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Supporting individual time management through the capture and display of temporal structures

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ABSTRACT

SUPPORTING INDIVIDUAL TIME MANAGEMENT THROUGH THE CAPTURE AND DISPLAY OF TEMPORAL STRUCTURES

by
Dezhi Wu

This thesis work 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 understanding the relationship between the quality of individual time management and an individual's understanding and use of temporal structures. This work consists of an exploratory field study to gather data on how people use temporal structures with electronic tools. It is followed by a survey that is given to a larger group of respondents in the same subject population examined with the field study. The survey examines the hypotheses developed from a literature review on the impact and role of time in people's work lives coupled with the information uncovered in the filed study on time management practices. A research model is developed using partial least squares to examine the relationships between the key survey constructs.

This study demonstrates that the use and understanding of temporal structures is an important component for good individual time management. Four properties of individual time management quality were identified and utilized to characterize who are good time managers. These four properties include *planning, meeting deadlines, sensing a lack of time control* and *engaging in procrastination.* Significant differences are found in the use of explicit temporal structures, creation of temporal structures and understanding of temporal structure relationships between good time managers and poor time managers.

A research model was built to understand the interacting variable relationships. Significant differences in the relationships between quality of individual time management and various temporal structures were discovered among students, faculty and staff members in the university studied. Students mostly use and understand a range of explicit and implicit temporal structures in their personal time management. Faculty members focus on using explicit temporal structures and creating their own temporal structures to support their time management. Staff members only utilize the temporal structures to do time planning. Implicit temporal structure understanding helps them avoid procrastination in their work. We explain these results as follows. The students are greatly entrained by a large number of tight and short deadlines which they do not have power to adjust, e.g., assignment due dates. Faculty members have much more time control and flexibility to create their own temporal structures. Except for meeting classes and turning in grades, they set their own schedules. Staff members are not concerned with meeting deadlines. They have constantly shifting instantaneous demands, part of which is responding to others temporal structure needs. Thus, their temporal structures only support their time planning, and avoid potential work delay. This research concludes that people exhibit different time experience based on their professions. Furthermore, good time managers demonstrate more skill in capturing and using their temporal structures than poor time managers. Because the current information technologies do not provide much support to capture temporal structures explicitly, this study also implies that it is likely to be a valuable exercise to integrate temporal structure features into personal time management systems such as electronic calendar tools.

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by
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CHAPTER 1

INTRODUCTION

Wednesday is a typical meeting date for Rose, who is a department chair and a professor in a U.S. university. As can be seen from her calendar (Figure 1.1), she will meet with the faculty for lunch, followed by a department meeting in the afternoon. Then Rose will join the college planning meeting and return for her office hours to meet with students at the end of the day. Her detailed Wednesday schedules can be found in her public online calendar, which is being used by the people she interacts with to learn of her availability and of key meetings that they may need to attend.

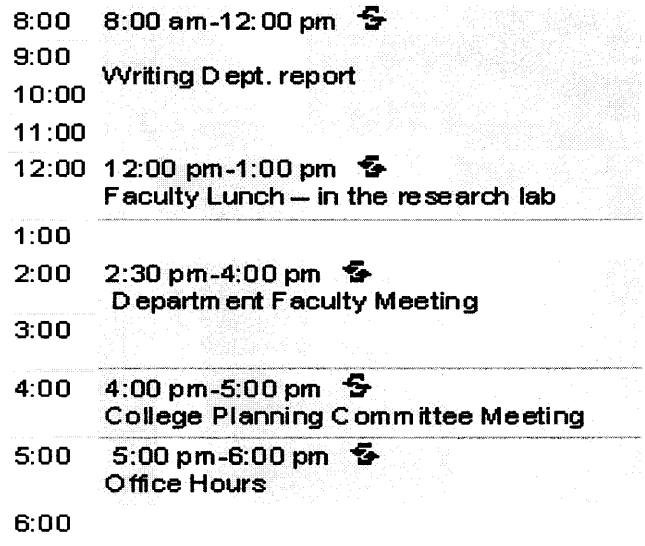

Figure 1.1 Rose's Wednesday schedules on her online calendar.

In the above calendar, the icon "" "represents Rose's repeated weekly activities. The college planning meeting in Rose's school is regularly held on Wednesdays, so most faculty members show up on this date knowing Rose will be available. She tries to plan

her department meetings on Wednesday as well, since it is easiest for her to schedule most of the faculty members who are there because she is there and vice versa. It is evident that Rose's personal online calendar for Wednesday shows this synchronization with university schedules because of other meetings that involve units of the faculty. To some extent, the repeated activities show Rose's temporal structures. Temporal structures are some organization of time that is used by humans to help them manage, comprehend or coordinate their use of time. For example, the 6 o'clock news is a temporal structure that governs a large amount of dinner and travel activity in the United States. Because most families know that the news (no matter what TV channel) will be on a 6 PM in their time zone, dinners are adjusted to meet this schedule as are employee departure times from work. However, before the 6 o'clock news, a temporal norm had families dinning at 6 PM, which probably created the temporal structure of the 6 o'clock news. Much of our time usage is governed by these temporal structures. This government is typically referred to as entrainment by organizational behaviorists. For example, Orlikowski et al. (2002) consider temporal structures as norms of "both shaping and being shaped by ongoing human action."

How and why is individual time scheduled according to the temporal structures of an organization? In Rose's Wednesday schedules, most of her time is allocated to administration meetings, which are created by the university. How Rose allocates her time in her personal calendar demonstrates how the organization's temporal structures impact her scheduling behavior and how she does her personal time management. In a workplace, most professionals have similar experiences to Rose's, thus individual time management is constrained and entrained by an organization's temporal structures. Rose,

in turn, creates entrainments and constraints for her faculty and students by her public organization of her time.

More details about temporal structures are explained in Chapter 1 and Chapter 2 of this dissertation. At this point, it is appropriate to give a detailed definition of the key terms that will be used throughout this dissertation. They are: *temporal structure, temporal norm* and *sociotemporal norm.* Table 1.1 gives a definition and examples of each of these terms in addition to an example and a counterexample to help the reader comprehend the subtle differences between these terms. In general, this dissertation uses the term "temporal structure" to refer to the key concern of this research, but other researchers use the additional terms to disambiguate various time-based constraints that people experience.

Table 1.1 Definitions of Major Terms

Term	Definition	Comment	Example	Counter Example
Temporal Norm	Culturally unstated time lags, created and accepted by a large group of members in human society	Often equivalent to sociotemporal norms but usually used to capture standards of time behavior more likely to come from cultural practices of communities	Dinner invites must be given two weeks in advance – if later they will be considered rude	Faculty meetings are held every third Wednesday – *a temporal structure rather than a temporal norm*
Temporal Structure	Patterned organization of time, used by humans to help them manage, comprehend or coordinate their use of time	Usually considered to be more explicit time structures - not socially derived -more likely to be derived from organization-based practices	Soccer practice happens at 6:00 PM on Tuesday and Thursday	It will rain all weekend - *there is no regular pattern although personal schedules may be affected*
Socio-temporal Norm	Temporal norms, adopted by governments, or a large group of humans	Often equivalent to temporal norms in research literature but associated more with precise cultural dates – more likely to come from larger social events, e.g., government holidays	Thanksgiving is the first Monday in October in Canada	The sun rises at 7:30 AM on September 21st – *although this is a regular event every year, it is not derived from human-centered practices*

In today's productivity-focused business environment, it is useful to understand how individuals manage their time in organizations. Individual time management is argued to be governed by the interplay of external organization constructs and individual

internal temporal rhythm. Most professionals spend a large percentage of their time in a workplace. Organizations function with a set of temporal rhythms and norms that can dramatically affect an organization's productivity, decision-making and management-directed changes (Ancona et al. 2001; Avital 2000; Gersick 1994; Maznevski et al. 2000; Waller et al. 2001; Webb et al. 1999), and thus people working in the organizations are dramatically entrained by these temporal structures or norms. Most professionals use either paper-based or electronic calendars to record and manage their working schedules, which are *explicit* temporal structures. Meanwhile, understanding their *implicit* temporal structures/norms might also be helpful to their individual time management. For example, it is useful to be aware of your manager and partners' schedules and availability in the workplace if you are doing teamwork. These types of temporal structure are sometimes not explicitly and publicly announced in the workplace, but they become known when you gain a deeper understanding of your organizations and other individual temporal behaviors. When these explicit and implicit temporal structures are synchronized with your own schedules, it is likely that you will create additional temporal structures in a personal schedule to meet demands and deadlines. These structures are likely to be based on your own understanding of the relationships between the temporal structures impacting you. This understanding helps your time management. Thus, individual time management is likely to be associated with both explicit and implicit temporal structures. Good time managers might exhibit a better ability in capturing, using and understanding of all types of temporal structures to support their individual time management. If this is so, we should see a relationship between time management quality and the use and

understanding of the various types of temporal structures and especially of the implicit relationships between temporal structures.

Two semi-structured interviews and a large survey were conducted to examine the above prediction. The first stage of this work was to conduct exploratory interviews. Two semi-structured interviews with twenty professionals in a U.S. Eastern Coast Technological University were carried out. The interviews served as a pilot study to gather information on various temporal structures that professionals experience in their daily workplace, and how they incorporated these structures in their individual time management. It was noted that better time managers (in terms of how much they accomplished in their work and how busy they were) were more likely to have intricate use of temporal structures as part of their scheduling behavior. The gathered information was then utilized to design and create a questionnaire for the second stage of this work, which was to deploy a large survey to the same university population. Because temporal structures are specific and inherently related to an individual work environment, the temporal structure questions in this survey were intentionally customized for different groups of people. The survey participants include students (undergraduate and graduate), faculty and staff members in this community. Over 700 people responded to this survey. This extensive collection of data provided us an opportunity to understand how different groups of people deal with their temporal structures, and how their individual time management is affected.

This dissertation work therefore elaborates and demonstrates that temporal structures are an important component of individual time management. It postulates that good time managers demonstrate stronger tendencies to use, understand and create the

various temporal structures in comparison to poor time managers. An analysis of the survey results finds a strong relationship between the temporal structure usage and good time management especially for those who are significantly entrained by external temporal structures. Moreover, this research also built and examined a research model to further test the relationships among the key properties of individual time management and temporal structure variables. Partial least squares (PLS) method, a structural equation modeling technique, was used to build this model. We find that students, faculty and staff members exhibit dramatic differences both in the relation between the components of what characterizes their time management behavior and in the relationship between these components and various temporal structures. These results are the core findings of this dissertation work.

The motivation for this work was not simply to demonstrate that good temporal structure usage and understanding is significantly related to better time management but that IF THIS IS SO, then improving the ability to use and understand temporal structures through the development of better electronic time management tools is likely to make good time managers into better time managers.

Overall, this dissertation consists of ten chapters. The first chapter introduces the objectives, major research methods and the overall structure of this dissertation. To provide the reader with a deep understanding of time and its relationship to individual time management, an integrated theoretical framework (see Figure 2.1) is presented in Chapter 2. This framework synthesizes time perspectives from Sociology, Organization Behavior and Psychology. It provides an understanding of how time is socially

constructed, and what the relationship between socially-constructed time and mechanical clock time is.

Chapter 3 reviews existing time management studies and relevant temporal structure studies. Since very little time research investigates the relationship between individual time management and temporal structures, this chapter critiques the existing studies and tries to build this potential relationship.

People adopt various time management tools, e.g. various paper-based and electronic calendar tools, to support their individual time management. However, temporal structure features are very rarely designed and incorporated in the current calendars or time management tools. Chapter 4 gives a thorough review on electronic calendar application design and tool implementation research. The extrapolated findings of this dissertation imply several new and innovative temporal structure calendar tool design ideas, which have the potential to support and enhance the quality of individual time management. Therefore, it is appropriate to document current technology in this chapter.

The overall research design, data collection methods, and detailed research measurements are explained in Chapter 5. The basic approach is to run studies to determine the relationship between the quality of individual time management and temporal structure use and understanding. Thus, a key feature of this chapter is operationalizing these variables. In terms of quality of individual time management, four dimensions are identified to differentiate who are good time managers and who are poor time managers. These four factors are *planning, meeting deadlines, sensing of a lack of control* to *engaging in procrastination behavior*. This work also creates a set of temporal

structure constructs, which measure individual *temporal structure knowledge, use of explicit temporal structures, understanding of implicit temporal structures, creation of temporal structures,* and *understanding of university-related temporal structures..*

The major data results are reported in Chapters 6, 7 and 8, which cover respectively the univariate, bivariate and multivariate data analysis for this dissertation. Chapters 6 and 7 present the detailed descriptive analysis, confirmatory factor analysis, and bivariate correlations among the validated constructs. For each valid construct, univariate analysis on each question item is also reported in Chapter 6. A structural equation model is then tested by partial least squares (PLS) method in Chapter 8. The PLS analysis results indicate differences among students, faculty and staff members in terms of the relationship between the factors that determine the quality of their individual time management and between these factors and their understanding and use of temporal structures.

Chapter 9 relates the findings of this thesis with the thesis motivation, that is, it presents arguments for improving electronic time management tools and suggests ways in which these tools might be improved based on the results uncovered in this thesis.

The key findings for this research are summarized in Chapter 10. Overall, this research shows there is a strong relationship between the quality of individual time management and the use and understanding of various temporal structures based upon three different population samples (student, faculty and staff). Based on these results, it is argued that current time management tools (e.g. calendars) do not provide much support for people to easily capture and use the wide range of temporal structures that entrain their lives. Chapter 10 also demonstrates how this work is tightly related to the

field of Information Systems. It discusses the limitations of this research and, then describes future research directions that arise from the results of this thesis.

In summary, this dissertation is structured as follows. First, relevant time research is reviewed, and an integrated conceptual framework is presented on how socially constructed time generates temporal norms or structures in an organization in Chapter 2. Second, the temporal structures and individual time perspectives are illustrated with detailed examples in Chapter 3. This is followed with an explanation of how these time perspectives impact individual time management behaviors. Third, key calendar studies are reviewed in Chapter 4, and the design of a new calendar that embeds temporal structures into its features is proposed in the future research (Chapter 9). Fourth, the dissertation research design is presented in Chapter 5. The design covers the research questions, hypotheses, methodologies and procedures. Fifth, descriptive data analysis results and index validation are reported in Chapter 6. Then bivariate data analysis and major hypotheses testing are followed in Chapter 7. In order to gain a comprehensive understanding of relationships among student, faculty and staff samples, a structural equation modeling technique – partial least squares (PLS) was utilized to build and examine the overall research models for the students, faculty and staff members. The PLS results are reported in Chapter 8. Chapter 9 ties the results from the various user studies to the thesis motivation, which is that of demonstrating that improving electronic time management tools will improve individual time management. Lastly, Chapter 10 draws the conclusions, and presents future research. The Appendices contain the research instruments used in this work.

CHAPTER 2

UNDERSTANDING TIME AND ITS RELATIONSHIP TO INDIVIDUAL TIME MANAGEMENT

> What is time? Who is able to easily and briefly explain that? Who is able ... And surely, we understand it well enough when we speak of it; we understand it also when in speaking with another we hear it named. What is time then? If nobody asks me, I know, but if I were desirous to explain it to one that should ask me, plainly I know not.
> - St. Augustine's Confessions, Book 11, Chapter 14 (Augustine 1961, p.294).

Everyone experiences *time*, but who exactly knows what *time* is? The quote from St. Augustine's illustrates how difficult the concept of time is. Different fields provide various explanations of *time*. In this dissertation, the key concern is *socially-constructed time* rather than astrophysical, biological and other aspects of time. Table 2.1 indicates different views of the recognized fundamental forms of time. Based on how people perceive the reality of time, time can be categorized into *objective* time and *subjective* time. The *objective* point of time is aligned with a Newtonian assumption of time as abstract, absolute, unitary, invariant, and mechanical (Clark 1985). The *objective* time can be represented from a common metaphor – *a clock.* With the invention of the clock, time can now be explicitly and quantitatively measured by a mechanical timing system governed by the precise behavior of an event in atomic physics. Time is an object independent of human beings and humans use this objective time as a measurement tool for structuring their time usage. A *clock* gives human beings a sense of time certainty, since time can be segmented into seconds, minutes, days, weeks, months and years. *Subjective* time is seen as relative, organic, and *socially constructed.* It views time as a product of norms, beliefs, and customs of individuals and groups (Clark 1985). *Socially*

constructed time is neither fixed nor invariant. It is created by members of society. The classic metaphors used to represent *socially constructed (subjective) time* are *a calendar* and *a schedule.* The calendar is an objective time representation that is being used to capture subjective time usage. A calendar provides a temporal structure template for people to record *socially constructed time.* A schedule defines a set of events that take place within objective time. For each event the schedule lists what the event is, what the duration of the event is, and where the event is going to take place etc. We define the relationship between the *objective* time and the *socially constructed* time as follows: *Socially constructed* time is quantified by *objective* time, which gives the socially constructed time certainty. In other words, *socially constructed* time is recorded into *calendars*, where *schedules* give meanings to each activity and *a clock* presents *objective* time duration in quantifiable units. The *objective* and *subjective* time form the fundamentals of various time dichotomy forms (see details in Table 2.1). Other scholars (Baert 1992; Bluedorn et al. 1988; Jacques 1982; Mumford 1963; Sorokin et al. 1937; Zerubavel 1981) utilize different terms to show the essential conceptualization of time, such as *cyclical vs. linear, quantitative vs. qualitative, clock-based vs. event-based,* and *chronos vs. kairos.* These dichotomies, in essence, present different perspectives of *objective* and *subjective* time.

The terms *quantitative* time and *qualitative* time give another representation of *objective* time and *subjective* time. The *quantitative* time represents *objective* time, and the *qualitative* time gives meaning to *subjective* time. Only when both *quantitative* time and *qualitative* time are utilized together, can *a schedule* in *a calendar* be given a time meaning. *Quantitative* time is seen to present time as quantities, that is, time can be

measured and counted into seconds, minutes, days, weeks, months, and years. In any calendar, it is evident that a schedule can be developed by placing activities into given time slots. For example, in Rose's schedule (see Figure 1.1), on Wednesday afternoon, she is holding a department faculty meeting. *Quantitative* time provides the time duration (quantity) of the meeting and the start (objective clock) time of the meeting. Every meeting participant knows they will have to show up at 2:30 PM, and that the meeting will be held for one and a half hours. *Qualitative* time actually gives the meaning to this activity. If it ran longer than three hours, faculty would complain of the length, which exceeded expectations. If the meeting took place in the morning, faculty would also complain because more conflicts could occur. If topics of relevance to the faculty were not discussed, the meeting would also have no meaning. "2:30 PM – 4:00 PM every third Wednesday" is meaningless for every participant. However, if she gives both *quantitative* time and *qualitative* time to the time slot 2:30 PM – 4:00 PM, people will know Rose is going to hold a faulty meeting at 2:30 PM – 4:00 PM every third Wednesday in the department conference room. At this point, *qualitative* time gives people precise temporal information that the meeting is to gather faculty members to discuss some department issues, and it will be held in the department conference room. It also carries with it all the subjective nuances that people expect of this meeting.

Table 2.1 Perspectives of Time Dichotomies

Time Categorizations	Comparisons	
The Reality of Time	*Objective*	*Subjective*
	Time is "independent of man," (Clark 1985) which views time is aligned with a Newtonian assumption of time as abstract, absolute, unitary, invariant, mechanical.	The subjective view of time indicates time is a product of norms, beliefs, and customs of individuals and groups. Such a view is "defined by organization members" (Clark 1985). Time here is assumed neither fixed nor invariant. It is seen as relative, organic, and socially constructed.
Types of Time Information	*Quantitative*	*Qualitative*
	The quantitative view of time implies that time is continuous, homogeneous, and therefore measurable because of equal parts are equivalent. (Starkey 1989)	The qualitative view of time is heterogenous, discontinuous, and unequivalent when different time periods are compared (Starkey 1989). In this view, *"time is in the events, and events are defined by organizational members."* (Clark 1985)
Representation of Time	*Clock-based*	*Event-based*
	Clock time is divisible and quantifiable. Time can be described by its consequence, duration, temporal location, and rate (Mumford 1963; Sorokin 1943; Sorokin et al. 1937; Zerubavel 1981).	Event-based time is perceived through the occurrence of *"meaningful events, including those that are related to seasonal variations.*(Bluedorn et al. 1988) ". Its time flow is unevenly, discontinuously, and contains varying levels of contingency and indeterminacy. The units are imprecise, although they may be relatively stable.
Greek Terms of time (Bazerman 1994; Kinneavy 1986; Miller 1992)	*Chronos*	*Kairos*
	Chronous is "the chronological, series time of succession...time measured by the chronometer not by the purpose."(Jacques 1982) It is typically used to measure the timing or duration of some actions.	Kairos is named after the Greek god of opportunity, refers to *"the human and living time of intentions and goals...the time not measured but of human activity, of opportunity* (Jacques 1982)."
The Flow of Time (Interdependent)	*Linear*	*Cyclical*
	A linear view of time postulate that time is steady gradual movement toward one direction (Gould 1987; Traweek 1988). It implies both that time is directional and that is uniform in its passage.	A cyclical view of time postulates that time involves the repetition of a pattern of logic (Baert 1992). It implies that time is phasic in its passage, but is non-directional and continually repeating itself.

Clock-based time is another version of *objective* time, which is precisely represented by a clock, a watch and other time mechanics. It is divisible and quantifiable. Time can be described by its consequence, duration, temporal location, and rate (Mumford 1963; Sorokin 1943; Sorokin et al. 1937; Zerubavel 1981). In contrast, *event-based* time is a theoretical concept of time that refers to the association of time to others' activities that take place or have taken place. For example, *event-based* time is seen to represent "meaningful events, including those that are related to seasonal variations" (Bluedorn et al. 1988). Therefore, *clock-based* time and *event-based* time have similar meanings to *objective* and *subjective* time.

Another time dichotomy *chronos* time and *kairos* time also represents *objective* time and *subjective* time. Jacques (Jacques 1982) states that *choronos* time shows "the chronological series of time of succession...time measured by the chronometer not the purpose." *Kairos* time represents the human and living time of intentions and goals. It is measured by human activity (Jacques 1982). Therefore, *kairos* time is similar in meaning to *subjective* time *(socially constructed time)* or *event-based* time, or *qualitative* time.

To add to our understanding of perception and use of time, the concepts of *linear* time and *cyclical* time have been postulated. Although there is still some debate among scholars, this dichotomy is used to supplement other perspectives of time. *Linear* time implies that time is directional, and that it is uniform in its passage (Gould 1987; Traweek 1988). *Cyclical* time postulates that time involves repetitive patterns, which are non-directional and continually repeating themselves (Baert 1992). These features of *time* can be incorporated into our subjective/objective time dichotomy. On the one hand, if individuals only treat time as *objective* time, time is more likely to be perceived as a

continuous succession of occurrences. This is generally a classical viewpoint of physical science and mathematics. On the other hand, if individuals think of time in a subjective sense, they are apt to view time as *cyclical*. Time is viewed as a recurring object, e.g., a life cycle.

The above views of time demonstrate that our social life is temporally structured in accordance with "mechanical time." They say little about our circadian cycle (biotemporal structure) (Zerubavel 1981). To understand how biological time affects socially constructed time, we use three basic temporal patterns mentioned in the literature: *physiotemporal patterns*, which are based on external recurring events such as the sun rising and setting; *biotemporal patterns,* which are based on internal biological clocks that govern when people feel sleepy and awake, etc.; and *sociotemporal patterns,* which consist of societal norms that form from other consistent temporal happenings, e.g., the harvest festival or the start of the workday. These temporal patterns provide the temporal regularities of our social activities and events, which are considered "*the first characteristics of modern machine civilization*" (Mumford 1963). Table 2.2, below, presents definitions, examples and placement in the subjective/objective time dichotomy for the above three temporal patterns.

Sociotemporal patterns indicate conventions of our *socially constructed time*, which show the temporal boundaries of each event or activity (Mukerjee 1943; Mumford 1963; Sorokin 1943; Zerubavel 1981). Sorokin and Merton (Sorokin et al. 1937) argue that social rhythmicity is associated with externally marked time units such as the hour or the week. Thus, social rhythmicity has an artificiality to it because it is adjusted to an external human-defined representation scheme. In essence, because of the length chosen

for a standard unit of time, social activities are set up to match multiples of this unit. For example, meetings are established with agendas that last one hour and parties are supplied with food and drink to last three hours.

Table 2.2 Temporal Patterns
(Synthesized from Zerubavel 1981 and McGrath & Kelly 1986)

Temporal Patterns	Definition	Example	Objective vs. Subjective Time
Physiotemporal patterns	Stemming from physics and astronomy and representing temporal regularities in quantities, these patterns regulate the movement of physical bodies.	The predictable time of day at which the sun rises on any particular day of the year.	Objective Time
Biotemporal patterns	Biotemporal patterns are those time behaviors of a biological organism that represent the structure of its time-based activities.	The fairly uniform circadian rhythms govern the body's temperature.	Objective plus Subjective Time
Sociotemporal Patterns	Sociotemporal patterns are those structures or regularities that occur in time and represent the time-based social interactions of an organism or group of organisms.	Tenure clock cycle in a university for faculty promotion.	Objective plus Subjective Time

It is argued that an individual's time management cannot be comprehended without involving what is called *socially constructed* time. Socially constructed time is that unit of time that is identified and supplied with a meaning, is usually scheduled on an individual's calendar, e.g., a wedding. Zerubavel (1981) identifies four major dimensions for temporal profiling of any social situation or event, that is socially constructed. These are *sequential structure, duration, temporal location,* and *rate of recurrence. Sequential structure* gives the order that the events take place in. The second parameter *duration*

shows how long events last. The third one, *temporal location,* indicates when events take place in a time continuum. The fourth parameter, *rate of recurrence,* tells us how often the events repeat. When referring back to Rose's Wednesday schedules, it is obvious that her routine daily activities are scheduled in a fairly rigid manner by these four dimensions. Her personal calendar demonstrates the temporal structures she captures, but also shows how she dynamically manages her time around these structures. Therefore, individual time management is dictated by an invisible or implicit hand – *socially constructed time*, even if this time management is explicitly represented by *a clock, a schedule* and *a calendar.*

Calendars have been viewed to be a useful tool for establishing and maintaining temporal regularity for collective activities (Zerubavel 1981). In other words, *calendars* function in capturing and maintaining temporal structures for individuals, and thus it is suggested that the capture and use of temporal structures, in particular, those dictated by the person's work organization, play an important role in the process of individual time management. The process of capturing and using temporal structures shows how individuals perceive *subjective time* or *socially constructed time,* and then how individuals record and use these temporal structures in their personal calendars. For instance, certain repeated activities or events represent typical temporal structures that individuals can capture and use. One example can be Rose's Wednesday faculty meeting (see Figure 1.1). In consequence, we cannot precisely evaluate an individual's time management skills without considering an individual's scheduling behavior, in particular, how the individual captures, uses, and even creates temporal structures. It is therefore

argued that the capture, use, and creation of temporal structures in individuals' scheduling behaviors might differentiate the quality of individual time management.

Based on the above statements, the following theoretical framework is built to understand individual time management (shown in Figure 2.1).

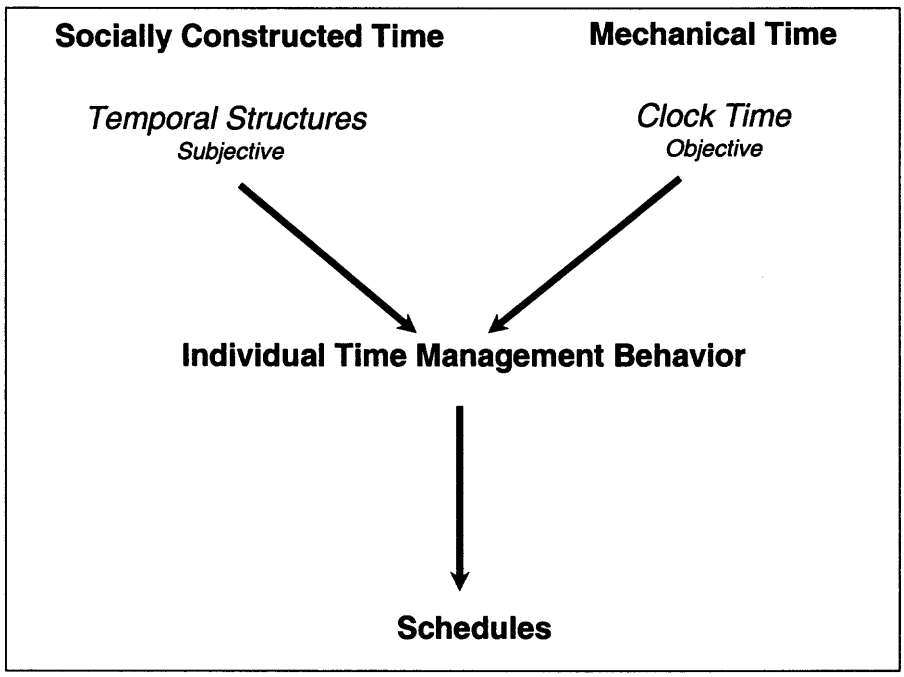

Figure 2.1 Individual time management conceptual framework.

In the above theoretical framework, *mechanical (objective)* time and *socially constructed* time are integrated through the act of individual time management, which can be explicitly represented by *a schedule.* Since most of professional time is governed by a person's organization, routine work schedules demonstrate a particular organization' temporal norms, which actually form an organizational temporal structure. These temporal structures regulate individual's time usage. Conversely, individual time usage in an organization reflects how individuals capture, and use these organizational temporal structures. Furthermore, an individual's time management demonstrates how he or she

manages their time in accordance to these temporal structures. Since these temporal structures can be explicit and implicit, how individuals manage their time can be widely diverse because implicit controls are not always obvious. Individuals have their time usage entrained in their organizations, but they also set up structures and norms that entrain others. For example, one professional is required to submit her/his annual activity report by a certain deadline. This deadline is set up by the administration, and then she/he needs to plan and allocate time for the required task. In this planning, meetings with co-workers are re-adjusted to make time for the deadline, so that they, in turn, need to re-adjust their schedules. Deadlines are an explicit temporal structure, which impacts individual time management. Individuals have to capture these temporal structures, and then use their personal calendars to capture, use and dynamically allocate reasonable time to complete the required task, the implicit part of the deadline. In this dissertation, one core idea is to investigate whether and how the capture, use and creation of temporal structures impacts individuals' time management.

Based upon the above presentation of how people construct and manage time, the following propositions are made. Individuals are assumed to use temporal structures in their personal time management. Individuals will show different levels of capturing, encoding, using, managing and creating temporal structures in their personal calendars. It is assumed that good time managers will be more effective in capturing explicit temporal structures and be more capable of encoding implicit temporal structures in their personal schedule. They will also be more effective in using the explicit temporal structures they capture and encode, and will have more potential to effectively manage these temporal structures to generate an effective and flexible schedule. Eventually, these diverse

individual scheduling behaviors cause different levels of time management quality, so that individuals perceive and attain different levels of outcomes from their individual time management. Thus, the above statements provide the core premises of this dissertation - that is, to establish the relationships between temporal structures and quality time management.

The literature review so far only explains research on how people use time. The next chapter will show how strongly temporal structures impact time usage and argue that only a good time manager can effectively steer a reasonable path through the many entrainments imposed by temporal structures. Thus, a good time manager would have a deeper understanding of the sociotemporal norms of her or his organization and the importance of adjusting to these norms. This depth of understanding would allow such a manger to track schedules, adjust to norms, and, in general, create all sorts of efficiencies in their own schedules.

CHAPTER 3

TEMPORAL STRUCTURES AND INDIVIDUAL TEMPORAL PERSPECTIVES

Temporal structures are a primary concept in organization behavior (Bluedorn et al. 1988; Clark 1985; Orlikowski et al. 2002), and organization change (Staudenmayer et al. 2002). A temporal structure is a patterned organization of time, used by humans to help them manage, comprehend or coordinate their use of time. It functions as "both shaping and being shaped by ongoing human action, and thus it is neither independent of human action (because it is shaped in action), nor fully determined by human action (because shaping that action)" (Orlikowski et al. 2002). It is argued that the temporal structure allows human beings to bridge the gap between *subjective* time and *objective* time. Through understanding how time is being structured by human lives (*subjective* time), temporal structures are evidently created by human beings to regulate their uncertain lives. *Objective* time actually represents the outcomes of the subjective understanding and manipulations of the temporal structures. Therefore, temporal structures, to a certain extent, reduce the uncertainty of human perception of time. It gives uncertain actions some regularity. For individuals in a workplace, their work time is being created by the organization members who regulate the temporal structures. Individuals in a workplace experience different regular deadlines, engage in routine activities, and take seasonal vacations. These individual temporal experiences are a result of the ongoing temporal structures, which regulate an individual's time usage, and thus impact individual time management.

Researchers argue that observing organizations through a temporal lens provides a useful framework for understanding organizational behavior (Ancona et al. 2001). Most

traditional lenses use political and cultural characteristics for observing an organization, while a temporal lens offer a time-based view of how managerial actions take place. This dissertation adapts constructs from this temporal lens approach to the study of individual time management.

Can we observe individual time management by characterizing the types and complexity of the temporal structures that are used? No existing research studies have focused on how individuals use temporal structures to manage their time. Thus, it is not known if different types of temporal structure usage allows individuals to more dynamically organize their work time, and contribute more productively to both their organizations and their personal lives. Organizations are under pressure to get their products to market faster than their competitors, adapt to changing market needs quickly and maintain small inventories while insuring immediate delivery (Stalk et al. 1990). Working in such a driven organizational culture means that employees suffer from difficulties in balancing family and work time, exhaustion, stress and health problems, etc. Perlow (1999) observed this type of time famine causing a group of software engineers to suffer from crisis mentality, constant interruptions and decreased collective productivity (see Figure 3.1). She convinced a subset of the workgroup she studied to change this crisis mentality by introducing explicit temporal structures that preserved personal work time and scheduled interactive time. This change in temporal structures helped the organization meet deadlines that had been previously slipping. Her work demonstrates that changes in organizational temporal structures can benefit collective productivity by improving each individual's productivity through the establishment of a temporal norm that protected individual work time. Perlow didn't, however, further

explore how this temporal structure introduction affected individual time management behavior. Hence, the question remains: what is the relationship between temporal structures and individual time management? This is the core research question to be answered in this dissertation work.

This Chapter is organized as follows. First, various forms of temporal structure are explained. Second, individual perceptions of time are presented. Then, existing time management empirical studies are reviewed. Fourth, some possible relationships between temporal structures and individual time management are extrapolated from the literature review and proposed.

3.1 Temporal Structures

Theoretically, temporal structures are composed of three components: (1) explicit schedules, sequencing patterns, and deadlines; (2) implicit rhythms and cycles of behavior; and (3) organizational cultural norms about time (Blount et al. 2001). Orlikowski and Yates (2002) categorize temporal structures into clock-based, event-based and practice-based time. They characterize clock-based time 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. 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.

Blount and Janicik (2001) have proposed a somewhat different temporal structure 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 3.1 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.

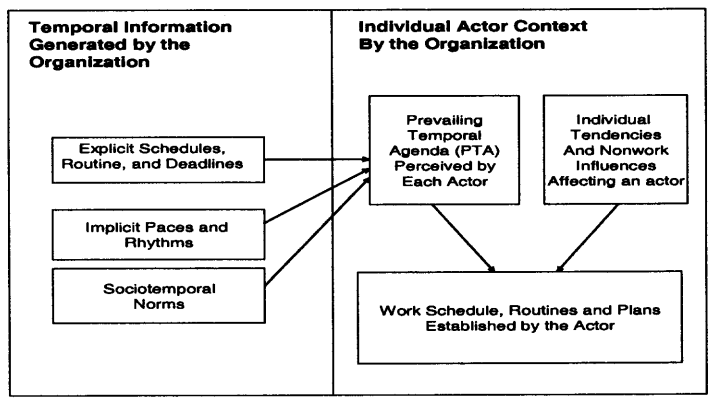

Figure 3.1 Conceptual model of temporal referents and personal schedule change at work.
(Adapted from Blount and Janicik 2001).

The understanding and use of temporal structures in an organization is likely to help individuals better perceive their external temporal environment. For example, if a manager frequently does time planning and time coordination in an organization, it could be beneficial to know how to better capture their temporal structures, in order to work more efficiently. Oncken and Wass (1974) point out three types of a managererial time: *boss-imposed time, system-imposed time,* and *self-imposed time.* Thus, if a manager intends to work more efficiently, he/she needs to better understand how his/her time is structured and entrained by the boss, peers, organization and his /her own scheduling practices.

At this time, there are a limited number of studies (Perlow 1999; Roy 1960; Zerubavel 1979) which examine an organization's temporal structures and look at the impact these structures have on the health of the organization. Roy (1960)'s work is perhaps the earliest and the most well-known temporal structure related research conducted on several machine operators in a small factory. Roy documented the *"banana time"* phenomena as an informal social interaction, which took place within a small workgroup of factory machine operators. In this working environment, he found that the work monotony was broken by an informal structure of *banana times, peach times, lunch times,* and *Coke times* created by the workers. Usually, these time patterns were called *"banana time"* Roy (1960) describes this time pattern as follows:

> Banana time followed peach time by approximately an hour....Ike would gulp it down by himself after surreptitiously extracting it from Sammy's lunch box, kept on a shelf behind Sammy's work station. Each morning, after making the snatch, Ike would call out, "Banana time!" and proceed to down his prize while Sammy made futile protests and denunciations (p. 170).

These time patterns created temporal structures for the workers, with the end result that these time intervals made the workday pass more quickly. Banana time, peach time, etc. were repeated throughout the day and the week. In essence, the machine operators had intentionally created their own temporal structures to develop timed interruptions in their routine work. Roy's study also illustrates that this self-created temporal structures impacted the individuals' psychological perception of time.

Perlow (1995; 1999) proposed an individual time use framework, which integrates the temporal and social organization of work. To test this framework, at "Ditto," a Fortune 500 corporation, she conducted a nine-month field study with a group of software engineers, who were under pressure to get their product to market. She took detailed notes of what the engineers did all day and how their use of time affected themselves and other people with whom they interacted. In this work place, individuals worked in cubicles and in a lab and were highly interactive. Much of their work required continuous interactions among the engineers. This interaction was intense because of very short deadlines. This situation created what was labeled a time famine for the individual engineers, since the engineers often had trouble completing their personal work during normal business hours. They had to come in early, stay late and work weekends. Moreover, their work quality was adversely affected. This vicious work-time cycle uncovered by Perlow is depicted in Figure 3.2. A crisis mentality and a reward system based on individual heroics perpetuated this disruptive form of interacting. To address this problem, a new temporal pattern called *quiet time* was introduced to the same group of software engineers. The *quiet time* gave the engineers a set time when they could work without interruption. Other times, called *interaction times,* were set aside for

interactive activities. Eventually, these new work patterns enhanced the group's collective productivity. Although Perlow was able to show that setting up a temporal structure that affected individual time management had implications on the quality of collective time use in the organization, she did not focus on researching how and why the individual engineers set up their calendars and managed their time. The relationship between the crisis management strategies in the organization and effective time usage for each of the employees was undoubtably not apparent to upper management, nor is is likely that management thought about creating new temporal structures as a method for achieving deadlines. If an individual's time usage can be improved by establishing new temporal structures in the organization, then it follows that managers who have a sense for how sociotemporal norms affect productivity can then proactively build explicit temporal structures that allow employees to use their time better. This dissertation addresses this possibility suggested by Perlow's research. Rather than predicting how management might establish new temporal structures to improve collective productivity, this research looks at how temporal structures are related to an individual's productivity. It argues that better time managers will be more capable of capturing, creating and structuring temporal structures than poor time managers and conducts research to show that these relationships exists.

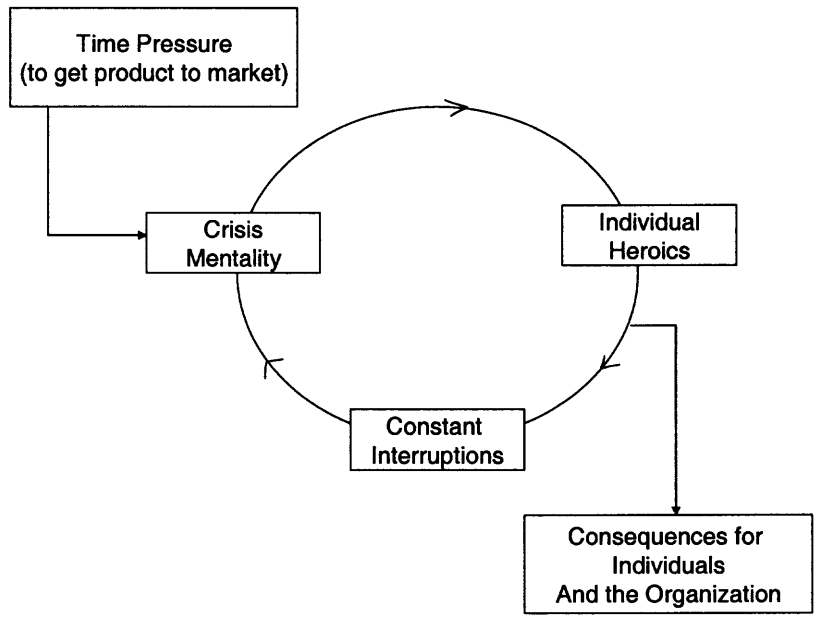

Figure 3.2 The vicious work-time cycle.
(Adapted from Perlow 1999).

In comparison to Perlow's work, *banana time* is created to have social interruptions, which provides job enjoyment in a boring working environment. , In Perlow's study, *quiet time* is created to structure random interruptions, which were decreasing individual productivity. Therefore, the impact of a new temporal structure can be quite different in different contexts. Workers in these two organizations were thus facilitated in their time usage in order to achieve job satisfaction or additional productivity.

Another important temporal structure study was conducted in a hospital (Zerubavel 1979). As Zerubavel writes,

> Most of the activities and events in hospital life – admissions, discharges, tests, operations, the administration of medication, meals, rounds, conferences, clinic appointments, family visits, and so on – are systematically regulated by fairly rigid schedules (Zerubavel 1981).

In this study, timing patterns in hospital life are considered. In particular, Zerubavel emphasizes that the calendar and the schedule introduce temporal routine, orderliness and structures for the employees, the patients, and the visitors in this hospital. Furthermore, the clock and the schedule even made non-routine into routine work. Zerubavel also demonstrates how the objective time and explicit employees' duty periods form temporal rhythms or structures in the hospital life, and illustrates that even non-routine work has regular temporal patterns.

Although Zerubavel doesn't explicitly point out hospital life as being regulated by the hospital's temporal structures, his research identifies various temporal structures in use in a hospital. Temporal structure were explicitly captured and shown in the hospital calendar. Both explicit and implicit temporal structures were captured by people in the hospital unintentionally, in order to smooth their work coordination. However, his work pays little attention to whether and how hospital temporal structures impact individuals' scheduling behaviors, and on how individual nurses, doctors and administrators capture temporal structures to manage their time.

Overall, this section has provided definitions and categorizations of the various types of temporal structures and then looked at three studies in which these temporal structures were identified or found to impact work. The categorizations will be used to develop the temporal structure constructs used in this research. Although none of the temporal structure usage studies focused explicitly on individual time management, they did suggest that temporal structure manipulation is likely to affect individual productivity. This thesis applies this suggestion to individual time management with the belief that better time managers are also better temporal structure manipulators. The next

two sections review what is known about time management measurements. This review is essential because this research needs to operationalize what constitutes good and bad time management if it is to be related to the manipulation of temporal structures.

3.2 Time Management Literature

Time management is the act of arranging the activities we plan to do in some form of structured order, usually in some clock-based representation of time for the purpose of accomplishing these activities as efficiently or effectively as possible. For example, a making out a prioritized list of things to do is time management as is saying "no" to requests to perform a favor for someone else. Ferner (1980) refers to this as "the management of the activities we engaged in during our time."

Time management has several perspectives. *First*, time management is a matter of working smarter. Most time management literature (Convey et al. 1994; Garret 1985; Noon and Webber 1972; Webber 1980) provide practice-oriented handbooks to give guidance to how to better manage one's personal time. While very few of them are research-oriented books, they represent the common cultural beliefs about how time is best managed in the Western World. Because time is a scarce resource, time management techniques teach individuals to make wiser choices in the use of their time, in order to work more efficiently, to better balance their family and work time, and thus, to be more likely to succeed in their careers. In practice, two fundamentals should be considered in the time management process. The first one is to know your short-term and long-term goals, and the second one is to prioritize your tasks. The practical methods include making to-do lists, prioritizing scheduling, and blocking out unnecessary

interruptions etc. The visible outcome predicted from these activities is that more work is done in less time. All of the self-help books emphasize the use of paper or electronic calendars for external representations of their time organization.

Second, time management is actually self management. The self-regulated learning research has found that time management is related to self-monitoring, self-judgement, and alertness (Corno et al. 1983; McCombs 1986; Zimmerman 1990).

Little empirical time management research has been done, because so many variables affect time management activities from an individual's personal perception of time usage to a person's need to manage time. In short, it takes *time* to do time research (Ancona et al. 2001). *Time* itself is very complicated, so there are many impediments to conducting research in this area. As Ancona et al. (2001, p. 647) states,

> First, we still have little theory about time lags, feedback loops, and durations, making it difficult to know when, or how long, and how often to measure key variables, even when we want to take on a temporal perspective. Second, we don't yet have all of the methodologies needed to measure complex temporal phenomena...Third, we are not experienced enough to know how to choose temporal variables.

Few time management studies attempt to associate time management variables with individual effectiveness. Table 3.1 summarizes these studies (Macan 1994; Macan et al. 1990; Porter et al. 1970; Tulga et al. 1980). Each of these studies is now discussed in more detail.

By investigating college students, it was found that the higher grade point averages (GPAs), the better the time management skills (Macan et al. 1990). This study explicitly indicates four dimensions of time management complexity: 1) Setting goals and prioritizing activities; 2) Mechanics, such as making lists; 3) Perceived control of time; 4) Preference for organization/disorganization. The results of the study show

correlations among the time management dimensions and students' perceptions of performance and job satisfaction. The study reports students' self-rating performance is positively correlated to all the time management dimensions except preference for organization/disorganization. The perceived time control is positively correlated to the students' GPAs and their perception of job satisfaction. Although this study provides evidence that better time management is related to higher student achievement, the study doesn't pay attention to the students' individual time management behaviors and how those students' calendaring behavior is related to their tool usage. This study also did not investigate how the students' schedules were constrained by temporal structures created by their school systems and their personal lives.

Britton et al. (1991) did a longitudinal time management study with ninety undergraduate students at the University of Georgia. In 1983, these students completed a time management questionnaire, and their high school Scholastic Aptitude Test (SAT) scores were obtained from college records. After four years, the grade point averages (GPAs) from the same group of students were collected. Based on the questionnaire analysis, the researchers found that both short-range planning and attitudes towards time usage significantly and positively correlated with GPAs. This study demonstrated that time management practices can influence college achievement.

Besides college students, organizational employees' time management behaviors were also explored. Forty city government administrators and 38 industrial managers participated in Porter and Maanen's (1970) study. This research discovered that different organizational contexts cause different time management behaviors. Less effective city administrators tended to do time allocation planning and perceived control over their time

allocations. Nevertheless, the more effective industrial managers conducted more time planning and perceived more control over their time. The city government administrators had well defined roles that did not change yearly unlike the industrial managers whose roles needed to adapt and adjust to changing market conditions. This meant that the temporal structure entrainment varied more for the industrial managers who then had to actively respond to these changes by more proactive time management practices.

Another time management study (Macan 1994) was conducted in a public social service agency and a department of corrections system with a sample of 353 employees. The results of this study do not show any statistically significant correlations between any time management attitudes and the employees' performance. However, this research discovered that perceived time control is negatively correlated with both job-induced tensions and with personal emotional levels. It also found that greater perceived time control caused higher job satisfaction. Therefore, this research illustrates that multiple variables are likely to be associated with an individual's time management skills.

Table 3.1 A Summary of Time Management Empirical Studies

References	Subjects	Major Findings	Implications
(Porter et al. 1970)	40 city administrators and 38 industrial managers	Comparing city administrators and industrial managers, the less effective managers did *less* time allocation and had less perceived control of their time.	The results imply that the time management quality can be with a result of different organizational contexts.
(Macan et al. 1990)	College students	1. Students' self-ratings of performance were significantly and positively correlated with all time management dimensions except preference for organization. 2. Student's grade point averages (GPAs) were positively correlated with perceived control of time. 3. The fundamentals (goal setting and prioritizing performance) were correlated only with students' self-rating of performance.	This study provides useful measures of time management quality, which is defined along four dimensions: 1) Setting goals and prioritizing activities; 2) Mechanics, such as making lists; 3) Perceived control of time; 4) Preference for organization/disorganization.
(Britton et al. 1991)	90 undergraduate college students	This study is a longitudinal study. The results show that both short-range planning and time attitudes were significantly and positively correlated with GPAs. It concludes that time-management practices may influence college achievement.	The results are similar to Macan's findings (1990) above.
(Macan 1994)	353 employees from a public social service agency	No significant relationships were found among any of the time management dimensions and employee performance. However, a higher perceived control of time caused lower perceived tensions and higher job performance.	It was found that tension and job performance are associated with perceived time control.
(Hall 1982)	40 faculty and staff	This study confirmed that there are large numbers of individual differences in time management practices.	This study needs to be extended to a much larger population to be validated
(Tulga 1979; Tulga et al. 1980)	Graduate students and faculty	The two studies measured short-term time management practices by testing graduate students and faculty on a time management computer game. In the game, several blocks on a computer screen – each block representing one job – moved toward a deadline. The subject could "work on" only one block at a time. As each block was worked on, it decreased in size until it disappeared on completion. The results show that individuals differed substantially in the optimality with which they allocated their time in this game.	The study provides evidence of individual time management differences from a psychology experiment.

