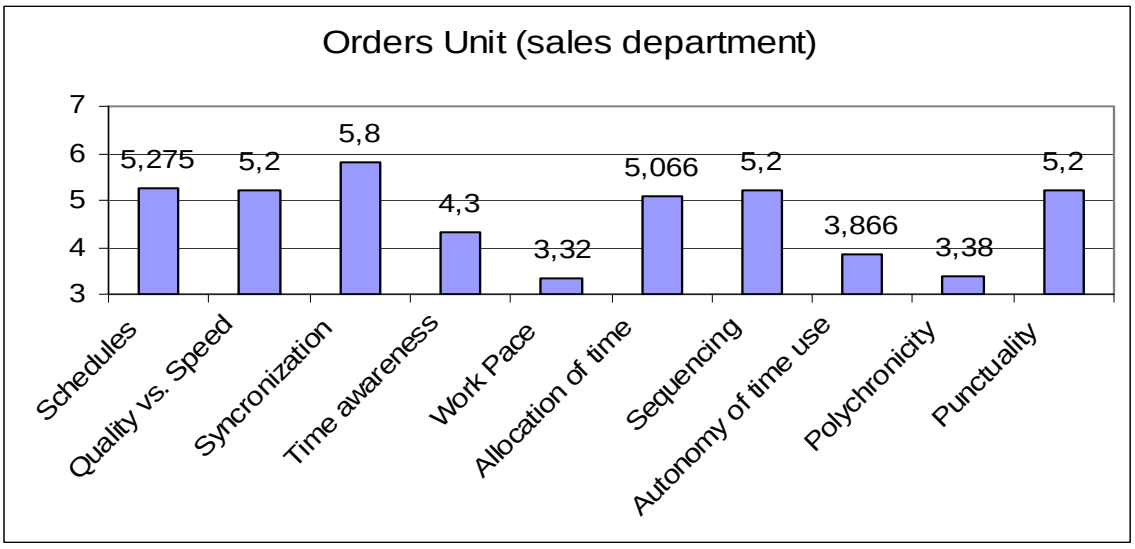

Table 7. Orders Unit temporal profile

Orders Unit temporal profile

The triangulation with interview data was made in this case with the manager only, since it was not possible to interview operators of this department. This makes the analysis of this department cultural dimensions and changes less rich then the previous ones.

The dimension of *synchronization and cooperation* with other departments is high today (5.8) as well as in the past, and reported to have increased since the workshop and the introduction of the workflow system. Again, interviewees underline the combination of these two factors as very important.

Nevertheless, the contribution of the system to the change is perceived in that it facilitates communications and tracks date and time on answers: “there is more control”.

In relation to *social cycles*, it was remarked that “before, they warned us that there was a dossier when they had time to, and we answered when we had time to…”, thus expressing that not only the Order Unit followed its own cycle of activity and dealt with complaints “when they had time to” but that the same did the Customer Point.

Quality versus speed, which seems to be a widely shared value in the company, scored high as well (5.2) and reported not to have changed so much in relation to the introduction of the workflow system, but, as stated by Storehouse interviewees, in relation to the increasing company emphasis on quality management and control.

Again, *schedules and deadlines* scored high (5.27), with remarks similar to those reported in the other two departments, which confirms that this dimension significantly increased, together with synchronicity and coordination, with special regard to deadlines.

This department underwent a similar process introduction of a new organization of labour as the customer service point, with contradictory results similar to the ones described before: *polichronicity* dimension still low (3.38), *sequencing* high and a general value of *allocation* even higher (5.2) than in customer point, though, again, it was remarked that the workflow system simplified the operations.

Autonomy of time use here was perceived as low (3.86), thus slightly increased, but in association with process of organizational change, and so was *time awareness (4.3)* for the same reason.

The dimension of punctuality, as generally referred to general importance of punctuality at work scored generally medium-high, and didn’t show any significant heuristic value for the purpose of our study.

