Web-Based Timesheets for Architecture Design Students

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ABSTRACT

Skills in time management are highly important to professional architects but rarely obtained through an architectural education. A Web-based application for collecting time data from architecture students can achieve multiple benefits to students and educators and perhaps remedy the problem. Several versions of the application have been written and tested. The next phase of research will include a widespread distribution of the Web service to collect data from many schools, courses, and students. Data collected using the software will reveal behavior patterns of architecture students and also provide empirical evidence to validate theories of design process.

1. TIME MANAGEMENT IN ARCHITECTURAL DESIGN

1.1 Motivation

The patterns of student and instructor behavior in architecture schools frequently appear to be a manifestation of a distinctive subculture centered around the design studio space and the courses taught within that space. This “studio culture” is recognized widely by those who are pursuing and have pursued an architectural education. Recently, the American Institute of Architecture Students has initiated an examination of studio culture that includes both high praise and harsh criticism (1). The studio is accepted to be at the core of architectural education and of great value in forging identity, community and lasting friendships. However, it also can engender unintentional and destructive habits and values that can carry over into the profession of architecture. Many of the problems with studio are related to poor and destructive management of time resources. Studio culture can engender overwork, myopic focus upon design at the expense of other courses and social adaptation, procrastination, sleep deprivation, and other destructive practices. A belief that studio culture should be changed to incorporate time management skills appears to be growing among students and educators.

1.2 Overview

Changes to course structure and assignments could have an impact upon studio culture to remedy some of the problems identified by the AIAS. Arguably, there is a need for better understanding of how students use time and also a need to coach them in better use of time. A Web-based approach to collecting time data from students is one way of achieving a better understanding of student’s behavior and providing greater guidance in architecture design studios. An implementation of this concept could make use of a database server that is equipped with a Web-based user interface. Such a tool has been demonstrated to be usable and acceptable to students and instructors. Furthermore, the implementation makes a timesheet service universally available to all architecture students who have Internet access and speak English. Thus it could be an effective tool for conducting research in both design process and time management.

2. Background

2.1 Previous Studies of Architecture Studios

In spite of the assessment by the AIAS that studio culture undervalues skills of time management, there hvae been only a few research efforts that have examined how architecture students manage their time. In a study of the design jury system for evaluating the products of studios, the issue of poor work habits and destructive attitudes toward the use of time were identified (2). This qualitative study made use of surveys as well as interviews with students, instructors and practitioners. It found that students often appear unable to plan their work or anticipate how much time tasks will require. Instructors sometimes encourage work patterns that involve major changes very late in the process. In some settings, instructors encourage "all nighters" before a project is due, and, because of sleep deprivation, students are unable to attend carefully to the reviewers comments.

In extensive observations of the interaction between studio students and instructors, similar problems have been identified (3). The intensive dialogue between instructor and student, while modeling a behavior of inquisitiveness and commitment to high quality, may also lead to indecisiveness and a poor valuation of the time that must be devoted to a project.

An informal study required students to keep timesheets of their studio work (4). The study documents several design studio courses and shows that most students exhibit a "fast and binge" pattern in which they work very little until just before the due date and then work extremely hard. Although students perceive that they work hard, their total effort over the course of the semester is no more than what can be achieved through moderate but steady effort each week.

Many educators and practitioners acknowledge the importance of time management skills. However, accreditation standards for architecture schools do not list time management as a necessary skill to be provided in school (5).

2.2 Design Methods

A discussion of time usage in studios immediately leads to the question of "What are the activities undertaken in design?" Numerous authors have suggested models of the design process. One model suggests a cycle of analysis, synthesis and evaluation (6). A model of design focused upon the programming stage also distinguishes sharply between analysis and synthesis (7). Another model suggests that there are eight fundamental design activities: formulation, synthesis, analysis, evaluation, documentation, reformulation of structure, reformulation of behavior, and reformulation of function (8).

Various research projects have attempted to study the design process empirically to explore particular theories of design. Researchers have staged design trials that compare process and products when aided by computers to those when unaided (9). Protocol analysis has employed "talk-aloud" approaches or videotaping of designers interacting on design teams (10, 11). However, there appears to have been no systematic study employing a statistically valid sample of students to allow confirmation of design process theory or establishment of typical patterns of time usage.

