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Time Experience within an Organization: How do Individuals Manage Temporal Demands and What Technology Can We Build to Support Them?

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ABSTRACT

This study examines the time management strategies of individuals in an academic institution and gathers information on the complex temporal structures they experience and manage. Its focus is on how electronic tools can be designed to incorporate the temporal structures that govern time usage and thus, help individuals to better manage their time. This work consists of an exploratory field study to gather data on how people use temporal structures with electronic tools. This is followed by a survey that will be given to a larger group of respondents in the same subject population examined with the field study. The survey will test the hypotheses developed from a literature review on time management coupled with the information uncovered in the field study. Finally a prototype computer time management tool will be developed and distributed on a trial basis to the same community surveyed. A brief follow-up study will then be conducted on the prototype’s use.

Keywords
Time, temporal structures, time management, electronic calendars, electronic time management tools, scheduling, organizational behavior.

INTRODUCTION

Organizations function with a set of temporal rhythms and norms that can dramatically affect an organization’s productivity, decision-making and management-directed changes (Acona et al 2001; Avital 2000; Maznevski and Chudoba; Gersick 1994; Waller et al 2001; Webb and Pettigrew 1999). These temporal norms are originally set by individuals within the organization in order to better manage the organization’s use of time. But, as an organization grows and adapts, these norms also entrain the groups that set them and can often lead to unproductive time use. In addition, the temporal norms may be implicit rather than explicit, and thus, have to be learned through experience by new employees. Managers may also establish temporal norms through edicts that they perceive as good management practice without being aware of a secondary temporal effect being created. For example, in a nine-month study of an engineering development group, it was found that a norm allowing constant interruptions was actively hindering the achievement of a tight deadline (Perlow 1999).

The time structures that govern how organizations use time are called temporal structures. This study is interested in examining personal time management and its relation to the temporal structures that govern an organization. It is focused on how individual time managers use such structures, whether the use of these structures improves time management and whether these structures can be captured and implemented in a computer tool that supports time management. It used semi-structured interviews followed by the dissemination of a survey and the development of a temporal structures calendar tool to study this topic.
The rest of the paper is organized as follows. The next section presents the theoretical background for the research. The proposed work to be done is then described, including the research hypotheses being tested. This is followed by a description of the semi-structured interviews that were conducted as a pre-cursor to survey development and deployment. This is followed by a description of the temporal structures prototype tool that will be developed and evaluated. The final section lists the expected contributions of this work.

THEORETICAL BACKGROUND

Most time-related studies in psychology and sociology concentrate on how people perceive time (Ben Zur and Breznitz 1981; Bluedorn et al. 1999; Cottle 1976; Kelly and McGrath 1985; Kavanagh and Araujo 1995) or how people use their time (Arndt et al. 1981, Czerwinski et al. 2004). A great deal of popular time management articles and books (Hall 1983; Lakein 1973; Morgenstern 2000) provide practical guidance on how to gain better control of time usage and get more work done. Key recommendations for successful time management include better estimation of time usage, identification of events in which time is not used well, allocating time to maintenance tasks – including time management and establishing closure procedures for meetings and tasks that tend to exceed allotted time. Although the literature does not mention temporal structures explicitly, the recommendation to set aside specific repeating time slots creates personal temporal structures.

Existing information systems time research focuses on electronic calendar usability issues or designs and use of collaborative calendar systems (Beard et al. 1990; Egger and Wagner 1992; Kelley and Chapanis 1982; Kincaid, Dupont and Kaye 1985; Payne 1993; Lee 1999; Crabtree, Hemmings, and Rodden 2003; Wu and Tremaine 2004). A second focus is on how time pressure affects software development teams (Austin 2001; Nan et al. 2003). The use of temporal structures is not mentioned, even though, in the case of group calendar studies, many organizational temporal structures are necessarily implicit in these calendars, e.g., weekly staff meetings.

Egger and Wagner (1992) come the closest to considering multiple temporal structures in their study of a surgery-scheduling task in a hospital. They developed a time management prototype called “Operation Book” that supported cooperative decision-making for establishing surgical schedules. This approach was taken because of the multiple conflicting temporal structures that existed among the different parties attempting to schedule surgery.