We summarize in the following table the results of our analysis on the changes of the temporal dimensions as resulted from the triangulation of data with those resulting from interviews:

	Temporal dimension	CUSTOMER POINT	STOREHOUSE & LOGISTICS	SALES DEPARTMENT
1	Schedules and Deadlines	+	+	+
2	Synchronization and coordination	+	+	+
3	Polychronicity	+/=	=	+/=
4	Sequencing	=/-	=	=
	Work pace	=/-	=	=
6	Autonomy of time use	+/-	=	=
7	Awareness of time use	+	=	+
8	Speed vs. Quality	=	=	=
9	Work pace	+/-	=	=
10	Allocation	+/-	+	=
	Temporal symmetry	+	+	+

Table8Changes of temporal dimensions of culture in three departments

6.2 Discussion and limitations of the study

The purpose of the study was to investigate if and to what extent the introduction of a workflow system transforms the temporal assumptions of the organizational units where it has been adopted, and to test the hypothesis that the temporal assumptions shared by people in organizational units before the introduction of the system can affect the way it is used, thus facilitating/hindering the achievement of the expected performance conveyed by the system.

A case study was conducted in the Italian branch of a multinational manufacturing company, where a Workflow System (Lotus Notes) had been introduced about eight months before the fieldwork started in order to improve customer service processes.

The first objective of the study was to assess the temporal performance expected by the managers adopting the system.
The results account for four types of temporal performance expected and widely shared by the management as a result of the introduction of the workflow system:

1. Speeding up the process of Complaint management
2. Reducing temporal misalignment among different departments
3. Shifting from a “batch logic” to a “one piece flow logic”
4. Adherence to defined “deadlines” for dossier definition and answers due to both internal and external clients

In order to test the hypothesis of the research, quantitative data from questionnaires and qualitative data from interviews and company documents were triangulated, accounting for the following results.

Following the introduction of the system, the temporal dimensions of the organizational culture of the three departments involved showed some significant changes which confirm hypothesis 1 of the study, but as well some contradictory effects which seem to confirm hypothesis 2.

In particular, the triangulation of data coming from questionnaires and semi-structured interviews showed that the three dimensions of synchronization and coordination, temporal symmetry among departments, and deadlines and scheduling had increased significantly. after the introduction of the system.

The increase of these three dimensions confirmed as well the achieving of three expected temporal performance: reducing misalignment among departments, obtaining adherence to defined deadlines and speeding up of the customer complaint process.

This kind of evidence supports the first hypothesis of the study, that the introduction of workflow systems transforms the temporal assumptions shared by people in organizational units.

On the contrary, the two dimensions of polychronicity and sequencing didn't show any significant change, and the social cycles characterizing the departments showed contradictory results. These dimensions were associated to achieving the objective that workers would shift from a batch logic to a one piece flow logic in performing their activities.

The analysis of qualitative data suggests that the persistence of two temporal dimensions of the organizational culture, i.e. monochronicity and sequencing, and the strength of the social cycles existing within some departments, influenced the expected use of the system and the achievement of one important temporal performance, the shift to a flow logic.

This kind of evidence supports the second hypothesis of the research that temporal dimensions of organizational culture can affect the use of the system thus hindering the achievement of the expected temporal performance.

It is important to underline that the introduction of the workflow system was combined with an internal workshop involving the managerial level, and that the results we report were associated by the respondents to both innovations introduced by the system and the

internal workshop: the different implications of these two factors on both cultural changes and performance have been only partly assessed and will require further investigation.

Limitations of the study

An important limitation of the study concerns the limits of single case studies, which don't allow generalizability of the results, thus the outcomes of this exploratory research will require further investigation to be confirmed, through replication of in more cases.

Secondly, though data triangulation of quantitative and qualitative data consented to gather richer information and to go through a process of validation by the respondents, we remind the statistical limitations of the quantitative analysis, due to the small sample of respondents which corresponded to the small number of people using the workflow system in some of the organizational units involved of this case.

Third, qualitative analysis was subject to the risk of interpretative bias since the researcher worked alone and the analysis didn't go through a process of double coding and cross checking with other researchers, as suggested by good practices (Miles and Huberman, 1994).

Forth, in view of an extension of this research design to more cases, a further criterion for case selection must be the dimension of organizational units and the number of system users, for the purposes of quantitative analysis and to give robustness to the results.

7. Conclusions

This work started from the premise that in the existing literature about ICTs and the organization of work, organizational dimensions like distribution of authority and control, standardization, centralization, specialization of labour have received great attention, but much less attention has been given to the study of the relationship between ICTs and the temporal dimension of the organization of work, in spite of the fact that we can consider the time dimension as one of the fundamental variables in organizational analysis since the early scientific management movement .