Although this research does not provide any information on the how temporal structures might impact individuals' time management, it does suggest that other powerful elements may affect time management performance. To assess time management, what information should be considered? What types of measures can be used in time management studies? First, we need to consider what criteria should be used, and second, what behaviors and practices should be assessed (Bluedorn et al. 1988). Among the few empirical time management studies (see the above Table 3.1), A study (Britton et al. 1991) validates three time management factors: *short-range planning*, *time attitude*, and *long-range planning*. This study used a 5-point scale consisting of the responses *always, frequently, sometimes, infrequently,* and *never.* The detailed items which form each factor are shown as follows.

Factor 1: Short-Range planning

1. *Do you make a list of things you have to do each day?*
2. *Do you plan your day before you start it?*
3. *Do you make a schedule of the activities you have to do on work days?*
4. *Do you write a set of goals for yourself for each day?*
5. *Do you spend time each day planning?*
6. *Do you have a clear idea of what you want to accomplish during the next week?*
7. *Do you set and honor priorities?*

Factor 2: Time Attitude

1. *Do you often find yourself doing things which interfere with your school work simply because you hate to say "No" to people?*
2. *Do you feel you are in charge of your own time, by and large?*
3. *On an average class day do you spend more time with personal grooming than doing schoolwork?*
4. *Do you believe that there is room for improvement in the way you manage your time?*
5. *Do you make constructive use of your time?*
6. *Do you continue unprofitable routines or activities?*

Factor 3: Long-Range Planning

1. *Do you usually keep your desk clear of everything other than what you are currently working on?*
2. *Do you have a set of goals for the entire quarter?*

3. *The night before a major assignment is due, are you usually still working on it?*
4. *When you have several things to do, do you think it is best to do a little bit of work on each one?*
5. *Do you regularly review your class notes, even when a test is not imminent?*

This dissertation develops constructs to measure the quality of individual time management from this study. In particular, it develops the *Planning* construct from the short and long range planning constructs presented above and the *Sensing a Lack of Control* construct from the time attitude construct used. In order to incorporate some of the self-help literature on time management in the time management quality measures, we turn to the literature in psychology on people's perception of time management behavior. This is covered in the next section.

3.3 Individual Level of Time Perceptions: Who Are Good Time Managers?

When considering time management at the individual level, we need to know how temporal information is perceived by individuals from the psychology field. Psychological time is "*the conscious experimental product of the processes which allow the (human) organism to adaptively organize itself so that its behavior remains turned to the sequential (order) relations in its environment*" (Michon et al. 1985). Individuals are likely to exhibit very diverse temporal personalities, since individuals' information processing may have various patterns and consequences of selective attention, encoding, storage, information retrieval, and judgment (Waller et al. 1995). These differences affect how able people are to manage complex patterns and relationships. In addition, multiple cognitive skills are required to juggle and adjust and understand time planning. Thus, one person can be very attentive to the world about him or her and so be very aware of a large number of implicit temporal structures that might cause entrainment but may also

be very bad at decision making and placing priorities on these constraints. Thus, although someone may have deep knowledge about temporal structures, this person may not be able to use that knowledge effectively to carry out good time management practices. The major concern in this thesis is how individuals exhibit their temporal information processing in their calendaring behaviors, in particular, in the way they capture explicit and implicit temporal structures. Thus, when we build the temporal structures constructs in the thesis, we need to build them so that it is the use and understanding of the temporal structures that is salient, not simply the awareness.

Psychological time provides certain stable individual characteristics of time perceptions, in particular, *time urgency* and *time perspective.* These two characteristics indicate individual differences in deadline pressure, planning and decision making, leading to individual differences in scheduling behaviors. Therefore, based on these individual differences, these characteristics are likely to distinguish who might be *good time managers*, and who might be *poor time managers.*

Time urgency indicates a sense of time awareness, of time pressure to get things done ,which creates a tendency to prioritize and schedule tasks (Conte et al. 1995). *Time perspective* shows how people do their planning in terms of past, present or future (Kluckhohn et al. 1961; Zimbardo et al. 1999). In terms of individual scheduling behaviors, one study (Friedman 1974) found that time-urgent individuals have a tendency to schedule more activities, and are capable of fitting these activities more comfortably into time slots. Friedman's study also indicates that time-urgent people try to fulfill all of their ambitions and commitments under deadline situations. Another study (Rastegary et al. 1993) found similar results to Friedman, but with an emphasis an individual

prioritizing skills. Rastegary's study shows that time-urgent individuals are more capable of prioritizing tasks by efficiently using deadlines. Time-urgent individuals can also demonstrate high striving and achievement in their work. They are more capable of completing more work within the same time compared with non-time-urgent individuals. Thus, it is suggested that time-urgent individuals have a tendency to be *good time managers* compared to non-time-urgent individuals. This thesis classifies the time-urgent measure as a *Meeting Deadlines* and builds a construct for this measure based on the results of these studies.

Another important aspect of individuals' time management is individuals' temporal aspects to past, present or future, called *time perspective.* Among time perspectives on past, present and future, individuals who have future time perspective, are seen to be highly goal-oriented individuals (Bird 1988; Das 1987; Zimbardo et al. 1999), and consider more future possibilities (Jones 1988), thus they are more likely to be a *good time manager.*

By synthesizing studies of *time urgency* and *time perspective*, one study (Waller et al. 2001) categorizes individuals' time perception into four prototypes: *organizer, crammer, visioner,* and *relator* (see details in the below Figure 3.3). Organizers exhibit time-urgent and future time perspectives. Crammers are highly aware of time urgency, but are more focused on present time perspective. Visioners tend to focus on future time perspective, but they are non-time-urgent, and the last case – relators are neither time-urgent nor future-time-perspective oriented. This thesis builds uses the research on time perspective and its relationship to time management to build a construct that we call *Engaging in Procrastination Behaviors.*

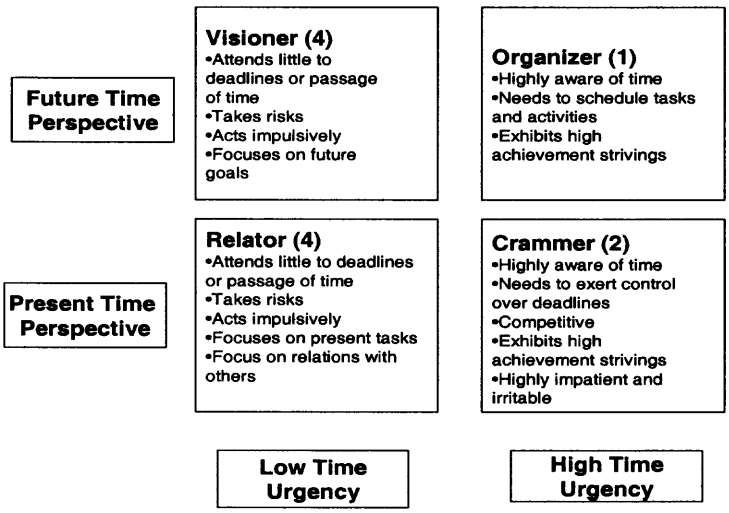

Figure 3.3 Individual time perception prototypes.
(adapted from Waller et al. 2001).

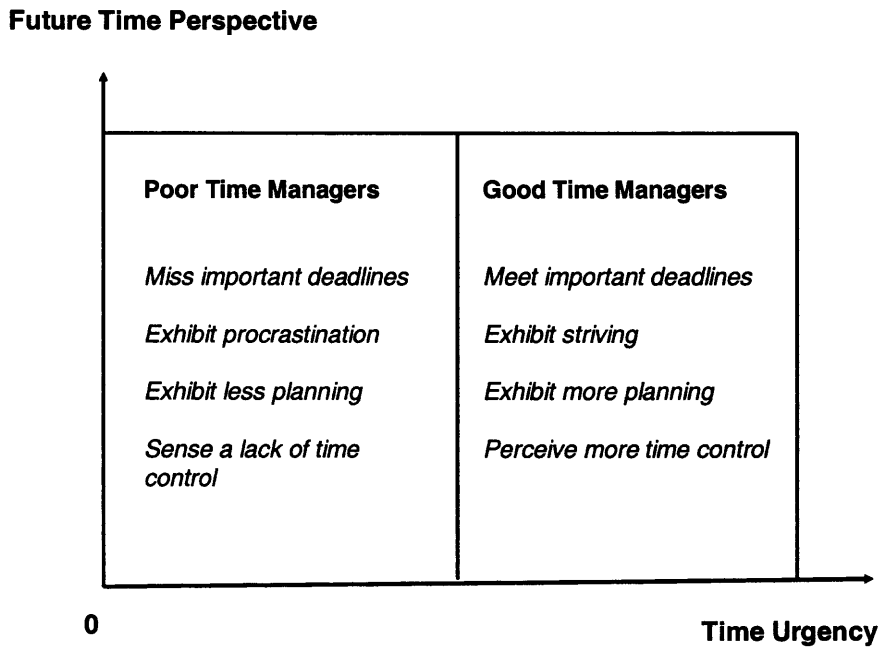

Figure 3.4 Who are good time managers?

Waller et al.'s (2001) research provides hints on who are more likely to be good time managers, since good time managers generally meet important deadlines, exhibit more productivity and high striving to achieve their short-term and long-term goals. Among the four prototypes in Waller et al.'s study, it is suggested that *organizers* and *crammers* can be grouped into *good time managers,* while *relators* and *visioners* are more likely to be *poor time managers.* Therefore, four dimensions of quality of individual time management are proposed and utilized to assess who are good time managers (shown in Figure 3.4) in this study. One is whether individuals can meet important deadlines, whether individuals always exhibit procrastinations or strivings, and whether their productivity is high. The core of this dissertation is to investigate how individuals both good time managers and poor time managers capture, use and create temporal structures to manage their time. The last three sections give us measurements for time management quality that can be compared to the capture, use and creation of temporal structures. We are also interested in knowing sorts of relationships among these variables, but this exploration will be carried out as future work.

In summary, this chapter reviewed previous research on temporal structures. From this review, Chapter 5 will develop the constructs we use to measure the use and understanding of temporal structures. The chapter also reviewed empirical time management studies and individual temporal perspectives. The thesis borrows two constructs that were used in the time management studies and then focuses on the development of two more constructs from the temporal perspective studies. The time management constructs will be developed in Chapter 5 and used to measure time management quality.

The next chapter will survey electronic calendar research and investigate the potential opportunities to integrate temporal structures into today's electronic time management systems.

CHAPTER 4

TIME MANAGEMENT TOOLS: CURRENT PRACTICE, NEW PROTOTYPES AND PROPOSED DESIGNS

The focus of this chapter is a review of electronic time management tools. This review is presented to support the underlying motivation for this thesis, which is to improve time management by providing better electronic time management tools that incorporate more types of temporal structures than are managed with existing tools. The chapter begins with a discussion of paper-based calendars which have served as the primary structure for representing time usage for all subsequent time management aids. This discussion relates time management practices to the types of temporal structures the paper calendar manipulates and to the paper calendar successor, the electronic calendar. A comparison is made between the advantages of paper-based tools and electronic tools to illustrate the types of advantages that moving to electronic means provides. This comparison is also made to illustrate that the advantages developed for the electronic time manager are the simplistic and somewhat obvious advantages of simplifying repeated entries and announcing time-based events.

Following this comparison, a list of the types of computer-based features that are found in most existing electronic calendar tools is provided. This list is used to characterize the types of improvements that electronic time management tools have brought to individual time management and also to demonstrate that these improvements are not based on a person's understanding and use of temporal structures. This electronic calendar feature discussion is followed by a presentation of user studies on calendar usage which begins to suggest the type of temporal structure features that might be

included in new electronic calendar designs. A set of creative new electronic time management designs are presented following the user studies. These are organized into tools which help a user to visualize schedules better and tools which help a user coordinate schedules with other users. Throughout each new design presentation and at the conclusion of this chapter, we point out where the designers have tried to incorporate temporal structures as a key element in the design. Since a key proposal of this thesis is to design electronic calendars that incorporate more types of temporal structures than the explicit temporal structures they now support, the review is focused on identifying what attempts, if any, have been made to do this by other researchers.

4.1 Paper-based Time Management Systems

Paper calendars have been around for a very long time. Almost every culture today uses some form of paper-based representation of time on which individuals record their personal usage of this time. The representation is invariably clock-based and structured according to astronomical phenomena such as the phases of the moon, the daily rotation of the earth and the movement of the earth around the sun. Such representations were naturally useful since these movements had a dramatic impact on weather which affected harvests and the availability of food sources. Today's paper calendars represent the accumulation of this knowledge into months of the year, weeks, days and hours.

Today's calendars also represent sociotemporal norms that are built into the structure. For example, in an American calendar, the month is divided into weeks so that the first day of the week is Sunday. The fact that a week has seven days is another norm that arose for religious reasons. For a personal scheduler, the day starts at 8:00 AM, not

at 4:00 AM, and it does not go beyond 9:00 PM following the biological clocks of humans but also following the norm of what is considered a standard work day. Thus, paper-based calendars, although clock-based, exhibit in their format, temporal norms accepted by an entire culture. In addition, some calendars come with additional temporal structures that are inserted for a subset of users. For example, a Yankees fan can purchase a calendar that shows all of the games played by the team. Paper calendars also show the key holidays (temporal events) of the culture that the calendar is designed for. Thus, paper-based calendars can be seen to already incorporate temporal structures in their design. However, because of the limitations of paper, these structures are explicit clock-based temporal structures, only.

Paper calendars are everywhere. They are the basic time management tools and have been regarded as an extremely valuable and important aid in people's professional lives (Kincaid, Dupont and Kaye 1985). Kincaid et al. write:

> Calendars are ubiquitous and important tools of office workers, particularly of office principals and their secretaries. Paper calendars are available in a wide variety of shapes, sizes and styles to suit almost any need. They are used to plan and record times of appointments and meetings, jobs to do, telephone calls to make, and time utilization in general. Most people regard them as critically important tools. Realizing their central role, the manufacturers of integrated electronic office systems have included electronic versions of the calendar in almost every system they offer, and, as with the paper versions, a variety of styles and structures are available (Kincaid et al. 1985, pp. 89-90).

Paper calendars are so useful because they allow individuals with multiple events constraining their lives (appointments) to place these events in external memory and to use this external memory to see the relationships between the events. The calendars are then used as a tool for thinking about the events and developing an optimal arrangement

for how these events utilize a person's time resource. The calendars also serve as a reminding tool so that a person does not have to use cognitive resources remembering what events are scheduled when. Thus, a paper calendar becomes an excellent tool for managing time.

However, because a paper calendar is on paper, certain limitations arise. First, schedules change. These changes are more difficult to make on paper. Second, the scheduled events are often repetitive requiring additional work to enter and later update these events. Third, paper calendars often do not have enough space for including information on a scheduled event. Fourth, the loss of a calendar is a serious loss because there are typically no backups. Fifth, paper-based calendars only support the recording of explicit clock-based temporal structures, and these are not supported efficiently. The development of the electronic calendar removed some of the difficulties incurred with the paper-based calendar. The next section compares the advantages and disadvantages of the paper and electronic tools showing how the addition of computing serves to help time management. Much of the support provided by electronic time management tools has not yet moved much beyond computerizing the type of scheduling done in paper-based calendar except for utilizing the update advantages of the computer. This case is made at the end of this section.

4.2 Paper-based vs. Electronic Time Management Systems

Users, today, can purchase a large variety of time management products, which are collectively referred as "calendar artifacts" (Palen 1998). Hundreds of calendars, personal time organizers, and diaries are available, especially in paper form. A change is

occurring, however. Computer-based time management tool sales are booming, in particular, mobile tools, e.g., Palms™, Blackberrys™ and cell phones. Both desktop and mobile computer systems offer time management support. We examine the advantages brought about by this switch to electronic time management in order to discuss whether the features added focus on temporal structure inclusion and manipulation support. Table 4.1 compares traditional paper-based calendars to computer-based calendars, to this end.

Table 4.1 Comparison of Paper-based Calendars and Electronic Calendars
(Summarized from Morgenstern 2000)

Types of Time Management Tools		Pros	Cons
Paper-based Calendars	Wall Calendars	o Provides a large view of time usage o Good for communicating with others o Easy to view o Location is always known	o Not flexible – hard to record multiple information items, e.g., to do lists o Not readily portable o Not easily updated
	Pocket-sized Calendars	o Easy to learn o Easy to use o Reliable (no battery failures) o Easy to see relationships between time-based events	o Backup is time-consuming. o Not easily shared with others. o Can grow bulky as information is added o Search is not efficient.
Electronic Calendar Tools	Desktops Mobile Devices	o Search is easy. o Updating of schedule is easy, even for repeating temporal structures o Easy to share o Backup is trivial. o Allows users to set up reminders (alarms)	o Not easily to access the archive information for reference without a computer. o Need to learn new programs in different devices. o Hard to read screen o Desktop not at all portable o Hard to enter in new information in mobile devices

Because of increasingly complex schedules, more and more professionals are adopting electronic time management tools to support their professional lives (Kincaid et al. 1985). The pilot study described in Chapter 5 (Wu and Tremaine 2004) found that

knowledge workers prefer electronic tools because of key features that make them more efficient to use. These include (1) the ability to quickly search for items, (2) the ability to get better overviews of time usage, especially by switching between multiple possible views or by using a larger display, (3) the ability to share scheduling information either through "beaming" on a mobile device or through a public online calendar, (4) the ability to make changes to a complex temporal structure by changing one instantiation of that structure and (5) the ability to create more complex temporal structures by selecting from a set of pre-defined parameters (e.g. repeat <daily, weekly, monthly> until <date>). Those users, in the study, who did not use electronic calendars complained mostly about the visibility of the small screen size of the mobile devices, the lack of portability of the desktop devices and the difficulty with data entry either because of the interface design or the input tools available (tiny keyboard on mobile devices).

The advantages provided by the electronic tools are clearly significant. Nevertheless, the porting of the paper-based calendar to its electronic cousin, in our view, suffers from a lack of vision. The electronic version is a replica of the paper version with the added features that come from the fast search capabilities of the computer and its ability to define global data structures on which updates can be performed. This latter capability helps users more easily develop temporal structures in their calendars, but only the kind that represent explicit repeating temporal events. The field of human-computer interaction designs new interfaces for users based on an analysis of how users think about and perform the task the technology is supporting. Thus, builders of electronic calendars could have examined how users think about and construct their schedules. As such, they

would have run into thinking about how to build tools that allow users to capture the more esoteric and complex temporal structures affecting their time coordination.

In the next section, we survey all of the common features found in today's purchasable electronic time management tools and then discuss which of these features represents support for temporal structure management.

4.3 Common Features Found in Current Electronic Time Management Tools

Many of the features suggested in the early user studies are now incorporated into readily available electronic time management tools. Many of these tools are integrated tools (commonly called PDAs for Personal Data Assistants) and even include a phone and a camera. This section focuses on the time management part of these systems and on the features provided by this software that support individual time management. In essence, it summarizes what is now currently purchasable. We divide this summary into four categories: (1) properties associated with temporal events, (2) additional capabilities for updating temporal events, (3) capabilities for multiple views of information and (4) capabilities for synchronizing events with other individuals, i.e., collaboration. We also indicate with this presentation of properties where these features begin to allude to the use of more sophisticated temporal structure planning and where they simply add the computerization advantages obtainable with any data management program.

Electronic time management tools allow a user to associate additional properties with an explicit temporal event that is being input to the tool. One key property is the alarm property, which can be realized in a variety of ways, e.g., by a screen display or by an auditory display. A second key property is repetition so that a temporal event that is

input once can be replicated according to a pre-designated pattern, e.g., biweekly, every month, etc. This second property immediately allows a user to create a more sophisticated temporal structure, albeit explicit, and saves the work of repeatedly entering this structure in a paper-based tool.

The global update feature of computers also allows electronic time management tool users to more readily update the temporal structures they have placed in their schedule. All repeated events can be deleted, moved or edited by working on one instantiation of the repeated event. Because today's schedules are constantly changing, this feature, alone, makes the electronic tool more effective.

The third class of functions that make electronic tools more effective for time management is their ability to provide multiple views of time usage. This is especially evident in the synchronization tools that allow a user to synchronize their PDA with their desktop computer. The larger screen of the desktop computer is able to display more events that are scheduled so that a calendar user can get a better overall picture of time usage. In addition, today's electronic calendar systems allow a user to display multiple perspectives of their time usage, daily, weekly or monthly. Reorganization of data to give a display that is more useful for a particular need is also a common capability of a computer. Although temporal patterns may be more visible, this functionality does not explicitly address temporal structure usage or encoding.

The fourth class of functions that are now found in electronic calendars are those that support collaboration. Today's commonly used calendars, e.g., Outlook™ and Yahoo!™ support the sharing of events between calendars. If a person signs up to use a common calendar, the events placed on that calendar will be transferred to their personal

calendar. Lotus Notes™ is perhaps one of the most sophisticated collaborative time management tools. Meeting times can be bartered through this package so that a negotiation occurs via email until a suitable time is found for all participants. Calendars can be shared in this system and similar ones so that scheduled events have a property of who is allowed to see the event and at what level of detail. In some sense, collaborative systems support more temporal structures than individual systems because the very sharing of schedule information informs others of implicit temporal activities and of the relationship between temporal activities. However, the design focus for these features was not based on considering what types of temporal structures might need supporting, and is inadvertent.

The next section presents a series of calendar user studies. Some of them were conducted as interviews of time management tool users to determine what types of features were used, others were conducted as ethnographic studies to determine how features affected personal time management or time coordination. All of the studies suggest temporal structure improvements although such terminology is not used in the study conclusions. Each study is described in the paragraphs, which follow and then discussed to point out the temporal structure issues uncovered.

4.4 Time Management Improvements Suggested by User Studies

Existing information systems research primarily focuses on electronic calendar usability issues or designs and use of collaborative calendar systems (Beard et al. 1990; Crabtree et al. 2003; Egger et al. 1992; Kelley et al. 1982; Payne 1993). 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 explicitly mentioned, even though, in the case of group calendar studies, many organizational temporal structures are recorded in these calendars, e.g. weekly staff meetings.

Kelley and Chapanis (1985) investigated the personal use of paper calendars by a small (23 users), but widely disparate and unrelated set of users in very different environments, ranging from real estate sales, to garage management, and to banking. This study predicts the widespread use of electronic calendars. By conducting open-ended interviews on the usage of personal calendars, the researchers uncovered useful electronic calendar features that would improve the effectiveness of the paper-based tool such as audio alarms, visual reminders, support for repetition of events, update and edit facilities, automatic archiving, and accuracy checks on inputted information. Of these features, the support for event repetition is support for the creation of an explicit temporal pattern. The suggestion for accuracy checks also supports temporal structure capture if the accuracy checks use temporal norms, e.g., an appointment beginning at 3 AM is likely to bring a query from the system, stating, "did you mean 3 PM?"

Kincaid, Dupont and Kaye (1985) state that the most important failure of many electronic calendars is lack of flexibility and functionality in comparison to the paper-based calendars. The aim of their study was to inform the design of future collaborative electronic calendars. Based on the survey they conducted, Kincaid, Dupont and Kaye uncovered the following issues in the development of collaborative calendar systems. They found that an automatic scheduling feature was not likely to be widely used, because people felt they could not interpret and assess others' availability. They also found that privacy concerns were an issue when sharing calendars with others. Their

study implies that the capture and management of implicit temporal information such as availability could be a useful temporal structure feature that electronic tools might support.

Payne (1993) interviewed twenty staff members from the IBM T.J. Watson Research Center to assess their collaborative calendar usage behavior. This research found that although a computerized group calendar system was available, people still used a mix of calendars, primarily relying on paper-based calendars. The events recorded on the shared calendar reflected shared activities and thus, the temporal structures of the organization, whereas the true usage of an individual's time was kept on private calendars. Thus, although the shared calendar system readily captured and displayed an organization's temporal structures, it did not achieve a desired feature of the sharing which was to indicate the implicit temporal behavior of each individual, in particular each person's availability.

Palen (1999a, 1999b) studied the use of collaborative calendar systems with 40 office-workers in a large computer company and developed a framework of synthesized perspectives for evaluating and designing of groupware calendar systems that integrates three perspectives: *individual user, technology,* and *social-organizational environment.*. She characterizes these three convergent perspectives as follows: 1) *Single-user demands* include diversity in calendar form and function, calendar usage (including scheduling, tracking, reminding, note recording/archiving and retrieval/recall), reconciling calendar needs and design affordances. 2) *Interpersonal communication* includes artifacts of temporality, peer judgment and interference, and interpersonal boundary management (including three aspects: privacy concerns about information-based content, privacy

concerns about time-based contents, and managing privacy), meeting arranging and beyond meeting arranging. 3) *Social-technical evolution* includes the social impact of the calendar design. Because Palen's study considers social-technical aspects of calendars, this study implicitly identifies the usage of sophisticated temporal structures especially in the group calendars. Her work illustrates the rich fashion in which many different cultural norms affect how people use and arrange time, especially when their time usage is public and viewable by others. A key finding in her work was the establishment of the sociotemporal norm of calendar sharing that was in place in the organization. Because the default of the calendar system in use was "sharing," the norm of sharing calendars became established as the company grew with the outcome that it was socially unacceptable to not share one's calendar leading users to additional sophisticated calendar usage behavior that guarded individual privacy. Many of the findings of Palen suggest the development of groupware calendar systems that allow users to represent temporal structures in a fashion that provides more flexibility and privacy.

A time management tool study close to Wu and Tremaine's study (2004) was conducted in a Computer Science department of a British university (Blandford et al. 2001). Blandford et al. borrowed most interview questions from a previous study (Palen 1999a) and interviewed sixteen staff members, who used a public time management tool called "Meeting Maker." This research reported how people used a suite of tools to support their personal and interpersonal time management. These tools included paper, electronic devices and other media. This study concludes that people use multiple tools because the temporal structures encoded in each of the tools have different purposes, e.g., organizational vs. personal temporal structures. This leads to a problem

with integration between time management tools. This same problem was found in Wu and Tremaine's study (2004). This work suggests that electronic temporal structure support should allow users to limit the viewing of their temporal structures both for privacy and for work context. For example, one view could be a temporal lens that only shows the most important appointments. Another could be a lens showing only long appointments, etc.

A recent calendar research (Crabtree et al. 2003) contributes to the design of Groupware Calendar Systems (GCSs) for use in domestic life. This study moves GCSs from workplace to home life. An ethnographic approach was used to investigate calendar use in domestic settings. The researchers found temporal structure conflict among the family members and a need for tools that supported negotiations on how these conflicts could be resolved.

In the next two sections, we present research prototypes that have been built to improve electronic time management tools. The key aspects of these prototypes is either improving a user's ability to see relationships between their time management usage through better visualizations or improving a user's ability to integrate their time management with others. However, some of these design features can be repackaged in terms of supporting temporal structures. The discussions following the presentation of these new designs attempts to do this as well as indicate where temporal structure support is not a feature of the proposed innovation.

4.5 Visualization Techniques

Computer Science has promulgated a fascinating array of new electronic calendar types that solve specific problems that users have with existing time management tools, in particular with being able to see the relationships between the multiple temporal events scheduled on calendars. Many of the techniques employed are visualization techniques that allow a user both to access specific information quicker and also see the relationship between detail information and a larger whole. Although these capabilities allow users to see temporal structure relationships, they are primarily between explicit temporal structures, and used mostly for noting whether time is heavily or lightly scheduled. Nevertheless, these visualization techniques allow users to better see temporal rhythms that are affecting their lives, e.g., new meetings every twenty minutes indicate a rapid tempo. The next sections describe these visualizations.

4.5.1 A Fisheye Lens Calendar System

The fisheye calendar (Bederson et al. 2003) (Figure 4.1) provides a visualization that helps users view a monthly schedule while still focusing on their daily schedule. It was designed to present the explicit temporal structures commonly input into today's electronic systems.

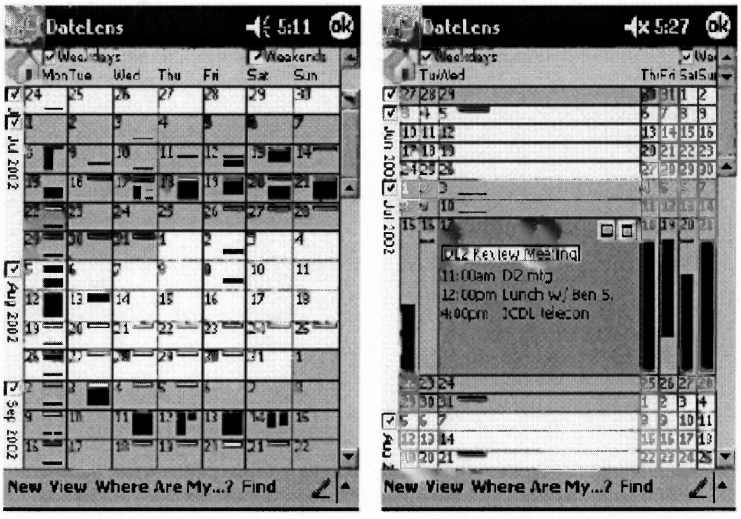

Figure 4.1 DateLens (Bederson et al. 2003).
(The left display shows the month view, which is expanded for the week of interest. The right view shows the weekly view, which expands for the date of interest.)

4.5.2 3D Calendar Visualization

Mackinlay et al. (1994) explored using 3D graphics and interactive animation to design and implement visualization to improve access to large amounts of time-based information. A Spiral Calendar (Figure 4.4) was designed for rapid access to an individual's daily schedule. 1) The Spiral Scheduler portion uses 3D graphics to integrate detail and context by placing objects in a 3D spiral. 2) The Time Lattice was designed for analyzing multiple daily schedules by aligning a collection of 2D calendars. This alignment helps to show the time relationships among the schedules of multiple individuals. This paper goes on to present an array of proposed designs, which are listed in the Table 4.2 below. All of these proposed calendar visualizations help a use to view the relationship between daily time constraints and weekly and monthly ones. None concentrate specifically on temporal structures, e.g. showing all related time usage in a single highlighted color. The time lattice design supports more temporal structure usage

than the other approaches because it displays what are normally implicit temporal structures that entrain co-workers lives. As such, it is likely to help time managers to schedule their time so that it aligns better with others' schedules.

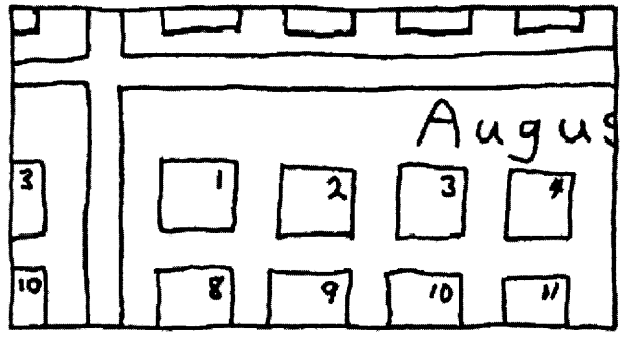

Figure 4.2 Sketch of a Pan/Zoom calendar design.
(Mackinlay et al. 1994) (Useful global context is lost as the user zooms into the homogeneous details).

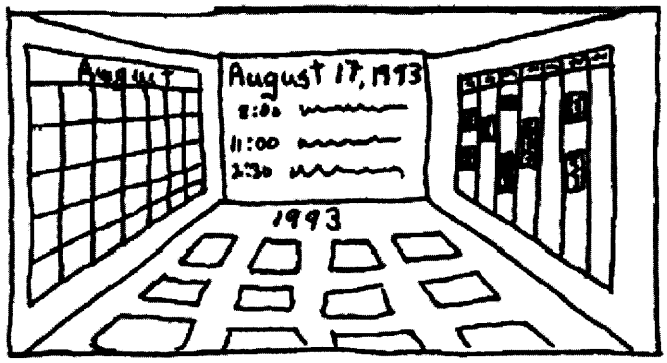

Figure 4.3 Sketch of a Calendar Room design.
(Mackinlay et al. 1994) (All calendars are visible but their relationships are not shown and the text on the walls and floor is foreshortened).

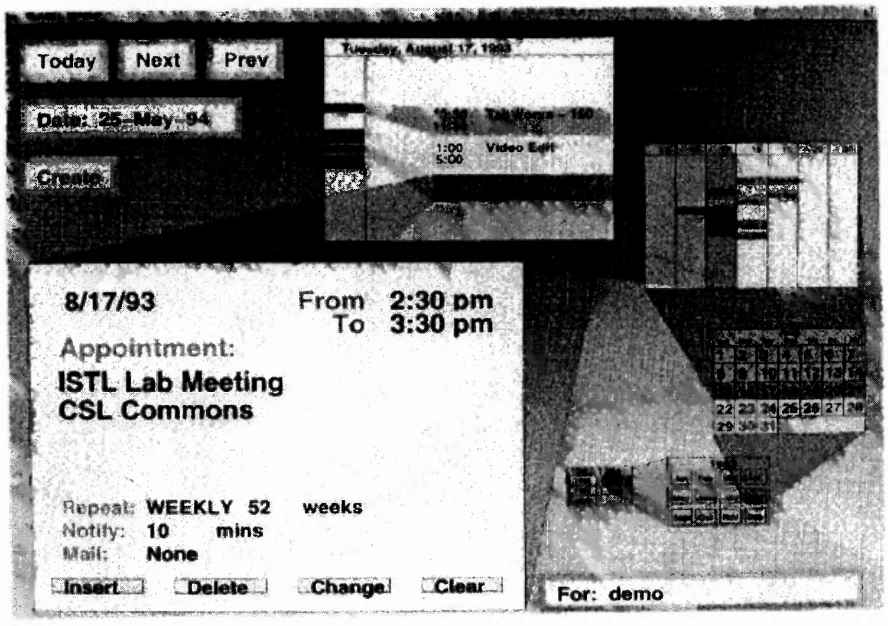

Figure 4.4 The Spiral Calendar Visualizer.
(Mackinlay et al. 1994) (Spiral Calendar was designed for rapid access to an individual daily schedule. A spiral layout combines detail and context in an intuitive 3D layout that allows the connection among calendars to be visible).

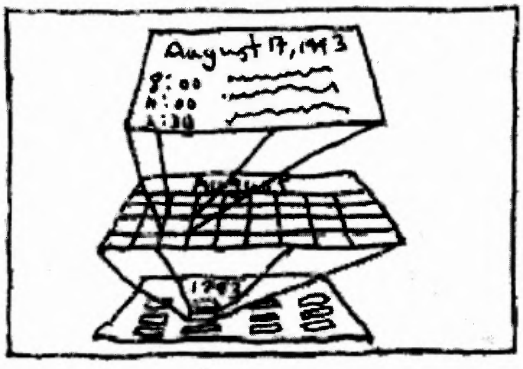

Figure 4.5 A Sketch of the Tower Calendar design.
(Mackinlay et al. 1994) (It results in foreshortened text but does show the connections among calendars).

Table 4.2 A Summary of Calendar Visualization Designs from Mackinlay et al. (Mackinlay et al.1994)

Calendar Designs	Reasons for Design Idea	Findings/Problems
Pan/Zoom Calendar (See Figure 4.2)	The design displays a hierarchy of calendars nested one inside the other, and an interactive animation allows the user to quickly zoom and pan over the nested views.	When all calendar information looks the same, pan/zoom navigation is a cognitive rather than a perceptual task as users try to keep track of where they are.
The Calendar Room (See Figure 4.3)	The design uses 3D to increase the density of the visualization to maximize the use of screen space.	The side walls of the calendar room are in extreme perspective, which results in foreshortened text that can be hard to read. The back wall is the natural place to put important information, but it is distant from the viewpoint, which makes the text smaller. Finally, the design could not show the connections between the various calendars, which makes navigation more difficult.
Tower Calendar (See Figure 4.5)	The design uses 3D to show the connections among calendars by stacking the calendars in a tower and connecting them by using truncated pyramids. The calendars are tilted toward the user and visible through the translucent pyramids.	The major problem of this design is that the text on the design is very foreshortened and hard to read.
Spiral Calendar (See Figure 4.4)	The design uses 3D to place the various calendars in a receding spiral. The spiral lets the text face the user and also shows the translucent truncated pyramids connecting the calendars.	3D makes efficient use of screen space because details are large and context is small but available for interaction. Perceptually the user can interact with familiar and engaging 3D objects.
Time Lattice	Time Lattice combines weekly calendars to form virtual 3D objects. The vertical axis represents hours, the horizontal axis represents days, and the depth axis represents individuals, who are displayed in different colors.	This design does not scale as its complexity increases significantly with the increase in number of calendars.

4.5.3 PowerView

The PowerView application (Björk et al. 2000) shows how non-standard graphical user interfaces, together with the introduction of links between data of different types, can ease the interaction with digital information on small mobile devices. The information visualization technique provides a structured and efficient way of displaying information and allows navigation using only four operators. Links between data entries further improve the system by presenting related information together.

PowerView (Figure 4.6) is an application providing access to the most typically used information stored in PDAs, i.e. address entries, meetings, e-mail, and to-do items. The interface is based on the flip zooming information visualization technique, modified to fit a given screen size. This technique allows for the presentation of several independent objects, and provides a moveable focus that lets the user select any object.

In order to provide structured presentation and navigation in the small display area, the information in the domains are organized into hierarchies. These hierarchies are based on the inherent structure of the information, i.e., address entries are stored in different groups depending on year, month and day. The hierarchies, however, increase the amount of navigational steps that are required to move between different entries. The PowerView application has proved to be a viable alternative to current user interfaces on PDAs. It offers a number of advantages over these interfaces in the form of integrating the presentation of information, minimizing the navigation needed to move between related information, and enabling information retrieval by singled-handed use. This work provides a structured and efficient visualization technique to display temporal structure

relationships by putting links between data entries, and supporting hierarchical and networked temporal structure relationships.

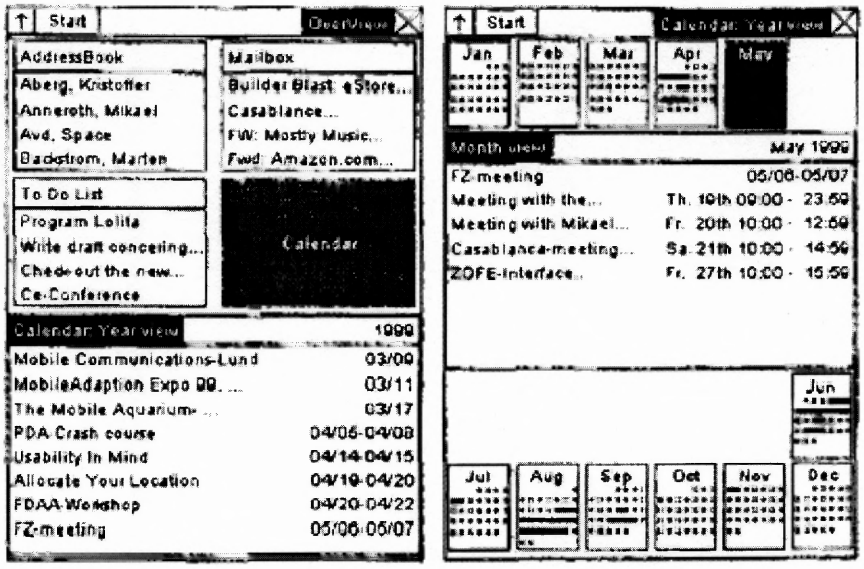

Figure 4.6 The PowerView calendar application (Björk et al. 2000).
The overall view of the PDA display (left), and the calendar view (right).

4.6 Collaborative Calendar Systems

4.6.1 Operation Book

Egger et al.'s work (1992) (see Figures 4.7, 4.8) focuses on time-management as the cooperative task of scheduling surgeries in a hospital. Standard qualitative research methods, such as semi-structured interviews and observation, were used to explore a hospital staff's planning practices, explicit and implicit priorities, individual and occupational differences, and perceived temporal problems of organizational and individual scheduling failures. Based on an analysis of the cultural complexity of scheduling of surgery in the large hospital studied, possibilities of using computer-support for strengthening the sharing of information and resources as well as participation

in decision-making were discussed. A time management prototype called "Operation Book," which resembled the document used in the clinic's daily planning sessions, was created (Figures 4.7, 4.8). Planning, administering, communicating and informing functions were implemented into this prototype.

Egger and Wagner (1992) come the closest to considering multiple temporal structures in their study of the surgery-scheduling task. Although temporal structure terminology was not explicitly reported in this study, this study implies that organizational and individual temporal structure conflicts could be better handled by further understanding the temporal culture complexity of the organization.

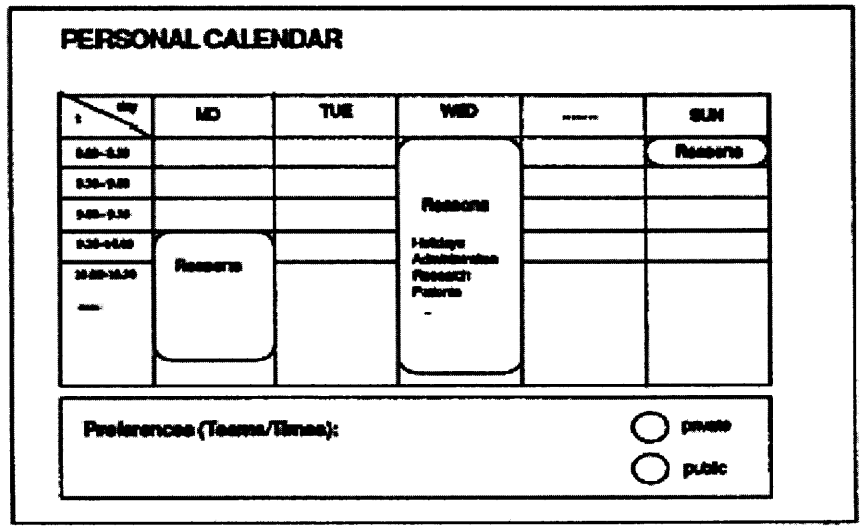

Figure 4.7 Personal calendar used in Operation Book.
(Egger and Wagner 1992).

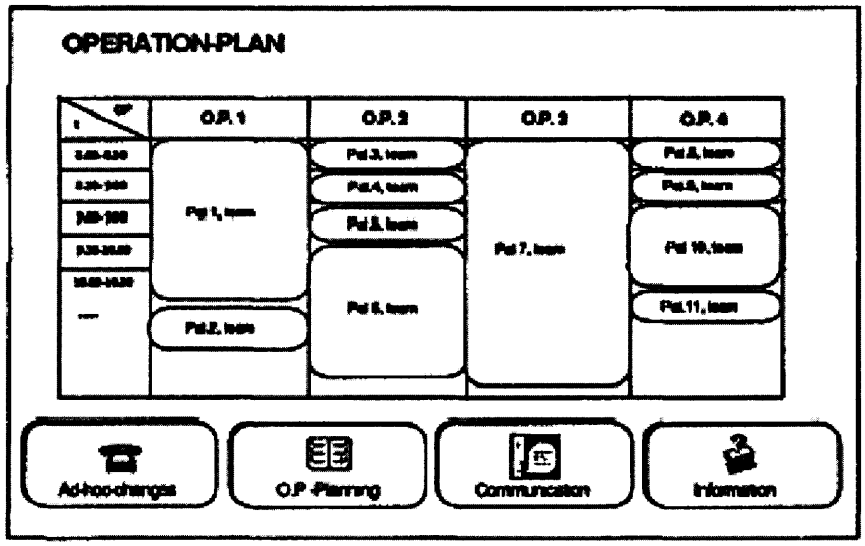

Figure 4.8 The Operation-Book Surgery Scheduling System.
(Egger and Wagner 1992).

4.6.2 Visual Scheduler

Transparency (Figure 4.9) was incorporated into a collaborative calendar application called Visual Scheduler (VS) (Beard et al. 1990) to support users in visualizing the priorities of individual events on the shared calendars. Calendars in Visual Scheduler could be overlaid so that a viewer could see which time slots might be open for a meeting. High priority events on anyone's calendar would be less transparent so that the time slot would appear filled. A controlled experiment and a field study showed that the VS system was faster and less-error prone compared to manual scheduling. The transparency technique allows its users to see the relationship between multiple temporal structures maintained by others and, as such, gives an overview of the temporal structure relationships between the individuals sharing the calendars. The field study found, however, that the priority information was encoded to match cultural norms, e.g., students rated their classes as high priority because they knew professors were viewing their calendars.

Figure 4.9 The transparency calendar design.
Transparency calendar (Beard et al. 1990; Harrison 1995) (left: plain font style; right: anti-interference 20% transparency).

4.6.3 The Augur and Ambush Calendar System

A groupware calendar system named Augur (Figure 4.10) was developed by a research group at the Georgia Institute of Technology (Palen 1999). This calendar application is designed to support personal calendaring practices, informal communication, and the social-technical evolution of the calendar system within a workgroup via predictive models, intelligent text processing, and visualization. This group of researchers also designed another calendar application called Ambush calendar system (Mynatt et al. 2001) (see Figure 4.11). Both the Augur and Ambush systems used a Bayesian model to predict event attendance (Figure 4.12). This approach is one of the first implementations that attempts to capture implicit probabilistic temporal events. This work thus represents the one example of the direction proposed in this thesis, that is, to study the issues and practices that users actually experience and engage in when managing the temporal reality that surrounds them, and to use this information to build better electronic tools to support them in this management.

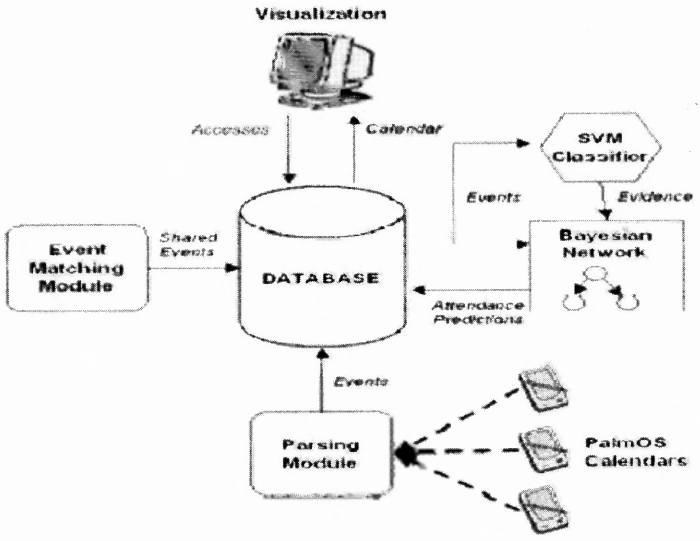

Figure 4.10 Augur calendar system diagram.
(Palen 1999).

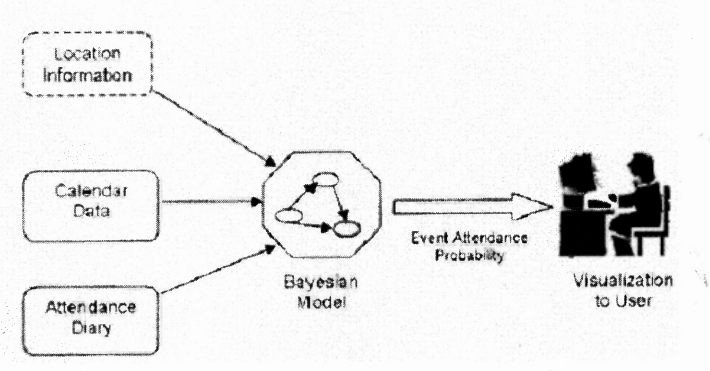

Figure 4.11 Ambush calendar system diagram.
(Mynatt and Tullio 2001).

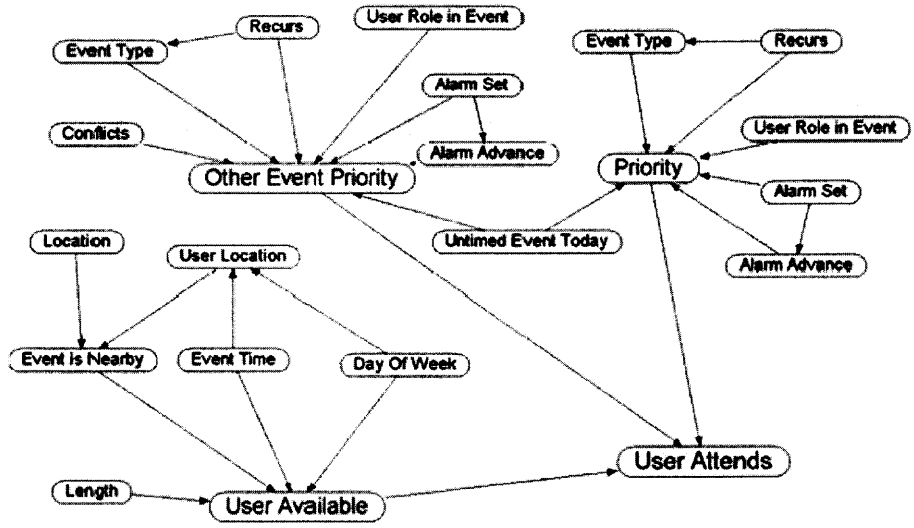

Figure 4.12 Bayesian model of event attendance of Ambush calendar system. (Mynatt and Tullio 2001).