Temporal structures are primarily a focus of research in organization behavior (Clark 1985; Bluedorn and Denhardt 1988; Orlikowski and Yates 2002), and organization change (Staudenmayer et al 2002). Researchers argue that observing organizations through a temporal lens provides a useful framework for understanding organizational behavior (Ancona et al. 2001). Orlikowski and Yates (2001) categorize temporal structures into clock-based, event-based and practice-based time. They characterize clock-based as a type of external time that is geared to calendars and clocks, such as schedules for meetings and classes. Event-based time is time that happens around an event, e.g., the scheduling of a thesis defense, which initiates a standard set of other deadlines such as the distribution of a thesis to a student’s committee one month before the defense. Practice-based time is a combination of clock- and event-based time such as the scheduling of vacations in summer when children are free of school obligations or the non-scheduling of meetings that are likely to be weakly attended just before Memorial Day in US-based offices. Blount and Janicik (2001) have proposed a different classification scheme. They organize temporal structures into three categories (explicit, implicit and sociotemporal) that reflect the location of knowledge about the temporal structures. Explicit temporal structures are those that are posted and made readily available, e.g., deadlines for turning in timesheets or reporting quarterly earnings. Implicit temporal structures are those that are known by the group or subgroup but never stated explicitly, e.g., the creation of advertising, shipment and delivery schedules in preparation for the Christmas shopping season. Sociotemporal norms are the usually unstated time lags that are expected by a culture, e.g., the amount of time to wait before requesting overdue information from a colleague again. Figure 1 presents the model that Blount and Janicik propose for how temporal structures are incorporated in an individual’s time management strategy. Thus, they suggest that time management is the active task of manipulating the temporal structures that govern a person’s work and leisure time. The two categorizations of temporal structures form separate dimensions for viewing time norms and both can be used to categorize any temporal event.
RESEARCH APPROACH

Researchers in management and organization behavior have shown that the temporal rhythms and norms exist, and that they collectively impact multiple aspects of an organization. They have even shown that individual productivity is hampered if temporal cycles clash. The focus of this research is on developing information technology to support better personal time management. This work examines (1) how the temporal structures discussed in the literature review are used in personal time management. We then propose to use these results to determine (2) whether temporal structure usage and creation improves time management, and (3) whether we can improve time management by supplying support for more easily capturing temporal structures through information technology. The use of temporal structures and their relationship to quality time management is addressed first through an exploratory field study, which has already been run. In the study busy professionals were interviewed about their time management strategies. A grounded theory analysis (Strauss and Corbin, 1990) of the data collected was used to develop an instrument that will survey a larger group of people on their use of temporal structures and the quality of their time management. The survey serves as a confirmatory study testing the hypotheses developed from the interview data and the literature review. These hypotheses are shown in Table 1. They test the awareness and use of different temporal structures uncovered in the interview and their relationship to time management strategies. They also collect data on how many of these structures are used explicitly in electronic calendars. In general, they state that better time managers are more aware of the temporal structures that impact their time usage, create their own temporal structures to help manage their time and also use more temporal structures in their electronic calendar entries.

To examine whether an information technology solution can both provide temporal structure support and thus, improve personal time management, a prototype tool will be developed that supplies this support. A follow-up field study on users of the prototype tool will gather data on the temporal structures used and their impact on personal time management. We expect other ramifications of this work as well. By developing temporal structures, we will develop a temporal knowledge base that does not currently exist at the institution under study. Many of the structures that are encoded are implicit and their development will make them explicit for new employees. We also expect that conflicts between some of the temporal norms and rhythms will become evident as they are overlaid on a personal calendar. This will thus, identify temporal problems that perhaps need resolution by the organization.
<table>
<thead>
<tr>
<th>Hypotheses</th>
<th>Testing Method</th>
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</thead>
<tbody>
<tr>
<td>Individuals who have electronic tools embed temporal structures in these tools</td>
<td>Semi-structured interview</td>
</tr>
<tr>
<td>Individuals who do not have electronic tools, have difficulty with encoding the temporal structures and tend to keep them implicitly</td>
<td>Semi-structured interview</td>
</tr>
<tr>
<td>Better time managers are more aware of all the temporal structures that entrain their use of time</td>
<td>Semi-structured interview</td>
</tr>
<tr>
<td>Better time managers begin work earlier because the temporal structures guide them in how their time will be used for other purposes</td>
<td>Semi-structured interview</td>
</tr>
<tr>
<td>Better time managers set up their own temporal structures to manage and protect their time</td>
<td>Semi-structured interview</td>
</tr>
<tr>
<td>Electronic calendars help people become better time managers</td>
<td>Semi-structured interview</td>
</tr>
</tbody>
</table>

