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The Wizard Interface as a Performance Tool

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A thesis submitted to

The Faculty of Graduate Studies and Research

In partial fulfillment of

The requirements for the degree of

Master of Arts

Department of Psychology

Carleton University

Ottawa, Ontario

January, 2000

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The undersigned recommend to the
Faculty of Graduate Studies and Research
Acceptance of the thesis:

The Wizard Interface as a Performance Tool

submitted by

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in Partial fulfillment of the requirements for
the degree of Master of Arts

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January, 2000

Abstract

Intelligent software agents, in the form of wizards, are interfaces that enable task execution and completion. For computer users, they have the potential to reduce human error and minimize cognitive load. This study examined the usefulness of wizards in task facilitation. Thirty-six computer literate subjects, with Windows 95 experience, were used for the experiment. Subjects completed a task using two different methods. Half of the subjects completed a task using the wizard first and then completed the same task using no wizard. The other half of the subjects completed a task without the aid of a wizard and then completed the same task with the aid of the wizard. Subjects were 46% faster and 34% more accurate on computer tasks when they used a wizard. Subjects were satisfied with their computer performance and found using the wizard made the computer task easier. Subjects also preferred completing the task with the aid of a wizard. Design guidelines are provided as a result of this study.

Dedicated to the memory of my mother

Mathilda Maria Rogiers-Dudzisz

Acknowledgments

A thesis is never a solo project. My gratitude extends to many who have been generous with their advice, time, expertise, encouragement and support.

I wish to thank my advisor, Dr. Richard F. Dillon, who taught me many lessons beyond textbook material. As an educator I value the education I received. I was intellectually challenged and a thesis developed through an iterative process. My unrelenting questions were promptly answered. I was accommodated as a part-time student and advised at a distance through electronic submissions and numerous e-mails. My academic schedule revolved around my free time during summers when most professors take summer leave. I am grateful for all these allowances.

My co-advisor, Dr. Jo Wood, provided a second perspective. Data were analyzed, numerous drafts annotated and comments submitted electronically. Likewise, I wish to thank her for advising at a distance.

A special thanks to William Bezanson and David Dewar, who provided guidance in the early stages of the study and allowed me to observe EPSS in the field at Nortel Networks.

I wish to thank my colleagues Peggy, James, Shirley and Elaine who were subjects for my pilot study. A special thanks to Arleigh Sawyer, who meticulously read the final draft of this document. I am also indebted to the students in the CURE lab, who answered phone calls, directed subjects, and were willing participants for my study.

Finally, and most importantly, I wish to thank my children Sarah and Michael, and husband Henk, who supported my endeavour with love and patience.

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The Wizard Interface as a Performance Tool

This thesis investigated the usefulness of wizards as aids that help users perform high-level computer tasks. Over the past two decades of the personal computer, ease of use in computer-based capabilities has improved greatly. Yet, users must still think and act at a low-level of task processing, reducing high-level goals into a series of low-level steps carried out with low-level tools. For example, to achieve the high-level goal of writing a résumé requires a user to make many decisions about appropriate content and organization. In addition, many low-level decisions about layout and formatting functions must be made as the writer uses low-level layout and formatting tools. User interface development is at the point where major improvements must enable users to work with high-level organizational and conceptual units. Currently, software developers use wizards as one technique to organize a series of low-level tasks into high-level conceptual units.

Wizards “are metaphors for assistants or magicians in the real world” (Gery, 1995). In computer applications, wizards are programs that are embedded in an application. They appear as dialogue screens that lead a user through a series of decisions that are required to accomplish a high-level goal. A user makes each decision by simply selecting from clear-cut alternatives that are illustrated in a dialogue box. With each choice, a filtering process is applied until the wizard finishes. In some cases, for example a software application installation wizard, completing the wizard results in completely accomplishing the high-level goal. In other cases, for example a résumé

wizard, completing the wizard results in a customized template so all the user does to achieve the goal is type in information. Each wizard, specialized to achieve a specific high-level goal, assumes much of the burden for low-level tasks. An effective wizard reduces the cognitive load of the user through simplifying the decision-making process. As a performance aid, it guides the user through a series of decision-making steps through structured prompting. The user merely makes choices and specifies answers.

Although wizards seem promising, wizards available to date have been far from effective. In most wizards, user interfaces are crude, and the wizards are too restrictive. Furthermore, wizards are generally unpopular with users (Spool, 1996), and one formal evaluation (Krull and Dionne, 1993) found wizards hindered, rather than helped, users perform tasks. Users need software-enabled higher-level computer task units, but current wizards do not seem to be doing the job. This thesis addresses the performance of current wizards with an objective of understanding their strengths and weaknesses. With understanding gained from this study, recommendations for effective use of wizards are made.