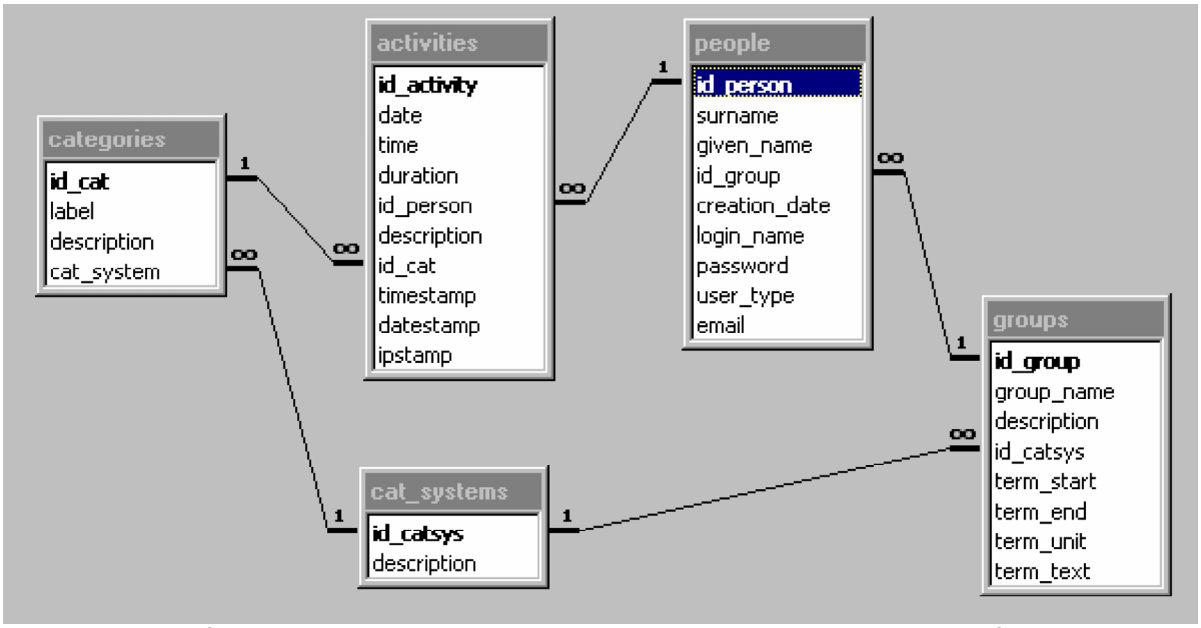
2.2 Web Services

The Internet and the World Wide Web are an extraordinary tool for conducting studies across very large and diverse populations. E-commerce sites such as Yahoo!, Amazon, Expedia and others are capable of collecting large amounts of data about buying and Web surfing habits. They employ technology that has become very accessible and widely understood. Essentially, a Web browser, such as Netscape or Microsoft Internet Explorer, presents a user interface to a customer that consists of forms. Using the form, a customer can submit data to a Web server. The Web server parses the data and provides it to a database server. Scripts that are executed in the browser or on the server compose new forms and reports that can be viewed by the customer using the browser. Software such as Microsoft Internet Information Service and Microsoft SQL Server can handle millions of transactions with no practical limits on the number of users.

Earlier research has tested the concept of a Web site to collect timesheet data from architecture students (12). The concept has been easy to implement and presents no special challenges to students who are typical of the intended customers.

3. CURRENT INVESTIGATIONS

3.1 Implementation



The current state of this research is a new implementation that has been written using Active Server Pages (ASP) Web pages and a SQL Server database. This commercial grade infrastructure is intended to support fielding a timesheet service publicly to any architecture design school in the world. The next stage of investigation involves promoting the use of the service among a moderate number of design studio courses at a diverse set of universities.

The SQL Server implementation employs the five tables shown in Fig. 1. A timesheet itself is made up of records in the *activities* table that are associated with a particular record in the *people* table. A record in the *activities* table is also associated with a record in the *categories* table to express the idea of classifying an activity according to a design method theory. Thus, the *categories* table may include a record for analysis, another for synthesis, and another for evaluation. A record in the *people* table is associated with a record in the *groups* table that is intended to represent a class. A record in the *groups* table is associated with a record in the *cat_systems* that designates a system for categorizing design process, such as Asimow's analysis-synthesis-evaluation theory or Gero's situated function – behavior – structure framework.

