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ITP5010

Systems Usability Testing and Design: A Case Study of the Implementation of Document Management Software at a Technical School

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ABSTRACT

This is a case study about the adoption and assimilation of document management software at a technical high school. The research was conducted as a usability study to fulfill requirements for a doctoral course in Information Systems. This paper identifies those issues related to a mandated innovation adoption chosen by an authority figure. The case applies Gallivan's (2001) Secondary Adoption and Organizational Assimilations Processes framework to draw conclusions and develop theoretical insights regarding the diffusion of complex technological innovations within an educational setting.

INTRODUCTION

Gallivan's (2001) framework of Secondary Adoption and Organizational Assimilation processes focuses on the consequences related to the adoption of a technological innovation when mandated by a primary authority in an organization. When technologies are complex there is a gap in assimilating the technologies into the every day routines of the employees (Fichman & Kemerer, 1999). Cooper & Zmud's (1990) Six Stage model for technology implementation is used to look at the technology assimilation stages. These stages include initiation, adoption, adaptation, acceptance, routinization, and infusion. It is used within this study to uncover those factors contributing to a slow assimilation of the document management software. Gallivan's framework is applied in the study to understand how the lack of use of the document management software is related back to the primary authority (principle) and the adoption process. This case study is important because it demonstrates the challenges of complex technology adoption and assimilation in a technical school setting. This case uncovers insights for students, educators, and administrators about the challenges of technology transference, including the diversity in perceptions about the value of the technology by the administration and the teachers. It also can be useful in learning about usability studies and the methodological steps involved in that process.

BACKGROUND

In June of 2002, document management software was implemented at a technical high school. By August, it was clear that the users (both faculty and staff) were not utilizing the system even though a Quality Assurance task force was created to lead the implementation process, employees received extensive training, and the users were given training manuals. The principle allowed a usability study to be conducted to discover the underlying issues behind the lack of use of the document management software. The objectives of the study were to first, conduct a user task analysis to watch how the employees use the interface. Second, discuss the issues they have with the software. Third, gain an understanding of the general perceptions and attitudes of the users. Fourth, recommend changes to the software to help increase use. The user task analysis protocol was taken from guidelines established by Hackos and Redish (1998). Next, to create a prototype design, incorporating changes to the interface, and to test the prototype with several employees. The usability testing protocol was taken from guidelines established by Rubin (1994).

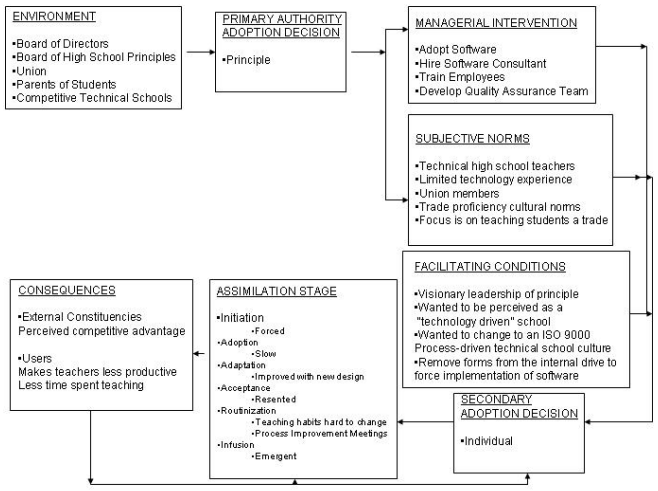
Interface

The interface is an electronic document management system (EDMS) developed by an application service provider (ASP) located in Colorado. It is a web-based application for the transfer of information such as forms for approval or process requirements needed for technical certifications such as ISO 9000. The software includes electronic signatures and can delineate authorship or read-only status by user. The system can also archive forms for future use. Since the interface is web-based, users must be able to access the Internet and have a password to use the system. The interface is an innovative product within a broad category of "process improvement" products. It is considered document control software and competes with both network providers and ASPs. ASP usage is growing because it is more cost-effective for companies to pay a one-time activation fee and variable rate by user than to buy the software and house it on their internal server, which requires maintenance and periodic upgrades. Customers use the Internet to access their data. Data is saved on the ASP servers versus a company's network.

Organizational Situation Analysis

The principle is a visionary leader and the primary authority mandating the adoption of the document management software for the following reasons: First, the school recently obtained ISO 9000 certification and the software is designed for ISO 9000 task flows. ISO 9000 certification helps in marketing the school to parents and other schools who are looking for technical placement of their students. ISO 9000 is also a stepping stone for future accreditation goals. Second, the use of document management software adds to the school's platform of being technologically advanced. It currently has extensive computer technology with over 300 computers and a 25% annual replacement rate, and its students use state of the art software. Since the principle solicits for funding, all of these areas add to the school's credibility. The principle reports to a board of directors and a board of high school principles that send students to the school. There is also a teacher's union. Gallivan's (2001) theoretical framework for Secondary Adoption and Organizational Assimilation Processes is adapted with a few changes and applied to the technical school to provide a situation analysis (Figure 1). The environmental factors contributed to the principle's necessity to develop a competitive advantage by marketing the school as a technologically advanced technical school. The principle then initiated the implementation of the software that helped in continuous updates for ISO 9000 specifications. The implementation of the software was given priority treatment with a team approach and consultants managed the project through the implementation with employees. The norms established in the school included hands on student training by teachers and inconsistent computer literacy. The principle initiated changing the norms by causing the teachers to make