The study has intended to give a contribution to this area of studies, through the following objectives:

- Presenting a review of the literature on time as social and cultural construct, with a focus on how the temporal dimension has conceptualized in organizational literature.
- Presenting a review of the state of the art of theoretical and empirical scientific contributions on the temporal impacts of ICTs in organizations
- Presenting the results of a case study which investigates the impacts of the introduction of a workflow system on the temporal assumptions of three organizational units within a company and tests the hypothesis that the temporal assumptions existing in organizational units before the introduction of the system can affect it's the way it is used, thus facilitating/hindering the achievement of the expected performance conveyed by the system.

We summarize as follows the finding of the thesis:

1. Sociological (Durkheim, 1965 Merton and Sorokin, 1937; Gurvitch, 1964; Zerubavel, 1981; Giddens, 1984;), anthropological (Hall, 1959, 1983) and organizational literature (Lawrence and Lorsch, 1967; Clark, 1985; Schein 1985; Bluedorn and Denhardt 1988; Gerschick, 1988; Gherardi and Strati, 1988;

Hofstede 1991; Butler; 1995; Trompenaars, 1998; Orlikowski and Yates 2002) have contributed to conceptualize time as a social and cultural construction, opening the way to a view of time as plural, multifaceted, relative, culturally determined, embedded in contexts and practices.Anthropological and sociological studies point out that our notions of time and temporal routines are deeply entrenched and directly related to the way we see the world (Zerubavel, 1981; Dubinskas 1988) and the presence of a known, reliable temporal structure is considered central to the way we interpret objects and events.

As far as organization theory is concerned, there has been a shift from a view of time as objective, external, universal (i.e. in Taylor) to the consideration of the internal, particular time of single organizations. The cultural perspective on organization has acknowledged time as a fundamental dimension of organizational culture (Hofstede, 1991 Schein, 1988, Schriber and Gutek, 1987), and in the last two decades conceptualizations of 'Organizational time' have driven attention to the co-existence of a plurality of internal and particular times and temporal patterns within each organization (Schriber and Gutek, 1987; Gherardi and Strati, 1988; Butler,1995).

In the literature on time as a social and organizational construction, we can find a plurality of terms to define the ways in which groups and organizations give shape to the temporal organization of their activities: Merton and Sorokin (1937) described how social groups create their own "time systems" according to the specific needs to coordinate their functions and achievements.

Zerubavel (1979) in his studies on the temporal organization in hospitals describes "sociotemporal reference frameworks" as collectively shared temporal patterns, working as "organizing schemes" relevant in a specific organizational context, while Barley (1988) in his study on the effects of the introduction of CT scanners in radiological departments uses the term "temporal orders" to indicate both quantitative and qualitative aspects of the temporal organization of the work of radiologists and technicians.

Schein (1985) in his study on organizational culture, maintains that organizational culture has groups' dominant assumptions of time and space embedded within it and describes several "assumptions on time" that characterize different national and organizational cultures.

Schriber and Gutek (1987) describe "norms about time" as specific "dimensions of organizational culture", proposing scales to measure these dimensions.

Butler (1995) in his conceptualization of "Organizational timeframes" describes temporal dimensions as ways to experience time in the organization which derives from its specific context: *timeframe* is referred to the way past, present and future are experienced within the organization.
In this view, time is seen as a dependent variable, as an outcome of the organizational and institutional context within which a timeframe is located.

Again, Orlikowski &Yates (2002) in their study on the temporal organization of a virtual team introduce the term of "temporal structures", which are enacted through every day practices and reproduced through routines.

Besides being a fundamental condition for the coordination of activities and the production of organizational outputs, the temporal organization of work processes, as pointed out by Barley(1988) plays a fundamental role also as "an interpretive framework for rendering action in the setting meaningful" [p. 125]. In other words, organizational actors evaluate and make sense of events occurring during their own activity or other people's activity using the temporal framework as a scheme of expectations to judge whether results and behaviours are appropriate.

Zerubavel (1979) in his study on temporal patterns in the organization of activities in hospitals found that various types of schedules worked as "cognitive maps", used by hospital's personnel, providing a background, a "repertoire of what is expected, likely or unlikely to occur within certain temporal boundaries" [p.125].