From the above presentation of electronic calendar prototypes, it is clear that new implementations are beginning to hint at supporting better temporal structure management with the best and most original approaches coming from studies of time management behavior. Chapters 9 and 10 will suggest additional new designs that arise from this dissertation's temporal lens perspective.

4.7 Summary of Time Management Tool Review

Overall, based on the review of current calendar applications, it is obvious that only a few of the current electronic calendar designs consider explicitly capturing and embedding temporal structures as part of the calendar application. The useful design ideas, which can possibly be utilized in supporting more types of temporal structures for electronic calendars is summarized in Table. 4.3.

Table 4.3 A Summary of Calendar Studies Reviewed in Chapter 4

Previous Calendar Studies	Chapter 4	Temporal Structure Design Implications
Kelly and Chapanis (1985)	Section 4.4	This study implies that accuracy checks can support temporal structure capture if the accuracy checks use temporal norms.
Kincaid, Dupont and Kaye (1985)	Section 4.4	This study implies that the capture and management of implicit temporal structure, such as availability could be a useful temporal structure feature that electronic tools might support.
Payne (1993)	Section 4.4	This study implies that although the shared calendar system readily captured and displayed an organization's temporal structures, it did not achieve a desired feature of the sharing which was to indicate the implicit temporal behavior of each individual, in particular each person's availability.
Palen (1999a, 1999b)	Section 4.4	This study implies that it is important to build groupware calendar systems that allow users to represent temporal structures in a fashion that provides more flexibility and privacy.
Blandford and Green (2001)	Section 4.4	This study implies that people need multiple views of their temporal structures because the different temporal structures have different purposes, e.g. organizational vs. personal.
Crabtree et al. (2003)	Section 4.4	This study found temporal structure conflicts among family members. It implies a need for tools that support negotiations on how these conflicts could be resolved.
Wu and Tremaine (2004)	Section 4.2	This study found that knowledge workers prefer electronic tools because of key features that make them efficient to use. (1) efficient search, (2) better views of time usage, (3) the ability to share, (4) the ability to make changes to a complex temporal structure, (5) the ability to create more complex temporal structures
Bederson et al. (2003)	Section 4.5	The prototype development provides a fisheye view that makes it easier to see temporal structure relationships.
Mackinlay et al. (1994)	Section 4.2	This implementation uses 3D and interactive animation to improve the access to multiple calendars enabling users to see the relationships between the temporal structures of others.
Björk et al. (2000)	Section 4.5	This work develops a visualization to display the temporal structure relationships between data entries.
Egger et al. (1992)	Section 4.6	This implementation attempts to provide support for resolving organizational and individual temporal structure conflicts in scheduling surgeries in a hospital.
Beard et al. (1990)	Section 4.6	This work uses a transparency technique that allows others to examine the importance of individually scheduled events. Thus, it allows users to obtain a better view of temporal structure relationships.
Palen (1999)	Section 4.6	This implementation uses a Bayesian model to predict meeting attendance, and as such, like Beard et al.'s study handles implicit temporal structures.

The next chapter presents the research design for this dissertation. To build the research design, the literature reviewed in Chapters 2 and 3 is coupled with the results from a pilot study on time management practices. Thus, the next chapter contains the detailed research questions, hypotheses, corresponding measurements and a research model used in this dissertation work.

CHAPTER 5

RESEARCH DESIGN

Researchers in management and organizational behavior have shown that temporal rhythms and norms exist, and that they collectively impact multiple aspects of an organization. They have also shown that individual productivity is hampered if temporal cycles clash. This suggests that individual time management is related to the temporal structures that govern and entrain an individual's life. At its simplest form, individuals use external records to capture explicit temporal structures that allow them to view this entrainment. This external record then allows individuals to view the relationships between the temporal structures affecting their lives and also the relationships between the different temporal structures. Knowing these relationships can, thus, help an individual build a personal schedule that optimizes his or her use of time while still abiding by the temporal structure entrainment that cannot be controlled. We expect people who are very busy or very interested in personal advancement to want to optimize their time usage and therefore, to spend time learning about the myriad of temporal structures that affect their lives so that they can best control them. It follows that people who are good time managers are likely to use and understand temporal structures in a more sophisticated fashion than people who are not. This thesis investigates this possibility. The focus of this research is therefore on understanding the relationship between the quality of individual time management and temporal structure use and understanding.

The thesis has this focus because its underlying motivation is that of developing new information technology to support better personal time management. In particular, the research is designed to provide evidence that the support of additional temporal structures in electronic time management tools will help users be better time managers. It recognizes that being a good time manager also involves a personal goal to be a good time manager. This goal is assumed and the focus of this work is to find evidence that additional temporal structure management tools will help such a person better achieve this goal.

This dissertation work examines (1) how the temporal structures discussed in the literature review are used in personal time management, (2) whether high usage and creation is related to an individual's time management quality, and (3) what design implications can be drawn from human studies for the inclusion of multiple types of temporal structures in electronic time management tools. The use of temporal structures and their relationship to quality time management is addressed first through an exploratory field study. In the field study, twenty busy professionals were interviewed about their time management strategies and time management tool usage. An analysis of the data collected was used to develop an instrument that surveyed a larger group of people on their use of temporal structures and the perceived quality of their time management. The survey served as a confirmatory study testing the hypotheses developed from the interview data and the literature review.

5.1 Research Approach

This study consists of two investigative stages. In the first stage, two in-depth semi-structured interviews were conducted with twenty professionals. Data were collected on each individual's time management strategies and the types of temporal structures they experienced and used. This stage was completed in May 2004. Based on the findings of these exploratory interviews, a survey with a large number of participants in the same institution was designed in Fall 2004, and then the survey was delivered to the same community in both Fall 2004 and Spring 2005. More details are as follows.

5.1.1 The First Stage: Two Semi-structured Interviews

5.1.1.1 Participants. It is argued that a university is an 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.

Twenty professionals in a U.S. technological university were recruited via emails in Nov. 2003. 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.

5.1.1.2 Procedure. The first interview lasted from 30 minutes to two hours. The major focus is on general time management strategies and types of time management tools people are using. In particular, we investigated all sorts of temporal structures that people are experiencing and using, and utilization, perceived effectiveness and satisfaction with various time management tools.

The second interview emphasized each individual weekly and longer time management strategies. Retrospect on their daily sample and weekly schedule planning was conducted. Each individual experience of sorts of temporal structures were investigated through this retrospective procedure.

With the consent of each participant, all interviews were audio-recorded. All individual information was kept confidential. After interviews, each participant was assigned a subject code and their names were removed from their interview transcripts.

5.1.1.3 Findings from the First Stage. The purpose of this initial stage was 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 assesses whether the temporal structures are explicit, implicit or sociotemporal norms. This information was further 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.

The data analysis on the interviews is complete (Wu et al. 2004). 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 5.1 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.

Table 5.1 Examples of Temporal Structures Uncovered in Interviews

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

The large majority of the temporal structures that we found in use were explicit and clock-based. Most of our respondents were using 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 used to guide the allocation of time in the schedule but 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 but some were graduate students and faculty. 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 longer hours than the better

time managers 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 second stage of this research is to distribute 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 Chapter 9 as part of future research.)

Based on these findings from the first stage study, the following second stage for this research was designed.

5.1.2 The Second Stage: Survey Delivery

A pre-set temporal structure survey was distributed to all participants to determine how the participants use various time management tools, to examine how much knowledge of temporal structures they currently have, to assess how good time managers they are, to determine how temporal structures are currently used by them, and whether they perceive that the use of temporal structures helps them become better time managers.

5.2 Research Questions and Hypotheses

5.2.1 Research Questions

Based on the literature review and an analysis of two semi-structured interviews conducted on 20 professionals, various time management strategies and temporal structures (see Table 5.1) have been identified. The literature plus self-report in the interviews also identified what characteristics described good time managers. From this dual analysis, the following research questions are proposed for study as the basis of this dissertation.

RQ1: What is the relationship between the knowledge of temporal structures and the quality of individual time management?

RQ2: What is the relationship between use of explicit temporal structures and the quality of individual time management?

RQ3: What is the relationship between understanding implicit temporal structures and the quality of individual time management?

RQ4: What is the relationship between the creation of personal temporal structures and the quality of individual time management?

RQ5: What is the relationship between the understanding of university-related temporal structure relationships and the quality of individual time management?

5.2.2 Hypotheses

Based on the initial results from the two semi-structured interviews and literature on time management and organization behavior, individual time management hypotheses are shown in Figure 5.2. We categorize individual time managers into good time managers and poor time managers (See Figure 5.1). Based on individual perceptions on *planning*, *meeting deadlines*, *sensing a lack of time control*, and *engaging in procrastination behavior*, a set of questions was designed to assess who are good time managers, and who are poor time managers (see Appendix C). These questions were developed from prior studies on time management (Macan et al. 1990). Some of the questions were borrowed from previously validated scales (Britton et al. 1991) and the rest were developed and iteratively tested with a small representative sample of the subjects to be surveyed.

	Individual Time Managers	
	Good Time Managers	Poor Time Managers
Planning		>>
Meeting Deadlines		>>
Sensing a Lack of Time Control		<<
Engaging in Procrastination Behavior		<<

Figure 5.1 Characteristics of good and poor time managers. The ">>" means that the count or mean value for one factor will be very significantly higher than that for the other.

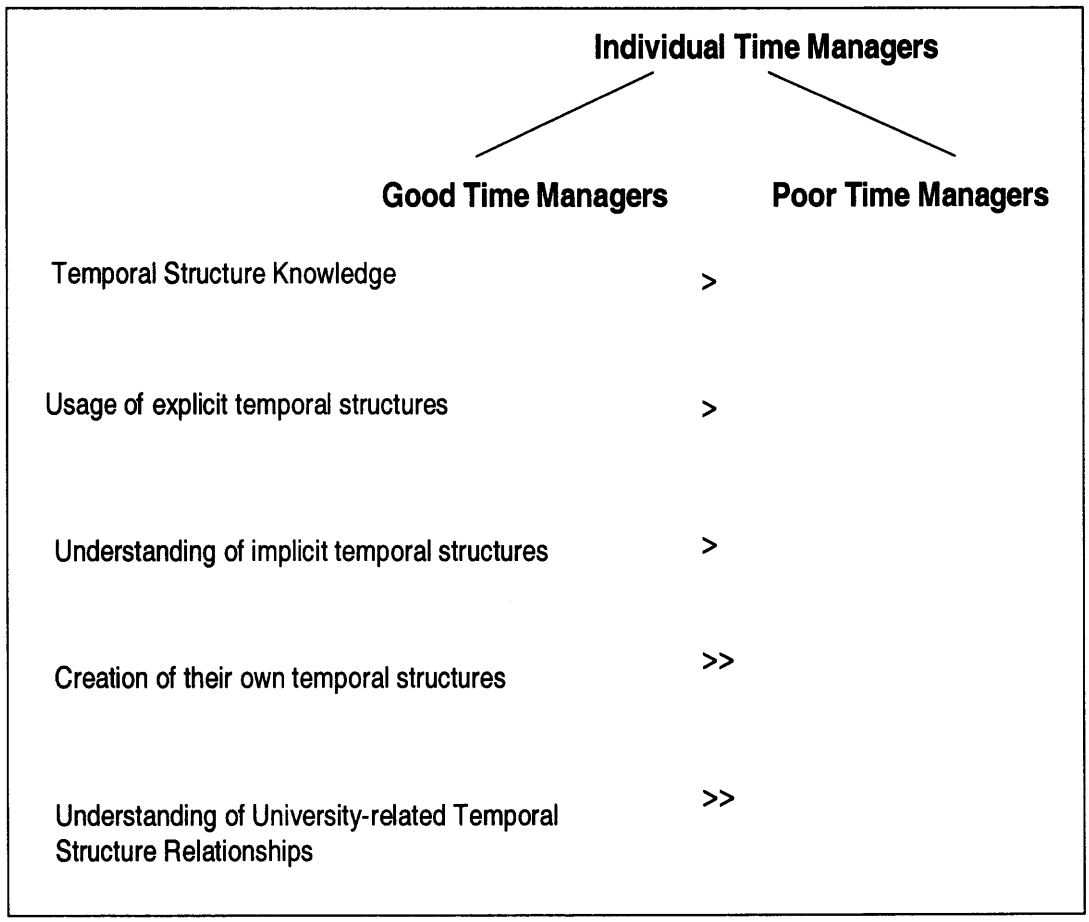

Figure 5.2 Major hypotheses of individual time management. The ">" means that the count or mean value for one factor will be significantly higher than that for the other. ">>" means that the difference will be very significant and pronounced.

The hypotheses will test the relationships among use, understanding and creation of temporal structures. We also collect data on how explicit temporal structures are used in electronic calendars. In general, these hypotheses state that better time managers are more aware of the temporal structures that impact their time usage, create more of their own temporal structures to help manage their time and also use more temporal structures in their electronic calendar entries. The specific hypotheses are as follows:

Hypothesis 1: Good time managers will have more temporal structure knowledge than poor time managers.

H1.1: Time managers who are good time planners will have more temporal structure knowledge than those who are poor time planners.

H1.2: Time managers who meet more deadlines will have more temporal structure knowledge than those time managers who exhibit less procrastination will have more temporal structure knowledge than time managers who exhibit more procrastination. who do not always meet deadlines.

H1.3: Time managers who perceive more control of their time will have more temporal structure knowledge than those who feel a lack of control.

H1.4: Time managers who exhibit less procrastination will have more temporal structure knowledge than those who exhibit more procrastination.

Hypothesis 2: Good time managers will use more explicit temporal structures than poor time managers.

H2.1: Time managers who are good time planners will use more explicit temporal structures than those who are poor time planners.

H2.2: Time managers who meet more deadlines will use more explicit temporal structures than those who do not always meet deadlines.

H2.3: Time managers who perceive more control of their time will use more explicit temporal structures than those who feel a lack of control.

H2.4: Time managers who exhibit less procrastination will use more explicit temporal structures than those who exhibit more procrastination.

Hypothesis 3: Good time managers will have a better understanding of implicit temporal structures than poor time managers.

H3.1: Time managers who are good time planners will have a better understanding of implicit temporal structures than those who are poor time planners.

H3.2: Time managers who meet more deadlines will have a better understanding of implicit temporal structures than those who do not always meet deadlines.

H3.3: Time managers who perceive more control of their time will have a better understanding of implicit temporal structures than those who feel a lack of control.

H3.4: Time managers who exhibit less procrastination will have a better understanding of implicit temporal structures than those who exhibit more procrastination.

Hypothesis 4: Good time managers will create more personal temporal structures than poor time managers.

H4.1: Time managers who are good time planners will create more personal temporal structures than those who are poor time planners.

H4.2: Time managers who meet more deadlines will create more personal temporal structures than those who do not always meet deadlines.

H4.3: Time managers who perceive more control of their time will create more personal temporal structures than those who feel a lack of control.

H4.4: Time managers who exhibit less procrastination will create more personal temporal structures than those who exhibit more procrastination.

Hypothesis 5: Good time managers will have a better understanding of University-related temporal structure relationships than poor time managers.

H5.1: Time managers who are good time planners will have a better understanding of university-related temporal structure relationships than those who are poor time planners.

H5.2: Time managers who meet more deadlines will have a better understanding of university-related temporal structure relationships than those who do not always meet deadlines.

H5.3: Time managers who perceive more control of their time will have a better understanding of university-related temporal structure relationships than those who feel a lack of control.

H5.4: Time managers who exhibit less procrastination will have a better understanding of university-related temporal structure relationships than those who exhibit more procrastination.

The above detailed hypotheses predict there are some temporal structure differences between good time managers and poor time managers. The overall proposed relationships among constructs are shown in the following research model (see Figure 5.3) and Table 5.2. The purpose for this research model is to answer the five research questions, and to gain a comprehensive understanding of the overall variable relationships. A more detailed description of this research model and model testing will be described in Chapter 8.

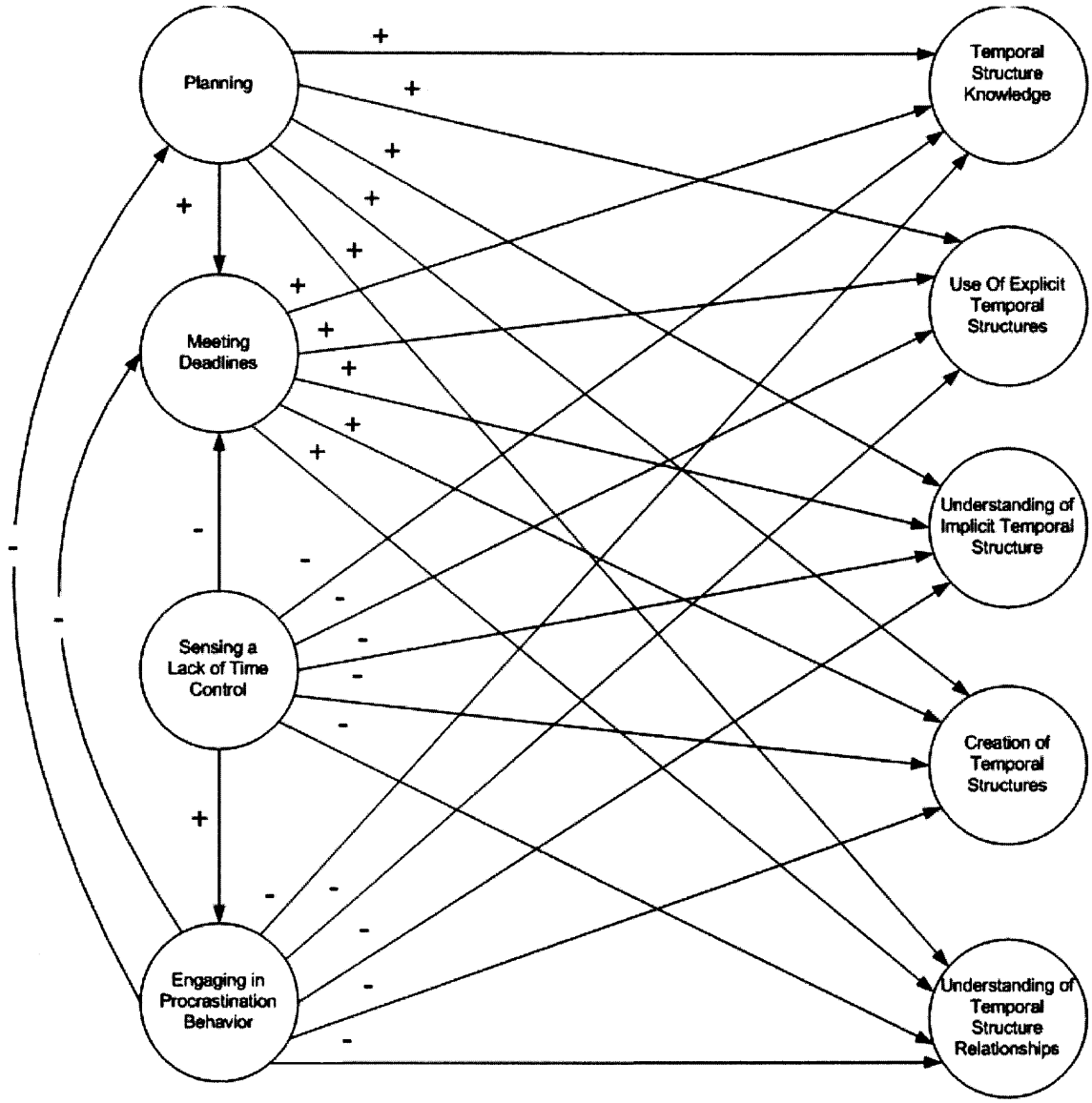

Figure 5.3 Temporal structure research model.
Note: "+" means there is a positive relationship between two variables, "-" represents a negative relationship between two variables.

Table 5.2 The Overall Proposed Relationships between Quality of Individual Time Management and Temporal Structures in the Research Model

	Bivariate Hypotheses	PLS Hypotheses
H1.1	*Time managers who are good time planners will have more temporal structure knowledge than those who are poor time planners.*	*Planning* will have a positive relationship with *temporal structure knowledge.*
H1.2	*Time managers who meet more deadlines will have more temporal structure knowledge than those who do not always meet deadlines.*	*Meeting deadlines* will have a positive relationship with *temporal structure knowledge.*
H1.3	*Time managers who perceive more control of their time will have more temporal structure knowledge than those who feel a lack of control.*	*Sensing a lack of control* will have a negative relationship with *temporal structure knowledge.*
H1.4	*Time managers who exhibit less procrastination will have more temporal structure knowledge than those who exhibit more procrastination.*	*Engaging in procrastination behavior will* have a negative relationship with *temporal structure knowledge.*
H2.1	*Time managers who are good time planners will use more explicit temporal structures than time managers who are poor time planners.*	*Planning* will have a positive relationship with *use of explicit temporal structures.*
H2.2	*Time managers who meet more deadlines will use more explicit temporal structures than those who do not always meet deadlines.*	*Meeting deadlines* will have a positive relationship with *use of explicit temporal structures.*
H2.3	*Time managers who perceive more control of their time will use more explicit temporal structures than those who feel a lack of control.*	*Sensing a lack of control* will have a negative relationship with *use of explicit temporal structures.*
H2.4	*Time managers who exhibit less procrastination will use more explicit temporal structures than those who exhibit more procrastination.*	*Engaging in procrastination behavior* will have a negative relationship with *use of explicit temporal structures.*

Table 5.2 The Overall Proposed Relationships between Quality of Individual Time Management and Temporal Structures in the Research Model (Continued)

	Bivariate Hypotheses	PLS Hypotheses
H3.1	*Time managers who are good time planners will have a better understanding of implicit temporal structures than those who are poor time planners.*	*Planning* will have a positive relationship with *understanding of implicit temporal structures.*
H3.2	*Time managers who meet more deadlines will have a better understanding of implicit temporal structures than those who do not always meet deadlines.*	*Meeting deadlines* will have a positive relationship with *understanding of implicit temporal structures.*
H3.3	*Time managers who perceive more control of their time will have a better understanding of implicit temporal structures than those who feel a lack of control.*	*Sensing a lack of control* will have a negative relationship with *understanding of implicit temporal structures.*
H3.4	*Time managers who exhibit less procrastination will have a better understanding of implicit temporal structures than those who exhibit more procrastination.*	*Engaging in procrastination behavior* will have a negative relationship with *understanding of implicit temporal structures.*
H4.1	*Time managers who are good time planners will create more personal temporal structures than those who are poor time planners.*	*Planning* will have a positive relationship with *creation of temporal structures.*
H4.2	*Time managers who meet more deadlines will create more personal temporal structures than those who do not always meet deadlines.*	*Meeting deadlines* will have a positive relationship with *creation of temporal structures.*
H4.3	*Time managers who perceive more control of their time will create more personal temporal structures than those who feel a lack of control.*	*Sensing a lack of control* will have a negative relationship with *creation of temporal structures.*
H4.4	*Time managers who exhibit less procrastination will create more personal temporal structures than those who exhibit more procrastination.*	*Engaging in procrastination behavior* will have a negative relationship with *creation of temporal structures.*

Table 5.2 The Overall Proposed Relationships between Quality of Individual Time Management and Temporal Structures in the Research Model (Continued)

	Bivariate Hypotheses	PLS Hypotheses
H5.1	*Time managers who are good time planners will have a better understanding of university-related temporal structure relationships than those who are poor time planners.*	*Planning* will have a positive relationship with *understanding of temporal structure relationships.*
H5.2	*Time managers who meet more deadlines will have a better understanding of university-related temporal structure relationships than those who do not always meet deadlines.*	*Meeting deadlines* will have a positive relationship with *understanding of temporal structure relationships.*
H5.3	*Time managers who perceive more control of their time will have a better understanding of university-related temporal structure relationships than those who feel a lack of control.*	*Sensing a lack of control* will have a negative relationship with *understanding of temporal structure relationships.*
H5.4	*Time managers who exhibit less procrastination will have a better understanding of university-related temporal structure relationships than those who exhibit more procrastination.*	*Engaging in procrastination behavior* will have a negative relationship with *understanding of temporal structure relationships.*

5.3 Data Collection and Measures

Major data were collected through the large survey in the second stage of this study. The detailed data collection plan is shown in Table 5.3. Quality of individual time management and the temporal structure measurements are presented in Tables 5.4, 5.5, 5.6, 5.7, and 5.8, respectively.

Table 5.3 Data Collection and Stages Used in the Dissertation

Hypotheses & Research Questions	Data Collection & Stage
Knowledge of temporal structures *H1.1, H1.2, H1.3, H1.4*	Semi-structured interview (Stage 1) Questionnaire (Stage 2)
Use of Explicit Temporal Structure *H2.1, H2.2, H2.3, H2.4*	Semi-Structured Interview (Stage 1) Questionnaire (Stage 2)
Understanding of Implicit Temporal Structures *H3.1, H3.2, H3.3, H3.4*	Questionnaire (Stage 2)
Creation of Temporal Structures *H4.1, H4.2, H4.3, H4.4*	Questionnaire (Stage 2)
Understanding of University-related Temporal Structure Relationships *H5.1, H5.2, H5.3, H5.4*	Questionnaire (Stage 2)
Research Questions *RQ1, RQ2, RQ3, RQ4, RQ5*	Questionnaire (Stage 2)

Table 5.4 Quality of Individual Time Management Measurements

Strongly Disagree 1 2 3 4 5 Strongly Agree

Constructs	Item No.	Question / Statement
Planning	ii225	On a work/school day, I usually make a schedule of the activities I have to do.
	ii224	Every day, I spend some time planning.
	ii226	I always plan my day before starting it.
	ii21	I usually make a list of things I have to do each day.
	ii26	At the beginning of each week, I plan what I will do for that week.
Meeting Deadlines	ii223	If I set priorities, I always honor them.
	ii29	I do the work that is the highest priority first.
	ii211	I feel that I always make constructive use of my time.
	ii213	I almost always get my work done on time.
Sensing a Lack of Time Control	ii210	I often have to stay up late to meet a deadline.
	ii27	I often underestimate the amount of time it will take to get something done.
	ii216	There is room for improvement in the way I manage my time.
	ii28	I find that I often spend too many hours on a project in order to make it perfect.
Engaging in Procrastination Behavior	ii24	I postpone doing hard tasks.
	ii212	I often postpone tasks that promised to do even though the deadline is approaching.
	ii215	I often postpone tasks that I promised to do even though the deadline is approaching.
	ii23	Socializing sometimes keeps me from making deadlines.
	ii220r	Whenever I have assigned tasks, I try to postpone doing them.

Table 5.5 Temporal Structure Measurements

Strongly Disagree 1 2 3 4 5 **Strongly Agree** (Note: S1 represents student sample, F stands for faculty sample, S2 means staff sample; items without showing sample resources, which mean that they are the same for student, faculty and staff.)

Constructs	Item No.	Question / Statement
Use of Explicit Temporal Structures	ii56	I write in special holidays in my calendar when they are not marked.
	ii55	I write birthdays and anniversaries in my calendar.
	ii54	I use my calendar to write down meetings with friends and colleagues.
	ii510	I always write my vacation plans in my calendar.
	ii51	I write due dates for my assignments/conferences/maintenance in my calendar.
	ii57	I put key dates for the university academic calendar into my calendar.
Understanding of Implicit Temporal Structures	ii513 (S1) ii516 (F) ii515 (S2)	I know I can always buy cheap products after big holiday.
	ii514 (S1)	I know I cannot have an incomplete grade before my graduation ceremony.
	ii512	I plan my travel time to avoid heavy traffic.
	ii515	It is expensive to book an airline ticket before traveling.
Creation of Temporal Structures	ii610(S1) ii66(S2, F)	I allocate time each day for planning and coordinating my schedules.
	ii611	I allocate time in my calendar in order to meet a deadline.
	ii69	I reserve time in my calendar for the possibility of having to change meetings with various people.
	ii63	I have specific times each week that I set aside for not allowing my friends to interrupt.
	ii65	When I work on a team, we always set aside a specific time each week when we can meet.
Understanding of University-related Temporal Structure Relationships	ii73 (S1)	I need to get my required form signed before my advisor leaves for a conference.
	ii72 (S1)	I need to know early when all my exams are held because some of them may conflict with others.
	ii71 (S1)	If I want to have a good class schedule for the next term, I need to register early.
	ii75 (S1)	I do not make any appointment with my advisor after 6:00 PM, since I know he/she will not be available at that time.
	ii74 (S1)	If it is possible, I want to schedule courses not during my specific holiday period.
	ii79 (F)	If possible, I intend to schedule my classes and meetings together within two or three days, since this arrangement can save my commuting time.
	ii710 (F)	I try to schedule my meeting with other faculty members when our university holds faculty meetings on the same day.
	ii79 (S2)	Whenever my supervisor needs to write annual reports for my unit, I usually try to allocate time to prepare for materials for him/her.
	ii78 (S2)	I am aware of my colleagues' availability, so I can do possible schedule adjustments if any emergency happens.

Table 5.6 Temporal Structure Knowledge (For Student)

Item No.	Question / Statement
ii41	I must schedule the use of the tennis courts a day in advance.
ii42	The food court closes at 7:00 PM during the week.
ii43	Classes are sometimes held on Saturday morning at NJIT.
ii44	Most day classes at NJIT are held twice a week.
ii45	I must submit my request to graduate during the first week of that semester.
ii46	I must pay my fees before the semester starts or I will be dropped as an NJIT student, even though I have registered for my courses.
ii47	The reading period that occurs before final exams is 1.5 weeks long.
ii48	In general, I can always drop a class right up to the last day of classes without penalty.
ii49	The Fall semester at NJIT is twelve weeks long.
ii410	Students must make up an incomplete grade one semester after they receive the grade, if they do not want to automatically receive an F.
ii411	If I do not register for classes within one week after the start of the term, I must pay a late fee.
ii412	Spring Break usually occurs at the end of February.
ii413	The gym closes at 12:00 midnight during the week.
ii414	The library is open until midnight daily.
ii415	There is free class period between 2:30 PM and 4:00 PM on Wednesdays.

Table 5.7 Temporal Structure Knowledge (For Faculty)

Item No.	Question / Statement
ii41	An untenured faculty will submit his or her materials for consideration for tenure during their fifth year at NJIT.
ii42	An Associate Professor is usually considered for promotion to Full Professor after working at NJIT for twelve years.
ii43	The NJIT faculty meeting is held twice per semester.
ii44	Equipment from media services must be reserved for classes at least twenty-four hours in advance.
ii45	I can apply for sabbatical leave after I have worked for NJIT for four years.
ii46	Faculty Statement of Activities reports are due in November yearly.
ii47	The open enrollment period for changing health benefits occurs in January every year.
ii48	If I borrow a book from the library, I am allowed to keep it for one month before renewing it.
ii49	I must submit travel reimbursements within two weeks after I have traveled.
ii410	I need to schedule office hours equal to the number of hours I teach.
ii411	I must schedule office hours on two separate days of the week.
ii412	If I am traveling, I need to warn my department about my travel plans at least one week before my travel begins.
ii413	If I intend to take a sabbatical, I must turn in my papers requesting the sabbatical by May before the academic year in which I plan to take the sabbatical.
ii414	I am allowed one day for consulting each week of the academic term.

Table 5.8 Temporal Structure Knowledge (For Staff)

Item No.	Question / Statement
ii41	The parking garage opens at 8:00 AM from Monday to Friday.
ii42	Human Resources is closed between noon and 1:00 PM.
ii43	Summer working hours begin at the end of May and end the last day in August.
ii44	If a new telephone connection is ordered, it will typically be connected within two weeks.
ii45	Typically, my position is renewed once a year.
ii46	The university pays its staff and faculty every two weeks.
ii47	Time sheets must be turned in two weeks before the next pay period of the university.
ii48	Staff employee evaluation forms must be turned in by May each year.
ii49	The Fall term is twelve weeks long.
ii410	Special rooms must be reserved five days in advance.
ii411	If an item is to be put on the university calendar, it must be submitted to the publicity office at least four weeks before it is to be published.
ii412	The open enrollment period for changing health benefits occurs in January every year.

In summary, Chapter 5 drew together the time management and temporal structure concepts into an argument for investigating their relationship in order to support the proposal to include multiple temporal structure features into electronic time management tools. Additional support was garnered for investigating the relationship between time management practices and temporal structures from interviews of good time managers. The reasoning from the literature review and interview study was used to create the research design for the survey presented and analyzed in the next chapters of

this thesis. The research design included the hypotheses to be tested, the constructs to be captured, the data collection plan, the measurement plan and the data analysis plan.

In Chapter 6, the survey delivery process is briefly described followed by a detailed descriptive analysis of the demographical information collected for the student, faculty and staff datasets. The confirmatory factor analysis, normality tests and index validation are also presented. Finally, a univariate analysis on each construct items for the three samples is reported in detail in last part of this chapter.

CHAPTER 6

DESCRIPTIVE DATA ANALYSIS AND INDEX VALIDATION

This chapter first describes the survey delivery process in an Eastern U. S. University. This is followed by descriptive data analysis, which presents the results of the survey in Section 6.2. This chapter also covers the questionnaire index validation, which can be found in Section 6.3. The validation method chosen was confirmatory factor analysis. All valid factor loadings and the Cronbach's Alpha value for each construct are presented in Section 6.3. Detailed univariate data analysis for each valid question item is presented in Section 6.4. Finally, a normality test for each construct is reported in Section 6.5.

6.1 Survey Design and Delivery Description

In this study, a total of 738 people responded to our survey either via an online survey or by filling in a hard copy questionnaire. The respondents' roles ranged from students, faculty to staff members. The survey was advertised via personal contacts and emails to members of the campus. First, contact information of potential participants was gathered either through the University Provost's office, or via colleagues. We also used the online public information listed for each academic department. Then the advertisement of this study was delivered via email to these potential participants. The incentive for answering this survey was the chance to win a state-of-the-art PDA for faculty and staff participants, or to earn three extra credits in class for student participants. The data collection process took about four months from November 2004 to February 2005.

This survey collected three major aspects of information from the participants. First, demographic information was requested in the first section of the survey. Second, a set of questions asked for information on the perceived quality of individual time management. These questions covered four properties of individual time management quality including *planning, meeting deadlines, sensing of a lack of time control,* and *engaging in procrastination behavior.* High values on the first two constructs identified good time managers, as did low values on the last two constructs. Third, as major dependent measures of temporal structures, five subsets of questions were designed to examine *temporal structure knowledge, use of explicit temporal structures, understanding of implicit temporal structures, creation of temporal structures,* and *understanding of university-related temporal structure relationships.* The detailed questions that formed these constructs will be discussed in Section 6.4.

Based upon empirical time management studies from the education and psychology fields, we adopted and modified ten useful questions on time management measurement (see Chapter 5), and also developed new questions to measure what we thought were critical to assess the quality of individual time management. Eventually we designed four time management constructs including two positive ones – *planning* and *meeting deadlines,* and two negative ones – *sensing a lack of time control* and *engaging in procrastination behavior.* These four constructs are utilized to measure our major independent variable – quality of individual time management. The detailed question items are listed in Chapter 5.

The key dependent variables are all concerned with temporal structures. However, we were not able to find existing validated temporal structure construct measures that could be directly adopted from the previous research. Because temporal structure research is still in a theory building stage in management science and organization behavior fields, and little empirical measures exist. Most scholars have developed their ideas to categorize different types of temporal structures from case studies in business organizations using qualitative measures. Information systems researchers have just begun to introduce issues of temporality to the IS field. We therefore created our own temporal structure questions, in part, because we needed to direct these questions to the temporal aspects of the organization we were studying. Our survey was validated through iterative development on a representative subject population of 10 people from each of three types of people we measured. The subjects were asked to explain their answers and then to explain the question. Based upon their feedback, some of the survey questions were rewritten and were iterated again until the responses matched what we expected. This iteration process took one month and half to complete. The validated five temporal structure constructs include "*temporal structure knowledge*," "*use of explicit temporal structures in personal calendars*," "*understanding of implicit temporal structures*," "*creation of temporal structures*" and "*understanding of university-related temporal structure relationships.*" The aim of our study is to understand how much knowledge different professionals have, and to investigate how individuals capture, and use explicit and implicit temporal structures to conduct their personal time management.

Because temporal structures are specifically related to individuals' work environment, the questionnaire was customized for students, faculty and staff members at

the researched university. Some common temporal structure information for the three types of people was gathered in the two semi-structured interviews, and was used to design the survey. For example, students answered temporal structure knowledge questions, such as "*I must schedule the use of the tennis courts a day in advance (true or false),*" "*I must submit my request to graduate at the end of a semester during the first week of that semester (true or false),*" "*the reading period that occurs before final exams is 1.5 weeks long (true or false)*" etc. For faculty members, the temporal structure knowledge questions were necessarily different. For instance, "*the faculty meeting is held twice per semester (true or false),*" "*faculty statement reports are due in November yearly (true or false),*" "*I need to schedule office hours equal to the number of hours I teach (true or false)*" etc. For staff members, temporal structure questions were customized as well, for example, the true false questions for them were "*if a new telephone connection is ordered, it will typically be connected within two weeks,*" "*time sheets must be returned in two weeks before the next pay period of the university,*" "*typically, my position is renewed once a year* " etc.

Mostly, *the use of the explicit temporal structures* construct included questions on explicit deadlines, meeting schedules and common deadlines for each specific group of people, for example, assignment deadlines for students, conference deadlines for faculty members, and maintenance deadlines for staff members. We were also interested in whether people recorded the temporal structure information into their personal calendars, and how they captured and understood implicit social temporal structures/norms in their individual time management. Thus, two sets of questions were designed to measure the use of explicit temporal structures, and an individual's understanding of implicit temporal

structures. Furthermore, we predicted that good time managers would be more likely to create their own temporal structures in their personal time management, and thus another set of questions was designed to measure the creation of temporal structures. In addition, we wanted to know how people understood the relationships among their temporal structures, so we also designed questions to measure understanding of university-related temporal structure relationships. More detailed constructs can be found in the "index validation" section.

6.2 Descriptive Data Analysis

This section summarizes the demographic information for three different samples including students, faculty and staff members. There were a total of 739 subjects who participated in this study. After eliminating invalid subjects (mostly because they were not true members of our investigated organization and therefore unlikely to have sufficient knowledge of its temporal structures or norms), the total number of valid responses was 703. Among the respondents, there were 560 students, 60 faculty, and 83 staff members (See Table 6.1 below).

Table 6.1 Number of Subjects Who Responded to the Questionnaire

Type of Sample	Total Responses	Valid Responses
Student	578	560
Faculty	62	60
Staff	99	83
Total	739	703

6.2.1 Student Sample (560 students)

Among the total of 578 student responses, there are 18 Ph. D. students, who are considered as outliers for the student sample. Since most Ph. D. students perform work

that is similar to faculty members, who do teaching and research, we removed them from the student set. Therefore, we used the remaining 560 responses for the student sample. There are many more male students (406, 72.5%) than female students (149, 26.6%) in the student sample which is characteristic of this engineering focused university. Five students didn't disclose their gender information. Seventy-six percent are full-time students; nineteen percent are part-time students, and the remaining are registered as non-matriculated students, which mean that they are not officially admitted by any program. Fifty-three percent of them are pursuing their bachelor degree; about forty percent are Masters students, and the rest students are not in any of degree program. The majority of the students are less than thirty years old (84.6%), about eleven percent are 31 – 40 years old, and the rest of them are over 40 years old. Almost ninety percent of the students have over five years of computer experience. The 560 students have diverse cultural backgrounds, which can be demonstrated from their native language distribution. About forty percent of their native language is English, and the other native languages are Chinese, Spanish, French, Korean, and Hindi.

Although the majority of the students are full-time, most of them are working while studying. Regarding their study hours per week, about forty-three percent students reported that they study less than 20 hours each week, about thirty-six percent study between 20 to 30 hours, about twelve percent study between 31 to 40 hours, about five percent study 41-50 hours, and the rest study over 50 hours each week. About twenty-seven percent reported working less than 20 hours every week; about fourteen percent work between 21 – 30 hours; thirteen percent work 31 – 40 hours, and about eighteen

percent students work over 40 hours each week. The rest did not report their work hours. The above time allocation shows how busy they are.

Because of the nature of this research, we are also interested in knowing whether people use any tools to assist their time management. Seventy-nine percent of our student participants reported using a variety of time management tools including both traditional paper-based tools and computer-based time management tools. Their tool selection is diverse. For example, they use Yahoo!™ Online Calendar, Outlook™ in both mobile devices (e.g. cell phone, Palm, PDA etc) and laptops, pocket-sized/wall-sized paper calendars, paper-based to-do lists, the university calendar, Lotus Notes calendars, and so on.

The detailed student demographic information can be found in Table 6.2.

Table 6.2 Demographic Information for the Student Sample

Items		N (%)	Missing Data
Gender	**Female**	149 (26.6%)	5 (0.9%)
	Male	406 (72.5%)	
Study Status	**Full-time**	426 (76.1%)	18 (3.2%)
	Part-time	109 (19.5%)	
	Non-matriculated	6 (1.1%)	
	Other	1 (0.2%)	
Degree Program	**Bachelor's**	299 (53.4%)	34 (6.1%)
	Masters'	226 (40.4%)	
	Other	1 (0.2%)	
Age	**20 or under**	42 (7.50%)	1 (0.2%)
	21-30	432 (77.1%)	
	31-40	63 (11.3%)	
	41-50	21 (3.8%)	
	51-60	1 (0.2%)	

Table 6.2 Demographic Information for the Student Sample (Continued)

Items		N (%)	Missing Data
Computer Experience	**1 year**	1 (0.2%)	2 (0.4%)
	2-3 years	9 (1.6%)	
	4-5 years	46 (8.2%)	
	Over 5 years	502 (89.7%)	
Native Language	**English**	226 (40.4%)	2 (0.4%)
	Spanish	38 (6.8%)	
	Hindi	78 (13.9%)	
	Chinese	39 (7.0%)	
	Korean	5 (0.9%)	
	Japanese	1 (0.2%)	
	French	4 (0.7%)	
	Arabic	15 (2.7%)	
	Other	159 (27.1%)	
Study Hours/ Week	**<20 hrs**	239 (42.6%)	3 (0.5%)
	21-30 hrs	201 (35.9%)	
	31-40 hrs	69 (12.3%)	
	41-50 hrs	25 (4.5%)	
Study Hours/ Week	**51-60 hrs**	10 (1.8%)	
	61-70 hrs	3 (0.5%)	
	Over 70 hrs	9 (1.6%)	
Work Hours/ Week	**<20 hrs**	149 (26.6%)	159 (28.4%)
	21-30 hrs	79 (14.1%)	
	31-40 hrs	73 (13.0%)	
	41-50 hrs	85 (15.2%)	
	51-60 hrs	13 (2.3%)	
	61-70 hrs	1 (0.2%)	
	Over 70 hrs	1 (0.2%)	
Years at the University	**< 1 year**	46 (8.2%)	2 (0.3%)
	1-3 years	352 (62.9%)	
	3-6 years	45 (8.0%)	
	4-6 years	105 (18.8%)	
	6-10 years	6 (1.1%)	
	Over 10 years	3 (0.5%)	
Use of Time Management Tools	**Yes**	442 (79.0%)	
	No	118 (21.0%)	

6.2.2 Faculty Sample

Sixty-two faculty members participated in this study, and they returned their surveys and consent forms via either email or internal campus mail. In this sample, there are two senior administrators, who were considered as outliers for this group of people, since most of their time is devoted to university administration work instead of teaching and research. Thus, we collected sixty valid faculty responses.

In terms of gender distribution for the faculty sample, about twenty-two percent are females, and seventy-five percent are males. About fifty-nine percent of faculty members (including 18.4% tenure-track assistant professors, 18.4% associate professors, 15.0% full professors and 6.7% distinguished professors) are in a tenure-track or tenured. The rest of the faculty members included 8.3% adjunct faculty and 26.7% special lecturers, whose major responsibility is teaching. In terms of their age distribution, 3.3% are between 21 to 30 years old, 23.3% are between 31 to 40, 33.3% are between 41 to 50, 20% are between 51 to 60, and the rest of them are over 60. The majority of them (74.9%) have been employed in this university for over three years. Most of them speak English as their native language, and the rest of them are originally from India, China, Italy, Korea, etc. 77.3% of the faculty members reported working over 40 hours each week. 88.3% reported that they rely on their time management tools to manage their professional and family time, and only 11.7% do not use any tools and rely on their memory instead. More detailed faculty demographic information can be found in Table 6.3.

6.2.3 Staff Sample

In total ninety-nine staff members responded to the questionnaire. This sample includes sixteen university senior administrators including deans, department chairs, and vice presidents. Since senior administrative time management behavior dramatically differs from regular staff members, we treated these responses as the outliers. As a result, we have eighty-three valid staff data in this sample.

In the staff sample, about fifty-five percent are females, forty-four percent are males, and two staff members didn't disclose their gender. Among these eighty-three staff members, about nineteen percent hold Bachelor's degree, about fifty-four percent have their Masters' degree, about seven percent have their Ph. D. degree, and the rest of them hold Associate degrees, various professional certificates, and so on. In terms of their age, about twenty-one percent are between 21 to 30 years old, about twenty-two percent are between 31 to 40, about thirty-three percent are between 41 to 50, about eighteen percent are between 51 to 60, and the rest are over 60 years old. The majority of them (83%) have been working in this university for over three years, and. 85.5% are English native speakers. Over half of them (53%) spend over forty hours each week on their professional jobs. About ninety-five percent use various time management tools to support their professional lives. Table 6.4 summarizes the demographic information for the staff respondents.

Table 6.3 Demographic Information for the 60 Faculty Respondents

Items		N (%)	Missing Data
Gender	**Female**	13 (21.7%)	2 (3.3%)
	Male	45 (75.0%)	
Work Role	**Adjunct Faculty**	5 (8.3%)	4 (6.5%)
	Assistant Prof.	11 (18.4%)	
	Associate Prof.	11 (18.4%)	
	Full Professor	9 (15.0%)	
	Distinguished Prof.	4 (6.7%)	
	Special Lecturer	16 (26.7%)	
Age	**21-30**	2 (3.3%)	
	31-40	14 (23.3%)	
	41-50	20 (33.3%)	
	51-60	12 (20.0%)	
	Over 60	12 (20.0%)	
Years at the University	**< 1 year**	5 (8.4%)	1 (1.6 %)
	1-3 years	10 (16.7%)	
	3-5 years	12 (20.0%)	
	5-8 years	5 (8.3%)	
	8-10 years	4 (6.7%)	
	Over 10 years	23 (38.3%)	
Use of Time Management Tools	**Yes**	53 (88.3%)	0 (0%)
	No	7 (11.7%)	
Computer Experience	**1 year**	1 (1.7%)	1 (1.6%)
	2-3 years	0 (0 %)	
	4-5 years	0 (0 %)	
	Over 5 years	58 (96.7%)	
Native Language	**English**	39 (65.0%)	0 (0%)
	Spanish	1 (1.7%)	
	Hindi	1 (1.7%)	
	Chinese	7 (11.7%)	
	Korean	1 (1.7%)	
	Italian	1 (1.7%)	
	Kikuyu	1 (1.7%)	
	French	2 (3.3%)	
	Other	7 (11.5%)	
Profession Work Hours/ Week	**<20 hrs**	2 (3.3%)	1 (1.7%)
	21-30 hrs	1 (1.7%)	
	31-40 hrs	12 (20.0%)	
	41-50 hrs	18 (30.0%)	
	51-60 hrs	15 (25.0%)	
	61-70 hrs	6 (10.0%)	
	Over 70 hrs	5 (8.3%)	

Table 6.4 Demographic Information for the 83 Staff Respondents

Items		N (%)	Missing Data
Gender	**Female**	45 (54.9%)	2 (2.4%)
	Male	36 (43.9%)	
Education Background	**Bachelor's**	16 (19.3%)	9 (10.8%)
	Masters'	45 (54.3%)	
	Ph. D.	6 (7.2%)	
	Other	7 (8.4%)	
Age	**20 or under**	0 (0%)	1 (1.2%)
	21-30	17 (20.5%)	
	31-40	18 (21.7%)	
	41-50	27 (32.5%)	
	51-60	15 (18.1%)	
	Over 60	5 (6.0%)	
Years at the University	**< 1 year**	12 (14.6%)	2 (2.4%)
	1-3 years	5 (6.1%)	
	3-5 years	17 (20.5%)	
	5-8 years	12 (14.6%)	
	8-10 years	6 (7.3%)	
	Over 10 years	29 (34.6%)	
Use of Time Management Tools	**Yes**	79 (95.2%)	1 (1.2%)
	No	3 (3.6%)	
Computer Experience	**1 year**	0 (0%)	1 (1.2%)
	2-3 years	0 (0%)	
	4-5 years	0 (0%)	
	Over 5 years	82 (98.8%)	
Native Language	**English**	71 (85.5%)	1 (1.2%)
	Spanish	4 (4.9%)	
	Hindi	1 (1.2%)	
	Chinese	5 (6.0%)	
	Other	1 (1.2%)	
Profession Work Hours/ Week	**<20 hrs**	0 (0%)	3 (3.6%)
	21-30 hrs	1 (1.2%)	
	31-40 hrs	35 (42.2%)	
	41-50 hrs	30 (36.1%)	
	51-60 hrs	11 (13.3%)	
	61-70 hrs	3 (3.6%)	
	Over 70 hrs	0 (0%)	

6.3 Construct Independence

Confirmatory factor analysis was conducted to assess the validity of the major constructs designed for this study. Varimax is an oblique rotation method utilized to identify factors that are entirely independent, so it is considered as an appropriate rotation method for confirmatory factor analysis. This section presents construct independence for the three samples of student, faculty and staff responses.