Figure 1. Adapted Framework of Gallivan's Secondary Adoption and Organizational Assimilation Processes



process improvements through ISO 9000 certification, and utilizing their computer technology through the process. The principle forced software use by removing all forms from the local drive. Mahler & Rogers (1999) suggest forcing use to build critical mass of interactive communication innovations. Software adoption was slow, based on each trade's standards. The process began with the Quality Assurance team and teachers creating ISO 9000 standards for their class procedures. Finally, the culture is adverse to change, resentment for the software is significant, and the teachers perceive a lack of regard for their time teaching students. There is a communication breakdown, as the teachers perceive the principle as more interested in external constituencies then the internal constituencies.

USER TASK ANALYSIS

A user task analysis was conducted following the guidelines of Hackos and Redish (1998). A brief review is outlined below:

The Site Visit

In order to understand attitudes toward the software, the application in-use, and the ability by users to maneuver through the system, a site visit was conducted in October 2002.

User Assumptions

The primary users were high school teachers and staff. The users had a working knowledge of computers, completed training of the document management software, and had read the manual.

Task Assumptions

Overall, the study was to understand how easy or difficult it is for users to access the software. Then, once they were in the system, how hard it was for them to find a document they were looking for.

Task Process Analysis:

1. Access Internet
2. Log-On to website
3. Go to application
4. Type in User Name and Password
5. Go into Collaboration
6. Click box to find document (3 choices)
7. Seek document looking for
8. Use document

Participants

The participants were broken down into categories established by Hackos & Redish (1999). These included Types of use (heavy or light); Purpose of use (electronic signature, form developer, technical administrator, clerical administrator or reviewer); or Level of use (user (lowest), author or administrator). The six users performed the following tasks:

Quality assurance – This person was the heaviest user. They added users; assigned them to groups; authored documents; routed documents for review and approval. They authored most documents. This person's computer was in a classroom.

Principle – They are the visionary leader that brought the most enthusiasm to the project. They authorized all forms, including reviewing, approving, and signing all documents. This person's computer was in their office.

Administrative assistant – This person used the system to access purchase orders. They were computer literate. Their computer was in an open office, accessible to students.

Network administrator – They supported users and answered their IT questions. Their computer was in their office.

Learning support instructor – They were an older teacher that accessed information for meetings. They were an occasional user with minimal computer literacy. Computer was in their classroom.

Wood products manufacturing instructor – Younger teacher that is was computer literate. They accessed forms for ordering supplies. Their computer was in a separate office above their classroom.

Summary of Site Visit

Each interview took about one hour to conduct and took place in the user's workspace. The interview process was spontaneous (Hackos & Redish, 1998). Concurrent contextual interviews provided a good format for capturing each user's comfort level with the software. The cultural environment was complex and resistance to change was strong. The challenges present for adopting this software included an 8:00 a.m. to 3:00 p.m. teaching schedule. The union typically provided incremental pay to attend a meeting or do a project with students after school. Users felt that there were too many changes all at once. From their perspective, ISO 9000 was implemented, one day the drive was gone, and the new software was forced on them. Since the principle is their supervisor, they felt pressure to conform to all of the changes, and were resentful of the situation.

ANALYSIS OF THE RESULTS

Once data was collected from the site visit, the data was analyzed using the following techniques: Profiles of users; Insight sheets, and Task sequences (Hackos & Redish, 1998). Due to limited space, Profiles of users and Task sequences will be left out of this paper. Results were that five of the six users felt the software increased their workload and connecting to the Internet made the process more difficult. The only one that did not feel that way was the principle. Four out of five users described change as "too much," "too quick," "constant," or "takes more time."

Insight Sheets

The various insights obtained from the site visit were captured and analyzed using Insight sheets (Hackos & Redish, 1998). Many issues were raised as to the software's effectiveness. These insights were recorded and synthesized to determine trends in attitudes and perceptions. Figure 2. includes a summary of insights. Overall, it was clear that the users needed some level of customization when using the software because of the differences in user needs of the software. Information from the site visit was used to create a prototype design of the interface so that users could customize a folder to include forms used on a regular basis.

User Insight	Potential Impact on Design
1. "When using the X drive, all I had to do is find the form I needed and print it out. They wiped it away one day and now there are too many forms to find the one I need."	The proposed design should allow users to have a custom folder in the application to locate the forms they need on a regular basis.
2. "Why do I have to go to company website? Then, I have to put in user name and password before getting to application."	