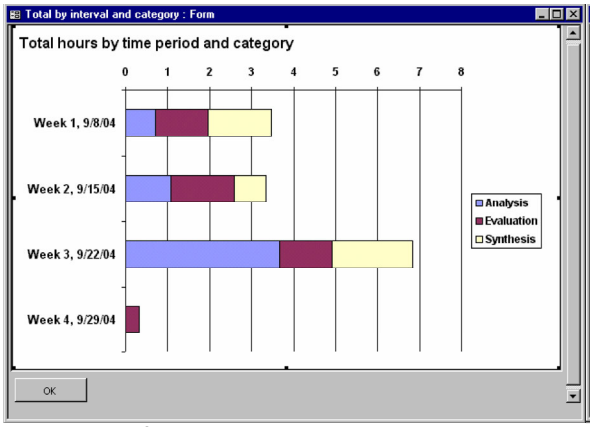
Analysis records are automatically stamped with several data to help record the context of the creation of the record. Timestamps and datestamps record the instant of the transaction. The IPstamp records the Internet Protocol address that identifies the computer being used by the customer. In most cases, because IP addresses are often allocated dynamically to computers as they log onto a network, the IPstamp does not identify the specific computer but does identify the subnet. The time and date information will be used to track the patterns of using the tool, answering questions of whether students diligently keep up with time usage by the hour or record time usage in a batch after longer periods. The IP address may help identify whether students work at home or at school. Both of these examples of "metadata" may help in analyzing the data for reliability and accuracy; one might assume that a customer who creates records frequently is more diligent and accurate than one who puts in many records in quick succession and may be reconstructing or inventing entries in the timesheet.

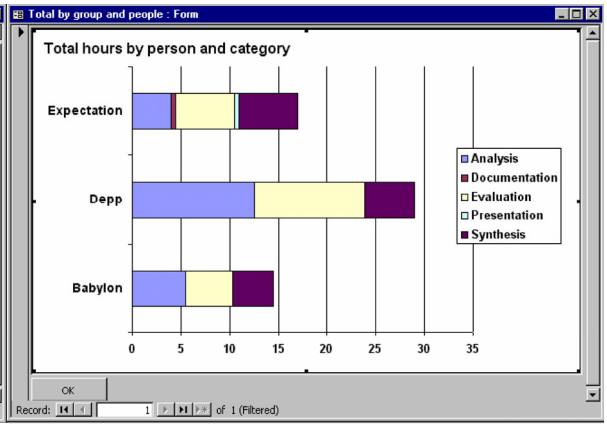
3.2 Demonstration

A customer must first be added as a user by the administrator. Each session requires the customer to login and enter a password to confirm identity. Actions are relatively limited: the customer may add another activity record, review his or her cumulative timesheet and delete or edit records, or examine reports. For adding a timesheet, the customer must enter a description of the activity, a date, a start time, a duration, and a category chosen from a list. The software will add a timestamp, a datestamp, IP stamp, and relation to the customer.

Reports present information about time usage in graphical format. Additional reports are being designed,

Fig. 1. Tables, fields and relations for timesheet application.





but currently four charts are provided. A pie chart shows the proportion of time spent by a particular customer in each category. A second pie chart shows the instructor's expectation for how much time should be spent in each category. A stacked bar chart shows the amount of time spent by a particular customer in each category each week of a project (fig. 2). A final bar chart shows the amount of time spent per week for each student in the group (or class) compared to the instructor's expectations (fig. 3).

3.3 User Trials

Fig. 2 Summary by category and week.

Fig. 3 Comparison of all students' total time usage.

students enrolled in design studios to test the willingness of students to use the system. Thirty-two students and faculty from both undergraduate and graduate courses have tested the system. Although trials have not been long enough to gather usable data, the trials have clearly established that the tool is easy to use, the concepts are easy to understand, and the value of the tool is evident.

For future trials, demographic data about the students will be collected to allow correlation of behavior to grades, year level, experience and other factors.

4. CONCLUSIONS

4.1 Summary of Results

The current research builds incrementally on previous work. The initial trials indicate that a Web-based time management application is easy for students to use. A small sample of students rapidly grasped the value and stated that they would use such software if it was available. The SQL Server implementation appears to be capable of supporting virtually unlimited traffic. The research is ready for the next step of widespread dissemination of the software as an Internet service.

This software can collect extensive data about actual design process and behavior of students. It will enable the collection of data that establishes through empirical evidence the work behavior of students with respect to time utilization. It also may serve as an apparatus for validating design methods theory by documenting the patterns of activities according to theoretical categories.

4.2 Future Work

The method of using a data-driven Web site to collect information about people's behavior is general to many other domains and research questions. In addition to collecting data from many architecture schools in many nations, there are other domains of design that may be amenable to this research method, such as product design, landscape architecture, or engineering. Other non-designerly activities could also be studied, such as construction or management. Indeed, the general question of what is the behavior pattern of any student in a university could be studied with this software. The research topic need not be limited to students, but could also be applied to achieve an understanding of professional behavior. The wide range of potential applications of this research suggest that the method itself is a notable contribution.

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