Table 1. Research Hypotheses Used in Proposed Study

A DESCRIPTION OF THE FIELD STUDY CONDUCTED

An initial study was conducted to determine the types of temporal structures used by organizations and individuals, the types of clock-based activities that occur, the characteristics of event time structures and the practice-based processes in place in the target organization (a university). It also assessed whether the temporal structures are explicit, implicit or sociotemporal norms. This information has been used to develop an instrument for measuring the temporal structures in use in the organization studied, how the temporal structures are being used and what effect their use has on time management.

It is argued that a university is a truly appropriate source of information for this research because a university has a collection of conflicting time patterns. It is a complex environment with multiple departments setting their own temporal structures (e.g., when department meetings and seminars take place in addition to a seasonal cyclic structure that is imposed on the university by term start and end times, and U.S. designated holidays). This research population choice should provide a rich and detailed collection of temporal management requirements.

Two sets of semi-structured interviews were conducted at an American technical university. Twenty individuals were interviewed. All were considered active and extremely busy employees of the university. Their roles ranged from receptionist to university president and spanned a diverse set of occupations in-between. Each of the interviews lasted approximately thirty minutes to two hours. The first interview focused on short-term time management strategies (those involving the current day’s scheduling) and the second interview focused on long-term time management strategies (those involving weekly, monthly and yearly scheduling). At no time in the interviews were temporal rhythms or norms mentioned.

The interviews were transcribed by a third party and two researchers examined half of the interview results coding the data for time management tool usage and for mentions of different types of temporal structures. The two researchers then compared their results to each other and established a more thorough definition of what items we viewed were temporal structure usage. The second half of the interviews were then reviewed and coded. The two researchers then sat and discussed their results on this second set of coding to determine if the inferences they made in the first set were found in the second half. Overall, the researchers found a wide range of conflicts in individual temporal structure management and a variety of strategies for managing this conflict.
Our interviews found that all of our time management respondents were using multiple temporal structures. Some of them used more than one calendar for managing their different temporal structures, e.g., one interviewee kept her husband’s schedule on her PDA (which was private information). Because of this, she was unable to synchronize her PDA schedule with her publicly displayed calendar. Other respondents re-typed university schedule times in their personal calendars. Still others annotated (but did not indicate time usage) their calendar with key temporal events generated by external entities (e.g., parking restrictions for parent’s day). All respondents reported difficulty in maintaining multiple temporal structures. Some, especially new employees, reported difficulties with knowing about the university’s temporal rhythms.

Table 2 presents examples of the types of temporal structures that subjects reported along with the transcribed text of the recorded interview. The structures are classified as to whether they are explicit (published and made known by some administrative aspect of the university), implicit (understood as a norm that was followed by a university but not published or officially stated anywhere) or a sociotemporal norm (culturally understood time usage). They are also labeled as clock-based, event-based or practice-based.

The large majority of the temporal structures that we found in use were explicit and clock-based. Most of our respondents used some form of electronic calendar system to maintain their schedules. Explicit clock-based and explicit event-based structures were often listed in the calendars while implicit structures and practices were maintained in the time manager’s head. Complaints about schedule juggling arose when cyclic university events were not synchronized with external cyclic events (e.g., due dates for grades conflicting with grant and conference paper deadlines) and when superiors imposed unplanned deadlines and meetings on people reporting to them.