Confirmatory factor analysis was run to confirm all the designed constructs. Table 6.5 and Table 6.6 below summarize all independent factor loadings for each construct. The tables also indicate the Cronbach's Alpha value for each construct. In the tables, S1 represents the student sample, F refers to the faculty sample, and S2 means the staff sample. The items with "r" (e.g. ii220r) mean that these items were reversed when we computed the constructs. "-" means the items did not load for specific constructs.

Table 6.5 Factor Loadings of Finalized Items for the Three Samples (1)

Constructs	Items	F1			F2			F3			F4			F5			F6		
		S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2
F1: Planning Cronbach Alpha: S1 = 0.82 F = 0.84 S2= 0.78	ii225	0.82	0.84	0.83															
	ii224	0.79	0.79	0.58															
	ii226	0.76	0.82	0.88															
	ii21	0.73	0.70	0.79															
	ii26	0.72	0.77	0.56															
F2: Meeting Deadlines Cronbach Alpha: S1= 0.64 F = 0.78 S2 = 0.58	ii223				0.75	0.76	0.70												
	ii29				0.71	0.78	0.50												
	ii211				0.66	0.80	0.73												
	ii213				0.65	0.77	0.71												
F3: Sensing a Lack of Time Control Cronbach Alpha: S1= 0.62 F= 0.75 S2= 0.63	ii210							0.77	0.90	0.61									
	ii27							0.70	-	0.80									
	ii216							0.66	-	0.60									
	ii28							0.62	0.90	0.75									

Note: "r" means the question item has been reversed; "S1" represents the student Sample; "F" stands for the faculty sample; "S2" means the staff sample; "-" means the items did not load for specific constructs.

Table 6.5 Factor Loadings of Finalized Items for the Three Samples (1) (Continued)

Constructs	Items	F1			F2			F3			F4			F5			F6		
		S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2
F4: Engaging in Procrastination Behavior Cronbach Alpha: S1 = 0.69 F = 0.73 S2 = 0.70	ii212										0.76	-	-						
	ii215										0.63	0.86	0.81						
	ii23										0.62	0.69	0.71						
	ii220r										0.52	-	-						
F5: Time Management Need Cronbach Alpha: S1 =0.81 F = 0.87 S2 = 0.81	ii33r													0.78	0.84	0.84			
	ii34r													0.76	0.84	0.79			
	ii36r													0.74	0.90	0.73			
	ii35r													0.72	0.86	0.72			
	ii313r													0.64	0.67	0.59			
	ii315r													0.62	-	0.65			
F6: Time Management Motivation Cronbach Alpha: S1 = 0.76 F = 0.65 S2 =0.83	ii316																0.84	0.86	-
	ii312																0.82	-	-
	ii314																0.82	0.86	-
	ii31r																-	-	0.93
	ii37r																-	-	0.93

Note: "r" means the question item has been reversed; "S1" represents the student Sample; "F" stands for the faculty sample; "S2" means the staff sample; "-" means the items did not load for specific constructs.

Table 6.6 Factor Loadings for Finalized Items for Three Samples (2)

Constructs	Items	F7			F8			F9			F10			F11		
		S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2
F7: Use of Explicit Temporal Structures Cronbach's Alpha: S1 = 0.82 F = 0.69 S2 = 0.85	ii56	0.85	0.74	0.91												
	ii55	0.78	0.80	0.79												
	ii54	0.77	0.74	0.74												
	ii510	0.73	0.65	-												
	ii51	0.67	-	-												
	ii57	0.52	-	0.88												
F8: Understanding Of Implicit Temporal Structures Cronbach's Alpha: S1 = 0.56 F = 0.60 S2 = 0.53	ii513 (S1) ii516 (F)				0.73	0.86	0.83									
	ii514				0.65	-	-									
	ii512				0.64	-	-									
	ii515				0.62	0.86	0.83									
F9: Creation of Temporal Structures Cronbach's Alpha: S1 =0.75 F =0.67 S2 = 0.62	ii610(S1) ii66(F, S2)							0.83	0.79	0.85						
	ii611(S1) ii67 (F,S2)							0.80	0.78	0.85						
	ii69 (S1)							0.79	-	-						
	ii63 (S1) ii610 (F, S2)							0.57	0.76	-						
	ii65 (S1)							0.52	-	-						

Note: "r" means the question item has been reversed; "S1" represents the student Sample; "F" stands for the faculty sample; "S2" means the staff sample; "-" means the items did not load for specific constructs.

Table 6.6 Factor Loadings for Finalized Items for Three Samples (2) (Continued)

Constructs	Items	F7			F8			F9			F10			F11		
		S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2	S1	F	S2
F10: Understanding Of University Temporal Structure Relationships	**ii73 (S1)**										**0.77**	-	-			
	ii72 (S1)										0.72	-	-			
	ii71 (S1)										0.67	-	-			
	ii75 (S1)										0.59	-	-			
	ii74 (S1)										0.61	-	-			
Cronbach's Alpha:	ii79 (F)										-	0.86	-			
S1 = 0.69	ii710 (F)										-	0.86	-			
F =0.64	ii79 (S2)										-	-	0.85			
S2 = 0.62	ii78 (S2)										-	-	0.85			
F11: Perceived Usefulness of Time Management Tools	ii110r													0.81	0.76	-
	ii18													0.80	0.85	0.93
	ii17													0.79	0.84	0.90
	ii113r													0.69	0.71	-
Cronbach's Alpha:	ii119r													0.67	-	-
S1 = 0.83	i114													0.64	-	0.82
F = 0.77																
S2 = 0.85																

Note: "r" means the question item has been reversed; "S1" represents the student Sample; "F" stands for the faculty sample; "S2" means the staff sample; "-" means the items did not load for specific constructs.

6.4 Construct Univariate Analysis

This section presents the univariate data analysis on each validated question item for students, faculty and staff.

Table 6.7 presents the validated five question items for the *planning* construct for the three samples. It shows all the distributions from Strongly Disagree (1) to Strongly Agree (5), means (M) and standard deviations (SD) on each of five planning questions. For example, 34.9% of students (Agree percentage = 25.1%, Strongly Agree percentage = 9.8%), 43.8% of faculty members (Agree percentage = 29.8%, Strongly Agree percentage = 14.0%), and 31.7% of staff members (Agree percentage = 26.8%, Strongly Agree percentage = 4.9%) agreed or strongly agreed that "*I always plan my day before starting it.*" About half of the participants (students = 44.1%, faculty = 51.7%, and staff = 47.6%) reported that they usually make a schedule of activities they have to do. For everyday activities, 37% of the participants often make a list of things to do each day, and for weekly activities, 45.1% students, 40.7% faculty and 32.9% staff members reported that they plan at the beginning of the week.

Table 6.7 Planning Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii225	On a work/school day, I usually make a schedule of the activities I have to do.	Student	10.9	21.9	23.0	33.9	10.2	3.11	1.18
		Faculty	6.9	19.0	22.4	37.9	13.8	3.33	1.15
		Staff	8.5	24.4	19.5	35.4	12.2	3.18	1.19
ii224	Every day, I spend some time planning.	Student	9.7	20.6	30.3	29.4	10.0	3.09	1.13
		Faculty	11.9	22.0	25.4	25.4	15.3	3.10	1.26
		Staff	7.3	20.7	28.0	36.6	7.3	3.16	1.07
ii226	I always plan my day before starting it.	Student	13.6	23.1	28.4	25.1	9.8	2.94	1.19
		Faculty	17.5	21.1	17.5	29.8	14.0	3.02	1.34
		Staff	14.6	19.5	34.1	26.8	4.9	2.88	1.12
ii21	I usually make a list of things I have to do each day.	Student	17.9	24.6	19.6	25.9	12.0	2.89	1.30
		Faculty	22.0	22.0	18.6	25.4	11.9	2.83	1.35
		Staff	18.3	23.2	22.0	23.2	13.4	2.90	1.32
ii26	At the beginning of each week, I plan what I will do for that week.	Student	13.1	16.6	25.2	33.6	11.5	3.14	1.21
		Faculty	10.2	30.5	18.6	25.4	15.3	3.05	1.27
		Staff	13.4	22.0	31.7	25.6	7.3	2.91	1.15

(Cronbach's Alpha: Student = 0.82, Faculty = 0.84, Staff = 0.78)

Table 6.8 shows how participants meet their deadlines, which include four question items. Staff members reported the highest rate of honoring their priorities (students = 62.9%, faculty = 62.7%, and staff = 73.2%), and thus they do the highest priority work first when they are in the workplace (students = 77.3%, faculty = 77.6%, and staff = 84.2%). Staff members also reported the highest percentage (students = 44.6%, faculty = 48.3%, and staff = 52.4%) on completing their work on time.

Table 6.8 Meeting Deadlines Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii223	If I set priorities, I always honor them.	Student	2.0	12.2	23.0	42.3	20.6	3.67	1.00
		Faculty	3.4	15.3	18.6	45.8	16.9	3.58	1.05
		Staff	0	6.1	20.7	50.0	23.2	3.90	0.83
ii29	I do the work that is the highest priority first.	Student	1.5	7.6	13.6	35.3	42.0	4.09	0.99
		Faculty	1.7	13.8	6.9	44.8	32.8	3.93	1.06
		Staff	0	3.7	12.2	29.3	54.9	4.35	0.84
ii211	I feel that I always make constructive use of my time.	Student	1.1	5.9	15.8	43.3	33.9	4.03	0.91
		Faculty	1.7	6.9	6.9	50.0	34.5	4.09	0.92
		Staff	2.4	2.4	12.2	37.8	45.1	4.21	0.93
ii213	I almost always get my work done on time.	Student	3.6	16.9	34.8	34.2	10.4	3.31	0.99
		Faculty	3.4	17.2	31.0	34.5	13.8	3.38	1.04
		Staff	2.4	17.1	28.0	39.0	13.4	3.44	1.01

(Cronbach's Alpha: Student = 0.64, Faculty = 0.78, Staff = 0.58 (invalid))

Table 6.9 indicates how participants experienced sensing a lack of control over their time, forcing them to stay up late to meet a deadline (Mean: students = 3.68, faculty = 3.34, and staff = 2.70). People also frequently underestimated the amount of time that it took to get things done, so that they felt there was always room for improvement in the way they managed their time. Besides the underestimation of work time, other time problems, such as perfectionism (Mean: students = 3.43, faculty = 3.46, and staff = 3.51), also made people lose control of their time. All of the above time perspectives form the *sensing a lack of time control* construct.

Besides *sensing a lack of time control*, another negative time management issue that people frequently experienced was *engaging in procrastination behavior.* In this study, students exhibit the most procrastination behavior compared to the other two groups of people. For example, students reported highest scores on postponing hard tasks (Mean: students = 2.80, faculty = 2.41, and staff = 2.30), and on delaying the tasks they promised to do (Mean: students = 2.54, faculty = 2.14, and staff = 1.95). Students also complained the most that socializing keeps them from meeting deadlines (Mean: students = 2.97, faculty = 2.17, and staff = 2.06). These results can be found in Table 6.10.

Table 6.9 Sensing a Lack of Time Control Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii210	I often have to stay up late to meet a deadline.	Student	4.4	15.5	18.4	31.1	30.7	3.68	1.19
		Faculty	8.6	22.4	15.5	32.8	20.7	3.34	1.28
		Staff	19.8	24.7	27.2	22.2	6.2	2.70	1.20
ii27	I often underestimate the amount of time it will take to get something done.	Student	8.8	25.0	22.9	28.7	14.6	3.15	1.21
		Faculty	-	-	-	-	-	-	-
		Staff	18.5	27.2	17.3	27.2	9.9	2.83	1.29
ii216	There is room for improvement in the way I manage my time.	Student	1.5	4.9	18.0	37.8	37.8	4.06	0.94
		Faculty	-	-	-	-	-	-	-
		Staff	7.4	4.9	17.3	42.0	28.4	3.79	1.14
ii28	I find that I often spend too many hours on a project in order to make it perfect.	Student	4.4	20.0	23.1	32.9	19.6	3.43	1.14
		Faculty	3.4	20.3	22.0	35.6	18.6	3.46	1.12
		Staff	3.7	14.6	23.2	43.9	14.6	3.51	1.03

(Cronbach's Alpha: Student = 0.62, Faculty = 0.75, Staff = 0.70)

Table 6.10 Engaging in Procrastination Behavior Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii24	I postpone doing hard tasks.	Student	16.4	29.9	21.2	22.6	9.9	2.80	1.24
		Faculty	30.5	28.8	16.9	16.9	6.8	2.41	1.28
		Staff	30.5	29.3	22.0	15.9	2.4	2.30	1.14
ii212	Even though some of the activities I engage in are unprofitable I still do them.	Student	5.5	11.1	19.3	34.9	29.3	3.71	1.16
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii215	I often postpone tasks that I promised to do even though the deadline is approaching.	Student	24.1	30.7	19.3	19.0	6.9	2.54	1.24
		Faculty	37.3	32.2	15.3	10.2	5.1	2.14	1.18
		Staff	45.7	28.4	12.3	12.3	1.2	1.95	1.09
ii23	Socializing sometimes keeps me from making deadlines.	Student	15.1	22.9	23.6	27.1	11.3	2.97	1.25
		Faculty	36.2	34.5	10.3	13.8	5.2	2.17	1.22
		Staff	41.5	29.3	17.1	6.1	6.1	2.06	1.18
ii220	Whenever I have assigned tasks, I try to do them immediately.	Student	7.3	23.1	29.6	29.1	10.9	3.13	1.11
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-

(Cronbach's Alpha: Student = 0.69, Faculty = 0.73, Staff = 0.70)

The three groups of individuals responded differently to the *planning*, *meeting deadlines, sensing a lack of time control,* and *engaging in procrastination behavior* constructs. Underlying reasons may be that the different groups of participants have different time management needs. We found that students exhibited the least need to do time management for their work (Agree plus strongly agree rates on time management need: students = 61.2%, faculty = 71.2%, and staff = 78.0%). It is also interesting to find out that students reported that they manage their life well without time management techniques (Mean: students = 2.66, faculty = 2.54, and staff = 2.22). This may be because that the age of most students is between 20 and 30, and that their lives are not as complicated as the other two groups of people, so they perhaps indicated some over confidence on their time management capabilities.

Because of different roles being played by those three groups of people, their sense of time management need is also impacted by the nature of their professions. We found interesting responses from three samples (Mean: students = 2.26, faculty = 2.21, and staff = 2.41) on "*my performance has nothing to do with my personal time management*," so staff members seem not quite concerned about their time management in their work. Students continually experience short hard deadlines to turn in their assignments and projects, and to take exams, so that their academic performance should be relevant to their ability in managing their time well. Faculty members have much more time freedom than other people. Except for the face-to-face teaching requirements, they can adjust most of their schedules. For instance, if they cannot meet one conference paper deadline, they always have opportunities to submit their papers to other later conferences. However, most staff members are doing supportive work in their offices, and the majority

of their time allocation relies on the work orders created by others. They do as much as they care of their work in their eight hour work day, but they do not really worry about re-arranging additional time to finish their tasks. Their professional performance is not evaluated by grades (for student), or the amount of research papers published in a certain period (for faculty). Instead, their performance assessment is more likely to be based upon their availability everyday. More details about the *time management need* construct can be found in Table 6.11. The respondents also reported how they perceived their own time management motivation. This is shown in Table 6.12. Because the three samples had different question items which loaded on the construct, Table 6.12 only indicates the validated items for each group of people.

Table 6.11 Time Management Need Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii33	I don't need time management for my own work.	Student	26.1	35.1	25.0	11.5	2.3	2.29	1.05
		Faculty	39.0	32.2	20.3	8.5	0	1.98	0.97
		Staff	51.2	26.8	14.6	7.3	0	1.78	0.96
ii34	I have sufficient capabilities to handle my life well without time management techniques.	Student	15.3	30.2	32.1	18.3	4.1	2.66	1.07
		Faculty	23.7	25.4	28.8	16.9	5.1	2.54	1.18
		Staff	28.4	38.3	22.2	4.9	6.2	2.22	1.01
ii36	My performance has nothing to do with my personal time management.	Student	30.5	34.6	17.2	13.5	4.1	2.26	1.15
		Faculty	34.5	31.0	20.7	6.9	6.9	2.21	1.20
		Staff	26.9	33.3	17.9	15.4	6.4	2.41	1.22
ii35	Improving my time management will not benefit me.	Student	37.9	39.3	14.5	6.3	2.0	1.95	0.98
		Faculty	28.8	35.6	25.4	6.8	3.4	2.20	1.05
		Staff	49.4	27.2	13.6	6.2	3.7	1.88	1.10
ii313	My job/study does not require me to manage my time well.	Student	36.8	35.7	15.7	8.6	3.2	2.06	1.08
		Faculty	58.6	22.4	8.6	6.9	3.4	1.74	1.10
		Staff	53.8	30.0	13.8	2.5	0	1.65	0.81
ii315	I don't care if time is wasted or not.	Student	49.7	27.8	13.8	6.5	2.2	1.83	1.03
		Faculty	-	-	-	-	-	-	-
		Staff	58.2	30.4	7.6	3.8	0	1.57	0.80

(Cronbach's Alpha: Student = 0.81, Faculty = 0.87, Staff =0.81)

Table 6.12 Time Management Motivation Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii316	Good time management will make me more successful.	Student	1.3	3.6	9.9	28.6	56.7	4.36	0.89
		Faculty	10.3	8.6	15.5	29.3	36.2	3.72	1.32
		Staff	-	-	-	-	-	-	-
ii312	Without good time management, both my life and work will suffer.	Student	4.5	8.3	19.4	38.8	29.1	3.80	1.09
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii314	It is necessary to improve my time management to achieve my goals.	Student	3.2	7.5	22.8	36.4	30.1	3.83	1.05
		Faculty	15.5	12.1	32.8	24.1	15.5	3.12	1.27
		Staff	-	-	-	-	-	-	-
ii31	I have no time management problems at all in both my work and my personal life.	Student	-	-	-	-	-	-	-
		Faculty	-	-	-	-	-	-	-
		Staff	18.5	34.6	24.7	13.6	8.6	2.59	1.19
ii37	I don't need time management for my own work.	Student	-	-	-	-	-	-	-
		Faculty	-	-	-	-	-	-	-
		Staff	7.5	31.3	26.3	22.5	12.5	3.01	1.16

(Cronbach's Alpha: Student = 0.76, Faculty = 0.65, Staff = 0.83)

The major dependent variables for this study are all relevant to *temporal structures.* We designed five subsets of questions to measure *temporal structure knowledge, use of explicit temporal structures, understanding of implicit temporal structures, creation of temporal structures,* and *understanding of university-related temporal structures.*

The detailed question items on *temporal structure knowledge* for students, faculty and staff members are shown in table 5.5 (student), table 5.6 (faculty), and table 5.7 (staff) respectively. We counted the number of correct answers that our respondents gave, and then calculated the percentage of their correct answers to use as a measure of their temporal structure knowledge.

Regarding the *use of explicit temporal structures*, we designed questions that most people experience in their lives. For example, *"I write in special holidays in my calendar when they are not already marked," "I write birthdays and anniversaries in my calendar," "I use my calendar to write down meetings with friends/colleagues," "I put key dates for the university academic calendars into my calendar"* and so on. Because of different life roles, our subject population reported their calendar use for writing down meetings with friends/colleagues. Eighty-five percent of staff members and 85.1% of faculty reported they use this type of explicit temporal structures all the time, while only 28.9% of students recorded their meetings with friends/colleagues in their calendars.

We had difficulty designing the implicit temporal structures questions, because our subject population was widely diverse on their use and understand. The confirmatory factor analysis on this construct was only barely valid for faculty members (Cronbach's Alpha: faculty = 0.60). Student and staff samples suffered with weak Cronbach's Alpha

values (Cronbach's Alpha: student = 0.56, and staff = 0.53). We tried to capture implicit temporal structures that were likely to be geared to our population, we did not succeed. We use this construct in Chapter 8, when we use structural equation modeling to show relationships. Although we find correlations between implicit temporal structures under sturdy and quality of time management constructs, this result should be viewed with suspicion. Some of the questions that caused problems, probably because they were not relevant to all of the tested population, are: "*I plan my travel time to avoid heavy traffic,*" "*I know I can always buy cheap products after big holidays,*" "*It is expensive to book an airline ticket before traveling.*" The univariate analysis for this construct is displayed in Table 6.14.

In terms of temporal structure behavior, we also predicted that people will create their own temporal structures in order to achieve their time management goals. Therefore, we designed questions, such as "*I allocate time each day for planning and coordinating my schedules,*" "*I allocate time in my calendar in order to meet a deadline,*" "*I reserve time in my calendar for the possibility of having to change meetings with various people,*" "*I have specific times each week that I set aside for not allowing my friends to interrupt*" and so on. The creation of personal temporal structures is likely to reduce time uncertainty, so that it enhances individual time management quality. For three subject populations, staff members reported the highest level of temporal structure creation for their personal time management, e.g. for the question "*I allocate time each day for planning and coordinating my schedules,*" the mean of staff member answers is highest (Mean: students = 2.67, faculty = 2.55, and staff = 2.91). Staff also score highest on

allocating time to meet deadlines (Mean: students = 3.15, faculty = 3.60, and staff = 3.79). The full details are reported in Table 6.15.

Table 6.13 Use of Explicit Temporal Structure Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii56	I write in special holidays in my calendar when they are not already marked.	Student	29.1	17.9	15.7	18.1	18.4	2.82	1.52
		Faculty	22.4	20.7	17.2	12.1	27.6	3.02	1.54
		Staff	21.8	10.3	9.0	20.5	38.5	3.44	1.60
ii55	I write birthdays and anniversaries in my calendar.	Student	24.0	15.1	13.5	23.2	24.1	3.11	1.54
		Faculty	31.0	20.7	10.3	22.4	15.5	2.71	1.50
		Staff	29.1	15.2	13.9	13.9	27.8	2.96	1.61
ii54	I use my calendar to write down meetings with friends/colleagues.	Student	34.4	19.1	18.6	18.5	10.4	2.54	1.43
		Faculty	5.2	5.2	5.2	34.5	50.0	4.19	1.10
		Staff	2.5	5.0	7.5	23.8	61.3	4.36	1.00
ii510	I always write my vacation plans in my calendar.	Student	26.7	15.9	16.6	20.6	20.2	2.97	1.55
		Faculty	32.1	8.9	23.2	12.5	23.2	2.86	1.57
		Staff	-	-	-	-	-	-	-
ii51	I write the due dates for assignments and the dates of exam in my calendar.	Student	13.8	11.3	14.2	28.1	32.6	3.56	1.42
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii57	I put key dates for the university academic calendars into my calendar.	Student	40.2	22.2	17.1	12.4	8.1	2.28	1.35
		Faculty	-	-	-	-	-	-	-
		Staff	15.2	10.1	16.5	24.1	34.2	3.52	1.44

(Cronbach's Alpha: Student = 0.82, Faculty = 0.69, Staff = 0.85)

Table 6.14 Understanding of Implicit Temporal Structures Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii513 (S1)/ ii516 (F) /ii515(S2)	I know I can always buy cheap products after big holidays	Student	1.8	4.1	22.3	33.5	38.3	4.08	0.99
		Faculty	5.2	5.2	20.7	34.5	34.5	3.88	1.11
		Staff	2.5	3.8	10.0	15.0	68.8	4.44	0.99
ii514	I know I cannot have an incomplete grade before my graduation ceremony.	Student	3.2	2.4	18	20.5	55.9	4.27	1.04
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii512	I plan my travel time to avoid heavy traffic.	Student	4.4	10.8	23.5	32.1	29.2	3.77	1.16
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii515	It is expensive to book an airline ticket before traveling.	Student	4.3	3.6	12.5	21.9	57.7	4.32	1.10
		Faculty	1.7	5.2	12.1	79.3	1.7	4.72	0.74
		Staff	0	0	19.8	23.5	56.8	4.37	0.80

(Cronbach's Alpha: Student = 0.56, Faculty = 0.60, Staff = 0.53)

Note: S1 represents the student sample; F stands for the faculty sample; S2 means the staff sample. If the question items are not specified by the three samples respectively, this means all three groups use the same question items.

Table 6.15 Creation of Temporal Structures Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii610(S1) /ii66 (S2, F)	I allocate time each day for planning and coordinating my schedules.	Student	20.3	24.3	30.0	19.1	6.3	2.67	1.18
		Faculty	27.6	17.2	32.8	17.2	5.2	2.55	1.22
		Staff	19.7	21.1	18.4	30.3	10.5	2.91	1.32
ii611	I allocate time in my calendar in order to meet a deadline.	Student	13.7	17.5	22.3	33.3	13.2	3.15	1.25
		Faculty	8.6	12.1	19.0	31.0	29.3	3.60	1.27
		Staff	6.4	9.0	15.4	37.2	32.1	3.79	1.18
ii69	I reserve time in my calendar for the possibility of having to change meetings with various people.	Student	20.2	23.8	31.2	19.0	5.8	2.66	1.17
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii63	I have specific times each week that I set aside for not allowing my friends to interrupt.	Student	28.4	27.0	22.1	15.6	6.9	2.46	1.24
		Faculty	34.5	19.0	20.7	12.1	13.8	2.52	1.43
		Staff	-	-	-	-	-	-	-
ii65	When I work on a team, we always set aside a specific time each week when we can meet.	Student	5.0	8.1	21.8	37.1	28.0	3.75	1.10
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-

(Cronbach's Alpha: Student = 0.75, Faculty = 0.67, Staff = 0.62)

Note: S1 represents student sample; F stands for faculty sample; S2 means staff sample. If the question items are not specified by the three samples respectively, this means all three groups use the same question items.

Since students, faculty and staff experience different working/study temporal structures, their understanding of temporal structure relationships is assumed to be different. We thus designed different sets of questions on this construct for the three samples. For students, we designed questions like "*I need to know early when all my exams are held because some of them may conflict with others,*" "*If I want to have a good class schedule for the next term, I need to register early,*" "*If it is possible, I want to schedule courses that do not meet during my specific holiday period,*" and so on. For faculty members, we use questions such as "*I try to schedule my meeting with other faculty members when our university holds faculty meetings on the same day.*" One example question for staff member is "*I am aware of my colleagues' availability, so I can do possible adjustments if any emergency happens.*" (See details in Table 6.16).

Most professionals rely on time management tools to support their professional lives, so we are also interested in knowing how different groups of people perceive the usefulness of their time management tools (See Table 6.17). Based upon the responses we collected, we find that staff members perceive their time management to be more useful than students and faculty members. For example, staff members reported their time management tool(s) helped them manage their time most (Mean: students = 3.81, faculty = 3.76, and staff = 3.95).

Table 6.16 Understanding of University-related Temporal Structure Relationship Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii73	I need to get my required form signed before my advisor leaves for a conference.	Student	1.8	3.4	26.0	27.4	41.4	4.03	0.99
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii72	I need to know early when all my exams are held because some of them may conflict with others.	Student	3.1	5.9	15.6	27.8	47.6	4.11	1.07
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii71	If I want to have a good class schedule for the next term, I need to register early.	Student	1.1	2.2	8.5	22.0	66.2	4.50	0.83
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii75	I do not make any appointment with my advisor after 6:00 PM, since I know he/she will not be available at that time.	Student	4.5	3.1	23.4	24.5	44.5	4.01	1.10
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii74	If it is possible, I want to schedule courses that do not meet during my specific holiday period.	Student	5.4	9.6	31.9	26.0	27.1	3.60	1.14
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii79 (F)	If possible, I intend to schedule my classes and meetings to occur on the same day, since this arrangement can save my commuting time.	Student	-	-	-	-	-	-	-
		Faculty	5.5	14.5	25.5	25.5	29.1	3.58	1.21
		Staff	-	-	-	-	-	-	-
ii710 (F)	I try to schedule my meetings with other faculty members when our university holds faculty meetings on the same day.	Student	-	-	-	-	-	-	-
		Faculty	10.5	12.3	28.1	33.3	15.8	3.32	1.20
		Staff	-	-	-	-	-	-	-
ii79 (S2)	Whenever my supervisor needs to write annual reports for my unit, I usually try to allocate time to prepare for materials for him/her.	Student	-	-	-	-	-	-	-
		Faculty	-	-	-	-	-	-	-
		Staff	3.9	9.1	36.4	32.5	18.2	3.75	0.98
ii78 (S2)	I am aware of my colleagues' availability, so I can do possible schedule adjustments if any emergency happens.	Student	-	-	-	-	-	-	-
		Faculty	-	-	-	-	-	-	-
		Staff	3.9	9.1	36.4	32.5	18.2	3.52	1.02

(Cronbach's Alpha: Student = 0.69, Faculty = 0.64, Staff = 0.62)Note: S1 represents the student sample; F stands for the faculty sample; S2 means the staff sample. If the question items are not specified by the three samples respectively, this means all three groups use the same question items.

Table 6.17 Perceived Usefulness of Time Management Tools Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
ii110r	I use my time management tool(s) very much.	Student	8.2	15.9	20.7	32.5	22.7	3.44	1.25
		Faculty	7.3	12.7	20.0	36.4	23.6	3.56	1.20
		Staff	-	-	-	-	-	-	-
ii18	My time management tool(s) help(s) me to use my time more efficiently.	Student	3.2	11.3	24.4	40.3	20.8	3.68	1.06
		Faculty	0	12.7	20.0	52.7	14.5	3.69	0.88
		Staff	1.3	11.4	17.7	41.8	27.8	3.84	1.01
ii17	My time management tool(s) help(s) organize my time.	Student	3.6	7.5	21.0	43.4	24.5	3.81	1.04
		Faculty	0	11.1	18.5	53.7	16.7	3.76	0.87
		Staff	1.3	9.0	20.5	32.1	37.2	3.95	1.03
ii113r	I mostly rely on my time management tools instead of remembering things in my head.	Student	14.5	26.8	23.6	23.1	12.0	2.91	1.25
		Faculty	14.5	18.2	18.2	27.3	21.8	3.24	1.37
		Staff	-	-	-	-	-	-	-
ii119r	I often check my schedules written in my time management tool(s).	Student	4.1	10.7	20.0	38.9	26.3	3.70	1.14
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
ii114	I feel that my time management tool(s) help me achieve my long-term goals.	Student	6.3	17.7	30.8	32.4	12.8	3.30	1.12
		Faculty	-	-	-	-	-	-	-
		Staff	5.1	15.4	33.3	24.4	21.8	3.42	1.15

(Cronbach Alpha: Student = 0.83, Faculty = 0.77, Staff = 0.85)
Note: "r" means the question item was reversed.

6.5 Construct Normality Test

A normal distribution test is commonly conducted to assess whether to choose parametric or non-parametric methods for further data analysis. Section 6.5 reports the normality tests for student, faculty and staff on the constructs validated in the previous sections. These normality tests provide a basis on which to select the appropriate data analysis methods for the bivariate analysis and hypotheses testing in the next chapter.

In order to test normal distribution on the validated constructs, mean scores for all the constructs were calculated. The Kolmogorov-Smirnov test was chosen to conduct normal distribution test. The null hypothesis (H0) means that the data are normally distributed. If the Kolmogorov-Smirnov test is significant ($p<0.01$), that means the null hypothesis (H0) is rejected. So the answer "Yes" to "H0 rejected" indicates that the data are not normally distributed. Then a non-parametric analysis should be chosen for further data analysis. If H0 is accepted, a parametric method is chosen because we have matched conditions for this use and they are more powerful statistical methods. The normal distribution tests for student, faculty and staff samples are shown in Table 6.18.

In addition, in order to confirm that three samples are not normally distributed, both skewness and kurtosis analyses were conducted. The rule-of-thumb for normality is that values of skewness and kurtosis should be between +2.5 and -2.5. Table 6.19 show that the three samples are mostly negatively skewed (skewness value < 0).

In summary, this chapter reports the preliminary data results on basic descriptive data analysis, construct validation and univariate analysis on each question item for validated constructs. Then normality test and skewness and kurtosis analyses were conducted. These preliminary data analyses provide a basis to conduct further bivariate

data analysis and parametric and non-parametric tests in Chapter 7. The chapter 7 reports the correlations between the validated constructs, and presents the differences between good time managers and poor time managers regarding the quality of individual time management and their use and understanding of temporal structures. The main hypotheses are examined for three types of people including students, faculty and staff.

Table 6.18 Normal Distribution Test for the Student, Faculty and Staff Samples

Factors	Student Kolmogorov-Smironov Z	P value	Ho Rejected (Yes/No)	Faculty Kolmogorov -Smironov Z	P value	Ho Rejected (Yes/No)	Staff Kolmogorov-Smironov Z	P value	Ho Rejected (Yes/No)
Planning	0.078	0.000	Yes	0.112	0.200*	No	0.093	0.200*	No
Meeting Deadlines	0.101	0.000	Yes	0.113	0.200*	No	0.108	0.060	No
Sensing a Lack of Time Control	0.045	0.066	No	0.144	0.041	No	0.095	0.200*	No
Engaging in Procrastination Behavior	0.070	0.000	Yes	0.115	0.200*	No	0.125	0.014	No
Time Management Need	0.066	0.000	Yes	0.136	0.068	No	0.105	0.080	No
Time Management Motivation	0.113	0.000	Yes	0.155	0.019	No	0.142	0.003	Yes
Temporal Structure Knowledge	0.074	0.000	Yes	0.112	0.060	No	0.149	0.000	Yes
Use of Explicit Temporal Structures	0.061	0.002	Yes	0.093	0.200*	No	0.120	0.022	No
Understanding of Implicit Temporal Structures	-	-	-	0.209	0.000	Yes	-	-	-
Creation of Temporal Structures	0.035	0.200*	No	0.098	0.200*	No	0.192	0.000	Yes
Understanding of University Temporal Structure Relationships	0.089	0.000	Yes	0.200	0.000	Yes	0.125	0.015	No
Perceived Usefulness of Time Management Tools	0.053	0.015	No	0.081	0.200*	No	0.101	0.176	No

Table 6.19 Skewness and Kurtosis Computation for the Student, Faculty and Staff Samples

Factors	Student Skewness Statistic	S. E.	Kurtosis Statistic	S. E.	Faculty Skewness Statistic	S. E.	Kurtosis Statistic	S. E.	Staff Skewness Statistic	S. E.	Kurtosis Statistic	S. E.
Planning	-0.22	0.11	-0.44	0.21	-0.01	0.32	-0.57	0.62	-0.37	0.27	-0.50	0.53
Meeting Deadlines	-0.63	0.11	0.35	0.21	-0.65	0.32	0.57	0.63	-0.45	0.27	0.29	0.53
Sensing a Lack of Time Control	-0.33	0.11	0.04	0.21	-0.37	0.31	-0.73	0.62	-0.46	0.27	-0.12	0.53
Engaging in Procrastination Behavior	0.24	0.11	-0.43	0.21	0.82	0.31	-0.22	0.62	0.62	0.27	-0.68	0.53
Time Management Need	-0.44	0.11	-0.27	0.21	-0.77	0.32	0.75	0.62	-0.80	0.28	0.37	0.55
Time Management Motivation	-0.87	0.10	0.65	0.21	-0.51	0.32	-0.29	0.62	-0.43	0.27	-0.55	0.54
Temporal Structure Knowledge	-0.18	0.10	-0.34	0.21	-0.07	0.31	-0.99	0.61	-0.51	0.266	0.19	0.53
Use of Explicit Temporal Structures	-0.06	0.11	-0.68	0.21	-0.29	0.32	-0.32	0.63	-0.51	0.27	-0.83	0.54
Understanding of Implicit Temporal Structures	-	-	-	-	-2.10	0.32	6.25	0.62	-	-	-	-
Creation of Temporal Structures	0.01	0.10	-0.17	0.21	-0.08	0.32	-0.60	0.63	-0.61	0.28	-0.23	0.55
Understanding of University Temporal Structure Relationships	-0.63	0.10	0.41	0.21	-0.37	0.32	-0.59	0.63	-0.10	0.27	-0.50	0.54
Perceived Usefulness of Time Management Tools	-0.43	0.12	-0.25	0.23	-0.20	0.33	-0.24	0.64	-0.38	0.27	-0.58	0.54

CHAPTER 7

BIVARIATE CORRELATION ANALYSIS AND HYPOTHESES TESTING

This chapter presents the bivariate analysis results, and compares the differences between good time managers and poor time managers on their temporal structure knowledge, usage, and relationship understanding. The major hypotheses are examined in this chapter.

7.1 Bivariate Correlation Analysis for Student Sample

The normality test on the constructs for the student sample (see Table 6.18) indicates that only temporal structure knowledge, sensing a lack of time control, creation of temporal structure, and perceived usefulness of time management tool are normally distributed. Therefore, Pearson correlation analysis was chosen for analyzing these four constructs. The rest of the constructs are not normally distributed, therefore Spearman's R was chosen to conduct bivariate correlation analysis for these data sets.

Table 7.1 lists non-parametric correlations among the constructs that are not normally distributed. *Planning* is significantly correlated to *meeting deadlines* (Spearman's R = 0.32, $p < 0.01$). It is also negatively associated with *engaging in procrastination behavior* (Spearman's R = -0.29, $p < 0.01$). This implies that a time manager who meets deadlines should also be a good planner. Time planning that is conducted in advance avoids procrastination. We also find no obvious relationship between *planning* and *sensing a lack of time control* (Pearson R = - 0.023, see Table 7.3). We interpret this to mean even a good time planner also cannot avoid feeling a lack of

time control, e.g. planning may underestimate the task completion time. Time planning is strongly associated with their *time management motivation* (Spearman R = 0.20, p<0.01) and *time management need* (Spearman R = 0.18, p< 0.01), that is, those who plan both feel the need and desire to plan.

There are significant correlations between *planning* and *use of explicit temporal structures* (Spearman R = 0.43, p<0.01, see Table 7.1), and a weak significant correlation between *planning* and *understanding of university-related temporal structure relationships* (Spearman R = 0.15, p<0.01, see Table 7.1), and between *planning* and *creation of temporal structures* (Pearson R = 0.58, p<0.01, see Table 7.4).

Meeting deadlines is negatively correlated with *engaging in procrastination behavior* (Spearman R =-0.47, p < 0.01, See Table 7.1), and has a significant but weak positive correlation with both *use of explicit temporal structures* (Spearman R = 0.20, p< 0.01) and *understanding of university-related temporal structure relationships* (Spearman R = 0.15, p < 0.01). In Table 7.4, it also shows there is a significant correlation between *meeting deadline* and *creation of temporal structures* (Pearson R = 0.36, p< 0.01). Therefore, the tendencies to capture, use and understand explicit and implicit temporal structures significantly relate to meeting deadlines. In other words, good time managers are more likely to capture and use their explicit and implicit temporal structures, and thus create their own temporal structures to manage their time more efficiently.

Engaging in procrastination behavior is negatively and weakly associated with the use of explicit temporal structures (Spearman R = -0.17, p< 0.01, see Table 7.1). Sensing a lack of time control is significantly related to engaging in procrastination behavior (Pearson R =0.40, p< 0.01, see Table 7.3). Lack of time control significantly motivates

time managers to learn and understand temporal structure relationships (Pearson R = 0.19, $p < 0.01$, see Table 7.3). The data also suggest that sensing a lack of time control is negatively associated with individual perceived usefulness of time management tools. In other words, if time managers perceive their tools as useful for their personal time management, they might also perceive that they have more time control. Table 7.4 also suggests that use of explicit temporal structures (Pearson R = 0.53, $p < 0.01$) and understanding of temporal structure relationships (Pearson R = 0.21, $p < 0.01$) significantly correlate with the creation of temporal structures.

Although these correlations are significant, almost none of them exceeds the 0.5 level, suggesting that although temporal structure use and understanding is probably a necessary condition for a student to be a good time manager, other factors must also play a role in their behavior. In the next section, we evaluate the faculty sample.

Table 7.1 Non-Parametric Bivariate Correlation Analysis for Student Sample

Constructs	Planning	Meeting Deadlines	Engaging in Procrastination Behavior	Time Management Need	Time Management Motivation	Use of Explicit Temporal Structures	Temporal Structure Relationship
Planning	1						
Meeting Deadlines	0.32 **	1					
Engaging in Procrastination Behavior	-0.29**	-0.47**	1				
Time Management Need	0.18**	0.06	-0.04	1			
Time Management Motivation	0.20**	0.08	0.10*	0.56**	1		
Use of Explicit Temporal Structures	0.43**	0.20**	-0.17**	0.14**	0.08	1	
Temporal Structure Relationship	0.15**	0.27**	-0.02	0.20**	0.35**	0.09**	1

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 7.2 Parametric Bivariate Correlation Analysis on "Temporal Structure Knowledge" for Student Sample

Items	Temporal Structure Knowledge
Planning	-0.071
Meeting Deadlines	0.007
Engaging in Procrastination Behavior	0.123**
Time Management Need	0.069
Time Management Motivation	0.020
Use of Explicit Temporal Structures	-0.095*
Creation of Temporal Structures	-0.089*
Temporal Structure Relationship	0.196**
Perceived Usefulness of Time Management Tool	-0.020

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 7.3 Parametric Bivariate Correlation Analysis on "Sensing a Lack of Time Control" for Student Sample

Items	Lack of Control
Temporal Structure Knowledge	0.042
Planning	-0.023
Meeting Deadlines	-0.070
Engaging in Procrastination Behavior	0.402**
Time Management Need	0.242**
Time Management Motivation	0.448**
Use of Explicit Temporal Structures	-0.069
Creation of Temporal Structures	-0.029
Temporal Structure Relationship	0.194**
Perceived Usefulness of Time Management Tool	-0.147**

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 7.4 Parametric Bivariate Correlation Analysis on "Creation of Temporal Structures" for Student Sample

Items	Creation of Temporal Structures
Temporal Structure Knowledge	-0.089*
Planning	0.583**
Meeting Deadlines	0.355**
Engaging in Procrastination Behavior	-0.292**
Sensing a Lack of Time Control	-0.029
Time Management Need	0.130**
Time Management Motivation	0.212**
Use of Explicit Temporal Structures	0.530**
Temporal Structure Relationship	0.214**
Perceived Usefulness of Time Management Tool	0.455**

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

7.2 Bivariate Correlation Analysis for Faculty Sample

Based upon normal distribution test results (Table 6.18), only two constructs, *the understanding of implicit temporal structures* and *the understanding of university-related temporal structures* are not normally distributed, so their correlation analysis needs to be run with a non-parametric method. The remaining constructs are all normally distributed, and thus, a Pearson's R correlation analysis was conducted. Details of this analysis are shown in both Table 7.5 and Table 7.6.

For the faculty sample, *planning* exhibits significant correlations with *the use of explicit temporal structures* (Pearson R = 0.36, $p < 0.01$) and *creation of temporal structures* (Pearson R = 0.69, $p < 0.01$). There are also significant correlations between *planning* and *time management need* (Pearson R = 0.46, $p < 0.01$), and between *planning* and *time management motivation* (Pearson R = 0.45, $p < 0.01$). *Meeting deadlines* is

significantly correlated to *creation of temporal structures* (Pearson R = 0.40, $p < 0.01$), and is negatively correlated with *engaging in procrastination behavior* (Pearson R = -0.58, $p < 0.01$). *Engaging in procrastination behavior* is negatively related to *perceived usefulness of time management tools* (Pearson R = -0.34, $p < 0.05$).

As we can see our time management measure of planning behavior is highly and significantly correlated with the use and understanding of temporal structures for the faculty sample. However, this result is not surprising since the use of temporal structures is embedded in the act of planning. It is more surprising not to find this high correlation for the students. We should also note that our faculty sample has the lowest N (60), so our results are not as likely to be representative of this population. In the next section, we analyze the staff sample.

Table 7.5 Parametric Bivariate Correlation Analysis for Faculty Sample

Constructs	Planning	Meeting Deadline	Sensing a Lack of Time Control	Engaging in Procrastination Behavior	Time Management Need	Time Management Motivation	Temporal Structure Knowledge	Use of Explicit Temporal Structures	Creation of Temporal Structures	Perceived Usefulness of Time Management Tools
Planning	1									
Meeting Deadlines	0.134	1								
Sensing a Lack of Time Control	0.140	-0.024	1							
Engaging in Procrastination Behavior	-0.074	-0.584**	0.205	1						
Time Management Need	0.457**	-0.118	0.225	0.310*	1					
Time Management Motivation	0.449**	-0.103	0.294*	0.369**	0.667**	1				
Temporal Structure Knowledge	0.016	0.124	-0.073	-0.153	0.056	0.116	1			
Use of Explicit Temporal Structures	0.359**	-0.100	0.059	0.040	0.359**	0.182	0.236	1		
Creation of Temporal Structures	0.690**	0.396**	0.145	-0.117	0.343*	0.414**	0.076	0.323*	1	
Perceived Usefulness of Time Management Tools	0.343*	0.424**	-0.044	-0.337*	0.117	-0.035	0.337*	0.291*	0.333*	1

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

* Correlation is significant at the 0.05 level (2-tailed)

Table 7.6 Non-Parametric Bivariate Correlation Analysis on "Understanding of Implicit Temporal Structures" and "Understanding of University-related Temporal Structure Relationships" for Faculty Sample

Constructs	Understanding of Implicit Temporal Structures	Understanding of University-related Temporal Structure Relationships
Understanding of Implicit Temporal Structures	1	
Understanding of University-related Temporal Structure Relationships	0.039	1
Temporal Structure Knowledge	-0.026	0.311*
Planning	0.091	0.266
Meeting Deadlines	-0.013	0.112
Sensing a Lack of Time Control	-0.132	0.066
Engaging in Procrastination Behavior	0.192	0.045
Time Management Need	0.378**	0.079
Time Management Motivation	0.223	0.226
Use of Explicit Temporal Structures	0.264	0.343*
Creation of Temporal Structures	0.075	0.276*
Perceived Usefulness of Time Management Tool	-0.009	0.196

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

7.3 Bivariate Correlation Analysis for Staff Sample

For the staff sample (Table 6.18), *time management motivation, temporal structure knowledge* and *creation of temporal structure* are not normally distributed, so a Spearman's R correlation analysis was conducted on those three constructs. The rest of the constructs are normally distributed, and thus, a parametric data analysis can be chosen to analyze their correlations.

Table 7.7 indicates that there is a significant relationship between *planning* and *use of explicit temporal structures* (Pearson $R = 0.33$, $p < 0.01$). Again, this is an

expected result because planning is the active act of managing time constructs. Staff members perceived high usefulness of their time management tools when they conduct their time planning (Pearson R = 0.42, $p < 0.01$). *Sensing a lack of time control* (Pearson R = -0.32, $p < 0.01$) and *engaging in procrastination behavior* (Pearson R = - 0.35, $p < 0.01$) negatively impact *meeting deadlines*, and not surprisingly *engaging in procrastination behavior* is likely to lead to a feeling that *lack of control* causes *procrastination* (Pearson R = 0.45, $p < 0.01$). Meanwhile, *understanding of university-related temporal structure relationships* is significantly associated with how staff members meet their deadlines (Pearson R = 0.36, $p < 0.01$), and it is also negatively related to *engaging in procrastination behavior* (Pearson R = - 0.27, $p < 0.01$).

Table 7.8 indicates that *temporal structure knowledge* supports staff members to meet their deadlines (Spearman R = 0.23, $p < 0.01$), and reduces their sense of time uncertainty (Spearman R = -0.25, $p < 0.05$). Furthermore, *temporal structure knowledge* significantly helps them to better understand university-related temporal structure relationships (Spearman R = 0.30, $p < 0.01$). We predict that good time managers will be more likely to create their own temporal structures. Both *planning* (Spearman R = 0.53, $p < 0.01$) and *meeting deadlines* (Spearman R = 0.35, $p < 0.01$) are significantly related to the *creation of temporal structures.* Both *use of explicit temporal structures* and *understanding of university-related temporal structures* significantly correlate with *the creation of temporal structures.* These results match the nature of staff work. Because their role is support role that involves an unmanaged stream of tasks coming in daily, staff needs to have a deeper understanding of the peak and lull work periods so that they can plan and use their time effectively. Thus, their work role makes them more aware of

the various university temporal structures, which entrain their own work. In general, a staff member needs to do a better job on temporal coordination with others than other individuals in the university. Our results show this behavior.

Again, although our correlations are significant, they are not large indicating that quality time management is related to the use and understanding of temporal structures but must also be explained by other factors. As with the faculty sample, the reader of this document should note that again, our sample size for staff was small. The next section examines the hypotheses we proposed for the relationships between individual time management and temporal structure use and understanding.

Table 7.7 Parametric Bivariate Correlation Analysis for Staff Sample

Constructs	Planning	Meeting Deadlines	Sensing a Lack of Time Control	Engaging in Procrastination Behavior	Time Management Need	Use of Explicit Temporal Structures	Creation of Temporal Structures	Perceived Usefulness of Time Management Tools
Planning	1							
Meeting Deadlines	0.252*	1						
Sensing a Lack of Time Control	-0.224*	-0.316**	1					
Engaging in Procrastination Behavior	-0.056	-0.351**	0.447**	1				
Time Management Need	0.095	0.138	0.029	-0.162	1			
Use of Explicit Temporal Structures	0.334**	0.188	-0.152	-0.132	0.283*	1		
Understanding of University-related Temporal Structure Relationships	0.196	0.355**	-0.312**	-0.273*	-0.071	0.171	1	
Perceived Usefulness of Time Management Tools	0.415**	0.594**	-0.332**	-0.292*	0.389**	0.402**	0.320**	1

** Correlation is significant at the 0.01 level (2-tailed)
* Correlation is significant at the 0.05 level (2-tailed)

Table 7.8 Non-Parametric Bivariate Correlation Analysis for Staff Sample

Constructs	Time Management Motivation	Time Management Knowledge	Creation of Temporal Structures
Time Management Motivation	1		
Time Management Knowledge	-0.095	1	
Creation of Temporal Structures	-0.289*	0.116	1
Planning	-0.171	0.020	0.534**
Meeting Deadlines	-0.525**	0.231*	0.352**
Sensing a Lack of Time Control	0.480**	-0.250*	-0.323**
Engaging in Procrastination Behavior	0.376**	-0.212	-0.091
Time Management Need	0.145	0.023	0.202
Use of Explicit Temporal Structure	-0.148	0.039	0.404**
Understanding of University-related Temporal Structure Relationships	-0.181	0.299**	0.387**
Perceived Usefulness of Time Management Tool	-0.205	0.075	0.401**

* Correlation is significant at the 0.05 level (2-tailed)
** Correlation is significant at the 0.01 level (2-tailed)

7.4 Hypotheses Testing

This section tests all major hypotheses proposed in Chapter 5. Because not all the data collected are normally distributed for the student, faculty and staff samples, both non-parametric and parametric t-tests were run to examine the temporal structure behavior differences between good time managers and poor time managers. Subsection 7.4.1 presents the hypotheses testing results for the student sample, subsection 7.4.2 indicates the hypotheses results for the faculty sample, and subsection 7.4.3 examines the hypotheses for the staff members. Lastly, a summary table presents the major results for the three samples.