Temporal patterns represent thus an expression of the specific organizational and professional culture which produces them, conveying a symbolic value, for the individual worker and the group of workers: according to Dubinskas (1988), the socially constructed character of time is such that all “times” existing within the high technology organizations of his study could be considered as “symbolic nexes around which coalesce issues of order, power, self definition and knowledge”.

Again, Zerubavel found that a major aspect of the socio-temporal order expressed by the “schedule” of coverage in the hospital was that it functioned “as a moral order”, an expression of some fundamental organizational values like responsibility towards the patients, fairness towards staff members, and it was also a criterion to judge the appropriateness of personnel’s behaviour: some actions were considered “legitimate”, for example, only at the end of a shift, but not at the beginning. In this view, the temporal dimension appeared central for the definition of the “boundaries of norms”.

The above mentioned cognitive and cultural functions of temporal patterns can be considered as a factor which contributes to their strength and permanence within a given organizational context; consequently, the introduction of technologies which have the potential for changing temporal patterns intails a challenge to a multiplicity of cognitive frameworks and cultural values on which organizational actors rely.

2. The literature review of contributions on the temporal impacts of ICTs in organizations showed that that studies in IS and Organizational disciplines on this topic have fully acknowledged the conceptualization of time as social construct, adopting theoretical frameworks derived from anthropological and sociological studies and from organizational culture research.

   Empirical studies, though still limited, have nevertheless covered in the last decade a wide range of different information systems and technologies, which we

classified based on their purpose as: automation of routine activities and business processes, decision support technologies, communication and groupware technologies

As far as research design is concerned, coherently with the theoretical frameworks adopted, interpretivist studies and studies mutuating structuration perspectives are focused on the interplay between ICT's and the social context of its implementation and use, thus considering the temporal dimension an important feature of the social context which contributes to shape the processes of implementation and use but is in its turn dialectically involved in changes occasioned by the introduction of ICTs.

These considerations about epistemological perspective and research design in the papers examined led us to remark that still limited attention is paid to the topic from a positivist perspective, with particular regard to contributions which examine if and to what extent assumptions on time and temporal patterns existing in organizations and workgroups affect the implementation, use, and expected outcomes of ICTs.

3. Coherently with these considerations on the state of the art of research on the topic, we conducted an empirical study which intended to give a contribution to this area of studies.

   The purpose of the empirical study was to investigate if and to what extent the introduction of a workflow system transforms the temporal assumptions of the organizational units where it has been adopted, and to test the hypothesis that the temporal assumptions shared by people in organizational units before the introduction of the system can affect the way it is used, thus facilitating/hindering the achievement of the expected performance conveyed by the system.

   A case study was conducted in the Italian branch of a multinational manufacturing company, where a Workflow System (Lotus Notes) had been introduced about

eight months before the fieldwork started in order to improve customer service processes.

In order to conduct the study, we chose to combine qualitative and quantitative methods for data collection. As many authors remarked, these methods need not be viewed as polar opposites (Van Maanen, 1983b). In particular, integration of quantitative and qualitative methods has been adopted in case studies in IS (Kaplan and Duchon 1988, Markus 1994, Cavaye 1996).

As Kaplan and Duchon state, combining these methods introduces both testability and context into the research. Collecting different kinds of data by different methods from different sources provides a wider range of coverage that may result in a fuller picture of the unit under study than would have been achieved otherwise.

Moreover, using multiple methods increases the robustness of results because findings can be strengthened through triangulation - the cross-validation achieved when different kinds and sources of data converge and are found congruent (Benbasat, et al., 1987; Jick, 1983; Yin, 2003), or when an explanation is developed to account for all the data when they diverge (Trend, 1979; Kaplan and Duchon 1988).

The first objective of the study was to assess the temporal performance expected by the managers adopting the system.
The results account for four types of temporal performance expected and widely shared by the management as a result of the introduction of the workflow system.

In order to test the hypothesis of the research, quantitative data from questionnaires and qualitative data from interviews and company documents were triangulated, bringing to the following results.: following the introduction of the system, the temporal dimensions of the organizational culture of the three departments

involved showed some significant changes which confirm hypothesis 1 of the study, but as well some contradictory effects which seem to confirm hypothesis 2.

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