In the set of respondents were individuals who complained less about the difficulty of managing their time and who also had more time for personal activities and additional achievements. Many of these individuals were in senior administrative roles. A number of features characterized their time management behavior. First, they were either better able to estimate the amount of time a task required, or to control the amount of time required for a task (that is, they did not work to perfection but to some level of acceptable standards on a product), and second, they created their own temporal structures to manage their life, that is, they allocated units of time for specific types of repeating activities. These better time managers also recorded more of the external temporal structures affecting their time usage in their electronic calendars.

In contrast, another subset of respondents, who complained about a lack of time for accomplishing anything significant, were much less likely to record and manage their time in a calendar system. Some of these individuals worked long hours and were constantly scurrying to meet deadlines. They indicated that much of their work was overdue. These individuals were much less likely to create temporal structures of their own, much less likely to be aware of the external temporal structures that impacted their lives (e.g., one faculty member was always surprised by conference paper due dates!) Another set of respondents managed their time by simplifying the temporal demands on their life. They limited the number of external activities they engaged in (conferences, university committees and non-work activities) and (if work permitted) spent large units of time away from the work environment that they found to be interruptive. However, unless these individuals then created temporal structures of their own for managing this less demanding time schedule, they were relatively unproductive in contrast to the better time managers, that is, they produced less work product.

The interviews indicated that knowledge and use of existing temporal structures plus the creation of additional personal temporal structures aided personal time management. A larger study is needed to confirm these results (thus, the planned distribution of a questionnaire to this community). The interviews also indicated that electronic calendar tools could be given features to help users maintain multiple temporal structures and visualize their impact on time usage (thus, the proposed development of a temporal structure prototype described in the next section.)
### Example of Temporal Structure

<table>
<thead>
<tr>
<th>Example of Temporal Structure</th>
<th>Type</th>
<th>From Interview Transcript</th>
</tr>
</thead>
<tbody>
<tr>
<td>University Calendar, e.g., schedules for start of classes, course withdrawal, commencement</td>
<td>Explicit</td>
<td>“I have to hand copy the university calendar into my PDA using graffiti. It’s a pain.”</td>
</tr>
<tr>
<td>Research meetings, Class schedules</td>
<td>Explicit</td>
<td>“Student meetings and administrative meetings are the most important, so I’ll always go to these meetings.”</td>
</tr>
<tr>
<td>Holding parties for special occurrences, e.g., baby showers, winning a grant proposal</td>
<td>Explicit</td>
<td>“I keep several bottles of champagne in my office… so when anyone gets a grant, I can bring it to faculty lunch.”</td>
</tr>
<tr>
<td>Days set aside on which to hold meetings, e.g., Monday and Wednesday free of classes during daytime</td>
<td>Explicit</td>
<td>“I schedule everything on Monday and Wednesday because that is when they come to school… so everyone else comes on those days, too.”</td>
</tr>
<tr>
<td>Specific times set each week for being with children</td>
<td>Explicit</td>
<td>“And then Wednesday, Thursday and Friday, I drive them to school and my wife drives them to school on Mondays.”</td>
</tr>
<tr>
<td>Specific days of week set aside for types of activities, e.g., meeting with students, administrative work</td>
<td>Explicit</td>
<td>“Yeah. I do have days that I try not to come to school. And they either set aside for research or grading school work or I’ll schedule medicals.”</td>
</tr>
<tr>
<td>Tenure Clock – when faculty needs to go up for tenure review</td>
<td>Explicit</td>
<td>“This is my third year. In three years, I want to make tenure here.”</td>
</tr>
<tr>
<td>Ph.D. Schedule – when students are expected to meet dissertation milestones</td>
<td>Explicit</td>
<td>“I hope I can get through my Ph. D in four years. I have had about half courses, and I think it will take about four years.”</td>
</tr>
<tr>
<td>Shopping at seasonal sales, e.g., day after Christmas</td>
<td>Implicit</td>
<td>“Yeah, I always shop after Christmas so I get things at 50 percent off… my Christmas cards are upstairs. We have a big house.”</td>
</tr>
<tr>
<td>Planned trips to visit family in other countries, e.g., in summer before it is too hot</td>
<td>Implicit</td>
<td>“So right now, my belief is that I stay in academia, I can spend significant part of one year in Japan over the summer and also in the US.”</td>
</tr>
<tr>
<td>Student award ceremonies, Staff award ceremonies, Parties for specific groups of individuals, e.g., faculty, department, college</td>
<td>Implicit</td>
<td>“I participate in a large majority of them (social events). Yes. I think the visibility is good.”</td>
</tr>
<tr>
<td>Planting times for flowers and shrubs</td>
<td>Implicit,</td>
<td>“Spring is the time that grades are due, but it is also the time to put in all the flowers. I am always late.”</td>
</tr>
<tr>
<td>Calls to Physical Plant to repair space followed by return calls if repair not performed</td>
<td>Implicit,</td>
<td>“They never come the first time you call, so I put it in my calendar to call again in a week.”</td>
</tr>
</tbody>
</table>