7.4.1 Student Sample

In the student sample, as major independent variables to differentiate who are good time managers and who are not, *planning, meeting deadlines,* and *engaging in procrastination behavior* are not normally distributed, (see Table 6.18), so it was appropriate to choose a non-parametric method to examine the differences between good time managers and poor time managers. The Mann-Whitney U test was therefore chosen to examine this difference. Since *sensing a lack of time control* is normally distributed, the regular parametric t-test method was chosen to test correspondent hypotheses.

The major dependent variables were found to not all be normally distributed as well (see Table 6.18). The only normally distributed dependent variable is *creation of temporal structures,* so the parametric t-test was utilized to examine its relationship with quality of individual time management. In addition, *temporal structure knowledge, use of explicit temporal structures,* and *understanding of university-related temporal structure relationships* are not normally distributed. Thus, the Mann-Whitney U test was chosen to

analyze the differences between those dependent variables and the quality of individual time management.

We identified *planning* as one criterion to differentiate who are good time managers. Therefore, we labeled those with higher scores on the planning construct as good time managers, and those were lower scores as poor time managers. This division was consistently utilized for all three samples.

Table 7.9 indicates that there is no obvious difference ($p = 0.621$) on *temporal structure knowledge* between good time planners (good time managers) and poor time planners (poor time managers). However, good time planners (good time managers) exhibit very significant differences in using explicit temporal structures ($p < 0.001$), creating temporal structures ($p < 0.001$, see Table 7.13) and understanding of university-related temporal structure relationships ($p = 0.004$), in comparison to poor time planners (poor time managers). Therefore, for the student sample, H 1.1 is not supported, and H 2.1, H 4.1, and H 5.1 are supported. Since *understanding of implicit temporal structure* is not a valid construct, we do not accept any results for H 3.1.

Meeting deadlines is the second criterion we define for our assessment of time management quality. Using the scores on the *meeting deadlines*, we grouped the first half of high scores into good time managers. The lower half are grouped into poor time managers. This categorization was done for students, faculty and staff.

Again, we do not find any significant difference in *temporal structure knowledge* between good time managers who meet more deadlines, and poor time managers who meet fewer deadlines. Time managers who meet more deadlines exhibit significant differences on *the use of explicit temporal structures* ($p = 0.004$, see Table 7.10),

understanding of university-related temporal structures ($p < 0.001$, see Table 7.10), and *creation of temporal structures* ($p < 0.001$, see Table 7.13). In this case, H 1.2 is not supported, and H 2.2, H 4.2, H 5.2 are supported. Again, H 3.2 is not valid for this sample.

The third criterion we defined to assess time management quality is *sensing a lack of time control.* We believe that good time managers will perceive better time control than poor time managers. We classified time managers based upon their average value on the *sensing a lack of time control* construct. Lower scores of *sensing a lack of time control* construct belonged to good time managers, and the remaining scores were used to define poor time managers. This division is also used for the faculty and staff samples.

Based upon the Mann-Whitney U Test results for the *sensing a lack of time control* variable (Table 7.11), good time managers who perceive more time control do not exhibit any differences on *temporal structure knowledge* ($p = 0.455$) and *the use of explicit temporal structures* ($p = 0.138$) compared to poor time managers who often lack time control, while there is a significant difference on *understanding of university-related temporal structure relationships* ($p = 0.001$) between these two groups of people. After conducting parametric t-tests on *the creation of temporal structure* construct (see Table 7.13), there is no difference found between good time managers and poor time managers on the *sensing a lack of time control* construct as well ($p = 0.408$). Therefore, H 1.3, H 2.3, and H 4.3 are not supported, while H 5.3 is supported. Because we were unable to build *the understanding of implicit temporal structures* construct, H 3.3 cannot be tested.

The last criterion to judge good time managers is *procrastination.* Because of the nature of this negative construct, scores were sorted in ascending order. Good time

managers are assumed to have less procrastination, so this group of people would have lower scores on *procrastination* than poor time managers. No significant differences on *temporal structure knowledge* (p = 0.078, see Table 7.12) and *understanding of university-related temporal structures relationships* (p = 0.379, see Table 7.12) were discovered between good time mangers and poor time managers. Good time managers who exhibit less procrastination are found to use significantly more explicit temporal structures (p = 0.006, see Table 7.12), and to create significantly more temporal structures (p < 0.001, see Table 7.13), in comparison to the time managers who often procrastinate. Therefore, H 1.4 and H 5.4 are not supported, and H 2.4 and H 4.4 are supported.

Table 7.9 Mann-Whitney U Tests Based Upon "Planning" (Student Sample)

Dependent Variables	Group	N	Mean Rank	Mann-Whitney U	Significa -nce
Temporal Structure Knowledge	Good Time Planner (group 1)	280	277.14	38258.000	0.621
	Poor Time Planner (group 2)	280	283.86		
Use of Explicit Temporal Structures	Good Time Planner (group 1)	273	325.99	22115.500	0.000 (**)
	Poor Time Planner (group 2)	270	217.41		
Understanding of University-related Temporal Structure Relationships	Good Time Planner (group 1)	276	294.40	32318.500	0.004 (**)
	Poor Time Planner (group 2)	273	255.38		

** P < 0.01
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.10 Mann-Whitney U Tests Based Upon "Meeting Deadlines" (Student Sample)

Dependent Variables	Group	N	Mean Rank	Mann-Whitney U	Significance
Temporal Structure Knowledge	Meeting More Deadlines (group 1)	280	286.00	37661.000	0.419
	Meeting Less Deadlines (group 2)	280	275.00		
Use of Explicit Temporal Structures	Meeting More Deadlines (group 1)	273	291.47	31538.500	0.004 (**)
	Meeting Less Deadlines (group 2)	270	252.31		
Understanding of University-related Temporal Structure Relationships	Meeting More Deadlines (group 1)	274	311.75	27606.000	0.000 (**)
	Meeting Less Deadlines (group 2)	275	238.39		

** $P < 0.01$
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.11 Mann-Whitney U Tests based upon "Sensing a Lack of Time Control" (Student Sample)

Dependent Variables	Group	N	Mean Rank	Mann-Whitney U	Significance
Temporal Structure Knowledge	Under Time Control (group 1)	280	275.41	37776.000	0.455
	Lack of Time Control (group 2)	280	285.59		
Use of Explicit Temporal Structures	Under Time Control (group 1)	268	282.11	34140.000	0.138
	Lack of Time Control (group 2)	275	262.15		
Understanding of University-related Temporal Structure Relationships	Under Time Control (group 1)	274	253.34	31739.000	0.001 (**)
	Lack of Time Control (group 2)	275	296.59		

** $P < 0.01$
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.12 Mann-Whitney U Tests based upon "Engaging in Procrastination Behavior" (Student Sample)

Dependent Variables	Group	N	Mean Rank	Mann-Whitney U	Significance
Temporal Structure Knowledge	Less Procrastination (group 1)	280	268.51	35842.000	0.078
	More Procrastination (group 2)	280	292.49		
Use of Explicit Temporal Structures	Less Procrastination (group 1)	268	290.91	31781.500	0.006 (**)
	More Procrastination (group 2)	275	253.57		
Understanding of University-related Temporal Structure Relationships	Less Procrastination (group 1)	275	280.93	36044.500	0.379
	More Procrastination (group 2)	274	269.05		

** $P < 0.01$
Group 1 – good time managers
Group 2 – poor time mangers

Overall, for the student sample, all the hypotheses testing results are summarized as follows:

H1: Good time managers will have more temporal structure knowledge than poor time managers.

*H1.1 Time managers who are good time planners will have more temporal structure knowledge than time managers who are poor time planners. (**Not Supported**)*

*H1.2 Time managers who meet more deadlines will have more temporal structure knowledge than time managers who do not always meet deadlines. (**Not Supported**)*

*H1.3 Time managers who perceive more control of their time will have more temporal structure knowledge than time managers who feel a lack of control. (**Not Supported**)*

*H1.4 Time managers who exhibit less procrastination will have more temporal structure knowledge than time managers who exhibit more procrastination. (**Not Supported**)*

H2: Good time managers will use more explicit temporal structures than poor time managers.

*H2.1 Time managers who are good time planners will use more explicit temporal structures than time managers who are poor time planners. (**Supported**)*

*H2.2 Time managers who meet more deadlines will use more explicit temporal structures than time managers who do not always meet deadlines. (**Supported**)*

*H2.3 Time managers who perceive more control of their time will use more explicit temporal structures than time managers who feel a lack of control. (**Not Supported**)*

*H2.4 Time managers who exhibit less procrastination will use more explicit temporal structures than time managers who exhibit more procrastination. (**Supported**)*

H3: Good time managers will have a better understanding of implicit temporal structures than poor time managers. (This hypothesis is invalid for the student sample, since the "understanding of implicit temporal structures" could not effectively be constructed from the date captured.)

Table 7.13 T-Tests on "Creation of Temporal Structures (Student Sample)

	Group	N	Mean	S.D.	T	df	Sig. (2-tailed)
Planning	**1**	276	0.45	0.87	11.82	546	0.000 (**)
	2	272	-0.45	0.92			
Meeting Deadline	**1**	277	0.27	1.02	6.56	546	0.000 (**)
	2	271	-0.27	0.90			
Lack of Control	**1**	272	0.04	0.97	0.83	546	0.408
	2	276	-0.04	1.03			
Procrastination	**1**	272	0.24	1.02	5.62	546	0.000 (**)
	2	276	-0.23	0.93			

Group 1 – Good Time Managers
Group 2 – Poor Time Managers
** $P < 0.05$

H4: Good time managers will create more personal temporal structures than poor time managers.

*H4.1 Time managers who are good time planners will create more personal temporal structures than time managers who are poor time planners. (**Supported**)*

*H4.2 Time managers who meet more deadlines will create more personal temporal structures than time managers who do not always meet deadlines. (**Supported**)*

*H4.3 Time managers who perceive more control of their time will create more personal temporal structures than time managers who feel a lack of control. (**Not Supported**)*

*H4.4 Time managers who exhibit less procrastination will create more personal temporal structures than time managers who exhibit more procrastination. (**Supported**)*

H5: Good time managers will have a better understanding of University-related temporal structure relationships than poor time managers.

*H5.1 Time managers who are good time planners will have a better understanding of university-related temporal structure relationships than time managers who are poor time planners. (**Supported**)*

*H5.2 Time managers who meet more deadlines will have a better understanding of university-related temporal structure relationships than time managers who do not always meet deadlines. (**Supported**)*

*H5.3 Time managers who perceive more control of their time will have a better understanding of university-related temporal structure relationships than time managers who feel a lack of control. (**Supported**)*

H5.4 Time managers who exhibit less procrastination will have a better understanding of university-related temporal structure relationships than time managers who exhibit more procrastination. ***(Not Supported)***

7.4.2 Faculty Sample

In faculty dataset, only *the understanding of implicit temporal structures* and *the understanding of university-related temporal structures* are not normally distributed, so most of constructs were examined by running a parametric method. Given that time management is likely to be affected by multiple variables besides temporal structures, we expect the effect size to be lower and thus expect difficulties in obtaining significant results with our smaller N.

Only sixty faculty members participated in this study. For the faculty sample, compared to poor time managers who do less time planning, good time managers who do more time planning exhibit significant differences on *creation of temporal structures* ($p < 0.001$, see Table 7.16) and *understanding of university-related temporal structure relationships* ($p = 0.007$, see Table 7.17). Faculty members who meet more deadlines also show significant differences in *the creation of temporal structures* ($p = 0.004$, see Table 7.16) in comparison to those who meet less deadlines. Therefore, for the faculty sample, only H 4.1, H 4.2 and H 5.1 were supported, and the other hypotheses were not supported.

Table 7.14 T-Tests on "Temporal Structure Knowledge" (Faculty Sample)

Constructs	Group	N	Mean	S.D.	T	df	Sig. (2-tailed)
Planning	**1**	30	0.37	0.22	-0.088	58	0.930
	2	30	0.38	0.20			
Meeting Deadline	**1**	30	0.39	0.22	0.705	58	0.484
	2	30	0.35	0.20			
Lack of Control	**1**	30	0.38	0.20	0.263	58	0.793
	2	30	0.37	0.22			
Procrastination	**1**	30	0.39	0.20	0.705	58	0.484
	2	30	0.35	0.22			

Group 1 – Good Time Managers
Group 2 – Poor Time Managers
** $P < 0.05$

Table 7.15 T-Tests on "Use of Explicit Temporal Structures" (Faculty Sample)

Construct	Group	N	Mean	S.D.	T	df	Sig. (2-tailed)
Planning	**1**	27	0.22	0.99	1.603	53	0.115
	2	28	0.21	0.98			
Meeting Deadline	**1**	28	-0.11	1.10	-0.775	53	0.442
	2	27	0.11	0.90			
Lack of Control	**1**	27	-0.02	1.00	-0.155	53	0.877
	2	28	0.02	1.01			
Procrastination	**1**	28	-0.09	1.06	-0.688	53	0.494
	2	27	0.09	0.94			

Group 1 – Good Time Managers
Group 2 – Poor Time Managers
** $P < 0.05$

Table 7.16 T-Tests on "Creation of Temporal Structures" (Faculty Sample)

Construct	Group	N	Mean	S.D.	T	df	Sig. (2-tailed)
Planning	**1**	29	0.54	0.795	4.968	54	0.000 (**)
	2	27	-0.58	0.878			
Meeting Deadline	**1**	27	0.39	1.01	3.05	54	0.004 (**)
	2	29	-0.37	0.85			
Lack of Control	**1**	26	-0.15	0.97	-1.06	54	0.294
	2	30	0.13	1.02			
Procrastination	**1**	28	0.10	1.07	0.776	54	0.441
	2	28	-0.10	0.93			

Group 1 – Good Time Managers
Group 2 – Poor Time Managers
** $P < 0.05$

Table 7.17 Mann-Whitney U Tests Based Upon "Planning" Factor (Faculty Sample)

Dependent Variables	Planning	N	Mean Rank	Mann-Whitney U	Significance
Understanding of Implicit Temporal Structures	Group 1	28	31.05	348.500	0.344
	Group 2	29	27.02		
Understanding of University-related Temporal Structure Relationships	Group 1	30	33.23	218.000	0.007 (**)
	Group 2	25	21.72		

** $P < 0.01$
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.18 Mann-Whitney U Tests Based Upon "Meeting Deadlines" Factor (Faculty Sample)

Dependent Variables	Meeting Deadline	N	Mean Rank	Mann-Whitney U	Significance
Understanding of Implicit Temporal Structures	Group 1	28	29.75	385.000	0.730
	Group 2	29	28.28		
Understanding of University-related Temporal Structure Relationships	Group 1	27	30.93	290.000	0.180
	Group 2	28	25.18		

** P < 0.01
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.19 Mann-Whitney U Tests Based Upon "Sensing a Lack of Time Control" Factor (Faculty Sample)

Dependent Variables	Lack of Control	N	Mean Rank	Mann-Whitney U	Significance
Understanding of Implicit Temporal Structures	Group 1	28	30.57	362.000	0.469
	Group 2	29	27.48		
Understanding of University-related Temporal Structure Relationships	Group 1	26	27.02	351.500	0.665
	Group 2	29	28.88		

** P < 0.01
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.20 Mann-Whitney U Tests Based Upon "Engaging in Procrastination Behavior" Factor (Faculty Sample)

Dependent Variables	Procrastination	N	Mean Rank	Mann-Whitney U	Significance
Understanding of Implicit Temporal Structures	Group 1	28	25.93	320.00	0.157
	Group 2	29	31.97		
Understanding of University-related Temporal Structure Relationships	Group 1	27	27.85	293.00	0.149
	Group 2	28	31.04		

** $P < 0.01$
Group 1 – good time managers
Group 2 – poor time mangers

The hypotheses testing results for the faculty sample are summarized below:

H1: Good time managers will have more temporal structure knowledge than poor time managers.

H1.1 Time managers who are good time planners will have more temporal structure knowledge than time managers who are poor time planners. ***(Not Supported)***

H1.2 Time managers who meet more deadlines will have more temporal structure knowledge than time managers who do not always meet deadlines. ***(Not Supported)***

H1.3 Time managers who perceive more control of their time will have more temporal structure knowledge than time managers who feel a lack of control. ***(Not Supported)***

H1.4 Time managers who exhibit less procrastination will have more temporal structure knowledge than time managers who exhibit more procrastination. ***(Not Supported)***

H2: Good time managers will use more explicit temporal structures than poor time managers.

*H2.1 Time managers who are good time planners will use more explicit temporal structures than time managers who are poor time planners. (**Not Supported**)*

*H2.2 Time managers who meet more deadlines will use more explicit temporal structures than time managers who do not always meet deadlines. (**Not Supported**)*

*H2.3 Time managers who perceive more control of their time will use more explicit temporal structures than time managers who feel a lack of control. (**Not Supported**)*

*H2.4 Time managers who exhibit less procrastination will use more explicit temporal structures than time managers who exhibit more procrastination. (**Not Supported**)*

H3: Good time managers will have a better understanding of implicit temporal structures than poor time managers.

*H3.1 Time managers who are good time planners will have a better understanding of implicit temporal structures than time managers who are poor time planners. (**Not Supported**)*

*H3.2 Time managers who meet more deadlines will have a better understanding of implicit temporal structures than time managers who do not always meet deadlines. (**Not Supported**)*

*H3.3 Time managers who perceive more control of their time will have a better understanding of implicit temporal structures than time managers who feel a lack of control. (**Not Supported**)*

H3.4 Time managers who exhibit less procrastination will have a better understanding of implicit temporal structures than time managers who exhibit more procrastination. ***(Not Supported)***

H4: Good time managers will create more personal temporal structures than poor time managers.

H4.1 Time managers who are good time planners will create more personal temporal structures than time managers who are poor time planners. ***(Supported)***

H4.2 Time managers who meet more deadlines will create more personal temporal structures than time managers who do not always meet deadlines. ***(Supported)***

H4.3 Time managers who perceive more control of their time will create more personal temporal structures than time managers who feel a lack of control. ***(Not Supported)***

H4.4 Time managers who exhibit less procrastination will create more personal temporal structures than time managers who exhibit more procrastination. ***(Not Supported)***

H5: Good time managers will have a better understanding of University-related temporal structure relationships than poor time managers.

H5.1 Time managers who are good time planners will have a better understanding of university-related temporal structure relationships than time managers who are poor time planners. ***(Supported)***

H5.2 Time managers who meet more deadlines will have a better understanding of university-related temporal structure relationships than time managers who do not always meet deadlines. ***(Not Supported)***

H5.3 Time managers who perceive more control of their time will have a better understanding of university-related temporal structure relationships than time managers who feel a lack of control. ***(Not Supported)***

H5.4 Time managers who exhibit less procrastination will have a better understanding of university-related temporal structure relationships than time managers who exhibit more procrastination. ***(Not Supported)***

7.4.3 Staff Sample

After conducting normality tests with the staff dataset (see Table 6.18), *knowledge of temporal structures* and *creation of temporal structures* were found to be not normally distributed; we therefore chose a non-parametric method to test hypotheses for these constructs. The rest of the constructs are normally distributed, and parametric t-tests were therefore conducted to examine the proposed hypotheses.

The construct "*meeting deadlines,*" which was used to assess quality of individual time management for the students and faculty could not be used for the staff members, because the Cronbach's Alpha is only 0.58. Therefore, for the staff sample, time management effectiveness was assessed by the three other constructs *planning, sensing a lack of time control,* and *engaging in procrastination behavior.*

Significant differences on *the use of explicit temporal structures* ($p < 0.001$, see Table 7.21) and *the creation of temporal structures* ($p < 0.001$, see Table 7.23) are found between time managers who do more time planning and those who do less time planning. In comparison to time managers who feel a lack of time control, those who perceive more time control exhibit significant differences on *understanding of university-related*

temporal structures (p = 0.002, see table 7.22) and on *the creation of temporal structures* (p = 0.014, see table 7.24). In addition, time managers who exhibit more procrastination have significantly less *temporal structure knowledge* (p = 0.019, see Table 7.25), and understand significantly less temporal structure relationships (p = 0.045, see Table 7.22) than those who do not procrastinate.

For staff sample, all H3 hypotheses, H1.2, H2.2, H4.2, and H5.2 are invalid because of the low Cronbach's Alpha values on *understanding of implicit temporal structures* and *meeting deadlines.* The supported hypotheses for the staff sample are H1.4, H 2.1, H 4.1, H5.3 and H5.4.

Table 7.21 T-Tests on "Use of Explicit Temporal Structures" (Staff Sample)

	Group	N	Mean	S.D.	T	df	Sig. (2-tailed)
Planning	**1**	39	0.40	0.75	3.893	75	0.000 (**)
	2	38	-0.41	1.06			
Sensing a Lack of Time Control	**1**	38	0.06	1.08	0.477	75	0.635
	2	39	-0.05	0.93			
Engaging in Procrastination Behavior	**1**	38	0.14	1.09	1.239	75	0.219
	2	39	-0.14	0.90			

Group 1 – Good Time Managers
Group 2 – Poor Time Managers
** P < 0.01

Table 7.22 T-Tests on "Understanding of University-related Temporal Structure Relationships" (Staff Sample)

	Group	N	Mean	S.D.	T	df	Sig. (2-tailed)
Planning	**1**	37	0.07	0.93	0.548	75	0.585
	2	40	-0.06	1.07			
Sensing a Lack of Time Control	**1**	38	0.35	0.86	3.217	75	0.002 (**)
	2	39	-0.34	1.02			
Engaging in Procrastination Behavior	**1**	37	0.24	0.97	2.037	75	0.045 (*)
	2	40	-0.22	0.99			

Group 1 – Good Time Managers
Group 2 – Poor Time Managers
* P < 0.05 ** P < 0.01

Table 7.23 Mann-Whitney U Tests Based Upon "Planning" Factor (Staff Sample)

Dependent Variables	Planning	N	Mean Rank	Mann-Whitney U	Sig. (2-tailed)
Temporal Structure Knowledge	Group 1	41	39.74	768.5000	0.500
	Group 2	41	43.26		
Creation of Temporal Structures	Group 1	37	48.82	339.500	0.000
	Group 2	39	28.71		(**)

** P < 0.01
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.24 Mann-Whitney U Tests Based Upon "Sensing a Lack of Time Control" Factor (Staff Sample)

Dependent Variables	Lack of Control	N	Mean Rank	Mann-Whitney U	Sig.
Temporal Structure Knowledge	Group 1	40	44.24	730.500	0.305
	Group 2	42	38.89		
Creation of Temporal Structures	Group 1	37	44.85	486.500	0.014 (*)
	Group 2	39	32.47		

* P< 0.05, ** P < 0.01
Group 1 – good time managers
Group 2 – poor time mangers

Table 7.25 Mann-Whitney U Tests Based Upon "Engaging in Procrastination Behavior" Factor (Staff Sample)

Dependent Variables	Procrastination	N	Mean Rank	Mann-Whitney U	Sig.
Temporal Structure Knowledge	Group 1	40	47.74	590.500	0.019 (*)
	Group 2	42	35.56		
Creation of Temporal Structures	Group 1	37	41.41	614.000	0.261
	Group 2	39	35.74		

* P < 0.05
Group 1 – good time managers
Group 2 – poor time mangers

The following paragraphs present the hypotheses testing results for the staff sample.

H1: Good time managers will have more temporal structure knowledge than poor time managers.

H1.1 Time managers who are good time planners will have more temporal structure knowledge than time managers who are poor time planners. ***(Not Supported)***

H1.2 Time managers who meet more deadlines will have more temporal structure knowledge than time managers who do not always meet deadlines. ***(Invalid)***

H1.3 Time managers who perceive more control of their time will have more temporal structure knowledge than time managers who feel a lack of control. ***(Not Supported)***

H1.4 Time managers who exhibit less procrastination will have more temporal structure knowledge than time managers who exhibit more procrastination. ***(Supported)***

H2: Good time managers will use more explicit temporal structures than poor time managers.

H2.1 Time managers who are good time planners will use more explicit temporal structures than time managers who are poor time planners. ***(Supported)***

H2.2 Time managers who meet more deadlines will use more explicit temporal structures than time managers who do not always meet deadlines. ***(Invalid)***

H2.3 Time managers who perceive more control of their time will use more explicit temporal structures than time managers who feel a lack of control. ***(Not Supported)***

H2.4 Time managers who exhibit less procrastination will use more explicit temporal structures than time managers who exhibit more procrastination. ***(Not Supported)***

H3: Good time managers will have better understanding of implicit temporal structures than poor time managers. (This hypothesis is invalid for the staff sample, since "understanding of implicit temporal structures" is invalid.)

H4: Good time managers will create more personal temporal structures than poor time managers.

*H4.1 Time managers who are good time planners will create more personal temporal structures than time managers who are poor time planners. (**Supported**)*

*H4.2 Time managers who meet more deadlines will create more personal temporal structures than time managers who do not always meet deadlines. (**Invalid**)*

*H4.3 Time managers who perceive more control of their time will create more personal temporal structures than time managers who feel a lack of control. (**Supported**)*

*H4.4 Time managers who exhibit less procrastination will create more personal temporal structures than time managers who exhibit more procrastination. (**Not Supported**)*

H5: Good time managers will have a better understanding of University-related temporal structure relationships than poor time managers.

*H5.1 Time managers who are good time planners will have a better understanding of university-related temporal structure relationships than time managers who are poor time planners. (**Not Supported**)*

*H5.2 Time managers who meet more deadlines will have a better understanding of university-related temporal structure relationships than time managers who do not always meet deadlines. (**Invalid**)*

H5.3 Time managers who perceive more control of their time will have a better understanding of university-related temporal structure relationships than time managers who feel a lack of control. ***(Supported)***

H5.4 Time managers who exhibit less procrastination will have a better understanding of university-related temporal structure relationships than time managers who exhibit more procrastination. ***(Supported)***

7.5 Summary of Hypotheses Results

To summarize the final hypotheses results for student, faculty and staff samples, Table 7.26 is created below.

Table 7.26 Summary of Hypotheses Testing for Three Samples

Hypotheses Supported (Yes/No)	Samples	Planning		Meeting Deadlines		Sensing a Lack of Time Control		Engaging in Procrastination Behavior	
Knowledge of Temporal Structures	Student	H 1.1 G > P	No	H 1.2 G > P	No	H 1.3 G > P	No	H 1.4 G > P	No
	Faculty		No		No		No		No
	Staff		No		Invalid		No		Yes
Use of Explicit Temporal Structures	Student	H 2.1 G > P	Yes	H 2.2 G > P	Yes	H 2.3 G > P	No	H 2.4 G > P	Yes
	Faculty		No		No		No		No
	Staff		Yes		Invalid		No		No
Understanding of Implicit Temporal Structures	Student	H 3.1 G > P	Invalid	H 3.2 G > P	Invalid	H 3.3 G > P	Invalid	H 3.4 G > P	Invalid
	Faculty		No		No		No		No
	Staff		Invalid		Invalid		Invalid		Invalid
Creation of Temporal Structures	Student	H 4.1 G > P	Yes	H 4.2 G > P	Yes	H 4.3 G > P	No	H 4.4 G > P	Yes
	Faculty		Yes		Yes		No		No
	Staff		Yes		Invalid		Yes		No
Understanding of University-Related Temporal Structures	Student	H 5.1 G > P	Yes	H 5.2 G > P	Yes	H 5.3 G > P	Yes	H 5.4 G > P	No
	Faculty		Yes		No		No		No
	Staff		No		Invalid		Yes		Yes

Note: G – good time managers; P – poor time managers; > differences are significant
Yes – hypothesis supported; No – hypothesis not supported

In this study, only small amount of valid data were collected from the faculty (N = 60) and the staff (N=83) samples, and thus, it is not clear whether our hypotheses would be supported if we increase our N. Over five hundred students (N=560) responded to our survey, so the hypotheses results based upon the student dataset are more likely to match the reality of time experience that everyone experiences. In addition, no obvious differences are found among student, faculty and staff samples in their use and understanding of temporal structures. This was, in part, due to sample size differences and the chosen data analysis methods.

The reader should note at this point, that although we ran paired comparisons of our time management quality constructs using both parametric and non-parametric analysis techniques, in truth, there is much dependency among our constructs both in the time management measures and definitely in the various temporal structures use and understanding measures. This first analysis is preliminary to investigate what relationships exist. We follow this in the next chapter with an analysis that controls for the interrelationships between the time management variables and people's use of temporal structures.

In order to get this deeper understanding of the overall relationship between the quality of individual time management and various temporal structures, a research model was proposed in the research design (see Chapter 5). The next chapter presents the procedure and results to test the research model by utilizing a multivariate data analysis method. The next chapter will also draw conclusions on differences among students, faculty and staff members.

CHAPTER 8

BUILDING AND TESTING A TEMPORAL STRUCTURE PLS MODEL FOR STUDENTS, FACULTY AND STAFF

This chapter first introduces the research model designed for this study. In section 8.2, a test of the measurement model is presented in detail. The software utilized in this research is the PLS-Graph version 3.0. A PLS data analysis was run on student, faculty and staff datasets respectively. Section 8.3 reports all results on the building of the structural model that represents the relationship between time management quality and use and understanding of temporal structures. PLS results for students, faculty and staff members are reported respectively. This chapter also summarizes the differences among student, faculty and staff in their capture, use and understanding of different types of temporal structures.

8.1 Building a Temporal Structure Research Model

In Chapter 5 the research model for understanding the relationships between time management quality and temporal structures usage factors was first described (see Figure 5.3). Four dimensions for assessing the quality of individual time management were proposed. They are *planning, meeting deadlines, sensing a lack of time control,* and *engaging in procrastination behavior.* The model indicates that these dimensions will have significant correlations with the temporal structure dependent constructs, that is, *temporal structure knowledge, use of explicit temporal structures, understanding of implicit temporal structures, creation of temporal structures,* and *understanding of temporal structure relationships. Planning* and *meeting deadlines* are predicted to be

positively correlated to the dependent temporal structure constructs, and *sensing a lack of time control* and *engaging in procrastination behavior* are correspondently proposed to be negatively correlated with these constructs. It is also assumed that correlations exist among the four constructs for quality of individual time management. These constructs are drawn from the literature but prior research has not investigated their relationships. We predict that *planning* will have a positive relation with *meeting deadlines*, *sensing a lack of time control* will be significantly related to *engaging in procrastination behavior*, and thus, will have a negative relation with *meeting deadlines*. We also predict that *engaging in procrastination behavior* will have a negative relation with both *planning* and *meeting deadlines*. These predictions are shown in the proposed overall research model in Figure 5.3. A plus sign "+" represents the positive relationships, and the minus sign "-" stands for a negative relation in this research model.

The validation of this research model on the student, faculty and staff datasets is presented in the next two sections.

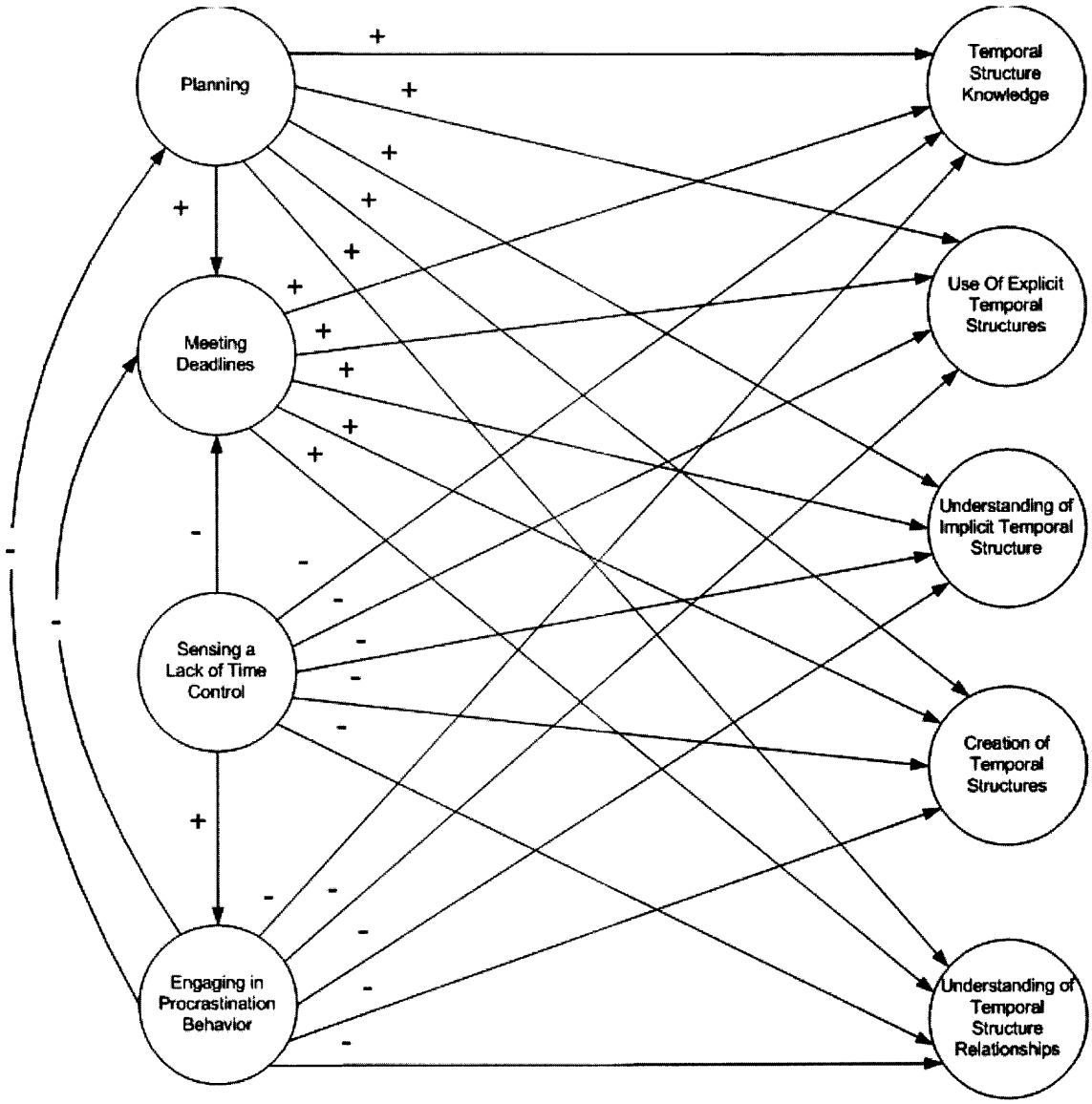

Figure 5.3 Temporal structure research model.
Note: "+" means there is a positive relationship between two constructs, "-" represents a negative relationship between two constructs.

8.2 Validation of the Measurement Model

First, the measurement model for our nine constructs was assessed with a confirmatory factor analysis using the PLS-Graph 3.0 software. We chose this software because 1) most of the construct data is not normally distributed in the student, faculty and staff samples; 2) we only collected a small amount of data from faculty (N=60) and staff members (N=83). The relationships between latent variables or constructs and their manifest variables, e.g. each validated question item, were assessed in the measurement model. We tested the measurement model by assessing construct reliability and validity, composite reliability for latent variables and discriminant validity. These analyses are presented below.

Individual item reliabilities, which examine the loadings of the manifest variables on their associated latent variables, are presented in Table 8.2 and Table 8.3. Question items with loadings higher than 0.50, are adopted in order to keep as many items as possible. Items with loadings less than 0.50 were removed from this study. However, similar to our construct loading analysis in Chapter 6, those items that formed our nine validated constructs passed the test for students, faculty and staff. This is shown in Tables 8.2 and 8.3.

Composite reliabilities in our measurement model range from 0.70 to 0.89 (See Table 8.1). Based upon the criteria suggested by Nunnally (Nunnally 1978) that a minimum value of 0.70 be acceptable for composite reliability, all the composite reliabilities for students, faculty and staff members are satisfactory. The composite reliability calculation is based upon the ratio of construct variance to the sum of construct and error variance. Although this coefficient has a similar interpretation to the

Cronbach's Alpha values presented in Chapter 5, they are a stronger test since the composite reliability takes into account the actual factor loadings rather than assuming that each item is equally weighted in determining the composite.

Construct validity was evaluated using discriminant validity. The discriminant validity is examined by comparing the shared variances between latent variables with average variance extracted (AVE) from each individual latent variable (Fornell and Larcker 1981). The amount of variance can be measured by AVE due to the construct association of the amount of variance from the measurement error. AVE is then calculated by the sum of loadings squared, and divided by the number of items in the constructs. Tables 8.4, 8.5, and 8.6 present the comparison of the square root of AVE and the correlations between the constructs for students, faculty and staff members respectively. In the three tables, the values on the diagonal represent the square root of the AVE for the corresponding construct. These values are required to be larger than the off diagonal elements if the construct is uniquely determined. The results shown in Table 8.4, 8.5 and 8.6 provide positive support for discriminant validity.

Therefore, the test of the measurement model is acceptable in terms of construct reliability and validity.

Table 8.1 Composite Reliability for Latent Variables

Constructs	Composite Reliability		
	Student	**Faculty**	**Staff**
Planning	0.87	0.89	0.85
Meeting Deadlines	0.79	0.86	0.79
Sensing a Lack of Time Control	0.79	0.80	0.77
Engaging in Procrastination Behavior	0.81	0.85	0.83
Temporal Structure Knowledge[1]	n/a	n/a	n/a
Use of Explicit Temporal Structures	0.86	0.81	0.89
Understanding of Implicit Temporal Structures	0.76	0.70	0.83
Creation of Temporal Structures	0.83	0.80	0.79
Understanding of University-related Temporal Structure Relationships	0.81	0.81	0.83

[1] There is only one item for "temporal structure knowledge," so composite reliability is not applicable for this construct.

Table 8.2 PLS Factor Loadings (1)

Constructs	Planning			Meeting Deadlines			Sensing a Lack of Time Control			Engaging in Procrastination Behavior		
	Student	Faculty	Staff	Student	Faculty	Staff	Student	Faculty	Staff	Student	Faculty	Staff
ii225	0.82	0.83	0.85									
ii224	0.78	0.81	0.50									
ii226	0.78	0.81	0.86									
ii21	0.71	0.69	0.80									
ii26	0.73	0.75	0.60									
ii223				0.75	0.78	0.74						
ii29				0.70	0.75	-						
ii211				0.63	0.83	0.76						
ii213				0.68	0.73	0.73						
ii210							0.75	-	0.75			
ii27							0.70	0.75	0.78			
ii216							0.78	0.88	0.59			
ii28							-	-	0.57			
ii24										0.80	0.84	0.80
ii215										0.77	0.87	0.84
ii23										0.57	0.71	-
ii220r										0.70	-	0.72

Note: "S1" represents student sample; "F" stands for faculty sample; "S2" means staff sample; "r" represents the question item is reversed. Construct items without specifically being identified by S1, F, and S2 mean that student, faculty and staff samples use the same items.

Table 8.3 PLS Factor Loadings (2)

Constructs	Use of Explicit Temporal Structures			Understanding of Implicit Temporal Structures			Creation of Temporal Structures			Understanding of University-related Temporal Structures		
	Student	Faculty	Staff	Student	Faculty	Staff	Student	Faculty	Staff	Student	Faculty	Staff
ii56	0.81	0.70	0.89									
ii55	0.72	0.66	0.75									
ii54	0.76	0.72	0.73									
ii510	0.70	-	-									
ii51	0.74	0.61	-									
ii57	0.57	0.56	0.87									
ii59 (F, S2)	-	0.60	0.72									
ii513				0.64	-	-						
ii514				0.68	-	0.82						
ii512				0.65	0.90	0.86						
ii515				0.67	-	-						
ii516 (F)				-	-0.53	-						
ii610							0.83	0.69	0.58			
ii611							0.80	-	-			
ii69							0.76	-	-			
ii63							0.59	-	-			
ii65							0.53	-	0.63			
ii66 (F, S2)							-	0.81	0.84			
ii67 (F, S2)							-	0.77	0.72			
ii73										0.78	-	-
ii72										0.74	-	-
ii71										0.72	-	-
ii75										0.58	-	-
ii74										0.54	-	-
ii79 (F, S2)										-	0.65	0.90
ii710 (F)										-	0.98	-
ii78 (S2)										-	-	0.78

Note: "S1" represents student sample; "F" stands for faculty sample; "S2" means staff sample; "r" represents the question item is reversed. Construct items without specifically being identified by S1, F, and S2 mean that student, faculty and staff samples use the same items.

Table 8.4 Discriminant Validity for Student Sample

Constructs	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1. Planning	**0.76**								
F2. Meeting Deadlines	0.35	**0.69**							
F3. Sensing a Lack of Time Control	-0.11	-0.14	**0.74**						
F4. Engaging in Procrastination Behavior	-0.30	-0.50	0.47	**0.72**					
F5. Temporal Structure Knowledge	**n/a**	**n/a**	**n/a**	**n/a**	**n/a**				
F6. Use of Explicit Temporal Structures	0.48	0.25	-0.09	-0.22	**n/a**	**0.72**			
F7. Understanding of Implicit Temporal Structures	0.17	0.26	0.15	-0.08	**n/a**	0.15	**0.66**		
F8. Creation of Temporal Structures	0.59	0.37	-0.10	-0.31	**n/a**	0.57	0.19	**0.72**	
F9. Understanding of University-related Temporal Structure Relationships	0.14	0.27	0.18	-0.06	**n/a**	0.10	0.45	0.22	**0.68**

Table 8.5 Discriminant Validity for Faculty Sample

Constructs	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1. Planning	**0.78**								
F2. Meeting Deadlines	0.11	**0.77**							
F3. Sensing a Lack of Time Control	-0.10	-0.47	**0.81**						
F4. Engaging in Procrastination Behavior	-0.06	-0.59	0.50	**0.81**					
F5. Temporal Structure Knowledge	0.02	0.10	-0.07	-0.15	**n/a**				
F6. Use of Explicit Temporal Structures	0.41	-0.10	-0.07	-0.03	0.17	**0.64**			
F7. Understanding of Implicit Temporal Structures	-0.05	0.39	-0.38	-0.33	-0.12	-0.12	**0.74**		
F8. Creation of Temporal Structures	0.68	0.31	-0.11	-0.09	0.08	0.34	0.15	**0.76**	
F9. Understanding of University-related Temporal Structure Relationships	0.30	0.10	-0.10	0.03	0.20	0.28	0.31	0.27	**0.83**

Table 8.6 Discriminant Validity for Staff Sample

Constructs	F1	F2	F3	F4	F5	F6	F7	F8	F9
F1. Planning	**0.74**								
F2. Meeting Deadlines	0.26	**0.74**							
F3. Sensing a Lack of Time Control	-0.24	-0.32	**0.68**						
F4. Engaging in Procrastination Behavior	-0.16	-0.41	0.48	**0.79**					
F5. Temporal Structure Knowledge	-0.004	0.19	-0.25	-0.09	**n/a**				
F6. Use of Explicit Temporal Structures	0.31	0.15	-0.19	-0.23	0.04	**0.79**			
F7. Understanding of Implicit Temporal Structures	0.33	0.26	-0.27	-0.43	0.21	0.43	**0.85**		
F8. Creation of Temporal Structures	0.49	0.33	-0.30	-0.23	0.11	0.38	0.54	**0.70**	
F9. Understanding of University-related Temporal Structure Relationships	0.23	0.36	-0.34	-0.31	0.30	0.18	0.44	0.34	**0.84**

8.3 Testing Temporal Structure PLS Models

Based upon satisfactory reliability and validity results in the measurement model, the structural model is now examined in this section. Figure 5.3 shows the original path correlations of the proposed overall construct relationships. In order to assess the level of significance of the path coefficient, bootstrapping with 1000 re-samples was computed for the three datasets using PLS-Graph version 3.0 software. Figure 8.1, Figure 8.3, and Figure 8.5 present the overall PLS data analysis results for students, faculty and staff members respectively. The final reduced PLS models with all insignificant links removed is then given in Figure 8.2 (students), Figure 8.4 (faculty), and Figure 8.6 (staff). This section also addresses the five proposed research questions.

Table 8.7 Path Coefficients for the Planning Construct

Paths	Student	Faculty	Staff
Planning → Temporal Structure Knowledge	-0.067	0.011	-0.096
Planning → Use of Explicit Temporal Structures	0.442 ***	0.419 **	0.273 *
Planning → Understanding of Implicit Temporal Structures	0.099 *	-0.105	0.261 *
Planning → Creation of Temporal Structures	0.518 ***	0.657 ***	0.408 **
Planning → Understanding of University-related Temporal Structure Relationships	0.069	0.290	0.111

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (one-tailed)

The above Table 8.7 shows the results of all paths related to construct *planning* for students, faculty and staff members. We predicted that there would be significant positive relationships between *planning* and all temporal structure variables. We have found 3 significant relationships for students, 2 for faculty and 3 for staff. No significant relationships were found for either *understanding of university-related temporal structure*

relationships or *temporal structure knowledge.* Both of these constructs are the most difficult ones for our respondents to use and understand implying that even good time planners are not good at handling these temporal structure issues. Note that *planning* is nearly the equivalent to *use of explicit temporal structures* and *creation of temporal structures.* Therefore, these predictions are neither surprising nor of research significance, since planning by definition is the act of manipulating and recording temporal structure data, we expect it to be correlated with these two dependent variables.

There is a significant relationship between *planning* and *understanding of implicit temporal structures* for students and staff but no relationship is found for faculty. We believe that this is because students and staff are more entrained by external temporal structures than faculty and therefore have to be more aware of the multiple ambiguously defined temporal norms in order to manage their life productively. More will be said about this in Chapter 9 when we discuss the different time management construct relationships for each role.

Table 8.8 Path Coefficients of Meeting Deadlines

Paths	Student	Faculty	Staff
Meeting Deadlines → Temporal Structure Knowledge	0.100	0.016	0.170
Meeting Deadlines → Use of Explicit Temporal Structures	0.076	-0.258	-0.007
Meeting Deadlines → Understanding of Implicit Temporal Structures	0.245 ***	0.248	0.036
Meeting Deadlines → Creation of Temporal Structures	0.141 ***	0.340 ***	0.174
Meeting Deadlines → Understanding of University-related Temporal Structure Relationships	0.276 ***	0.122	0.229

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (one-tailed)

The relationships between *meeting deadlines* and temporal structure variables are shown in Table 8.8. We consider the *meeting deadlines* construct as the most relevant construct in our assessment of time management quality. For students, *meeting deadlines* is significantly related to all temporal structure constructs except *temporal structure knowledge* and the *use of explicit temporal structures*. For faculty, only the *creation of temporal structures* is significantly related to *meeting deadlines*. For staff, there are no significant relationships.

Students are highly entrained by temporal structures. They need to respond to many short, tight deadlines all coming from different individuals (their instructors). Because of this, we would expect them to have many temporal structure relationships between *meeting deadlines*. In contrast, staff has few, if any deadlines. Work arrives from many sources. Their role is to prioritize the work according to a set of given rules and accomplish what they can within the prescribed hours of their workday. Thus, we would not expect the usage of temporal structures to meet deadlines. Faculty are less entrained by others' temporal structures but still need to effectively meet the deadlines that they set for themselves. Thus, the significant relationship between *meeting deadlines* and *creation of temporal structures* can be expected. It is not clear why students and faculty do not show a relationship between *meeting deadlines* and *use of explicit temporal structures*, but *planning* is highly correlated with this temporal structure construct and may have absorbed this relationship.

Table 8.9 Path Coefficients for Sensing a Lack of Time Control

Paths	Student	Faculty	Staff
Sensing a Lack of Time Control → Temporal Structure Knowledge	0.009	0.013	-0.260
Sensing a Lack of Time Control → Use of Explicit Temporal Structures	-0.008	-0.095	-0.047
Sensing a Lack of Time Control → Understanding of Implicit Temporal Structures	-0.200 ***	-0.230	-0.015
Sensing a Lack of Time Control → Creation of Temporal Structures	0.018	0.056	-0.136
Sensing a Lack of Time Control → Understanding of University-related Temporal Structure Relationships	-0.227 ***	-0.092	-0.186

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (one-tailed)

Table 8.9 summarizes the path analysis for the relationships between *sensing a lack of time control* and use, understanding, and creation of temporal structures for students, faculty and staff. We find that for students, *sensing a lack of time control* is significantly related to *understanding of implicit temporal structures* ($\beta = 0.200$, $p < 0.001$), and *understanding of university-related temporal structure relationships* ($\beta = 0.227$, $p < 0.001$). No other significant results are found for the other two groups.