Figure 2. Insight Summary Sheet

User Insight	Potential Impact on Design
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2. "Why do I have to go to company website? Then, I have to put in user name and password before getting to application."	Recommendation will be to put a shortcut on users desktop for one click to log-in.
3. "I don't have a clue what the forms are called. There are several hundred forms. Alphabetical by name doesn't help me. And clusters don't help either."	A "My Documents" folder will allow user to find form only once and save it into a personal folder to access on demand.
4. "Everything is jumbled on software. ISO Policies and Procedures, forms, job descriptions, work instructions, use forms and Do Procedures."	Recommendation will be to sort all documents by categories. Database should be designed by how user views forms.
5. "The administrative team does not have its own cluster. There is too much information to find stuff." 6. "I went from file cabinet near students to going up to my office, connecting to Internet and trying to find forms for ordering supplies. What is the added value to the student?"	Recommendation will be to include an Administrative Team cluster to access forms needed by that group of users. Recommendation will be to allow teachers to print forms that do not change regularly but are used on a regular basis and alert them through the standard software e-mail when updates are made to the forms they are using.

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The User Interface Prototype Design

The procedure for getting into the application included going to the company web site and logging on. All forms popped-up in a box and there were three ways forms could be accessed: Index, Alphabet, and Search. However, most users did not know the names of the forms and, therefore, could not locate the forms they needed. The prototype made the software easier to use by clustering the forms by form type and use. The user could then create a "My Documents" folder within the software to locate the forms they used most often. Administration was still able to update and control the forms because they remained at a remote location through the ASP. This reduced the number of steps to locate documents and saved time.

THE USABILITY TEST

The purpose was to determine if the prototype mock-up makes the process of using the document management application easier.

Research Question

Does the incorporation of a "My Documents" area help users locate their individual documents in less time than the previous design? And, if so, will this change increase employee use?

User Profile

The test was conducted in November, 2002. Nine users were targeted for the prototype mock-up test. This sample was a convenience sample and was sufficient (Rubin, 1994). The user profile was determined in order to retest users that provided important information in the original site visit to ensure validation of the mock-up. And to test the mock-up with other users to determine whether or not the mock-up effectively met the objectives of the test (see User profiles in Appendix I).

Test Design

The usability test method used observation and interview (Test Method for Prototype can be reviewed in Appendix II). In order to understand whether or not the prototype enabled users to find their documents faster, observation was necessary. The participants received a short, verbal introduction about the prototype test. After the orientation was completed, the participant was asked to sit down at their desk and log onto the software. Once in the system, the interviewer walked the participant through opening the new icon "My Documents" and showed them how the documents that are used all the time can now be saved to that folder within the application's desktop. After showing the participant the new "My Documents" folder and how to put forms used most often in it, the interviewer asked the participant what they thought of the process. All verbal and non-verbal comments and/or communication were recorded.

RESULTS

The usability test showed that adding a "My Documents" feature increased user satisfaction with the software. Eight out of nine users felt that the customized folder met user's needs better and reduced frustration.

CONCLUSIONS AND RECOMMENDATIONS

Although implementation of the document management software followed organizational adoption and simulation guidelines prescribed by Gallivan (2001) and noted by Mahler & Rogers (1999), further research may uncover whether or not this is a typical adoption process for technical schools. Changes were made to the software for easy access to a "My Documents" folder that became a universal design element of the software. Research on communication strategies about implementing complex technological innovations, perceived as disruptive to internal constituencies, is also recommended. Finally, how productivity is measured in a technical school environment warrants further consideration.

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APPENDIX I

Role	Area	Tested at Site Visit	Computer Knowledge	Quality Team	Attitude to software
Administrative Assistant (1)*	Main Office	Yes	Yes	No	Neutral
Counselor(2)	Main Office	No	No	Yes	Negative
IT Specialist (3)	IT	Yes	Yes	Yes	Positive
Teacher(4)	Adult Ed	No	Yes	Yes	Negative
Teacher(5)	Wood Shop	Yes	Yes	No	Negative
Teacher(6)	Carpentry	No	No	Yes	Negative
Teacher(7)	Electrical	No	No	Yes	Negative
Teacher(8)	Dental	No	Yes	Yes	Negative
Teacher(9)	Health	No	No	Yes	Negative

** Numbers represent User #*

APPENDIX II

Test Method for Prototype

1. Nine employees were observed and interviewed based on their availability and time requirements. A person in the main office called them and asked them if they had a few minutes to look at an update to their document management software. Once they isolated a time to meet, the caller requested that the interview take place in their office/classroom.
2. Caller announced that the interviewer will take less than 10 minutes and that the administrator encouraged their participation.
3. The test setup consisted of the user logging on to the software on their computer the way they normally do. The interviewer then showed them the new feature of "My Documents" and how they could now add their documents to a customized folder on the actual system.
4. The interviewer then interviewed each user and recorded their reactions to the new feature as well as any verbatim comments about the software or its use.
5. The interviewer ended the session by debriefing the user, asking them if there were anything, specifically, they would like the interviewer to address with Administration or the software company.