| Table 2. Examples of Temporal Structures Uncovered in Interviews |
Development of a Temporal Structure Prototype

The final part of this study will be the development and trial of a calendar prototype that will provide the academic temporal structures discussed earlier. The long term intent of this work is to provide a system that will allow users to build their own temporal structures through a rule-based system much like Object-Lens (Lai and Malone 1988) and to also share and copy other structures and norms. The prototype will be a pre-cursor to this work. It will be built on top of a university calendar system that already exists at the academic institution under study. Temporal norms from the university will be built into the university calendar system and academic staff, students and faculty will be able to add these norms to their personal calendar systems. This innovation will be announced through the web-based campus news system. A subset of users of the temporal norms will then be interviewed to ascertain how useful the norms proved to be.

The existing university calendar systems currently allow users to build and share multiple calendars within the university calendar system. Figure 2 gives an example of the academic calendar for 2004-2005. This is representative of a clock-based temporal structure where university deadlines and events are placed on specific dates and times in the calendar. Although this calendar already allows for sharing, it does not support a number of user interface features such as a (1) a description of the temporal structure (2) support for synchronization with multiple types of personal calendars and (3) the ability to drag an icon of the temporal structure to a personal electronic calendar. Adding these features to the calendar system will be part of the work done in building the proposed prototype.

Figure 2. An Example of Academic Temporal Structure. It can be iconized and dragged and dropped on to personal calendar. This is an explicit, clock-based structure.
Figure 3 gives an example of an event-based temporal structure that includes sociotemporal norms. The figure presents a calendar representation of what would happen if an icon for setting the date for a dissertation defense were dragged to a specific calendar date on a person’s personal calendar. The icon would automatically generate other events and deadlines that reflected the department’s cultural norms associated with the thesis defense. These would include such unusual items as providing a small brunch for the defense attendees, which represents the culture of one of the departments interviewed in the exploratory field study. Each of these event-based temporal norms will be hand coded in the prototype and adapted to individual department norms.

![Calendar Example](image)

**Figure 3. An Example of an Event-based Temporal Structure.** The student drags the dissertation defense icon to her calendar. The full schedule is automatically created based on pre-programmed socio-temporal norms in the department.
EXPECTED CONTRIBUTIONS

This study will contribute to the organization behavior field by further defining and characterizing the types of temporal structures in an organization. In addition, this work will extend prior work by looking at how temporal structures affect and influence personal time management quality. Prior research has looked at the impact of temporal structures as a collective issue whereas this research looks at the possibility that the individual understanding and use of temporal structures can generate “good” types of entrainment that make for better time management.

The research is also another effort to bring the management research on temporal structures into the information systems field. Other work has been done especially in noting that time pressure on software development projects can have both a negative and positive effect depending on its intensity (Nan et al. 2003; Austin 2001) and in managing global virtual teams (Saunders et al. 2004).

The study will also develop a prototype that captures and displays temporal structures in an organization as a first step in developing a system that permits users to build their own temporal structures as part of their calendar management. Adoption and use of this tool has the potential for automatically capturing temporal knowledge in an organization. Thus, this work fits in with the current knowledge management research in Information Systems. Additionally, looking at organizations through a temporal lens can be a powerful tool for understanding organization problems and opportunities. Visualizations of the multiple temporal rhythms and norms governing an organization are not only a useful personal time management tool but an effective way to view and manage implicit and often unproductive temporal entrainments.

REFERENCES