We explain these results as follows: We do not expect staff to experience a lack of control that is related to external temporal structures. As stated previously, their job is to perform work according to a prescribed set of prioritization rules. If more work enters their inbox in one day then they can complete, they simply do the rest the next day. They may experience a lack of control over the volume of work coming in, but it is not related to external deadlines they need to know about. Faculty, similarly, may feel a lack of control, but it, too, will not be related to external temporal structures but rather to their own life management in which they set their personal deadlines. In contrast, the students, who are the most entrained by temporal structures, show a relationship between sensing a

lack of control and the most sophisticated temporal structure constructs, *understanding of implicit temporal structures* and *understanding of university-related temporal structure relationships.* We do not find a significant relationship between *sensing a lack of control* and *creation* or *explicit use of temporal structures.* A student can use and create personal temporal structures and still feel out of control unless they understand the multiple dynamics and problems that occur when different temporal structures interfere. Thus, only the good time managers who understand the deeper relationships between temporal structures are likely to feel that they are in control of their time management, especially for the rapid fire due date pressure that students experience. Thus, although we predicted that all relationships would be significant, this relationship structure for students, in retrospect, supports our case more strongly than that of having all temporal structure constructs being significantly correlated with *sensing a lack of control.*

Table 8.10 Path Coefficients of Engaging in Procrastination Behavior

Paths	Student	Faculty	Staff
Engaging in Procrastination Behavior → Temporal Structure Knowledge	0.139 **	-0.146	0.087
Engaging in Procrastination Behavior → Use of Explicit Temporal Structures	-0.047	-0.112	-0.164
Engaging in Procrastination Behavior → Understanding of Implicit Temporal Structures	-0.017	-0.078	-0.369 ***
Engaging in Procrastination Behavior → Creation of Temporal Structures	-0.097 *	0.123	-0.025
Engaging in Procrastination Behavior → Understanding of University-related Temporal Structure Relationships	-0.005	0.166	-0.107

Note: * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$ (one-tailed)

The above table 8.10 shows all path analysis results on the relationship between *engaging in procrastination behavior* and our temporal structure variables. For students, their *temporal structure knowledge* impacts their *procrastination behavior* ($\beta = 0.139$, $p < 0.01$). We ignore the significant but very small β value showing a relationship between *procrastination* and *creation of temporal structures.*. We also find a significant relationship between *procrastination behavior* and *understanding of implicit temporal structures* for staff members ($\beta = -0.369$, $p < 0.001$). Other significant relationships do not exist.

We interpret these results as follows. The significant relationship between student *procrastination* and *temporal knowledge* may indicate that students who are better time managers, through knowing about the different temporal entrainments that are placed on them, may procrastinate less. However, the types of questions we asked for the *temporal knowledge* construct dealt with higher level items in the university and not with the very detailed entrainment that would affect procrastination. Therefore, this explanation is weak.

Staff and faculty may procrastinate even if they know a lot about time constraints because they are not affected as dramatically as students. Although everyone uses explicit temporal structures, individuals still may procrastinate. This is also true for the creation of temporal structures. The results for the temporal construct, *understanding implicit temporal structures* is also difficult to explain. We would expect students who are better time managers to have a deeper *understanding of explicit temporal structures* which would prevent them from procrastination. The one explanation that we put forward is that students who procrastinate can and do stay up all night to finish work. Staff, in

contrast, work set hours so that if there are temporal structures that entrain their work, understanding of these structures will tend to stop procrastination. However, we would expect this relationship to then hold for *understanding of university-related temporal structure relationships* also. It does not. Thus, this explanation is weak. As indicated before, we do not expect faculty behavior to be affected by either of these constructs because of their lack of entrainment by them.

8.4 Research Hypotheses Summarization

In Chapter 5, the key research hypotheses were presented for this thesis. They were presented first as univariate hypotheses which were tested in Chapter 7 and then as multivariate hypotheses to be used for the structural model built from the datasets. This section steps back from the presentation of results given in section 8.3 and provides an overview of how well the results addressed the research hypotheses.

Figures 8.1 presents the overall structural model for students. Figure 8.2 presents the structural model for students after insignificant links are removed. Similarly, Figures 8.3 and 8.4 present the overall and reduced structural model for faculty members and figures 8.5 and 8.6, the overall and reduced structural models for staff. The beta values shown on the links between the temporal structure constructs and the management quality constructs are the same beta values we discussed in the previous section. The three reduced models show that multiple significant relationships exist for the student dataset but NOT for the faculty and staff dataset. Tables 8.11, 8.12 and 8.13 illustrate this in a clearer fashion. The cells shaded in yellow in the table indicate a significant relationship. Only in Table 8.11 for the student dataset do we find a reasonable number

of yellow cells to support our contention that quality time management is related to the use and understanding of temporal structures. The Tables 8.12 and 8.13 for faculty and staff contain, respectively, three and four yellow cells (affirmed hypotheses) out of twenty possible cells. Table 8.14 shows these results in summary fashion for each of our PLS hypotheses. Again, we see that almost all of the hypotheses that support a significant relationship between quality time management and use and understanding of temporal structures are found in the student category.

There are two possible explanations for these mixed results. First, the respondent population for the student dataset was much larger than the population used for the faculty and staff dataset. In addition, the beta values for the student dataset are sometimes small indicating that, although a significant relationship exists, it is still small. Thus, the lower N's on the faculty and staff dataset may not have been enough to tease out these relationships, especially the more subtle ones such as *understanding of temporal structure relationships.* Because N for the student dataset was so large, we believe that this result is robust and that we have shown, at least for the student case, that there is a significant relationship between quality time management and use and understanding of temporal structures.

Our second explanation takes into account another result that was not predicted for the quality time management constructs. The relationships between the management quality constructs are very different for each of the three groups (see Figures 8.2, 8.4 and 8.6). This suggests that there are differences between management behavior for students, faculty and staff which may affect their use of temporal structures. We discussed some of these differences in the previous sections, in particular, the effect of temporal structure

entrainment on time management behavior. For example, the student time management quality structural model shows a significant relationship between *planning* and *meeting deadlines*. This is expected, that is, one expects that people who plan will be better at meeting deadlines. However, no such relationship is found for either faculty or staff. As discussed earlier, neither faculty nor staff are impacted by external temporal structures as much as students are. Faculty are not impacted because they set their own time agenda. Staff are not impacted because their work is not defined by deadlines but by a specified work period. The missing relationship between *planning* and *meeting deadlines* provides some validity for this explanation. Although faculty and staff plan, they do not need to plan to meet deadlines. Thus, the second explanation for having significant results only for the student dataset may be that our relationship only holds for those who are more heavily affected by external temporal structures over which they have little control.

The next chapter ties together the results of this thesis research with the overall research goal of improving time management by building better electronic time management tools. It uses data collected in our survey and comments made by users of electronic calendar tools in a small longitudinal study to make a case for providing better electronic temporal structure capture to improve time management.

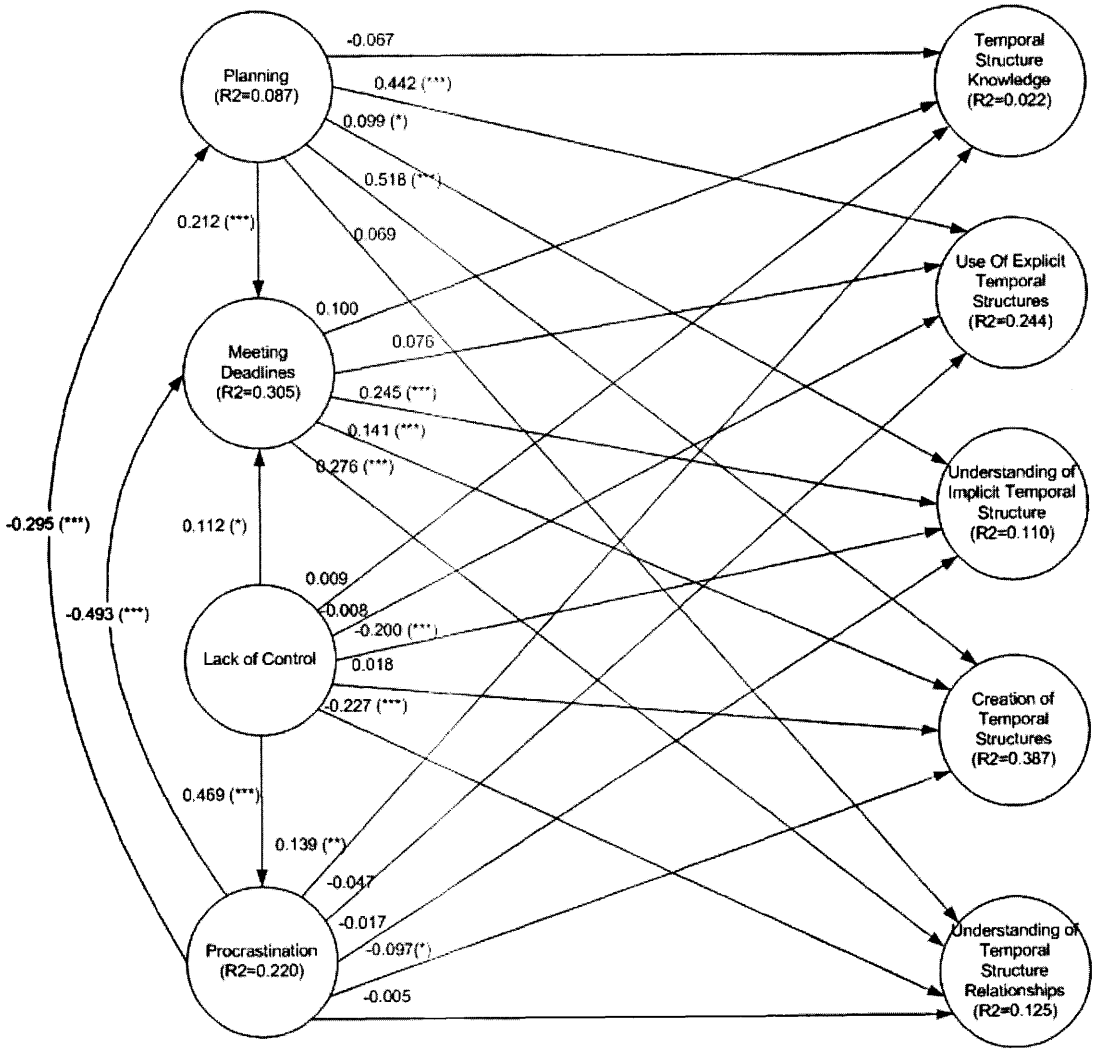

Figure 8.1 Student sample PLS model results.
(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

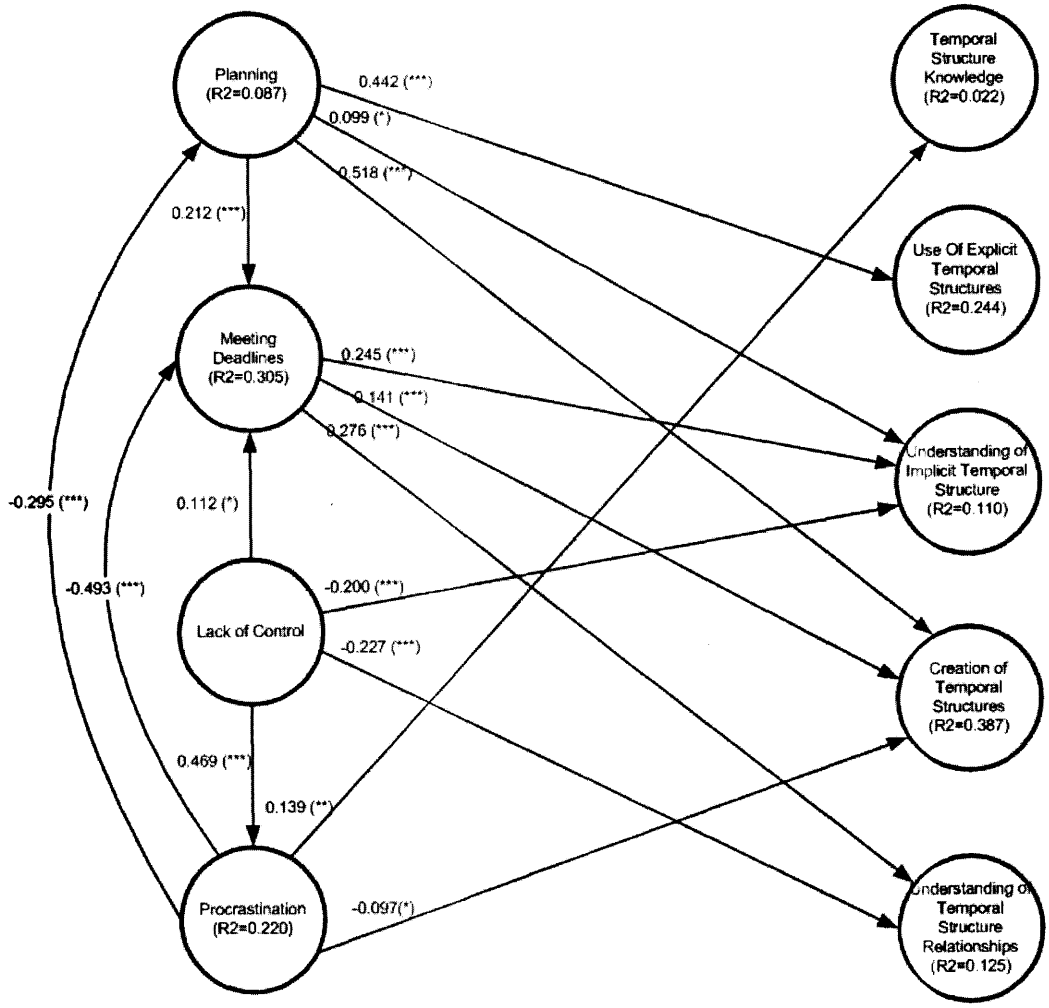

Figure 8.2 Student sample reduced PLS model.
(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

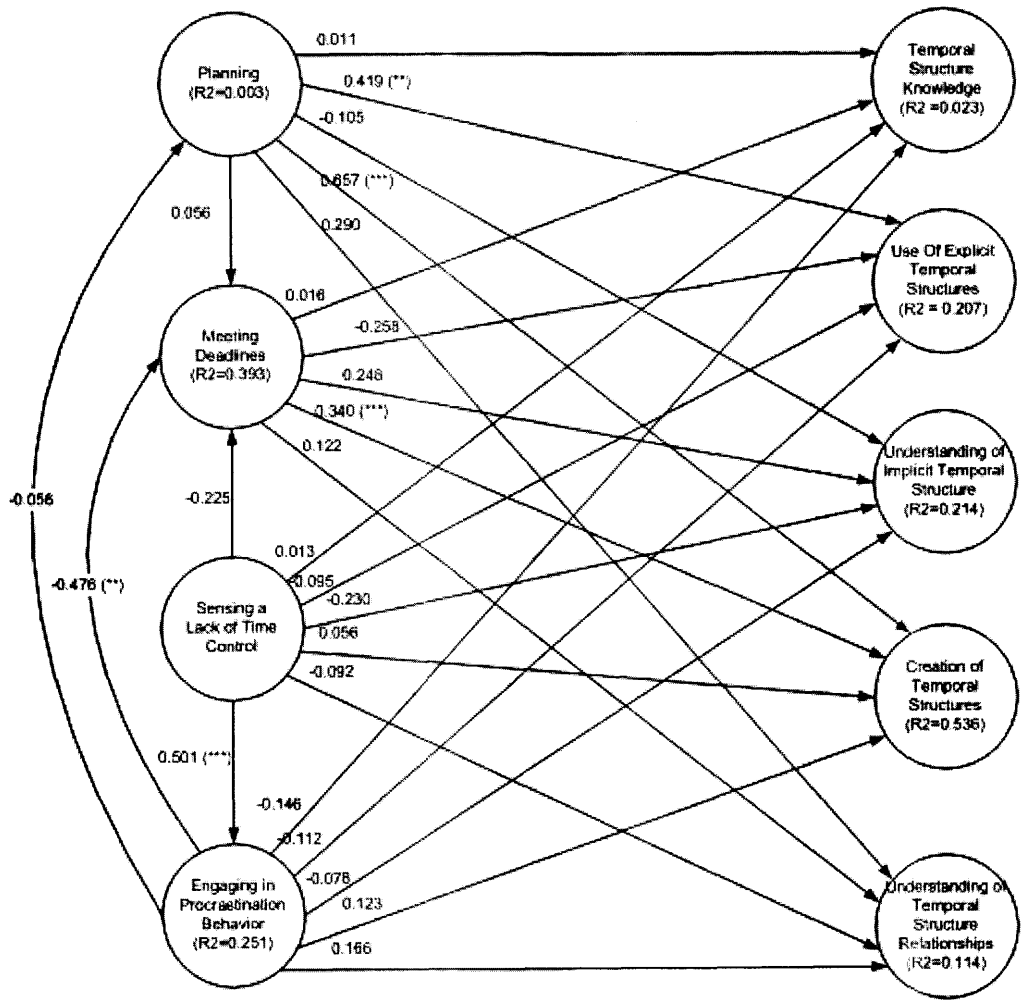

Figure 8.3 Faculty sample PLS model results.
(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

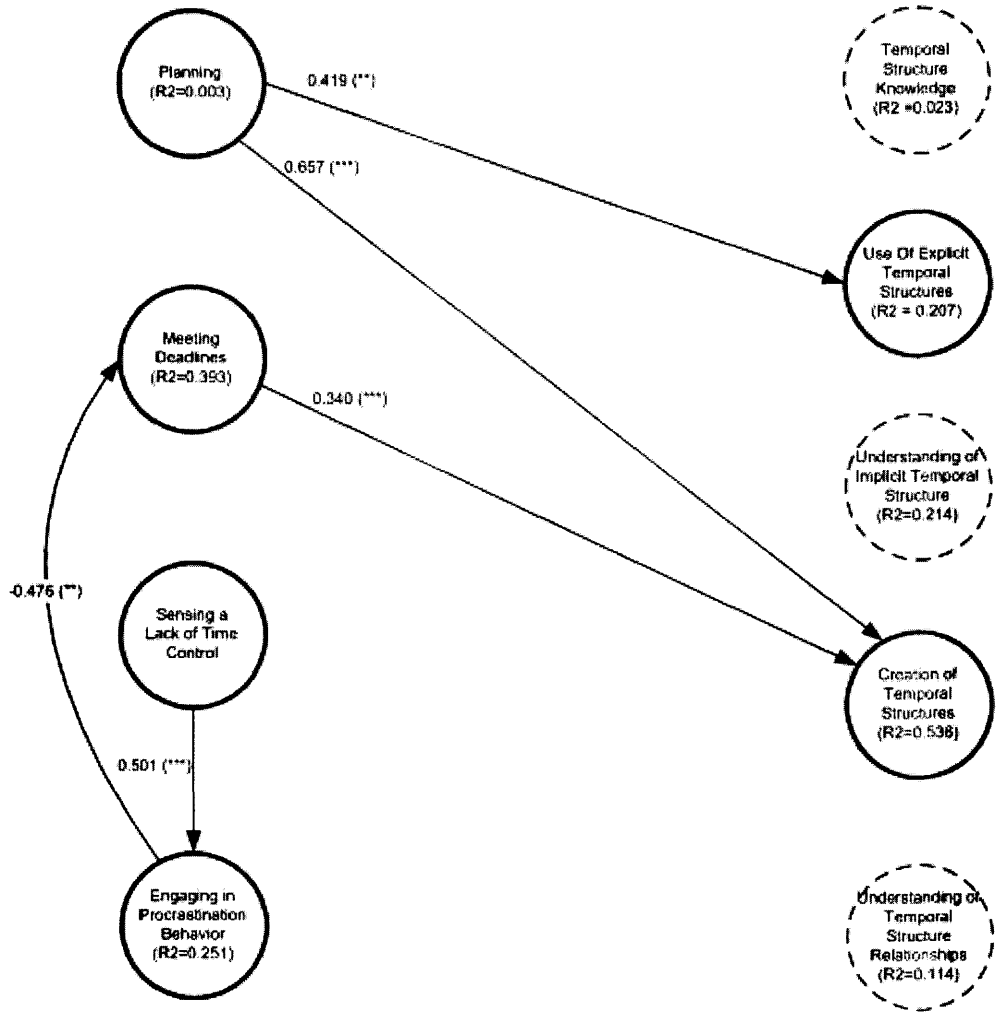

Figure 8.4 Faculty sample reduced PLS model.
(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

Note: ◌ represents insignificant variable; ○ represents significant variable

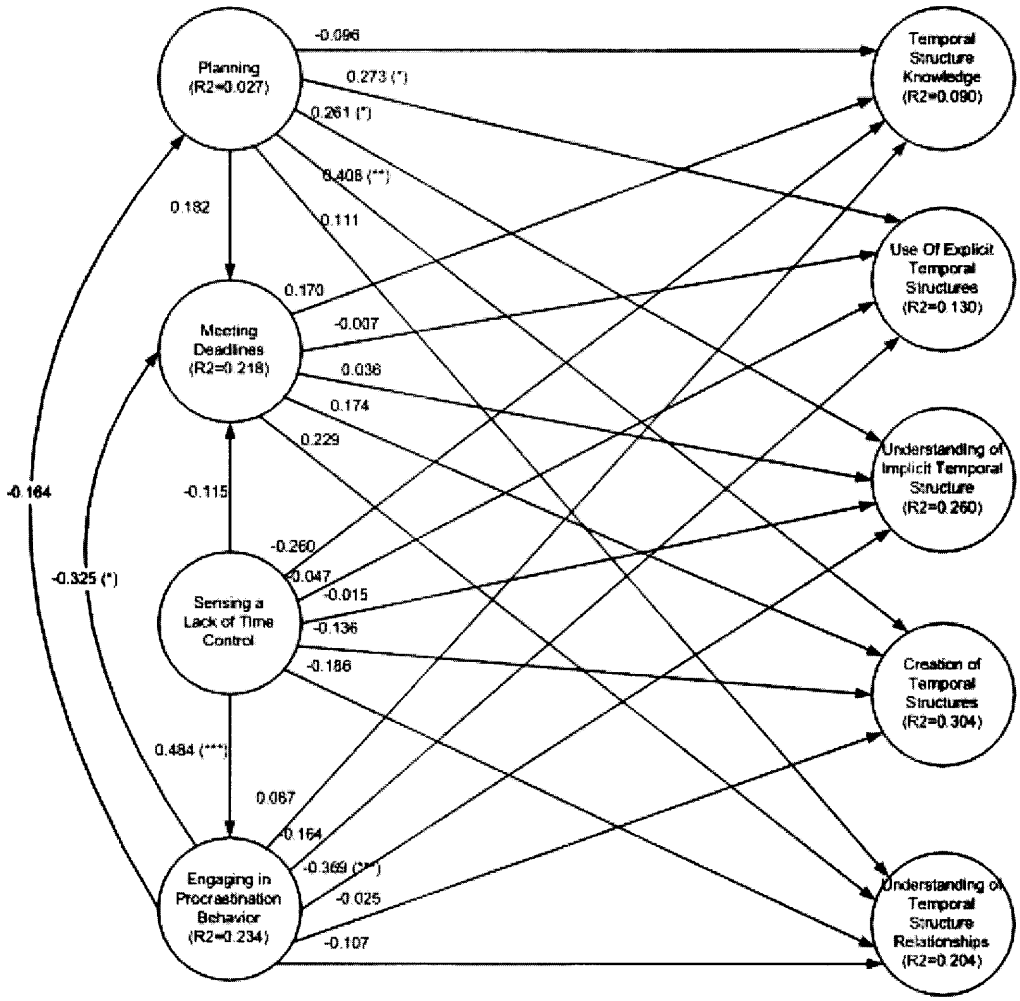

Figure 8.5 Staff sample PLS model results.
(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

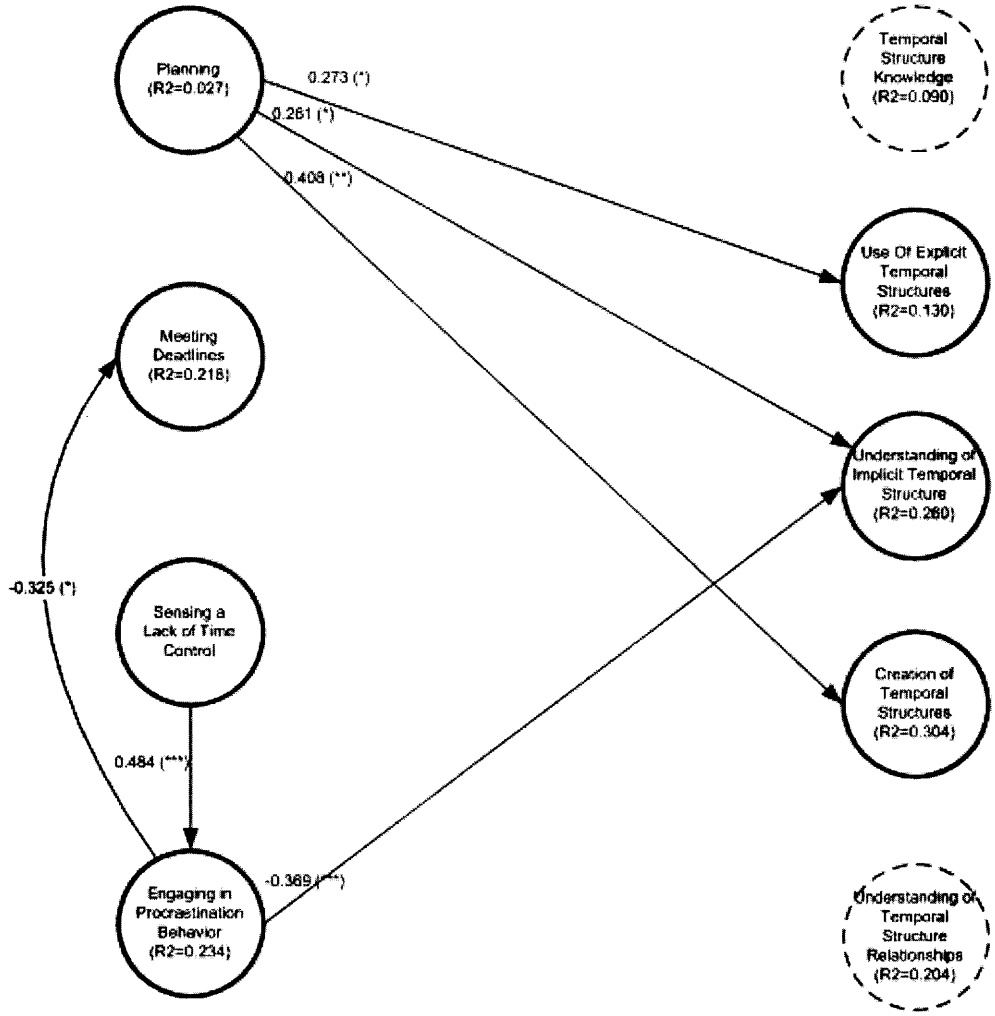

Figure 8.6 Staff sample reduced PLS model.
(* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$).

Note: ◌ represents insignificant variable; ○ represents significant variable

Table 8.11 PLS Results for the Student Dataset

Note: All cells shaded in yellow indicate that the hypothesis is supported for that construct relationship. Hypotheses that are supported are labeled "YES." Hypotheses that are not supported are labeled "NO"

Students (N = 560)	Temporal Structure Knowledge	Use of Explicit Temporal Structures	Understanding of Implicit Temporal Structures	Creation of Temporal Structures	Understanding of Temporal Structure Relationships
Planning	No	**Yes**	**Yes**	**Yes**	**No**
Meeting Deadlines	No	No	**Yes**	**Yes**	Yes
Lack of Control	No	No	**Yes**	No	Yes
Procrastin-ation	Yes	**No**	**No**	Yes	**No**

Table 8.12 PLS Results for the Faculty Dataset

(Note: all cells shaded in yellow indicate that the hypothesis is supported for that construct relationship. Hypotheses that are supported are labeled "YES." Hypotheses that are not supported are labeled "NO.")

Faculty (N = 60)	Temporal Structure Knowledge	Use of Explicit Temporal Structures	Understanding of Implicit Temporal Structures	Creation of Temporal Structures	Understanding of Temporal Structure Relationships
Planning	No	**Yes**	No	**Yes**	No
Meeting Deadlines	No	No	No	**Yes**	No
Lack of Control	No	No	No	No	No
Procrastin-ation	No	No	No	No	No

Table 8.13 PLS Results for the Staff Dataset
(Note: all cells shaded in yellow indicate that the hypothesis is supported for that construct relationship. Hypotheses that are supported are labeled "YES." Hypotheses that are not supported are labeled "NO.")

Staff (N = 83)	Temporal Structure Knowledge	Use of Explicit Temporal Structures	Understanding of Implicit Temporal Structures	Creation of Temporal Structures	Understanding of Temporal Structure Relationships
Planning	No	**Yes**	**Yes**	**Yes**	No
Meeting Deadlines	No	No	No	No	No
Lack of Control	No	No	No	No	No
Procrastin-ation	No	No	**Yes**	No	No

Table 8.14 Summary of the PLS Results for All the Proposed Hypotheses
(Note: Cells that are labeled "*Supported*" and shaded in yellow are the significant relations found with the PLS structural model.)

PLS Hypotheses	Sample	PLS Results
H1.1 *Planning* will have a positive relationship with *temporal structure knowledge.*	Students	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H1.2 *Meeting deadlines* will have a positive relationship with *temporal structure knowledge.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H1.3 *Sensing a lack of control* will have a negative relationship with *temporal structure knowledge.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H1.4 *Engaging in procrastination behavior will* have a negative relationship with *temporal structure knowledge.*	Students	*Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H2.1 *Planning* will have a positive relationship with *use of explicit temporal structures.*	Student	*Supported*
	Faculty	*Supported*
	Staff	*Supported*
H2.2 *Meeting deadlines* will have a positive relationship with *use of explicit temporal structures.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H2.3 *Sensing a lack of control* will have a negative relationship with *use of explicit temporal structures.*	Students	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H2.4 *Engaging in procrastination behavior* will have a negative relationship with *use of explicit temporal structures.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H3.1 *Planning* will have a positive relationship with *understanding of implicit temporal structures.*	Student	*Supported*
	Faculty	*Not Supported*
	Staff	*Supported*
H3.2 *Meeting deadlines* will have a positive relationship with *understanding of implicit temporal structures.*	Students	*Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H3.3 *Sensing a lack of control* will have a negative relationship with *understanding of implicit temporal structures.*	Student	*Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H3.4 *Engaging in procrastination behavior* will have a negative relationship with *understanding of implicit temporal structures.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Supported*

Table 8.14 Summary of the PLS Results for All the Proposed Hypotheses (Continued)

PLS Hypotheses	Sample	PLS Results
H4.1 *Planning* will have a positive relationship with *creation of temporal structures.*	Students	*Supported*
	Faculty	*Supported*
	Staff	*Supported*
H4.2 *Meeting deadlines* will have a positive relationship with *creation of temporal structures.*	Student	*Supported*
	Faculty	*Supported*
	Staff	*Not Supported*
H4.3 *Sensing a lack of control* will have a negative relationship with *creation of temporal structures.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H4.4 *Engaging in procrastination behavior* will have a negative relationship with *creation of temporal structures.*	Students	*Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H5.1 *Planning* will have a positive relationship with *understanding of temporal structure relationships.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H5.2 *Meeting deadlines* will have a positive relationship with *understanding of temporal structure relationships.*	Student	*Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H5.3 *Sensing a lack of control* will have a negative relationship with *understanding of temporal structure relationships.*	Students	*Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*
H5.4 *Engaging in procrastination behavior* will have a negative relationship with *understanding of temporal structure relationships.*	Student	*Not Supported*
	Faculty	*Not Supported*
	Staff	*Not Supported*

CHAPTER 9

RELATIONSHIP BETWEEN TIME MANAGEMENT TOOLS AND TEMPORAL STRUCTURE USAGE

This chapter supports the argument begun in Chapter 4 for the need to design and implement electronic time management tools that incorporates more temporal structures than are now being used. The support is based upon the survey data analysis, upon the pilot interviews, and upon a small longitudinal study that was conducted. Section 9.1 describes the correlations between *perceived time management tool usefulness* and individual time management quality. It also documents a few significant correlations that occurred between *perceived time management tool usefulness* and the four temporal structure constructs investigated in this thesis. The longitudinal study is presented in Section 9.2. It examines whether capturing and utilizing temporal structures in an electronic time management tool improves individual time management quality. Section 9.3 summarizes and extrapolates the results presented in Sections 9.1 and 9.2. and combines this data with salient results from our pilot interviews presented in Chapter 5. The results that are used and summarized are those that apply to the arguments being made that designing better electronic time management tools that make it easier for people to capture a wider range of temporal structures will lead to better time management. Throughout Section 9.3, explicit suggestions are made for design opportunities that would capture a currently unavailable or difficult to capture temporal structure.

9.1 Correlations among Time Management Tools, Temporal Structures and Quality of Individual Time Management

The survey collected additional information on perceived time management tool usefulness. Six questions formed a construct labeled *perceived usefulness of time management tools* (see Table 6.17). For the three subject samples, the construct reliability was found to be satisfactory (Cronbach Alpha: Student = 0.83, Faculty = 0.77, Staff = 0.85). A correlation analysis was run to examine the relationship between *perceived usefulness of time management tools,* quality of individual time management and the temporal structure constructs.

Significant correlations were found between *perceived usefulness of time management tools* and quality of individual time management (See Table 9.1). Only *Sensing a Lack of Control* was not significantly correlated for the Faculty sample. This data contains more significant correlations than we found between time management quality and the temporal structure constructs investigated. These correlations are interpreted as follows. If users perceive time management tools to be useful, it is very likely that they are using time management tools. Thus, the implication is that users of time management tools are better time managers. This will be addressed further in Section 9.3.

Significant correlations were also found between perceived usefulness of time management tools and all temporal structure constructs except understanding of implicit temporal structures and understanding of temporal structure relationships for Faculty (See Table 9.2). Again, the argument can be made, that if individuals perceive a tool to be useful, they are very likely to use it. In this case, if individuals are using a time management tool, they are, by definition, recording explicit temporal structures and

creating new temporal structures. They are not working with implicit temporal structures or temporal structure relationships because current time management tools do not support these activities.

Table 6.17 Perceived Usefulness of Time Management Tools Construct

Strongly Disagree 1 2 3 4 5 Strongly Agree

Items	Questions	Sample	1 (%)	2 (%)	3 (%)	4 (%)	5 (%)	Mean	S.D.
Ii110r	I use my time management tool(s) very much.	Student	8.2	15.9	20.7	32.5	22.7	3.44	1.25
		Faculty	7.3	12.7	20.0	36.4	23.6	3.56	1.20
		Staff	-	-	-	-	-	-	-
Ii18	My time management tool(s) help(s) me to use my time more efficiently.	Student	3.2	11.3	24.4	40.3	20.8	3.68	1.06
		Faculty	0	12.7	20.0	52.7	14.5	3.69	0.88
		Staff	1.3	11.4	17.7	41.8	27.8	3.84	1.01
Ii17	My time management tool(s) help(s) organize my time.	Student	3.6	7.5	21.0	43.4	24.5	3.81	1.04
		Faculty	0	11.1	18.5	53.7	16.7	3.76	0.87
		Staff	1.3	9.0	20.5	32.1	37.2	3.95	1.03
Ii113r	I mostly rely on my time management tools instead of remembering things in my head.	Student	14.5	26.8	23.6	23.1	12.0	2.91	1.25
		Faculty	14.5	18.2	18.2	27.3	21.8	3.24	1.37
		Staff	-	-	-	-	-	-	-
Ii119r	I often check my schedules written in my time management tool(s).	Student	4.1	10.7	20.0	38.9	26.3	3.70	1.14
		Faculty	-	-	-	-	-	-	-
		Staff	-	-	-	-	-	-	-
Ii114	I feel that my time management tool(s) help me achieve my long-term goals.	Student	6.3	17.7	30.8	32.4	12.8	3.30	1.12
		Faculty	-	-	-	-	-	-	-
		Staff	5.1	15.4	33.3	24.4	21.8	3.42	1.15

(Cronbach Alpha: Student = 0.83, Faculty = 0.77, Staff = 0.85)
Note: "r" means the question item was reversed.

Table 9.1 Significant Correlations between *Perceived Usefulness of Time Management Tools* and Quality of Individual Time Management

Pearson's R /P Value	Planning		Meeting Deadlines		Sensing a Lack of Control		Engaging in Procrastination Behavior	
Students	0.501	$p < 0.01$	0.313	$p < 0.01$	-0.147	$p < 0.01$	-0.322	$p < 0.01$
Faculty	0.343	$p < 0.05$	0.424	$p < 0.01$	-0.044	-	-0.337	$p < 0.05$
Staff	0.415	$p < 0.01$	0.594	$p < 0.01$	-0.332	$p < 0.01$	-0.292	$p < 0.05$

Table 9.2 Significant Correlations between *Perceived Usefulness of Time Management Tools* and Temporal Structure Constructs

Pearson's R /P Value	Use of Explicit Temporal Structures		Understanding of Implicit Temporal Structures		Creation of Temporal Structures		Understanding of Temporal Structure Relationships	
Students	0.486	$p < 0.01$	0.082	-	0.455	$p < 0.01$	0.106	$p < 0.05$
Faculty	0.291	$p < 0.05$	-0.036	-	0.333	$p < 0.05$	0.168	-
Staff	0.402	$p < 0.01$	0.151	-	0.352	$p < 0.01$	0.320	$p < 0.01$

9.2 A Longitudinal Study on the Impact of Time Management Tools on Time Management Quality

To examine whether incorporating temporal structures into current electronic time management tools will improve individual time management, a small four-month longitudinal study was conducted with two student subjects in Spring 2005.

Subjects were first interviewed about their current individual time management practices, and then introduced to an electronic online time management tool called Yahoo™ Online calendar. Following this introduction, each subject met weekly with the experimenter for two months and then biweekly after that. During the first meeting, the subjects were asked about their daily activities, which were used to identify the temporal structures entraining their lives. For example, explicit temporal structures impacting

students are university academic schedules, individual course schedules, and so on. The subjects were also aware of implicit temporal structures that affected them, for example, the need to register early to avoid late fees, awareness of computer lab peak times for scheduling their computer usage, etc. In addition, they were asked whether any time management tools were utilized to support individual time management. At the beginning of this study, each of the subjects relied mainly on personal memory (90 %) to remember their schedules while occasionally using an additional paper calendar or a cellphone (e.g., for birthdays). They complained of frequently missing deadlines. In the second meeting, each subjects' temporal structures were explicitly explained by the experimenter, and the Yahoo online calendar was then introduced to the subjects. With the aid of the experimenter, each subject was asked to manually enter all their current temporal structures into the Yahoo online calendar. This took about three hours. After the first few meetings, the two subjects met with the experimenter weekly. After two months, the two subjects met with the experimenter biweekly. The purpose of the follow-up meetings was to examine whether the subjects used the Yahoo online calendar to manage their time, and whether they had problems in using the calendar tool. They adopted the new tool and used it regularly to manage their personal and student activities. After four-months of observation, a semi-structured interview with each subject was conducted to examine whether utilizing temporal structures in the electronic time management tool impacted their individual time management quality. The interviews suggested that the subjects perceived great improvement on their personal time management quality, and that they even recommended the tool to fellow team members to better coordinate their team activities. They reported becoming more productive and more organized with the

adoption of the electronic tool and the incorporation of the temporal structures affecting their lives. The following quotes illustrate this. (Note: the temporal structures used by the students are boldfaced and underlined. The key part of the student's answer to a specific question is boldfaced.)

1. Can you please describe how you conducted your time management before you adopted the Yahoo! online calendar? What were your time problems at that time?

Subject A: Before I adopted the Yahoo online calendar, I used to use the old fashioned method of pen and paper by inputting timelines into my paper calendar book or my wall calendar. Most of the time it was used only for short term planning like a week ahead or so, and ***I was also most of the time depending on my memory to memorize important deadlines or events. I used to face plenty of time problems like inaccuracy of information and updating my calendar often was sometimes a problem especially since I did not carry a pen around.***

Subject B: Well, prior to me adopting the Yahoo calendar, that is the Yahoo online calendar, ***a lot of my time management was between everything on top of my head or using my cellphone*** *to track down many of my tasks for the day or the week. I also used* ***sticky notes (yellow pad)*** *by writing down tasks on the paper and sticking them on the wall of my desk area. Prior to the Yahoo online, the biggest problem was trying to remember the tasks in my head. Even so, sometimes you get sidetracked by distractions such as a phone call, a knock on the door, or any other form of distraction. This sidetracking can also lead you to forget to do thing; In turn, it will cause you to* ***forget to do things or tasks****. Overall,* ***the problem with having everything in your head is "trying to remember"****. The problem with using sticky notes is, for example, if you leave for school, and you may have tasks jotted down on this yellow post it notes. Now, if you leave for school without bringing those notes with you or transferring the tasks onto another piece of paper, then you will obviously forget to complete one task out of the many that you tried to remember. Other problem that I can think of is trying* ***to use many tools to manage your time can be quite difficult****. The reason is that you will need to update all entries throughout all your time management tools. This can be a burden on managing your time.*

2. Has your time management changed after you adopted the Yahoo! online calendar? If yes, can you give me one example of what changed? Can you give me another example? How much do you think these changes are useful or not?

Subject A: Yes, it has changed quite differently after adopting the Yahoo online calendar. First of all ***it has helped to stay more focused and more organized*** *since I was able to sync my calendar between my PDA* (the student bought a PDA after the Yahoo! Online calendar was introduced to him) *and MS Outlook and hence always be updated and have more control of my time. Another example,* ***I become more***

productive by using the calendar sharing feature with team mates. I think that these changes are extremely useful since it provides me with me better feel of my time schedule for short and long term planning.

*Subject B: "Certainly did", Yahoo calendar has everything in front of you._**The advantage was that I gained more time by only using one tool instead of many tools.** The thing that changed with using Yahoo online calendar is that I had gained several hours after using this tool. **Another example of change using this tool is that it minimized the opportunity of me forgetting to complete a task or missing an appointment or meeting. The changes are definitely useful. The changes are useful in a sense that it improved my organization skills and increased my efficiency, quality of work, set my priorities straight, arriving on meetings and appointments on time.***

3. How did you schedule your activities in your calendar? For example, your course schedules.

*Subject A: Usually, I would input the **recent events** on the go to whatever device available at the time and then sync with the rest of the tools later. For example, I have a **project due** in two weeks I will make sure to input the event on my online or the PDA whichever is available to me at that time then later on I would make sure that my online calendar and my PDA and my outlook are synchronized and then setup enough reminders according to my availability.*

*Subject B: First of all, my activities were based on the time slots. For example, I scheduled an activity such as having **lecture class on such day and time**. So, I entered the day that activity was held as well as the time. I pretty much entered everything I thought that I needed in the calendar to manage my time. Other examples were **appointments such as projects for group work, paying bills, grocery shopping, or car maintenance (such as oil change on given date).** Also, I entered **professor's availability schedule** in the calendar so I know when to see the professor for help. I would put down when they are available.*

4. Do you put any university calendar events into your calendar? If so, why? If not, why not?

*Subject A: Yes, I input the major university events calendars like **exams, bill pay, professors' office hours, team meeting, project deadlines and advisors appointments**. I do that because it provides me with better flexibility of my time and let me plan ahead of time on how busy I would be during the different school days. Also, it allows me to keep a good balance between my work schedule, school schedule and personal time.*

*Subject B: Yes, I did! I entered **deadline dates such as when is the registration period for a given semester, registration changes, end of semester date, final exam***

period, or advisement period for students. *One event I scheduled which I thought was useful which was having a reminder task for registering for summer until the day of. This assured me that I need to choose my courses quickly before they get filled up.*

5. Do you schedule your study time in your calendar? If so, how? If not, how did you find time to study? What are the advantages and disadvantages when you schedule or do not schedule your study time?

Subject A: I usually do not input study time into my calendar. I found time to study depending how free I will be during the day or the week after completing the other tasks. In other words, I don't dedicate special study period during the day but it depends if I was falling behind in certain class or there was common exams approaching then I will make sure to ***free up more time in my schedule to get ready ahead of time****. The major disadvantages are that sometimes I underestimated the time it will take to study for a certain class. I would be under a lot of pressure and sometimes I don't spend enough time to finish what I should have finished before.*

Subject B: Yes, I did. I scheduled my study time by looking at the calendar by figuring out what available slots are available. So, I look at all the dates and made sure there is an availability slot. The advantages of using the calendar tool to schedule my study time is being fully prepared for an exam which is a big plus. Another advantage of ***scheduling study time is that it prevents me from cramming****. Also, I might add that is scheduling my study time prevents me from having to do two tasks on that day.*

6. Do you ever create your own schedules in addition to simply capturing your external existing schedules? If so, can you give me an example of this type of schedules you would like to create? Why did you do so? Or why didn't you do so? Would you like to create your own schedules in your electronic time management tool? Can you easily create your own schedules before and after you adopted your tool? How?

Subject A: Yes, sometimes I would schedule my personal schedule with the regards to the external existing schedules. For example, ***the national and religious holidays*** *I would input them to my calendar to see what I have to do before or after that holidays and if there was a repeating event that will interfere with that holiday and what would be the best date to shift it to another date. Yes I would like to create my own schedule in electronic format. I can easily create my schedule after I adopted the tool since I can add special events like* ***birthdays*** ***or religious holidays or weather updates*** *for the whole year and I will update itself if there were any changes to be made.*

Subject B: There are several schedules I create on my own in addition to simply capturing on my own external existing schedule. ***One schedule can be where I schedule my grocery shopping task at a time where the supermarket is not insanely crowded.*** *Also, a good example for me would be* ***trying to avoid traffic during rush hour or peak time****. So, in turn, I would make sure that I was not traveling around those times. Another big "no-no" is attempting to schedule a task such as grocery*

shopping on day that forecasters are calling for a big storm such as a snow storm. I know that I will need to schedule grocery shopping task as early as possible rather than the last minute in which everyone will be at the supermarket during that period. Another example I can think of is a store having a sale. In that respect, I would make sure that I make my schedule to visit that store during the very beginning of the week or the first day so that I can make sure that the products don't sell out. I would definitely create schedules for these activities in my Yahoo calendar. In reference to creating my own schedule before I adopted this tool, I would probably say no because as I said earlier that the ability of the human mind to remember many tasks can be quite complex especially when distractions occur. After adopting the calendar, the Yahoo calendar tool definitely helped me out.

7. How do the external schedules impact your own time management? What are your strategies to synchronize them with your own schedule?

*Subject A: External schedules impact the way I arrange my personal schedules and sometimes I have to cancel or postpone some schedules if it interfere with the **personal schedul**e. For example, I have a meeting with coworkers at certain day that occurs every week but it happen to be **a special religious holiday** at the same day, I would have to cancel the meeting on that day and reschedule for another day. My strategy is basically to **input the major external schedules** yet as we go so I can avoid any future interference with my personal schedule.*

*Subject B: An external schedule that impacts my time management is doing **maintenance** on my car. As a car owner, I am very well aware that a vehicle requires maintenance of oil every 3000 miles or say about every 3months. Now, I know that every time this occurs that I need to take care of this or else my car will no longer works. The problem with this is that the 3000 mile mark doesn't necessary fall on a given date. So, with that in mind, I must account for this day and time. The strategy to synchronize this task with my existing schedule is to assure that the specific time and day is allocated to complete this developing task.*

8. Are there any schedules you want more specific, which most of time you cannot easily capture?

*Subject A: The main schedules that I want to more specifics about are the tasks that I have to **share with team members.** I would like to be able to enter more data or descriptions about **the next task scheduled** and also it would be a convenient to send an automated e-mail or text message with all the updates that needs to be done for the next schedule or meeting time which will improve productivity.*

*Subject B: Yes, there are several schedules that I want to be more specific such as **scheduling computer lab time or grocery shopping** as mentioned above. Computer lab time implies that I choose to go to the computer lab before 10 am and after 7 pm*

because of the availability of PCs and related tools. In reference to shopping, I would make sure that I don't go shopping during the time where the supermarket is jam packed with shoppers. Those times would be on Friday evening after 5 pm, Saturday (1 1am-6 pm), and Sunday (11 am-6 pm). I made sure that I was not ***planning a shopping task*** *in those slots if the slots were available. The question is how do I know this? The only way one would know this information is if he or she had experienced this or word of mouth. Another schedule that I want to be more specific is attempting to go shopping on Black Friday. For those that don't know,* ***Black Friday*** *is a day that follows Thanksgiving Day marking the first day of the* ***Christmas season shopping****. On this day, everyone hits the malls. What does this mean? This means that the stores are packed, jammed and traffic is crazy. My solution to avoid this is to get up early before everyone which assures me that*

a.) I avoid traffic
b.) I make sure that more merchandise is left for me to purchase.

This longitudinal study confirms that people use a large variety of temporal structures in their personal time management, which include both explicit (e.g. course schedules, birthdays, university calendars etc.) and implicit temporal structures (e.g. grocery shopping time, traffic time etc.). Implicit temporal structures were hard to capture, for instance, scheduling computer lab time relied on how many PCs were available. Similarly, relationships between temporal structures impacted their use and coding such as the general shopping rhythms of others. Both the implicitness of these rhythms and the impact they had on time usage could not readily be captured by the student's tools but were induced from the student's personal experiences. In addition, the closing interview and student behavior (encouragement of others to use the online calendar tool) suggests that the tool usage was perceived to improve personal time management significantly.

9.3 The Argument for Improving Current Electronic Time Management Tools

In this section, the information presented in the first two sections, plus some information from the pilot interview results in Chapter 5 is drawn together to build an argument for improving electronic time management tools. Although this work will be future research, the thesis has collected enough data to strongly suggest that work on building such systems will result in significant improvements in individual time management in organizations. The argument being made is four fold. First, information is provided that indicates that existing electronic time management tools are already improving time management. From this it is extrapolated that if existing tools are improving time management, then better tools will improve it more. Thus, our next three arguments are for specific improvements to current electronic time management tools that will lead to easier and more productive use of these tools. Three possible improvements are suggested and supported by either difficulties that users in the research study complained of with the use of existing tools or of successes they experienced with the clever use of existing tools. The improvements are better and easier capture of temporal structures, especially ones that are commonly used; the addition of intelligent agents to electronic tools to sort out conflicts and capture data on implicit temporal structures; and the use of collaborative tools for coordinating temporal structures.

The arguments, suggested improvements and support found in this thesis are listed in the paragraphs which follow.

Argument 1: Electronic time management tools will make better time managers.

Support for this argument will suggest that if the use of current tools is already making better time managers, then it can be extrapolated that the improvement of these tools will make even better time managers. This leads us to Arguments 2, 3 and 4. These final arguments are examples of how electronic time management tools can be improved. Support is given for why these changes would improve the quality of time management. This support is drawn from the three studies conducted in this thesis.

Support for Argument 1:

The thesis found significant correlations between *perceived usefulness of electronic time management tools* and all categories of quality of time management (See Tables 9.1). It is argued that if people perceive electronic time management tools to be useful, then they also have a high probability of adopting such tools. Thus, it is argued that use of an electronic time management tool is also significantly correlated with good time management. Section 9.1 also showed a significant correlation between the *perceived usefulness of electronic time management tools* and the use and creation of explicit temporal structures. This also supports the case that if people perceive a tool as useful, they will use it, because the use and creation of explicit temporal structures is precisely what individuals do with existing electronic time management tools.

Comments from the longitudinal study also indicated that the use of an electronic tool significantly improved each of the students' time management. For example, Subject A comments, "*it has helped me to stay more focused and more organized...and hence always be updated and have more control of my time. Another example, I become more productive by using the calendar sharing feature with team mates. I think that these*

changes are extremely useful since it is provides me with me better feel of my time schedule for short and long term planning." More positive comments can be found in Section 9.2.

Argument 2: Electronic time management tools need to be designed to make it easier to capture temporal structures.

This is the first suggestion for a proposed improvement in electronic time management tools. It needs to be supported by complaints about current use of the tools, in particular, specific difficulties that users have been observed to experience in attempting to put temporal structures into their time management tools. It also needs to be supported by a feasibility argument, that is by examples of how such an improvement might be implemented.

Support for Argument 2:

Significant correlations were found between *perceived usefulness of electronic time management tools* and *creation of temporal structures*. These correlations indicate that these tools were being used heavily, but that the usage involved the work that was necessary to create each individual temporal structures. It follows that if we provide ways to make this creation easier, that the time management tool will be considered even more useful. An example of such an easier creation is the availability of "drag and drop" temporal structures that can be pulled to one's personal calendar without the effort of finding the calendar times and dates and setting all the repeat parameters. One existing example of this type of feature is that provided by the United Airlines reservation site. Once an airline reservation is purchased, users have the option of dragging and dropping

an icon on to their Outlook calendar that will automatically update the calendar with their flight departure and arrival times.

Complaints from subjects in the pilot study who were new employees at the university were often about their lack of knowledge of the existing temporal structures of the university. For example, they did not know how to plan for specific due dates of documents or special meetings on campus because these dates and times were not widely enough advertised. Having drag and drop icons that would put these dates directly on one's personal calendar would have been a useful addition for these employees and helped them to manage their own time better.

The two students in the longitudinal study complained about the difficulty of recording all of the detailed information they needed to manage their time better in their electronic calendars. Although all of the information they were recording was already kept electronically, they were required to re-input this data in their personal calendar. Examples of this included, listing the due dates of bills, putting in assignment due dates, putting in class schedules, etc.

Argument 3: Electronic time management tools need to be designed to capture and support more than explicit temporal structures.

This is the second suggestion for a proposed improvement in electronic time management tools. It needs to be supported by the identification of problems that users encountered either in managing multiple temporal structures or in trying to capture temporal structures that were not amenable to the electronic tools in use.

Support for Argument 3:

In the longitudinal study, both students complained about the difficulty of synchronizing multiple conflicting temporal structures. For example, although they knew that the best time to access computers in the computer lab was probably early in the morning, they also knew that this was the worst time to commute to the university because it conflicted with rush hour commuters. What students wanted for their calendar tools was more intelligence in the calendar system for which they could specify and solve these conflicting relationships. For example, in the computer lab access problem, they would like to specify the morning rush hour as an irresolvable constraint and then have the calendar tool schedule computer lab usage that did not violate this constraint.

In addition, the two longitudinal study students were not completely sure of what times were the best times to access the lab computers because this was not included as information in the computer lab time schedules. That is, the students not only wanted the explicit temporal structure of lab open hours, but also the implicit temporal structure of the best lab open hours. This information can be readily captured through the daily online computer usage and even incorporated in a "drag and drop" tool that allows a student to schedule the best, medium or adequate computer use times. Such additional information will certainly save these students' some personal time and help them manage their time more efficiently.

In the pilot study, the busy time managers complained considerably about having to keep multiple schedules for the multiple lives they led. For example, almost all managers kept a separate calendar for home and for work. This created problems, however, when the schedules conflicted. It would have been better to have one calendar

that worked with multiple views and also had intelligent agents that examined the relationships between home and work temporal structures when new time allocations were input. Such calendar support would either save the individual from time lost to rescheduling events or time lost checking the multiple schedules.

In the pilot study, the subjects also complained about it being too much work to capture all the temporal structures associated with an event. For example, if a person served as a technical paper's chair for a conference, this person needed to not just put in the date when the papers were due, but also personal dates for setting up the reviewing software, the assignment of reviewers, the notifications to reviewers, the due dates for reviews, the notification dates for authors and the due dates for final copy of the papers. Having a "drag and drop" event temporal structure that knew about weekends and holidays would make this scheduling effort much easier and also allow the person using it so see much more clearly how this event impacted time management for the months ahead.

Argument 4: Electronic time management tools should support collaborative activities.

This is the third suggestion for improvement in electronic time management tools. Currently, except for a few systems, events that are shared between multiple people are recorded individually by each member of a working team. Two possible methods for handling this problem are suggested. First, a temporal structure can be declared as shared with others so that when one person inputs the temporal structure, it automatically appears on other's calendars. Or, one person can create a "drag and drop" temporal

structure that can be mailed around by email to other team members, giving them the option of putting this temporal structure on their personal time management tool. For example, one person may want his or her friends to attend all of the university basketball games, but this does not mean that his or her circle of friends will be interested in doing so.

Support for Argument 4:

In the longitudinal study, the students complained about the difficulty of scheduling team meetings for their class programming projects. They would have liked the other members of the team to be keeping similar calendar schedules so that meetings would not be forgotten. They would have also liked to have shared calendars so that scheduling meetings would be easier.

In the pilot study, one subject kept a public calendar. This was reported as an efficient time management ploy because it put the burden of finding a free time slot for a meeting on the other person and avoided the exchange of multiple emails that attempted to set up a workable time for both individuals.

Although the above arguments are speculative, that is, they are being made on a small number of interviews or a small number of subjects studied in the longitudinal study, the comments and the intensity of the comments about the difficulties that individuals were having with time management, in particular, being able to incorporate the large number of, and the more ambiguous types of temporal structures into a time management tool indicates that a problem is waiting to be solved. Although the subjects using electronic time management tools all reported significant happiness with their tools,

this is perhaps because this is all that is available at the moment. We argue that there should be more and give plausible descriptions of what this "more" should behave like.

The next chapter gives an overview of the findings of this research and relates them to the research questions posed earlier in this dissertation. It also discusses how this research is related to the field of Information Systems, and what can be drawn from this research to apply to Information Systems. The limitations of this research are discussed in addition to listing the overall contributions of this thesis. Finally, future possible directions for expanding this work are presented.

CHAPTER 10

CONCLUSION

This chapter relates the key findings for this dissertation research to the general research questions posed and discusses why the results from this research are important to the field of Information Systems. It also discusses the limitations of this work and gives a summary of the overall contributions of this thesis research. Finally, future research directions are suggested that are related to a number of unpredicted results uncovered in the data analysis.

10.1 Key Research Findings

All five research questions that were presented in Chapter 5 ask what is the relationship between quality of individual time management and the use or understanding of different temporal structures. For this thesis research, we developed and captured four measures of individual time management quality (*planning, meeting deadlines, sensing a lack of time control* and *engaging in procrastination behavior)* and analyzed the relationship between these measures and five others that we developed and used to capture how people use and understand different temporal structures. The data analysis results provide some but not all of the answers to our five posited research questions. Below, we present each research question, indicate what support we have found for the question, and then discuss why or why not we believe the thesis answers the question.

RQ1: What is the relationship between the knowledge of temporal structures and the quality of individual time management?

Only one relationship between *engaging in procrastination behavior* and *temporal structure knowledge* is found in the student sample ($\beta = 0.139$, $p < 0.01$), and nothing significant is obtained from faculty and staff members. These results indicate that the quality of individual time management is not greatly impacted by *temporal structure knowledge.*

However, although this construct is a knowledge rather than subjective measure, there is a key problem with its usage on our large population because we could not accurately assess whether the temporal knowledge involved in the question was relevant to a respondent's work. Thus, responses to some subset of the temporal knowledge questions were probably guesses. The electronic administration of this question also had problems so that we cannot accurately state that we have answered this first question.

RQ2: What is the relationship between use of explicit temporal structures and the quality of individual time management?

The PLS data results show that one common relationship exists between *planning* and *use of explicit temporal structures* for students ($\beta = 0.442$, $p < 0.001$), faculty ($\beta = 0.419$, $p < 0.01$) and staff ($\beta = 0.273$, $p < 0.05$). Since the time management construct for *planning* has a tautological relationship with the temporal structures concept *use of explicit temporal structures,* we completely expect this relationship and do not feel that this positive relationship can be used to indicate that we

have answered this research question. Positive relationships between *meeting deadlines* and this temporal construct would have been better indicators of a positive relationship. Thus, Research Question 2 has not been adequately addressed.

RQ3: What is the relationship between understanding implicit temporal structures and the quality of individual time management?

The results indicate that *understanding of implicit temporal structures* impact students, faculty and staff differently. The PLS results demonstrate that there is a significant relationship for students between *understanding of implicit temporal structures* and *planning* ($\beta = 0.099$, $p < 0.05$), *meeting deadlines* ($\beta = 0.245$, $p < 0.001$) and *sensing a lack of control* ($\beta = -0.200$, $p< 0.001$). For faculty members, nothing is found in terms of their quality of individual time management and their understanding of implicit temporal structures. For staff members, a significant positive relationship is found between *planning* and *understanding of implicit temporal structures* ($\beta = 0.261$, $p < 0.05$) and a significant negative relationship between *procrastination* and this construct ($\beta = - 0.369$, $p < 0.001$).

Because the number of student respondents is high for this temporal structure construct and because we have confirmed seventy-five percent of the hypotheses for the student dataset, we feel comfortable in stating that we have confirmed a relationship between quality of time management and *understanding of implicit temporal structures.*

RQ4: What is the relationship between the creation of personal temporal structures and the quality of individual time management?

Overall, there is a common significant relationship between *planning* and *creation of temporal structures* for the three groups of people (Student: $\beta = 0.518$, $p < 0.001$; Faculty: $\beta = 0.657$, $p < 0.001$; Staff: $\beta = 0.408$, $p < 0.01$). As indicated earlier for the *use of explicit temporal structures*, *creation of temporal structures* is also a type of planning behavior so that we also have a tautology here, that is, significant relationships found between this construct and *planning* do not effectively address the research question. However, we also find a significant positive relationship for students and faculty for *meeting deadlines* and a significant negative relationship for students for *procrastination behavior.* Again because of our large N for the student dataset, we can comfortably state that we have found a significant relationship between the quality of time management and the *creation of temporal structures.* Thus we have answered this research question.

RQ5: What is the relationship between the understanding of university-related temporal structure relationships and the quality of individual time management?

There are two significant relationships found only for students. The students perceive their *understanding of university-related temporal structure relationships* are significantly related to their efforts for *meeting deadlines* ($\beta = 0.276$, $p < 0.001$) and their *sense of lack of control* ($\beta = 0.227$, $p < 0.001$). Again, because our respondent numbers are so high for students and because we have found at least fifty percent of our hypotheses supported for this dataset, we argue that we have found relationships

between *understanding of university-related temporal structure relationships* and quality of time management. Thus, we have answered research question five.

Overall, this thesis research has found answers to three of our five research questions. For the first research question that we were not able to answer effectively, it is partially a problem of poor research design that prevented us from getting adequate answers to this question. For the second research question, we would have a relationship that we could discuss if we were not so stringent in defining the *planning* construct as too closely allied with our temporal structures. In any case, having provided insights into three of the five posed research questions is a good result.

10.2 Relationship to Information Systems Field

Finding a relationship between how good someone manages their time and how well they use and understand temporal structures does not initially appear to be a relevant research topic for Information Systems. In this section, we build the argument as to why this research is a first step towards providing useful input to problems that face information systems researchers. First, the reader should note that the entrance into this research problem was a result of the first pilot study we ran, that is, a set of interviews to determine how people use electronic tools for managing their time. From this study, we found that users had significant complaints about the capabilities of their electronic tools, in particular, their inability to capture and represent the multiple time constraints that affected their time management. We hypothesized that we could build better electronic time management tools that supported a wider variety of temporal structures and also allowed the seamless transfer of organizational temporal structures.

However, with any such proposal for a new type of tool, it is important to determine the potential efficacy of this tool. Thus, we embarked on an assessment of whether such a tool would be useful. Literature from the field of organizational behavior suggested that temporal structures could impact productivity, but had not conducted research on the relationship between individual time management quality and temporal structure use and understanding. We therefore embarked on a study of whether this relationship existed. If it does, then building a tool that makes it easier to capture multiple temporal structures should help good time managers. We also conducted a four-month longitudinal study with two students, which suggested the need to improve the current electronic time management tools by integrating more than explicit temporal structure features. Thus, this work is information systems research because it performs research that assesses the viability of building a new software system. This work was also supported by a question in our survey, which queried respondents about the perceived usefulness of their time management tools. Perceived usefulness was both significantly correlated with time management quality measures and with temporal structure usage. This was elaborated on in Chapter 9.

The work is also information systems research because temporal structures are a salient form of organizational knowledge. As such, an electronic tool, which captures this knowledge, is performing knowledge management. In building our constructs to assess what types of temporal structure knowledge users perceived in our organization, we obtained data on the types of temporal knowledge that are relevant to individual time management and the types that are not. Our constructs are an initial attempt to represent and capture a variety of temporal structures that have been identified by

organizational behaviorists. With refinement, they could serve as a template for temporal structure knowledge capture.

Professionals often have a need to capture and use temporal structure knowledge in their work places. However, many temporal structures are not obvious. This thesis research illustrates the need for organizations to make their temporal structures more explicit to their employees. Making these structures available electronically, e.g. via an electronic corporate-wide calendar, can dispense important temporal structures to employees. The corporate calendar can be utilized as a knowledge management system to facilitate the capture and use the temporal structures, and thus it could help individuals improve their time management quality. In practice, organizations can create some temporal structure training programs for their employees, and thus making them better time managers similar to the two students in our longitudinal study.

Nowadays, global virtual teams are pervasive, especially for software development teams. Those virtual teams are entrained by different temporal structures and also by different temporal cultures in different parts of the world. These cultural differences translate into time management practices. Thus, what is considered good time management practice in one geographic unit will not necessarily be considered to be good time management practice in another. These differences will inherently create conflicts, in particular, if they are implicit temporal rhythms that even the employees affected are unaware of. This work can be expanded to capture the temporal structures and temporal cultural norms in different geographic units of global virtual teams. Just making these temporal norm differences explicit is likely to help global virtual team management.

Software engineering focuses only on task accomplishments in software not on the possible temporal norms that impact the project. If the project deadlines are set so that flexibility and adjustments are inherent in the schedule, team members will be able to use their own time management skills and set up schedules that are more effective and productive for the team as a whole. For example, negotiating individual deadlines that take into account each person's other temporal constraints (e.g., Joe's daughter is getting married next month) will leave people less frazzled and better able to work productively on the work that is part of the project. Our work demonstrates that good time managers are very aware of temporal structure relationships. Running projects that use these relationships will also make team members more aware of how they use their time and, thus, be better time managers. Chapter 9 makes some suggestions for intelligent agent development for electronic time management tools that builds in some of this flexibility.

Our work on demonstrating that there is a relationship between good time management and the higher use of temporal structures can serve as a measure of quality of individual time management. As we have seen, the model and relationships for what makes a good time manager vary with the different roles that people have in life. However, the relationships between some of our temporal structure constructs continued to exist for all of these roles, in particular, use of explicit temporal structures and creation of temporal structures. Thus, these two constructs could be used as a measure of the quality of a time manager. This is related to information systems research as follows. There are many studies in which the quality of a person's time management has an impact on other outcomes. Being able to get a measure of this

value, no matter what the role of the person, can help us capture a valuable measure that impacts a model that a researcher is building.

10.3 Limitations

The limitations for this research are as follows. First, we utilized subjective measures for the independent variables, that is, we asked users to give their perceptions on how much they procrastinated, felt a lack of control, etc. Subjective measures have been shown to not always accurately reflect actual behavior.

Our second limitation is that of using subjective measures for some of our temporal structure questions. This limitation is more pronounced because we had no construct development that we could use from prior research. For some of the questions, we would not have been able to use questions from a validated survey because we needed to make the temporal structure knowledge we queried about specific to the organization.

Our third limitation is some reservation on the external validity of our dependent and independent measures. Although we drew questions from prior research that had been carried out on time management, there was no evidence that the questions had been externally validated by correlating them with other behavioral measures. We did validate our questions by iteratively interviewing twenty respondents who told us what they thought the question meant and what their answer meant, this number is not enough to build a thorough evaluation of type of question. As indicated in the previous paragraph, our temporal structure questions were created entirely for this research, and thus, had no prior empirical studies to test their validity. Fortunately, for both our

dependent and independent variables, our construct validity was high which softens this limitation somewhat.

Our fourth limitation was our experimental site choice, that is, a technological university. The university was also small in size so that it may have reflected a particular unique culture. This hurts the generalizability of our results to a larger group of organizations.

Our fifth limitation is the size of two of our respondent groups. We received a ten percent response rate for our questionnaire from faculty and staff and a ninety percent response rate from the students we administered our survey to. Because the organization we investigated was not large, our N's were very low for faculty and staff. Thus, although we received results that indicated that these two groups were very different from the student group, we cannot ascertain if this difference is real or a result of the small size of our dataset. In addition our response rate for this group was very low which suggests possible response bias problems.

10.4 Contributions

The contributions of this research are as follows (numbered and shown in boldface):

1. This research finds that there is a significant relationship between the quality of time management and the amount of usage and understanding of different temporal structures when the temporal structures significantly entrain the individual.

This is our key finding. Although we did not find this relationship for the faculty and staff, we argue that the number of students involved in the study and the

number of significant relationships we found (fifty percent) justifies this result. However, because we did not find this relationship for faculty and staff, we qualify our result with the key time related difference between students and faculty and staff.

2. This research is an additional study that brings organizational behavior research on temporal structures into the information systems field.

The paradigm for research in organizational behavior is very different than the paradigm primarily used for information systems. Temporal structure studies in the organizational behavior field involve case studies, grounded theory, ethnographic techniques and closed loop analysis. Making the leap to building constructs for the temporal structures proposed by the organizational behavior research is a large leap (possibly too early) that brings this type of research into the information systems paradigm. Building a structural model to examine the relationships between the temporal structure constructs and a human performance variable (time management) is a technique that would not be undertaken by the organizational behaviorists. Thus, moving to empiricist modeling helps to bring these concepts to information systems research.

3. This research contributes a new set of validated temporal structure constructs.

By validated, we mean internally validated. This research generated five constructs from fifty questions using those questions which loaded best. All loadings were high for the final set of selected questions, especially in the PLS validation.

4. This research contributes a new set of validated time management constructs.

By validated, we mean internally validated. This research generated four constructs from twenty questions using those questions which loaded best. All loadings were high for the final set of selected questions, especially in the PLS validation.

5. This research extends prior work by looking at how temporal structures are related to personal time management quality.

One research study on temporal structures has looked at how specific types of temporal structures affected overall productivity for an organization. Other research has shown how temporal structures affect corporate decision making which then affects organizational outcome. None of the research has looked specifically at how different time management behaviors in an organization might respond to temporal structures. Our work investigates the human trait of time management skills and looks at its relationship to temporal structure understanding, knowledge and use.

6. This research finds highly different time management behavior for individuals in different organizational roles.

Although not predicted, our structural models showed different relationships between the four constructs we used to measure time management skill. We speculate that these differences are due to the amount of control our subjects had over the temporal entrainments that drove their life. More research is needed to determine if this result is real and also the underlying reasons for this result.

7. This research also implies that designing and implementing temporal structure features into electronic time management systems would be a useful tool for many employees.

The relationship we found between temporal structures and good time management implies that a tool that supports the use of these temporal structures would be desirable for those users who already practice good time management habits. This is borne out by the significant positive relationship we found between amount of electronic calendar usage and good time management, that is, people who strive to be good managers want efficient electronic support for this time management task.

10.5 Future Research

Because this thesis is the first step in understanding the relationship between quality of individual time management and temporal structures, to build a time management tool that integrates temporal structure features obviously becomes part of the future research. Some of the ideas for developing such an electronic time management tool were suggested in Chapter 9. They are elaborated with examples in this section. In addition, other research is both suggested by data that is not yet analyzed and by the differing time management quality relationships found among our three subject populations. The following paragraphs present future research plans (1) to build a time management tool that integrates more temporal structure types, (2) to analyze the demographic data that was collected and (3) to examine the management quality model differences that appeared in our structural model.

Since the motivation for performing this thesis work was to improve people's time management, and since the belief supported by the results of this dissertation indicated that a better electronic time management tool is a method for doing so, the first proposed future research is that of implementing an electronic time management

tool that will do a better job of capturing and manipulating the multiple temporal structures that affect each individual. The first feature of this tool will that of increasing the ease in which temporal structures are captured. The "drag and drop" method was suggested as a solution for this in Argument 2 of Chapter 9. In essence, the solution is one of electronic re-use. Since temporal structures are often already explicitly defined electronically by an organization, allowing personal calendars to automatically receive these pre-defined temporal structures will save users much copying time. We identify this method as a "drag and drop" method because we imagine the temporal structure as a predefined object that can appear as an icon on a web page or in an email message and then be dragged and dropped on one's personal calendar. Figures 10.1 and 10.2 provide two examples of this proposed improvement. Figure 10.1 illustrates the clock-based temporal structure that represents a typical university academic calendar that could be iconized and dragged to a personal calendar. Figure 10.2 illustrates an event-based temporal structure for a thesis defense. This structure could be iconized and dragged to a student's personal calendar. Embedded in the event would be knowledge of weekends so that due dates would be allocated during the business week.

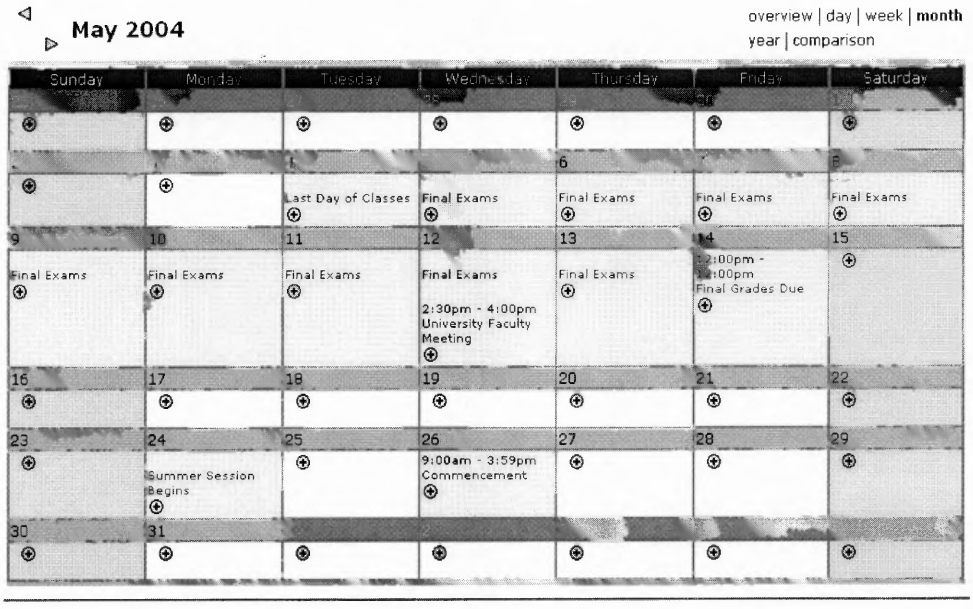

Figure 10.1 Example of academic temporal structure that can be iconized an dragged and dropped on to personal calendar. This is an explicit, clock-based structure.

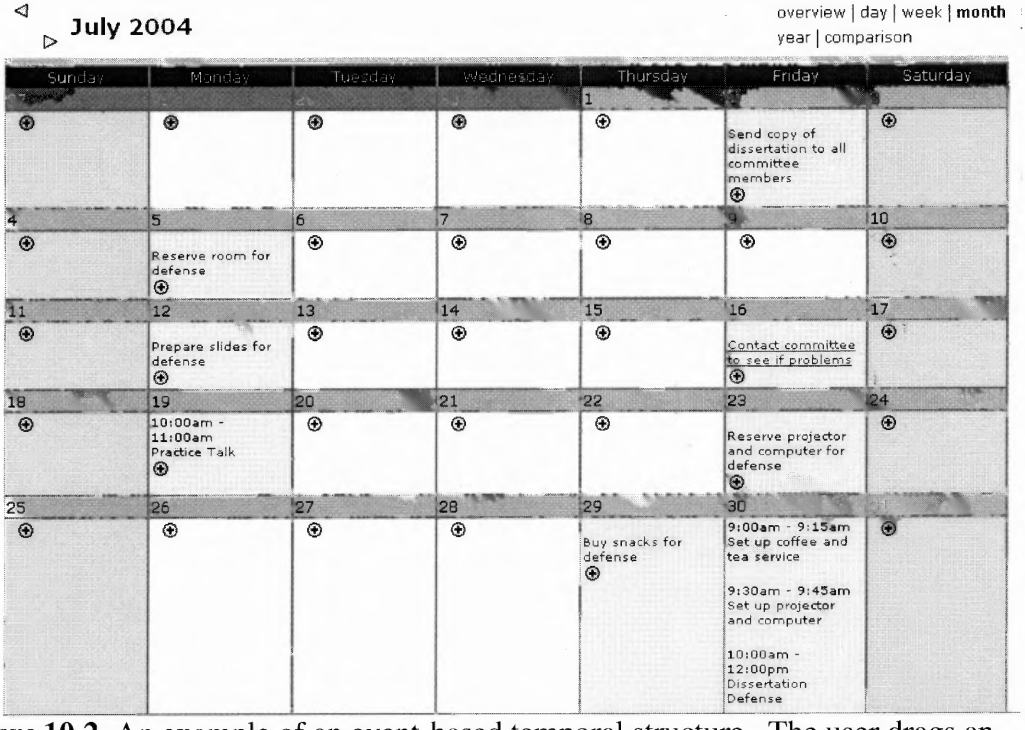

Figure 10.2 An example of an event-based temporal structure. The user drags an iconized version of a dissertation defense to his or her calendar. The rest of the schedule is automatically created based on socio-temporal norms in the department. Defenses usually include a practice defense at a Monday seminar and the student usually brings brunch for the attendees.

The above description gives example of how the "drag and drop" temporal structures would be used and what they might consist of. The key improvement to the electronic calendar system would be the development of a toolkit or application programming interface (API) that would allow users to develop "drag and drop" temporal structures. For the academic calendar, for example, we envision that a user create the new academic calendar on an existing calendar and then proceed to define it as a temporal structure. Rules could be added from a rules database that would specify how the temporal structure should behave when it encounters other temporal structures on the personal calendar it is being dragged and dropped on.

The second suggested improvement to existing electronic time management systems follows Argument 3 in Chapter 9. This second improvement is ways in which implicit temporal structures can be incorporated into time management tools. Our interview subjects clearly stated implicit temporal structures that were guiding their time management decisions but also indicated that they had no way of incorporating these structures into their current calendars. One classic example is that of scheduling an oil change for a car. It is known that it should be done once every 3000 miles, but it is also known that there is some flexibility in this time and also not known exactly when this time will happen. Our improvement envisions calendars learning from prior behavior and from some user intervention, that is, a user could indicate that automobile travel had a relationship with scheduling an oil change. A smart calendar system could then learn that much travel meant early oil changes and little meant later ones. The safety range could also be specified, but a system could possibly learn this range by

recognizing when other events that were normally not cancelled for an oil change were suddenly cancelled.

A key feature of implicit temporal structures is they do not have precise time constraints but a distribution of entrainment. For example, when a graduate student begins to exceed his or her time of being a graduate student beyond four years at a university, it is implicit that the dissertation defense should occur soon. The actual amount of acceptable time to be a graduate student depends on the field of study and also, dramatically on the number of years financial support is provided, but there is also an implicit understanding of what "good" completion dates are. Thus, one of the improvements that could be made to an electronic calendar system would be the ability to define this distribution of time and the importance given to each point in the distribution, that is, for example, zero years past expected time could equal 1 or good, one year past expected time could equal 2 or okay and two years past expected completion time could equal 3 or not okay. In some sense, this makes an implicit temporal structure explicit, but gives its user more flexibility in establishing schedules.

The third improvement stems from Argument 4 in Chapter 9, that of providing collaboration support in an electronic time management tool. Some of this already exists in a variety of calendar tools, e.g., Lotus Notes™ and the Yahoo!™ Online calendar system. The improvement we envision is the ability to share temporal structures across calendars, so that when one person creates or modifies a temporal structure, it is updated on all calendars. If the change or addition conflicts with other rules guiding any one of the group's personal time management tools, this is reported to the temporal structure creator and changes are suggested that would make the created or

changed temporal structure work. For large collaborating teams, such an improvement would be an impossible software management task so that priority rules and other accommodations by team members would need to be made.

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 et al. 1988) and to also share and copy other structures and norms. Our plan is to build a quick prototype of our improvements in the university calendar system of the university we studied. This prototype will be a pre-cursor to this future 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 popular calendar systems work by storing appointments in an XML database. The XML tags have been defined by the World Wide Web calendar standards committee. This makes it relatively trivial to synchronize one calendar with another simply through database updates. There are a number of existing synchronization programs (e.g., IS4Yahoo! which synchronizes a Yahoo calendar with an Outlook calendar) that can be invoked to support the transfer of the temporal structures to individual calendars. Thus, the development of hand-coded university and department level temporal structures that can be synched with existing electronic calendars is relatively straightforward allowing the quick creation of a prototype.

Then, the next stage of this future research will be follow-up semi-structured interviews and a longitudinal study on this proposed tool. After three month observation (especially before the semester starts, midterm period and holiday period, the semester ends), a few of the participants, who actually use the temporal structure feature (will get data from log data), will be interviewed. This will help explain whether the use of temporal structure feature will explicitly help people couple with their time management. In the meantime, more participants will be invited to adopt the proposed tool to manage their time. We will capture all log data from each individual user, and will also observe what problems they will be facing and whether the proposed temporal structure tool significantly supports their individual time management within at least half a year. A pre-survey and a post survey will be then designed and delivered before and after the proposed tool is introduced to the participants.

In addition to building and evaluating a new electronic tool, further data analysis needs to be done on the data already collected in the survey that was conducted. Analyses still need to be carried out using the demographical information, e.g. gender, job roles, language, age etc., to determine what effect these variables had on the quality of time management and on the use and understanding of temporal structures. For example, we plan to investigate the differences between working and non-working students in terms of their time management quality and the way they utilize and manage their temporal structures with their time management tools. We expect the working students to be better time managers and to use and create more temporal structures because of the existing time constrains, employment places on their available time. We also plan to investigate whether tenured and untenured faculty members manage their

time differently. Among our participants, some senior administrators also answered our questionnaire. Since their time management is distinct from faculty and staff members, we excluded their data in the current data analysis. We plan to examine how these administrators utilize and manage their temporal structures. In addition, we are also interested in exploring whether cultural differences have a significant impact on individual time management behaviors. Finally, we plan to test additional structural research models, to determine whether utilizing temporal structures in time management tools improves an individual's time management quality. Note that the current model shows that good time management encourages the use of temporal structures. Structuration theory (Giddens 1987) suggests that the use of temporal structures should, in turn, improve time management quality. We also plan to examine the underlying reasons for the very different structures we obtained for the relationships between the time management quality constructs for Students, Faculty and Staff.

APPENDIX A

CONSENT FORM AND IRB APPLICATION

Appendix A presents consent form and IRB application materials that were used in this research.

NEW JERSEY INSTITUTE OF TECHNOLOGY
323 MARTIN LUTHER KING BLVD.
NEWARK, NJ 07102

CONSENT TO PARTICIPATE IN A RESEARCH STUDY

TITLE OF STUDY: Supporting Individual Time Management through the Capture and Display of Temporal Structures

RESEARCH STUDY:

I,_____ , have been asked to participate in a research study under the direction of a doctoral candidate _____Ms. Dezhi Wu and Dr. Marilyn Tremaine
Other professional persons who work with them as study staff may assist to act for them.

PURPOSE: The purpose of the study is to examine whether a time management tool will impact how people perceive their time.

DURATION:

My participation in this study will last for ___2 hours over two weeks_____

PROCEDURES:

I have been told that, during the course of this study, the following will occur:

1. I will be interviewed in terms of my own personal time management issues up to 2 hours. Each interview will last approximately 1 hour.
2. I will be audio taped during the interview.
3. I will fill out a questionnaire, which takes about 15 minutes.

PARTICIPANTS:

I will be one of about 20 participants to participate in this trial.

EXCLUSIONS:

I will inform the researcher if any of the following apply to me:
I do not have computer experience.

RISK/DISCOMFORTS:

I have been told that the study described above may involve the following risks and/or
discomforts: N/A

CONFIDENTIALITY:

Every effort will be made to maintain the confidentiality of my study records. Officials of NJIT will be allowed to inspect sections of my research records related to this study. If the findings from the study are published, I will not be identified by name. My identity will remain confidential unless disclosure is required by law.

PAYMENT FOR PARTICIPATION:

I have been told that I will receive $0 compensation for my participation in this study.

CONSENT AND RELEASE:

I fully recognize that there are risks that I might be exposed to by volunteering in this study which are inherent in participating in any study, I understand that I am not covered by NJIT's insurance policy for any injury or loss I might sustain in the course of participating in the study.

RIGHT TO REFUSE OR WITHDRAW:

I understand that my participation is voluntary and I may refuse to participate, or may discontinue my participation at any time with no adverse consequence. I also understand that the investigator has the right to withdraw me from the study at any time.

INDIVIDUAL TO CONTACT:

If I have any questions about my treatment or research procedures that I discuss them with the principal investigator. If I have any addition questions about my rights as a research subject, I may contact:
Richard Greene, M.D., Ph.D., Chair, IRB (973) 596-3281

SIGNATURE OF PARTICIPANT

I have read this entire form, or it has been read to me, and I understand it completely. All of my questions regarding this form or this study have been answered to my complete satisfaction. I agree to participate in this research study.

Subject: Name:_____
Signature:_____

Date:_____

SIGNATURE OF READER/TRANSLATOR IF THE PARTICIPANT DOES NOT READ ENGLISH WELL

The person who has signed above, _____, does not read English well, I read English well and am fluent in (name of the language) _____, a language the subject understands well. I have translated for the subject the entire content of this form. To the best of my knowledge, the participant understands the content of this form and has had an opportunity to ask questions regarding the consent form and the study, and these questions have been answered to the complete satisfaction of the participant (his/her parent/legal guardian).

Reader/
Translator: Name:_____
Signature:_____
Date:_____

SIGNATURE OF INVESTIGATOR OR RESPONSIBLE INDIVIDUAL

To the best of my knowledge, the participant, _____, has understood the entire content of the above consent form, and comprehends the study. The participants and those of his/her parent/legal guardian have been accurately answered to his/her/their complete satisfaction.

Investigator's Name:_____
Signature:_____

Date:_____

HUMAN SUBJECT RESEARCH REVIEW FORM (A)
NJIT INSTITUTIONAL REVIEW BOARD

Name: Dezhi Wu

NJIT Address: Room 4215 / 4317 GITC Building

Department:: Dept. of Information Systems

NJIT Affiliation (Check all that apply)

Faculty	___	Research Associate	__
U/G Student	___	Doctoral Candidate	X
Graduate Student	___	Post Doctoral	___
Other ___			

Project Title: Supporting Individual Time Management through the Capture and Display of Temporal Structures

This project will be conducted:

NJIT Campus	X	Off Campus	_____
Both	_____		

Anticipated Sponsor (s) of this project:

NJIT	_____	Government	_____
Foundation	_____	Federal	_____
Organization	_____	State	_____

Starting Date of Project: Dec. 1, 2003

Closing Date of Project: August 31, 2005

To Principal Investigator: In addition to the questions below, please furnish copies of any questionnaires interview formats, testing instruments or other documents necessary to carry out the research.

The completed forms should be sent to: Richard Greene, M.D., Ph.D.
by e mail greener@adm.njit.edu or office mail
Chair, IRB, Colton 431

New Jersey Institute of Technology
University Heights
Newark, NJ 07102-1982

1. Project Title: Supporting Individual Time Management by the Capture and Display of Temporal Structures

2. List the name and the Faculty/Student/Staff status of the persons conducting the research:

a. Principal Investigator: Ms. Dezhi Wu, a doctoral candidate in Information Systems Department, New Jersey Institute of Technology

b. Others: Dr. Marilyn Tremaine, Advisor, Information System Department, New Jersey Institute of Technology

3. In a few words (100 or less) describe the objectives, methods and procedures of the research projects. This summary will used to describe your project to the committee on Human Subjects.

We are measuring the impact of time management how people perceive their time. The initial pilot study will conduct interviews with faculty members and Ph. D. students in Information Systems Department and Management School at New Jersey Institute of Technology. We will audio-record the interviews and take some pictures of time management tools, which the subjects are using.

4. List name and institutional affiliation of any research assistants, workers student that will be working on this project.
N/A

5. If research assistants, workers, students will be working on the project describe their qualifications, special training and how they will be supervised.
N/A

6. What is the age of the subjects and how will they be recruited?

Some faculty members and several Ph. D. students in Information Systems Department and Management School at NJIT will be recruited through emails and direct contact. All their ages are over 20.

7. Attendant risks: Indicate any physical. psychological, social or privacy risk or pain, which may be incurred by human subjects, or any drugs medical procedures that will be used. (This includes any request for the subjects to reveal any embarrassing, sensitive, or confidential information about

themselves or others.) Also, indicate if any deception will be used, and if so, describe it in detail. Include your plans for debriefing.

N/A

8. Evaluate the risks presented in 7.
   a. Is it more that would normally be encountered in daily life? No.

   b. Do your procedures follow established and accepted methods in your field? Yes.

9. How will the risk be kept at a minimum? (e.g. describe how the procedures reflect respect for privacy, feeling, and dignity of subject and avoid unwarranted invasion of privacy or disregard anonymity in any way.) Also, if subjects will be asked to reveal any embarrassing, sensitive, or confidential information, how will confidentiality of the data be insured? Also include your pans for debriefing. If subjects will be placed under any physical risk, describe the appropriate medical support procedures.

   Data and audio tapes will be kept in a locked file cabinet in the PI's office, and all records will not identify subjects.

10. Describe the benefits to be derived from this research, both by the subject and by the scientific community (this is especially important if research involves children).

    Subjects will enjoy being helped to manage their time. The community will benefit from better time management, which might be beneficial for increased productivity. It will provide some insights to develop and deliver a time management prototype for the community.

11. Describe the means through which human subjects will be informed of their right to participate, not to participate, or withdraw at any time. Indicate whether subjects will be adequately informed about the procedures of the experiment so that they can make an informed decision on whether or not to participate.

    We will inform human subjects of their rights with the initial consent form we will give the subject. This is attached.

12. Complete the attached copy of the Consent Form and the Institutional Review Board will make a determination if your subjects will be at risk. This Consent Form must include the following five pieces of information: (1) The purpose of the research, (2) the procedures involved in the work, (3) the potential risk of participating, (4) the benefits of the research, (5)

that the subjects are free to withdraw from the research at any time with no adverse consequences.

13. Furnish copies of questionnaires, interview formats, testing instruments or other documents to carry out the research. If questionnaires are not complete pleas submit an outline of the questions to be used. You will have to submit the completed questionnaire to the Committee before the research can begin.

    Attached:
    1) Application form to NJIT IRB board.
    2) Consent form for subjects participating in the study.
    3) Faculty Interview protocol.
    4) Pre-test questionnaire.
    5) Subject debriefing document.

14. If the subjects will be minor children, complete Consent Form as prescribed in paragraph 12 for signature by parent or guardian. If the project is approved (regardless of the Board's determination concerning risk), it will be necessary that a Consent Form be secured for every minor child.

15. Attach copy of permission of facility to conduct the proposed research (if other that NJIT).

    N/A

APPENDIX B

FIELD STUDY PROTOCOL

Appendix B includes research instruments that were utilized in the two pilot interviews.

Time Management Attitude Pre-Test

For each of the following questions, please circle a response that corresponds to the following scale:

1. I do not like to juggle several activities at the same time.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

2. People should not try to do many things at once.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

3. When I sit down at my desk, I work on one project at a time.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

4. I am comfortable doing several things at the same time.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

5. I often combine other activities with chores around the house.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

6. When I watch television, I like to give it my undivided attention.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. When supervising children or visiting with family, I usually drop whatever else I am doing.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

8. I often try to read the newspaper or a magazine while I'm doing something else, such as eating.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

9. A good deal of work can be accomplished over a business lunch.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

10. When I shop, I like to get all my errands done at once.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

11. I often shop with friends or family, since I can visit at the same time.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

12. While waiting for appointments, I always bring something along to do.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

13. I try to shop on my way home, rather than making special trips for shopping purposes.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

14. I often eat or drink while I'm driving or commuting.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

15. When I shop, I like to get all my errands done at once.

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

INTERVIEW GUIDE FOR TIME MANAGEMENT

INTERVIEWEE_____ INTERVIEWER_____

Date_____ Time started_____ Time ended_____

Introduction (to be spoken to the subject):

We are interviewing selected faculty members regarding their time management strategies. Please be assured that what you share in this interview will be kept completely confidential. You might be identified in a report as "a full time faculty member said," but would not have your identity revealed as a specific individual. So please feel free to tell us what you really think and feel; this will be the most helpful in trying to find out how to improve time management tools for faculty members and students in the future.

I will be tape recording the interview to try to make sure that we have an accurate record of your views and experiences, but also taking a few notes, just in case something goes wrong with the recording. In the meantime, I will also take several pictures of your time management tool. I am putting the tape recorder on the table – feel free at any time to shut it off. [Note: start tape recorder and announce name of interviewer, name of interviewee, and date]

1. Gender: _____Female ____Male

2. What is your approximate age:
   _____ Less than 18
   _____ 18-25
   _____ 26-35
   _____ 36-45
   _____ 46-60
   _____ Over 60

3. Is English your native language? ____Yes
   _____No

4. Your Original Citizenship is:

   ____America ___Canada ___Australia ____China ____South Korean

   ____India ____New Zealand ____Israel ____ Southern European Countries
   _____Northern European Countries _____Africa Countries

   If not included in the above area, please indicate _____

5. Ethnic group
   _____ "white" American
   _____ black

_____ Hispanic
_____ Asian
_____ Other or not determinable

6. Please answer this question by the following scale.
I am a perfectionist?

1	2	3	4	5
Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree

7. What is your major role in your current position? How long have you been in this position?

1) Full-time full professor _____
2) Full-time associate professor _____
3) Full-time assistant professor _____
4) Full-time researcher _____
5) Full-time administrator _____
6) Part-time advisor _____
7) Ph. D. Student as a TA/RA _____
8) Part-time Ph. D. student having a full-time job (e.g. special lecturer) _____

8. Approximately, how many hours do you work each week?

1) 40 hours
2) 40-50 hours
3) 50-60 hours
4) 60-70 hours
5) Over 70 hours

9. Approximately, how many hours do you work at school per week? _____hours/week

10. Approximately, how many hours do you work at home on a university related work per week? _____hours/week

11. How do you typically spend your weekends? Is any of this university related work? If so, how much? When do you do it?

12. What are your major responsibilities for your current job position?

Usually how many hours do you spend on each responsibility? Would you please list them?

1) Email + Communication (external + internal) _____
   - Approximately, how many hours do you spend answering your emails every day? _____hours/day
   - Approximately, how many hours do you spend on communicating with internal colleagues each week? _____ hours/week
   - Approximately, how many hours do you spend on communicating with external researchers for collaborative research or other work? _____hours/week

2) Teaching _____

- How many different courses are you teaching this term? ___
- How many sections do you have to teach this term? _____
  ___(number) Face-to-face courses ____Online courses
- Approximately, how many hours/week do you spend for preparing and giving lectures? _____hours/week
- Approximately, how many hours do you provide as office hours? _____hours/week
- If you grade your course assignments yourself, approximately how many hours do you spend on grading? _____ hours/week
- Approximately how many hours do you use for generating new course materials each week? _____hours/week _____hours/month

3) Research _____ hours/week

- Currently, how many research projects are you involved in? _____
- How many other faculty members are collaborating with you for these projects? _____
- How many students are working on these projects? _____
- How many research meetings do you have each week/month? _____
- Approximately, how many hours do you spend on these research meetings each week/month? _____
- Approximately, how many hours do you spend on web search for references each week? _____hours/week
- Approximately, how many hours do you spend on paper reading each week? _____hours/week
- Approximately, how many hours do you spend on paper writing each week? _____hours/week
- Approximately, how many hours do you spend on grant proposal writing each week/each month? _____hours/week
  _____hours/month
- How often do you participate on research conferences outside of NJIT each year? _____
- How many Ph. D. students do you have? _____
- Do you advise these Ph. D. students for their dissertation work? _____
- How often do you meet these Ph. D. students? _____/week
  _____/bi-week
  _____/month

4) Advising _____

- Approximately, how many students are you advising? _____
- Who are your advising subjects (Not including students in your class)?
  ____Undergraduate students ___Master students
  ____Ph. D. students
  ____If others, please indicate _____
- How many hours each week do you provide advice for those students?
  _____ hours/week
- Usually, what kinds of advice do you students ask? _____
- How many Master students do you have? _____
- Why do they need your advice? ____Master Project
  Others, please indicate _____

Time management strategies questions

13. Have you ever assigned your tasks to others, when you are too busy? If so, how do you motivate others to help you?
14. When you have too many unproductive meetings, how do you manage your time to deal with your more important work?
15. What types of time management strategies are you using for more productive meetings, when you have to attend too many administration meetings?
16. What are the criteria for you to set up your task priorities? Do your priorities help you better manage your time? If yes, how? If not, why?
17. Do you usually participate in all social events, when you have too much work to do? If yes, why? If not, why?
18. When you have too much work to do, what kind of time management strategies you use to get your work done on time?
19. If you could not meet all deadlines, what do you usually do?
20. When you have important deadlines, how do you handle family functions?
21. When you have hard tasks to do, how do you make yourself motivated?
22. When you have too many administrator services to commit, do you still maintain and continue your research? If yes, how?
23. When you are having too many responsibilities to commit, do you usually do some exercises? If not, how do you keep yourself healthy?
24. As a faculty member, when do you decide you have enough graduate students? How much time do you devote on each graduate student?
25. Do you usually schedule your off-time on your calendar? Why?
26. When you are too busy to do your research, what kind of time management strategies do you use to help you out?
27. What kind of time management strategies do you use to manage your unexpected visitors, when you are facing more important work to do?
28. What kind of time management strategies do you use to deal with people who stay in your office over scheduled time?
29. When your colleagues frequently bother and only talk about trivial things, how are you going to deal with these people?
30. Do you have any trouble managing your time?
    _____Yes. What types of trouble do you have?
    How do you plan to solve your time management problems?

    _____No. Would you please share with us about your successful time management strategy?

31. Are you using a tool to manage your time?
    _____ A paper-based time management tool
    _____ A computer-based software
    _____ A mobile device, such as a PDA, Palm
    _____ A combination of the above tools (Please indicate _____)
    _____ Not at all

Only pick up ONE scenario to interview.

1) Usually do you use ***a paper-based*** time management tool? For example, a notebook?

- If so, why do you like to use a paper-based time management tool?
- How long have you been using this type of paper-based time management tool?
- What percentage of your work appointments do you schedule into this tool?
- In general, can this paper-based tool fit your time management need?
- What types of functions do you use in the paper-based time management tool? For example, recording appointments, listing meeting schedules etc.
- Which functions do you use most often?
- Is it efficient to organize your time?
- Why don't you use a computer tool to manage your time? Are there any difficulties to use certain time management software?

2) Usually do you use ***a computer tool*** to manage your time? For example, Lotus notes, outlook calendar.

- Are you satisfied with this software?
- How long have you been using this type of computer tool to manage your time?
- What percentage of your work appointments do you schedule into this tool?
- In general, can this software fit your time management need?
- Which functions do you ever try in this software?
- Which functions do you use most often?
- Are these most used functions helpful for your time management?
- What are the benefits to use software for doing your time management?
- What kind of functions are missing from the current software you are using? Why do you need these functions?

3) Usually do you use ***a mobile device*** (such as: PDA/Palm/PocketPC) to manage your time?

- **If yes**
  - Do you satisfy to use these mobile devices to manage your time?

- How long have you been using this type of mobile time management tool?
- What percentage of your work appointments do you schedule into this combined tool?
- In general, can this mobile tool fit your time management need?
- Which functions do you often use for your time management?
- Why are these functions good?
- Do you think the PDA can be efficient to manage your time?
- What kind of functions are missing in the current mobile application? Why do you expect these functions?

- **If no**
  - Please indicate some reasons why you don't use it? (Expense is high? Not easy to use?)
  - Are you going to try the mobile device? Why?

4) Usually do you use ***a combined tool*** (eg. A notebook + a mobile device, a notebook+ a computer software, a notebook + a computer software, etc.) to manage your time?

- Do you satisfy with the combined time management tools?
- How long have you been using this type of combined time management tool?
- What percentage of your work appointments do you schedule into this tool?
- How do these tools support your routine work?
- In general, can the combined tool fit your time management need?
- Are these most used functions helpful for your time management? How?
- What kind of functions are missing though you are using the combined time management tools? Why do you need these functions?

32. In what ways do you feel you lose control for your time management? Can you please tell me what they are?

33. From your experience, what are the most important ways for viewing your time management efficiency?

34. Do you ever keep track of your daily/weekly/yearly time usage information?
    a. If yes, why do you do that?
    b. If not, why?

35. Do you ever count how much time you have been spent on the specific responsibilities? For example, how many hours do you spend on your teaching each week? Etc.

    - If yes, how do you count?

    - If not, why this count does not matter?

36. Do you clearly know exactly how you spend your time everyday?

37. If there is a tool, which can help you view how you spend your time each week, month, year, are you going to use it?

    If yes, why?
    If not, why?

38. What techniques have you tried for measuring your time efficiency?

39. Are there any things you tried in your time management, while that did not work well? Probe -- (If yes, why; what went wrong?)

40. What is your short-term (3 years) goal?

41. What is your long-term (10 years) goal?

From Question 42 to Question 47, please fill out two tables: one is a daily task table, and the other is a weekly task table.

42. Would you please give me a list of all your work tasks for next week and next whole day, when you are going to stay at campus?

43. Would you please list the task priorities?

44. How hard is your tasks? If giving you a scale, please scale the task difficulty level as Easy :1:2:3:4:5: Difficult

45. How much deadline stress on these tasks? Would you please scale them?
Very little: 1: 2: 3: 4: 5: Very much

46. When are you going to accomplish these tasks?

47. When are you going to stay at campus for a whole day next time?

48. Can I make an appointment with you for a daily time management observation and a follow-up interview for your weekly time management? It would be nice if we can schedule before Dec. 17, 2003. Both of the interviews will take you about two hours. Considering the project I am doing, I will have to bother you twice when I conduct both a daily time management observation and a weekly time management retrospect.

Weekly Tasks Table

Task Item	Task Description and Rating
Task 1	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 2	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 3	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 4	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty

Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 5	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 6	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 7	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 8	
Starting Date	
Planned Completion Date	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High

Daily Tasks Table

Task Item	Task Description and Rating
Task 1	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress Level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 2	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 3	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 4	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 5	
Starting Time	

Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 6	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 7	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High
Task 8	
Starting Time	
Planned Completion Time	
Task Difficulty Level	Easy : 1: 2: 3: 4: 5: Difficulty
Deadline Stress level	Very little: 1: 2: 3: 4: 5: Very much
Relevance to your short-term goal	Very little: 1: 2: 3: 4: 5: Very much
Priority Level	Low: 1: 2: 3: 4: 5: High

Appointment date for **a daily time management observation**:

Subject name: _____

Date: _____ Location: _____

The first visit time: _____ (about 15 minutes to collect daily completed tasks)

The second visit time: _____ (about 45 minutes to show both planned and completed tasks visualization and conduct the daily time management interview)

Appointment date for **a weekly time management retrospect**:

Date: _____ Time: _____

Location: _____

The first visit time: _____ (about 15 minutes – collect weekly completed tasks information)

The second visit time: _____ (about 45 minutes – show the visualization of planned and completed tasks visualizations, then conduct the retrospect weekly tasks interview)

THANK YOU VERY MUCH FOR YOUR PARTICIPATION. YOUR TIME IS HIGHLY APPRECIATED!

The Second Interview: a Daily and Weekly Time Management Retrospect

1. In the first interview, the scheduled daily tasks and their priorities will be collected when the subject filled out the daily tasks table.

2. I will use Microsoft Project to create the visualization of all daily tasks for the subject.

At the end of the scheduled day:

I will come to the subject's office to check how his/her tasks are finished. Afterwards, I will again create the time management visualization for the actual task completion.

The following date:

Procedure:
1. I created the visualization for both of planned and completed daily tasks.
2. I will show the text-based daily time management information for the subject first.
3. Then I will show the subject their planned and completed time management visualization.
4. Conduct a daily time management interview.

Interview Questions:

1) This is your daily time management visualization. Do you like to see this visualized task information?

- **If yes**, why do you like the visualized time management information? Did this visualization change how you perceived your time? How? Did this visualization impact your planning and time management strategies?

- **If not**, why didn't you like the visualized time management information?

2) Comparing to text-based and visualized time management information, which types of information do you like more? Why do you prefer text-based/visualized information?

3) Did you find any of your time management flaws on this date?
- **If yes**, what types of trouble did you have last week? Why couldn't you finish your tasks?
- **If not**, how did you manage your time well last week?
- Which type of information (eg. Text-based, visualized) is easier for you to identify your time flaws? Can you please explain why?

4) What are the most time wastes in your daily work? Does this daily work mirror most of your ordinary life? Can you please tell me how do you get rid of these time wastes? Do you ever be aware of your time wastes before you view this time management data? How?

5) When do you feel losing control for your time management? If yes, please indicate some situation.

6) After viewing your time management planned and completed tasks, are you going to change your time management strategies? How?

7) We are going to create a new time management visualization tool. From your point of view, what types of time management visualization functions do you expect to benefit your time management most?

8) Have your time management strategies affected your own professional development? If so, in what ways?

9) Overall, how do you see or expect the dynamics of the time management visualization as

- roles of teaching
- roles of research
- roles of advising
- roles of administrator
- others

10) Overall, in your experience, in what ways has a time management tool been a fulfilling tool?

11) What advice would you give to us, who are going to develop and deliver a time management visualization tool?

THANK YOU VERY MUCH FOR YOUR PARTICIPATION. YOUR TIME IS HIGHLY APPRECIATED!

If you have any further thoughts, please feel free to email me with them (give my email address: dezhi.wu@njit.edu, Office phone number: 973-596-5655)

(Present thank you gift)

Comments about the tenor of the interview eg, was respondent comfortable and forthcoming, reticent, hostile?

APPENDIX C

QUESTIONNAIRE

Appendix C includes three sets of questionnaires that were delivered to students, faculty and staff members.

Personal Use of Pre-set Schedules

The questionnaire, which follows is a request for information on the types of schedules you include in your personal calendar, where you obtained them from and what you use them for. Pre-set schedules are any sort of external or internal schedule such as the university academic calendar or a seminar schedule for your department.

Please note that this information page will be removed from the rest of the questionnaire and kept in a locked cabinet by the person distributing this questionnaire. At no time will your confidentiality in replying to this questionnaire be violated.

Please provide the following work information about yourself before turning the page and proceeding with the rest of the questionnaire.

Name: (Please print) _____ **Subject Code** _____

Today's Date (MM/DD/YY) _____

Subject code: _____

Please circle your answers based on your current situation, so your answer is not limited to one answer.

Subject Code _____

Personal Use of Pre-set Schedules Questionnaire

(Students)

The questionnaire is about the types of schedules you include in your personal calendar, where you obtained them from, and what you use them for. Pre-set schedules are any sort of external or internal schedule such as the university academic calendar or a seminar schedule for your department.

Please note that this information page will be removed from the rest of the questionnaire and kept in a locked cabinet by the person distributing this questionnaire. At no time will your confidentiality in replying to this questionnaire be violated.

It should take you approximately 20 minutes to answer this questionnaire.

Please provide the following work information about yourself before turning the page and proceeding with the rest of the questionnaire.

Name: (Please print) _____ **Course Name** _____

Your Professor _____

Today's Date (MM/DD/YY) _____
[2]

[2] If you have any questions, please contact Dezhi Wu via dezhi.wu@njit.edu.
Mailing Address: Dezhi Wu
Department of Information Systems, College of Computing Sciences
New Jersey Institute of Technology
Newark, NJ 07102

Student Subject code: _____

I: Background

Please circle your answers based on your current situation, so your answer is not limited to one answer.

1. I am a (Circle **all** that apply):
[a] Administrative Staff (please select one *Junior, Senior*)
[b] Professor (Please select one: *distinguished, full, associate, assistant, special lecturer)*
[c] Full-time Student (Please select one: *Ph. D., Masters, Undergraduate, non-matriculated)*
[d] Part-time Student (Please select one: *Ph. D., Masters, Undergraduate, non-matriculated)*
[e] Other, please indicate _____

2. I am studying/working in (Circle **all** that apply):
[a] College of Computing Sciences [b] School of Management
[c] Newark College of Engineering [d] School of Architecture
[e] College of Science and Liberal Arts [f] Albert Dorman Honors College
[g] A university administrative office (please indicate which unit)_____
[h] Other, please indicate _____

3. I am a: [a] Female [b] Male

4. My age is: [a] 20 or under [b] 21-30 [c] 31-40 [d] 41-50 [e] 51-60 [f] over 60

5. My native language is:
[a] English [b] Spanish [c] German [d] French [e] Arabic [f] Chinese [e] Japanese [f] Korean [g] Hindi [h] Other, please indicate _____

6. I have used a computer for about [a] 1 year [b] 2-3 years [c] 4-5 years [d] over 5 years

7. 1) I study (e.g. read course work, write papers etc.) about ____ hours every week. [a] Less than 20 hours [b] 21-30 hours [c] 31-40 hours [d] 41-50 hours [e] 51-60 hrs [f] 61-70 hrs [g] over 70 hrs

   If you have a job, please answer question 2). Otherwise, please skip this question.
   2) I work at my job about ____ hours every week. [a] Less than 20 hours [b] 21-30 hours [c] 31-40 hours [d] 41-50 hours [e] 51-60 hrs [f] 61-70 hrs [g] over 70 hrs

8. I have been studying / working at NJIT for ___ years. [a] Less than 1 year [b] 1-3 years [c] 4-6 years [d] 7-10 years [e] over 10 years

9. I use a paper/electronic tool(s) to help me manage my time. [a] Yes [b] No

10. If your answer for question 9 is "Yes", please answer this question. Otherwise, please skip to questions II-2 (see page 4).

11. I am using the following calendar tools to manage my time (Circle **all** that apply):
[a] A pocket-sized paper calendar
[b] A wall-sized paper calendar
[c] MS Outlook™ in a PDA /Palm
[d] MS Outlook™ in a desktop
[e] MS Outlook™ calendar application in a cell phone
[f] NJIT Highlander Pipeline online calendar
[g] Yahoo / MSN online calendar
[h] A paper-based to-do list

[i] An electronic to-do list
[j] Post-it
[h] A tool different than the ones listed above (please describe it) _____

II: In the following questionnaire, we are going to ask you questions about the types of calendars you use and what types of general information you write in the calendar. In addition, we will also be asking you about your time management strategies in conjunction with your personal calendar.

Please **circle the number** to the right of each word or phrase that best represents your answer.

Questions II-1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
1. I am dissatisfied with my time management tool(s).	1	2	3	4	5	6
2. I think my time management tool(s) is (are) effective.	1	2	3	4	5	6
3. I have many complaints about the calendar system(s) I use.	1	2	3	4	5	6
4. My time management tool(s) help(s) remind me of important deadlines.	1	2	3	4	5	6
5. I don't always schedule everything on my time management tool(s).	1	2	3	4	5	6
6. I only schedule important deadlines in my time management tool(s).	1	2	3	4	5	6
7. My time management tool(s) help(s) organize my time.	1	2	3	4	5	6
8. My time management tools help me to use my time more efficiently.	1	2	3	4	5	6
9. Cost is the major reason for my choice of time management tool(s).	1	2	3	4	5	6
10. I do not use my time management tool(s) very much.	1	2	3	4	5	6
11. I often update my schedules in my time management tool(s).	1	2	3	4	5	6
12. I do not use many of the features of my time management tool(s).	1	2	3	4	5	6

Questions II-1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	N/A
13. I mostly remember things in my head instead of relying on my time management tools.	1	2	3	4	5	6
14. I feel that my time management tool(s) help(s) me achieve my long-term goals.	1	2	3	4	5	6
15. The complexity of my life caused me to choose my time management tool(s).	1	2	3	4	5	6
16. Ease of use is a major concern for me to choose my time management tool(s).	1	2	3	4	5	6
17. I choose my time management tool(s) because my working place/university provides me the tool(s).	1	2	3	4	5	6
18. I always share my calendars with my friends and partners.	1	2	3	4	5	6
19. I rarely check my schedules written in my time management tool(s).	1	2	3	4	5	6
20. I keep separate time management tools to manage my work time and my family affairs.	1	2	3	4	5	6

Questions II-2	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I usually make a list of things I have to do each day.	1	2	3	4	5
2. If I take a train or a bus, I often bring work with me to do.	1	2	3	4	5
3. Socializing sometimes keeps me from making deadlines.	1	2	3	4	5
4. I postpone doing hard tasks.	1	2	3	4	5
5. I always schedule private time	1	2	3	4	5
6. At the beginning of each week, I plan what I will do for that week.	1	2	3	4	5
7. I often underestimate the amount of time it will take to get something done.	1	2	3	4	5
8. I find that I often spend too many hours on a project in order to make it perfect.	1	2	3	4	5
9. I do the work that is the highest priority first.	1	2	3	4	5
10. I often have to stay up late to meet a deadline.	1	2	3	4	5
11. I almost always get my work done on time.	1	2	3	4	5
12. Even though some of the activities I engage in are unprofitable I still do them (e.g. play video games).	1	2	3	4	5
13. I feel that I always make constructive use of my time.	1	2	3	4	5
14. On an average work / school day, I often spend more time on personal grooming than on work.	1	2	3	4	5
15. I often postpone tasks that I promised to do even though the deadline is approaching.	1	2	3	4	5
16. There is room for improvement in the way I manage my time.	1	2	3	4	5
17. I feel that I am in control of my own time.	1	2	3	4	5
18. Even though I am very busy, I	1	2	3	4	5

find it difficult to say "NO" to people.					
19. When I have multiple things that I need to do, I usually work on them one at a time.	1	2	3	4	5
20. Whenever I have assigned tasks, I try to do them immediately.	1	2	3	4	5
21. I never set goals for months ahead.	1	2	3	4	5
22. When I work, my desk is usually cluttered with multiple things I am working on.	1	2	3	4	5
23. If I set priorities, I always honor them.	1	2	3	4	5
24. Every day, I spend some time planning.	1	2	3	4	5
25. On a work / school day, I usually write a schedule of the activities I have to do.	1	2	3	4	5
26. I always plan my day before starting it.	1	2	3	4	5

Questions II-3	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I have no time management problems at all in both my work and my personal life.	1	2	3	4	5
2. I work hard to improve my time management.	1	2	3	4	5
3. I don't need time management for my own work.	1	2	3	4	5
4. I have sufficient capabilities to handle my life well without time management techniques.	1	2	3	4	5
5. Improving my time management will not benefit me.	1	2	3	4	5
6. My performance at school has nothing to do with my personal time management.	1	2	3	4	5
7. I have no problems managing my time.	1	2	3	4	5
8. I am too busy to improve my time management skills.	1	2	3	4	5
9. It is hard for me to change my habits, although I know I need to improve my time management.	1	2	3	4	5
10. I take actions to improve my time management.	1	2	3	4	5
11. Missing important deadlines makes my life miserable.	1	2	3	4	5
12. Without good time management, both my life and work will suffer.	1	2	3	4	5
13. My job/study doesn't require me to manage my time well.	1	2	3	4	5
14. It is necessary to improve my time management to achieve my goals.	1	2	3	4	5
15. I don't care if time is wasted or not.	1	2	3	4	5
16. Good time management will make me more successful.	1	2	3	4	5

Please answer the following questions in terms of whether you believe the statement about the requirements or rules of NJIT is true or not at all true. You may also select the answer "don't know" if you do not know the answer.

Questions II-4	Not at all True	Mostly Untrue	Don't Know	Mostly True	True
1. I must schedule the use of the tennis courts a day in advance.	1	2	3	4	5
2. The food court closes at 7:00 PM during the week.	1	2	3	4	5
3. Classes are sometimes held on Saturday morning at NJIT.	1	2	3	4	5
4. Most day classes at NJIT are held twice a week.	1	2	3	4	5
5. I must submit my request to graduate during the first week of that semester.	1	2	3	4	5
6. I must pay my fees before the semester starts or I will be dropped as an NJIT student, even though I have registered for my courses.	1	2	3	4	5
7. The reading period that occurs before final exams is 1.5 weeks long.	1	2	3	4	5
8. In general, I can always drop a class right up to the last day of classes without penalty.	1	2	3	4	5
9. The Fall semester at NJIT is twelve weeks long.	1	2	3	4	5

Questions II-4	Not at all True	Mostly Untrue	Don't Know	Mostly True	True
10. Students must make up an incomplete grade one semester after they receive the grade, if they do not want to automatically receive an F.	1	2	3	4	5
11. If I do not register for classes within one week after the start of the term, I must pay a late fee.	1	2	3	4	5
12. Spring Break usually occurs at the end of February.	1	2	3	4	5
13. The gym closes at 12:00 midnight during the week.	1	2	3	4	5
14. The library is open until midnight daily.	1	2	3	4	5
15. There is free class period between 2:30 PM and 4:00 PM on Wednesdays.	1	2	3	4	5

Questions II-5	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Relevant to My Life
1. I write the due dates for assignments and the dates of exams in my calendar.	1	2	3	4	5	6
2. I use the Highlander Pipeline course schedule and use it to tell me when I have to go to class	1	2	3	4	5	6
3. I always write my entire course schedule in my personal calendar.	1	2	3	4	5	6
4. I use my calendar to write down meetings with friends.	1	2	3	4	5	6
5. I write birthdays and anniversaries in my calendar.	1	2	3	4	5	6
6. I write in special holidays in my calendar when they are not	1	2	3	4	5	6

already marked.						
7. I put my professor's office hours in my calendar.	1	2	3	4	5	6
8. I write down the extra curricular meetings I attend in my calendar.	1	2	3	4	5	6
9. I put down the dates when I need to renew or return books in my calendar.	1	2	3	4	5	6
10. I always write my vacation plans in my calendar.	1	2	3	4	5	6
11. I would never ask for a four weeks extension on a due assignment.	1	2	3	4	5	6
12. I plan my travel time to avoid heavy traffic.	1	2	3	4	5	6
13. I know I can always buy cheap products after big holidays.	1	2	3	4	5	6
14. I know I cannot have an "incomplete" grade before my graduation ceremony.	1	2	3	4	5	6
15. It is expensive to book an airline ticket just before traveling.	1	2	3	4	5	6
16. I always come to library early in order to have a good space to study.	1	2	3	4	5	6
17. The best time to use the university gym is at 5:00 PM.	1	2	3	4	5	6
18. If I want to use a university computer, it is best to arrive at the computer lab before 10:00 AM.	1	2	3	4	5	6
19. Usually it is best to go to the university cafeteria either before 12:00 PM noon or after 1 PM.	1	2	3	4	5	6
20. We can expect to have a job fair at the beginning of the Fall semester.	1	2	3	4	5	6

Questions II-6	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I often schedule study time in my calendar.	1	2	3	4	5
2. I have specific times each week that I set aside for exercises.	1	2	3	4	5
3. I have specific times each week that I set aside for not allowing my friends or family to interrupt.	1	2	3	4	5
4. I always schedule travel time before classes so I will not be late.	1	2	3	4	5
5. When I work on a team, we always set aside a specific time each week when we can meet.	1	2	3	4	5
6. I make sure that my friends/family members know that they should not call me during or before specific times.	1	2	3	4	5
7. I schedule my vacations weeks in advance.	1	2	3	4	5
8. I am usually the person that sets the schedules for when I get together with my friends or colleagues.	1	2	3	4	5
9. I reserve time in my calendar for the possibility of having to change meetings with various peoples.	1	2	3	4	5
10. I allocate time each day for planning and coordinating my schedules.	1	2	3	4	5

11. I allocate time in my calendar in order to meet a deadline.	1	2	3	4	5
12. I always schedule my social time to occur during lunch time.	1	2	3	4	5
13. I schedule time to check my email every day.	1	2	3	4	5

Questions II-7	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. If I want to have a good class schedule for the next term, I need to register early.	1	2	3	4	5
2. I need to know early when all my exams are held because some of them may conflict with others.	1	2	3	4	5
3. I need to get my required form signed before my advisor leaves for a conference.	1	2	3	4	5
4. If it is possible, I want to schedule courses not during my specific holiday periods.	1	2	3	4	5
5. I do not make any appointment with my advisor after 6:00 PM, since I know he/she will not be available at that time.	1	2	3	4	5
6. Our university is usually open on President's Day, so I don't usually plan my long weekend vacation at that time.	1	2	3	4	5
7. If I am in a group and my partners are always late, I don't need to stick to meeting schedule.	1	2	3	4	5
8. On specific days of the week, I make sure my schedule is flexible enough to accommodate meetings with friends/family, etc.	1	2	3	4	5
9. If the university course schedules are frequently changed, that will be a disaster for me to manage my time.	1	2	3	4	5

III: Open-ended Questions

1. Do you generally meet your important deadlines? (1) If so, what practices do you follow that help you meet these deadlines? (2) If not, why do you think you miss these deadlines?

2. What do you think you could do to help you meet the deadlines?

3. Is it important to coordinate your life to meet external schedules (e.g. university academic calendar) to manage your time? Why or why not?

4. How much do your time management tool(s) really aid(s) in managing your time? Explain what tools you use and how they help you?

5. What difficulties do you currently have with your time management tools, e.g. not up-to-date, not always with me etc. Please list as many as you can think of.

THANK YOU VERY MUCH FOR YOUR KIND PARTICIPATION!

Faculty Subject code: _____

Please circle your answers based on your current situation. You are NOT limited to one answer.

I: Background

12. I am a (Circle **all** that apply):
[a] Administrative Staff (please select one *Junior, Senior*)
[b] Professor (Please select one: *distinguished, full, associate, assistant, special lecturer)*
[c] Full-time Student (Please select one: *Ph. D., Masters, Undergraduate, non-matriculated)*
[d] Part-time Student (Please select one: *Ph. D., Masters, Undergraduate, non-matriculated)*
[e] Other, please indicate _____

13. I am studying/working in (Circle **all** that apply):

[a] College of Computing Sciences [b] School of Management
[c] Newark College of Engineering [d] School of Architecture
[e] College of Science and Liberal Arts [f] Albert Dorman Honors College
[g] A university administrative office (please indicate which unit)_____
[h] Other, please indicate _____

14. I am a: [a] Female [b] Male

15. My age is: [a] 20 or under [b] 21-30 [c] 31-40 [d] 41-50 [e] 51-60 [f] over 60

16. My native language is: [a] English [b] Spanish [c] German [d] French [e] Arabic [f] Chinese [e] Japanese [f] Korean [g]Hindi [g] other, please indicate _____

17. I have used a computer for about [a] 1 year [b] 2-3 years [c] 4-5 years [d] over 5 years

18. I work at my profession about ____ hours every week. [a] Less than 20 hours [b] 21-30 hours [c] 31-40 hours [d] 41-50 hours [e] 51-60 hrs [f] 61-70 hrs [g] over 70 hrs

19. I have been working at NJIT for ___ years. [a] Less than 1 year [b] 1-3 years [c] 4-6 years [d] 7-10 years [e] over 10 years

20. I use a(n) paper/electronic tool to help me manage my time. [a] Yes [b] No

If your answer for question 9 is "Yes", please continue answering questions. Otherwise, please skip to Questions II-2 (see page 4).

21. I am using the following calendar tools to manage my time (Circle **all** that apply):
[a] A pocket-sized paper calendar
[b] A wall-sized paper calendar
[c] MS Outlook™ in a PDA /Palm
[d] MS Outlook™ in a desktop
[e] MS Outlook™ calendar application in a cell phone
[f] The Highlander Pipeline online calendar
[g] Yahoo / MSN online calendar
[h] A paper-based to-do list
[i] An electronic to-do list
[j] post-it
[k] A tool different than the ones listed above (please describe it) _____

II: In the following questionnaire, we are going to ask you questions about the types of calendars you use and what types of general information you write in the calendar. In addition, we will also be asking you about your time management strategies in conjunction with your personal calendar.

Please **circle the number** to the right of each word or phrase that best represents your answer.

Questions II-1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I am dissatisfied with my time management tool(s).	1	2	3	4	5
2. I think my time management tool(s) is (are) effective.	1	2	3	4	5
3. I have many complaints about the calendar system(s) I use.	1	2	3	4	5
4. My time management tool(s) help(s) me to remember important deadlines.	1	2	3	4	5
5. I don't always schedule everything on my time management tool(s).	1	2	3	4	5
6. I only schedule important deadlines in my time management tool(s).	1	2	3	4	5
7. My time management tools help(s) organize my time.	1	2	3	4	5
8. My time management tools help me to use my time more efficiently.	1	2	3	4	5
9. Cost is the major reason for my choice of time management tool(s).	1	2	3	4	5
10. I do not use my time management tool(s) very much.	1	2	3	4	5
11. I often update my schedules in my time management tool(s).	1	2	3	4	5
12. I do not use many of the features of my time management tool(s).	1	2	3	4	5
13. I mostly remember things in my head instead of relying on my time management tools.	1	2	3	4	5
14. I feel that my time management tool(s) help me achieve my long-term goals.	1	2	3	4	5
15. The complexity of my life caused me to choose my time management tool(s).	1	2	3	4	5
16. Ease of use is a major concern for me to choose my time management tool(s).	1	2	3	4	5
17. I choose my time management tool(s) because my working place/university provides me the tool(s).	1	2	3	4	5
18. I always share my calendars with my friends and partners.	1	2	3	4	5

Questions II-1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
19. I write more than schedules and deadlines in my calendar(s).	1	2	3	4	5
20. I keep separate time management tools to manage my work time and my family affairs.	1	2	3	4	5

Questions II-2	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I usually make a list of things I have to do each day.	1	2	3	4	5
2. Whenever I find myself with spare time, e.g. waiting to see my doctor, I bring work to do.	1	2	3	4	5
3. Socializing sometimes keeps me from making deadlines.	1	2	3	4	5
4. I postpone doing hard tasks.	1	2	3	4	5
5. I always schedule private time	1	2	3	4	5
6. At the beginning of each week, I plan what I will do for that week.	1	2	3	4	5
7. I often underestimate the amount of time it will take to get something done.	1	2	3	4	5
8. I find that I often spend too many hours on a project in order to make it perfect.	1	2	3	4	5
9. I do the work that is the highest priority first.	1	2	3	4	5
10. I often have to stay up late to meet a deadline.	1	2	3	4	5
11. I almost always get my work done on time.	1	2	3	4	5
12. Even though some of the activities I engage in are unprofitable I still do them.	1	2	3	4	5
13. I feel that I always make constructive use of my time.	1	2	3	4	5
14. On an average work / school day, I spend more time on personal grooming than on work.	1	2	3	4	5
15. I often postpone tasks that I promised to do even though the deadline is approaching.	1	2	3	4	5
16. There is room for improvement in the way I manage my time.	1	2	3	4	5
17. I feel that I am in control of my own time.	1	2	3	4	5
18. Even though I am very busy, I find it difficult to say "NO" to people.	1	2	3	4	5
19. When I have multiple things that I need to do, I usually work on them one at a time.	1	2	3	4	5
20. Whenever I have assigned tasks, I try to do them immediately.	1	2	3	4	5
21. I never set goals for months ahead.	1	2	3	4	5
22. When I work, my desk is usually	1	2	3	4	5

cluttered with multiple things I am working on.					
23. If I set priorities, I always honor them.	1	2	3	4	5
24. Every day, I spend some time planning.	1	2	3	4	5
25. On a work / school day, I usually make a schedule of the activities I have to do.	1	2	3	4	5
26. I always plan my day before starting it.	1	2	3	4	5

Questions II-3	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I have no time management problems at all in both my work and my personal life.	1	2	3	4	5
2. I work hard to improve my time management.	1	2	3	4	5
3. I don't need time management for my own work.	1	2	3	4	5
4. I have sufficient capabilities to handle my life well without time management techniques.	1	2	3	4	5
5. Improving my time management will not benefit me.	1	2	3	4	5
6. My supervisor is always tardy, so I don't need to worry about my own time management.	1	2	3	4	5
7. My performance at school has nothing to do with my personal time management.	1	2	3	4	5
8. I have no problems managing my time.	1	2	3	4	5
9. I am too busy to improve my time management skills.	1	2	3	4	5
10. It is hard for me to change my habits, although I know I need to improve my time management.	1	2	3	4	5
11. I take actions to improve my time management.					
12. Without good time management, both my life and work will suffer.	1	2	3	4	5
13. I try very hard to meet deadlines.	1	2	3	4	5
14. My job doesn't require me to manage my time well.	1	2	3	4	5
15. It is necessary to improve my time management to achieve my goals.	1	2	3	4	5
16. I don't care if time is wasted or not.	1	2	3	4	5
17. Good time management will make me more successful.	1	2	3	4	5

Please answer the following questions in terms of whether you believe the statement about the requirements or rules of NJIT is true or not at all true. You may also select the answer "don't know" if you do not know the answer.

Questions II-4	Not at all True	Mostly Untrue	Don't Know	Mostly True	True
1. An untenured faculty will submit his or her materials for consideration for tenure during their fifth year at NJIT.	1	2	3	4	5
2. An Associate Professor is usually considered for promotion to Full Professor after working at NJIT for twelve years.	1	2	3	4	5
3. The NJIT faculty meeting is held twice per semester.	1	2	3	4	5
4. Equipment from media services must be reserved for classes at least twenty-four hours in advance.	1	2	3	4	5
5. I can apply for sabbatical leave after I have worked for NJIT for four years.	1	2	3	4	5
6. Faculty Statement of Activities reports are due in November yearly.	1	2	3	4	5
7. The open enrollment period for changing health benefits occurs in January every year.	1	2	3	4	5
8. If I borrow a book from the library, I am allowed to keep it for one month before renewing it.	1	2	3	4	5
9. I must submit travel reimbursements within two weeks after I have traveled.	1	2	3	4	5

Questions II-4	Not at all True	Mostly Untrue	Don't Know	Mostly True	True
10. I need to schedule office hours equal to the number of hours I teach.	1	2	3	4	5
11. I must schedule office hours on two separate days of the week.	1	2	3	4	5
12. If I am traveling, I need to warn my department about my travel plans at least one week before my travel begins.	1	2	3	4	5
13. If I intend to take a sabbatical, I must turn in my papers requesting the sabbatical by May before the academic year in which I plan to take the sabbatical.	1	2	3	4	5
14. I am allowed one day for consulting each week of the academic term.	1	2	3	4	5

Questions II-5	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Relevant to My Life
1. I write conference deadlines in my calendar.	1	2	3	4	5	6
2. I use the NJIT Highlander Pipeline course schedule and use it to tell me when I have to teach.	1	2	3	4	5	6
3. I always write all department meetings in my calendar.	1	2	3	4	5	6
4. I use my calendar to write down appointments with colleagues.	1	2	3	4	5	6
5. I write birthdays and anniversaries in my calendar.	1	2	3	4	5	6
6. I write in special holidays in my calendar when they are not already marked.	1	2	3	4	5	6
7. I put key dates for the university academic calendars into my calendar.	1	2	3	4	5	6
8. I put down the dates when I need to renew or return books in my calendar.	1	2	3	4	5	6
9. I always write vacation plans in my calendar.	1	2	3	4	5	6
10. I either come in late or leave early to have quiet time to work on my research.	1	2	3	4	5	6
11. I never schedule parties or outings with friends during my grant proposal/paper deadline periods.	1	2	3	4	5	6
12. I would never ask for an extension on a paper submission to a conference.	1	2	3	4	5	6
13. If I have a dinner party, I can announce it the day before to the invites.	1	2	3	4	5	6
14. I know I should have a certain number of publications by my tenure time.	1	2	3	4	5	6
15. I know it is expensive to book an airline ticket just before traveling.	1	2	3	4	5	6
16. I know I can always buy cheap products after big holidays.	1	2	3	4	5	6
17. My vacations should never be scheduled near the start or end of a semester.	1	2	3	4	5	6
18. Although I have previously scheduled some events in my calendar, I should cancel them whenever higher-level administrators request a meeting.	1	2	3	4	5	6
19. I always select the best time to meet with my research project partners.	1	2	3	4	5	6
20. I plan my travel time to avoid heavy traffic.	1	2	3	4	5	6

Questions II-6	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I regularly set aside time each week for exercise.	1	2	3	4	5
2. When I work on a team, we always set aside a regular time when we can meet.	1	2	3	4	5
3. I have a regular schedule for when I am at work and at home.	1	2	3	4	5
4. I set up regular times to spend with my family or close friends.	1	2	3	4	5
5. I reserve flexible time in my calendar for the possibility of having to change meetings with various people.	1	2	3	4	5
6. I allocate time each day for planning and coordinating my schedules.	1	2	3	4	5
7. I mark time in my calendar in order to meet a deadline, e.g. paper/grant deadlines.	1	2	3	4	5
8. I always schedule my social time to occur during lunch time.	1	2	3	4	5
9. I schedule time to answer my email.	1	2	3	4	5
10. I have specific times that I set aside each week that I do not allow my friends or family to interrupt.	1	2	3	4	5
11. I make sure that my friends know that they cannot call me during or before specific times.	1	2	3	4	5
12. I am usually the person that sets the schedules for when I get together with my friends or colleagues.	1	2	3	4	5
13. I often schedule time to learn new skills in my personal calendar.	1	2	3	4	5
14. I don't usually schedule academic/journal paper reading time in my personal calendar.	1	2	3	4	5
15. I set up regular meeting times with each of my students.	1	2	3	4	5

Questions II-7	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Our university is usually open on President's Day, so I don't usually plan my long weekend vacation at that time.	1	2	3	4	5
2. Since my partners are always late for our group meeting, I don't need to exactly stick on meeting schedule.	1	2	3	4	5
3. I don't schedule social events during my colleagues' religious holidays.	1	2	3	4	5
4. I reserve flexible time on certain dates, in anticipation of possible meetings with my colleagues.	1	2	3	4	5
5. If I work with a tardy supervisor/colleague, I will always have trouble scheduling my work efficiently.	1	2	3	4	5
6. If school is closed because of bad weather, I would like to know earlier to plan my commuting time.	1	2	3	4	5
7. If university schedules are frequently changed, I will have trouble managing my time.	1	2	3	4	5
8. I am aware of my colleagues' availability, so I can do possible schedule adjustments if any emergency happens.	1	2	3	4	5
9. If possible, I intend to schedule my classes and	1	2	3	4	5

meetings together within two or three days, since this arrangement can save my commuting time.					
10. I try to schedule my meetings with other faculty members when our university holds faculty meetings on the same day.	1	2	3	4	5
11. Before agreeing to write a paper for a conference deadline, each person on the paper needs to assess their personal schedules.	1	2	3	4	5

III: Open-ended Questions

6. Do you generally meet your important deadlines? (1) If so, what practices do you follow that help you meet these deadlines? (2) If not, why do you think you miss these deadlines?

7. What do you think you could do to help you meet the deadlines?

8. Is it important to coordinate your life to meet external schedules (e.g. university academic calendar) to manage your time? Why or why not?

9. How much do your time management tool(s) really aid(s) in managing your time? Explain what tools you use and how they help you?

10. What difficulties do you currently have with your time management tools, e.g. not up-to-date, not always with me etc. Please list as many as you can think of.

THANK YOU VERY MUCH FOR YOUR KIND PARTICIPATION!

Staff Subject code: _____

Please circle your answers based on your current situation. You are NOT limited to one answer.

I: Background

22. I am a (Circle **all** that apply):
[a] Administrative Staff (please select one *Junior, Senior*)
[b] Professor (Please select one: *distinguished, full, associate, assistant, special lecturer)*
[c] Full-time Student (Please select one: *Ph. D., Masters, Undergraduate, non-matriculated)*
[d] Part-time Student (Please select one: *Ph. D., Masters, Undergraduate, non-matriculated)*
[e] Other, please indicate _____

23. I am studying/working in (Circle **all** that apply):

[a] College of Computing Sciences [b] School of Management
[c] Newark College of Engineering [d] School of Architecture
[e] College of Science and Liberal Arts [f] Albert Dorman Honors College
[g] A university administrative office (please indicate which unit)_____
[h] Other, please indicate _____

24. I am a: [a] Female [b] Male

25. My age is: [a] 20 or under [b] 21-30 [c] 31-40 [d] 41-50 [e] 51-60 [f] over 60

26. My native language is: [a] English [b] Spanish [c] German [d] French [e] Arabic [f] Chinese [e] Japanese [f] Korean [g]Hindi [g] other, please indicate _____

27. I have used a computer for about [a] 1 year [b] 2-3 years [c] 4-5 years [d] over 5 years

28. I work at my profession about ____ hours every week. [a] Less than 20 hours [b] 21-30 hours [c] 31-40 hours [d] 41-50 hours [e] 51-60 hrs [f] 61-70 hrs [g] over 70 hrs

29. I have been working at NJIT for ___ years. [a] Less than 1 year [b] 1-3 years [c] 4-6 years [d] 7-10 years [e] over 10 years

30. I use a(n) paper/electronic tool to help me manage my time. [a] Yes [b] No

If your answer for question 9 is "Yes", please continue answering questions. Otherwise, please skip to Questions II-2 (see page 4).

31. I am using the following calendar tools to manage my time (Circle **all** that apply):
[a] A pocket-sized paper calendar
[b] A wall-sized paper calendar
[c] MS Outlook™ in a PDA /Palm
[d] MS Outlook™ in a desktop
[e] MS Outlook™ calendar application in a cell phone
[f] The Highlander Pipeline online calendar
[g] Yahoo / MSN online calendar
[h] A paper-based to-do list
[i] An electronic to-do list
[j] post-it
[k] A tool different than the ones listed above (please describe it) _____

II: In the following questionnaire, we are going to ask you questions about the types of calendars you use and what types of general information you write in the calendar. In addition, we will also be asking you about your time management strategies in conjunction with your personal calendar.

Please **circle the number** to the right of each word or phrase that best represents your answer.

Questions II-1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
21. I am dissatisfied with my time management tool(s).	1	2	3	4	5
22. I think my time management tool(s) is (are) effective.	1	2	3	4	5
23. I have many complaints about the calendar system(s) I use.	1	2	3	4	5
24. My time management tool(s) help(s) me to remember important deadlines.	1	2	3	4	5
25. I don't always schedule everything on my time management tool(s).	1	2	3	4	5
26. I only schedule important deadlines in my time management tool(s).	1	2	3	4	5
27. My time management tools help(s) organize my time.	1	2	3	4	5
28. My time management tools help me to use my time more efficiently.	1	2	3	4	5
29. Cost is the major reason for my choice of time management tool(s).	1	2	3	4	5
30. I do not use my time management tool(s) very much.	1	2	3	4	5
31. I often update my schedules in my time management tool(s).	1	2	3	4	5
32. I do not use many of the features of my time management tool(s).	1	2	3	4	5
33. I mostly remember things in my head instead of relying on my time management tools.	1	2	3	4	5
34. I feel that my time management tool(s) help me achieve my long-term goals.	1	2	3	4	5
35. The complexity of my life caused me to choose my time management tool(s).	1	2	3	4	5
36. Ease of use is a major concern for me to choose my time management tool(s).	1	2	3	4	5
37. I choose my time management tool(s) because my working place/university provides me the tool(s).	1	2	3	4	5
38. I always share my calendars with my friends and partners.	1	2	3	4	5

Questions II-1	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
39. I write more than schedules and deadlines in my calendar(s).	1	2	3	4	5
40. I keep separate time management tools to manage my work time and my family affairs.	1	2	3	4	5

Questions II-2	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
27. I usually make a list of things I have to do each day.	1	2	3	4	5
28. Whenever I find myself with spare time, e.g. waiting to see my doctor, I bring work to do.	1	2	3	4	5
29. Socializing sometimes keeps me from making deadlines.	1	2	3	4	5
30. I postpone doing hard tasks.	1	2	3	4	5
31. I always schedule private time	1	2	3	4	5
32. At the beginning of each week, I plan what I will do for that week.	1	2	3	4	5
33. I often underestimate the amount of time it will take to get something done.	1	2	3	4	5
34. I find that I often spend too many hours on a project in order to make it perfect.	1	2	3	4	5
35. I do the work that is the highest priority first.	1	2	3	4	5
36. I often have to stay up late to meet a deadline.	1	2	3	4	5
37. I almost always get my work done on time.	1	2	3	4	5
38. Even though some of the activities I engage in are unprofitable I still do them.	1	2	3	4	5
39. I feel that I always make constructive use of my time.	1	2	3	4	5
40. On an average work / school day, I spend more time on personal grooming than on work.	1	2	3	4	5
41. I often postpone tasks that I promised to do even though the deadline is approaching.	1	2	3	4	5
42. There is room for improvement in the way I manage my time.	1	2	3	4	5
43. I feel that I am in control of my own time.	1	2	3	4	5
44. Even though I am very busy, I find it difficult to say "NO" to people.	1	2	3	4	5
45. When I have multiple things that I need to do, I usually work on them one at a time.	1	2	3	4	5
46. Whenever I have assigned tasks, I try to do them immediately.	1	2	3	4	5
47. I never set goals for months ahead.	1	2	3	4	5
48. When I work, my desk is usually cluttered with multiple things I am working on.	1	2	3	4	5
49. If I set priorities, I always honor them.	1	2	3	4	5
50. Every day, I spend some time planning.	1	2	3	4	5
51. On a work / school day, I usually make a schedule of the activities I have to do.	1	2	3	4	5
52. I always plan my day before starting it.	1	2	3	4	5

Questions II-3	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
18. I have no time management problems at all in both my work and my personal life.	1	2	3	4	5
19. I work hard to improve my time management.	1	2	3	4	5
20. I don't need time management for my own work.	1	2	3	4	5
21. I have sufficient capabilities to handle my life well without time management techniques.	1	2	3	4	5
22. Improving my time management will not benefit me.	1	2	3	4	5
23. My supervisor is always tardy, so I don't need to worry about my own time management.	1	2	3	4	5
24. My performance at school has nothing to do with my personal time management.	1	2	3	4	5
25. I have no problems managing my time.	1	2	3	4	5
26. I am too busy to improve my time management skills.	1	2	3	4	5
27. It is hard for me to change my habits, although I know I need to improve my time management.	1	2	3	4	5
28. I take actions to improve my time management.	1	2	3	4	5
29. Without good time management, both my life and work will suffer.	1	2	3	4	5
30. I try very hard to meet deadlines.	1	2	3	4	5
31. My job doesn't require me to manage my time well.	1	2	3	4	5
32. It is necessary to improve my time management to achieve my goals.	1	2	3	4	5
33. I don't care if time is wasted or not.	1	2	3	4	5
34. Good time management will make me more successful.	1	2	3	4	5

Please answer the following questions in terms of whether you believe the statement about the requirements or rules of NJIT is true or not at all true. You may also select the answer "don't know" if you do not know the answer.

Questions II-4	Not at all True	Mostly Untrue	Don't Know	Mostly True	True
1. The parking garage opens at 8:00 AM from Monday to Friday.	1	2	3	4	5
2. Human Resources is closed between noon and 1:00 PM.	1	2	3	4	5
3. Summer working hours begin at the end of May and end the last day in August.	1	2	3	4	5
4. If a new telephone connection is ordered, it will typically be connected within two weeks.	1	2	3	4	5
5. Typically, my position is renewed once a year.	1	2	3	4	5
6. The university pays its staff and faculty every two weeks.	1	2	3	4	5
7. Time sheets must be turned in two weeks before the next pay period of the university.	1	2	3	4	5
8. Staff employee evaluation forms must be turned in by May each year.	1	2	3	4	5
9. The Fall term is twelve weeks long.	1	2	3	4	5
10. Special rooms must be reserved five days in	1	2	3	4	5

advance.					
11. If an item is to be put on the university calendar, it must be submitted to the publicity office at least four weeks before it is to be published.	1	2	3	4	5
12. The open enrollment period for changing health benefits occurs in January every year.	1	2	3	4	5

Questions II-5	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree	Not Relevant to My Life
1. I write my maintenance department staff availability schedules in my calendar.	1	2	3	4	5	6
2. I use the NJIT Highlander Pipeline, and use it to tell me my deadlines and meeting schedules.	1	2	3	4	5	6
3. I always write all department meetings in my calendar(s).	1	2	3	4	5	6
4. I use my calendar to write down appointments with colleagues.	1	2	3	4	5	6
5. I write birthdays and anniversaries in my personal calendar.	1	2	3	4	5	6
6. I write in special holidays in my calendar when they are not already marked.	1	2	3	4	5	6
7. I put key dates for the university academic calendars into my calendar.	1	2	3	4	5	6
8. I put down the dates when I need to renew or return books in my calendar.	1	2	3	4	5	6
9. I always write vacation plans in my calendar.	1	2	3	4	5	6
10. I either come in early or stay late to have quiet time to work on my stuff.	1	2	3	4	5	6
11. I schedule time to submit time sheets in my calendar.	1	2	3	4	5	6
12. I always make maintenance orders as early as possible in order to avoid unexpected delay.	1	2	3	4	5	6
13. If I have a dinner party, I can announce it the day before to the invites.	1	2	3	4	5	6
14. I always schedule time in advance to collect information before my supervisor holds a meeting.	1	2	3	4	5	6
15. I know it is expensive to book an airline ticket just before traveling.	1	2	3	4	5	6
16. I know I can always buy cheap products after big holidays.	1	2	3	4	5	6
17. My vacations should never be scheduled near the start or end of a semester.	1	2	3	4	5	6
18. Although I have previously scheduled some events in my calendar, I should cancel them whenever higher-level administrators request a meeting.	1	2	3	4	5	6
19. I always select best time to interact with my supervisor.	1	2	3	4	5	6
20. I plan my travel time to avoid heavy traffic.	1	2	3	4	5	6

Questions II-6	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
16. I regularly set aside time each week for exercise.	1	2	3	4	5
17. When I work on a team, we always set aside a regular time when we can meet.	1	2	3	4	5
18. I have a regular schedule for when I am at work and at home.	1	2	3	4	5
19. I set up regular times to spend with my family or close friends.	1	2	3	4	5
20. I reserve flexible time in my calendar for the possibility of having to change meetings with various people.	1	2	3	4	5
21. I allocate time each day for planning and coordinating my schedules.	1	2	3	4	5
22. I mark time in my calendar in order to meet a deadline, e.g. paper/grant deadlines.	1	2	3	4	5
23. I always schedule my social time to occur during lunch time.	1	2	3	4	5
24. I schedule time to answer my email.	1	2	3	4	5
25. I have specific times that I set aside each week that I do not allow my friends or family to interrupt.	1	2	3	4	5
26. I make sure that my friends know that they cannot call me during or before specific times.	1	2	3	4	5
27. I am usually the person that sets the schedules for when I get together with my friends or colleagues.	1	2	3	4	5
28. I often schedule time to learn new skills in my personal calendar.	1	2	3	4	5

Questions II-7	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
12. Our university is usually open on President's Day, so I don't usually plan my long weekend vacation at that time.	1	2	3	4	5
13. Since my partners are always late for our group meeting, I don't need to exactly stick on meeting schedule.	1	2	3	4	5
14. I don't schedule social events during my colleagues' religious holidays.	1	2	3	4	5
15. I reserve flexible time on certain dates, in anticipation of possible meetings with my colleagues.	1	2	3	4	5
16. If I work with a tardy supervisor/colleague, I will always have trouble scheduling my work efficiently.	1	2	3	4	5
17. If school is closed because of bad weather, I would like to know earlier to plan my commuting time.	1	2	3	4	5
18. If university schedules are frequently changed, I will have trouble managing my time.	1	2	3	4	5
19. I am aware of my colleagues' availability, so I can do possible schedule adjustments with them if any emergency happens.	1	2	3	4	5
9. Whenever my supervisor needs to write annual reports for my unit, I usually try to allocate time to prepare for materials for him/her.	1	2	3	4	5
10. If my supervisor has tasks which require to be done immediately, I usually close my door to avoid unnecessary interruptions.	1	2	3	4	5

III: Open-ended Questions

11. Do you generally meet your important deadlines? (1) If so, what practices do you follow that help you meet these deadlines? (2) If not, why do you think you miss these deadlines?

12. What do you think you could do to help you meet the deadlines?

13. Is it important to coordinate your life to meet external schedules (e.g. university academic calendar) to manage your time? Why or why not?

14. How much do your time management tool(s) really aid(s) in managing your time? Explain what tools you use and how they help you?

15. What difficulties do you currently have with your time management tools, e.g. not up-to-date, not always with me etc. Please list as many as you can think of.

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