A General Statement of the Problem

When performing a series of low-level commands to complete a complex task, users frequently lose sight of their goal and get lost in the procedural steps to be followed. For example, the goal to write a résumé requires several of the following formatting steps: setting font style and size; setting spacing before, within, and after paragraphs; highlighting text; and setting margins (Figure 1). In addition, the different

Figure 2 illustrates a wizard interface for a résumé. There are three important aspects to a wizard. First, the user does not have to know or remember the issues that have to be addressed. The wizard specifies each issue, as indicated on the left in the

Figure 2. Wizard steps for a high-level goal.

wizard in Figure 2. Second, the user does not have to remember what alternatives are possible on the right of the wizard. In the example, the wizard shows alternative types of headings so all the user does is select one of the choices. Third, when there is a required

order of operations, the user does not have to remember it. This is shown in the wizard by the line on the left. Through task structuring, user variability is reduced and cognitive task processing simplified.

Wizards are of two types. One type encapsulates a procedure. For example, an installation wizard or a network trouble-shooting wizard walks a user through the steps required to install software or correct a problem in a network. The second type of wizard results in a format for something, for example, a résumé or a newsletter. The latter wizard is a way to tailor a template. Templates and wizards are interfaces that offer aggregates of low-level task function. The template provides assistance through formatting layout, whereas the wizard allows more customizable layout design.

Templates

Templates are pre-specified layout designs for the user to adopt. Low-level formatting skills are abandoned and the user merely inserts text and pictures. Adobe PageMaker's newsletter template (Figure 3) illustrates the pre-defined format this particular newsletter will have. Areas are blocked for text, pictures, and headlines. Templates provide a layout framework that is limited in variety to the number of templates available. In PageMaker, the user has a choice of two templates, each specifying a unique layout. Changes to the layout are possible only if the user edits and modifies the layout. The PageMaker template allows the user to complete the newsletter project by inserting text and importing graphics. Some applications provide dozens of templates in an attempt to meet user needs. For example, Microsoft PowerPoint has over 80 templates for slide layouts.

Figure 3. Adobe PageMaker 6's template for a newsletter.

Wizards

Wizards differ from templates on several criteria. A wizard dialogue box prompts the user through a series of question and answer screens. Wizards are customizable templates offering greater user choice of design options. Figure 4 and Figure 5 illustrate a wizard dialogue box with the design options of customizing a newsletter.

Wizard interfaces, therefore, have a designing component along with the sequentially presented dialogue screen that presents the user with logical guiding tools. The user enters a wizard dialogue and specifies parameters of task execution. Although the user makes decisions that define the criteria, the wizard provides the questions,

Figure 4. Microsoft's Publisher newsletter wizard dialog box.

Figure 5. Microsoft's Publisher newsletter wizard dialog box.

provides the alternatives for each question, and automates the task (Spool, 1996). It is in this automated process that the wizard interface has the potential to reduce human error and facilitate task completion. Dryer (1997, p. 266) defines wizards as “UI agents that provide task assistance by breaking the task into a series of linear steps.” This linear component is typical of many wizards but not all wizards. Some wizards allow users to jump forward or backward in the interface.

Review of the Literature

Few formal evaluations have analyzed exactly how and under what circumstances wizards improve human performance. Prominent in the literature is that wizards are a novel approach to computer interaction. Moreover, users are unfamiliar with wizards and have a difficult time using them. They are hypothesized to aid users in task completion. However, the literature criticizes wizards as hindering user performance because of design flaws.

Gunderson (1995) criticizes wizards because they create user reliance upon them for task execution. “As we become dependent on the wizards, widgets, gadgets and gizmos that facilitate our daily chores, they tether us to the apron strings of technology... We depend on it to make our lives easier and do things that are humanly impossible” (Gunderson, 1995, p. 37).

Tibbetts and Bernstein (1997) criticize wizards for rushing users through tasks, inhibiting proper task modelling. The authors feel users are unaware of exactly what the wizards are doing, and that wizards do not permit skill development.

Dryer (1997), conducted a study to determine what types of tasks should be handled with a wizard. His study defined wizards and guides as “UI agents,” with wizards differing from guides in the degree of assistance they provide the user. Wizards are available to the user only through accessing a different interface, outside standard application procedures. Wizards also limit user flexibility, and Dryer claims they reduce user error. Guides, on the other hand, point out user actions within the application interface. Thus, they “may present more opportunities for people to make mistakes than wizards do.” However, Dryer feels this guiding process is educational and skills acquired are generalizable.

To determine which tasks would benefit from wizards, Dryer surveyed 61 beta testers of IBM’s OS/2 Warp. Subjects were computer literate with no previous IBM OS/2 operating system experience. All subjects did, however, have general awareness of information systems. Computer experience was a between-subjects variable. Subjects were grouped into two experience groups, a “high” experience group, and a “low” experience group. The criterion for experience was the number of hours per day a user spent using a computer. A questionnaire survey answered by mail assessed user perceptions of 57 tasks on dimensions of “importance,” “frequency,” and “difficulty.” Examples of tasks included dragging objects, installing a printer driver, and changing mouse buttons. Users rated the tasks on importance, their difficulty, and how frequently they were performed. From these ratings, Dryer concluded that computer experience did not affect a subject’s perception of tasks. There were differences in ratings among the tasks, and subjects used different ratings on importance, frequency, and difficulty for the

same tasks. Dryer concluded that wizards would be useful for tasks that are difficult, important, or rarely performed.

Spool (1996) usability tested wizards from seven commercial applications: Microsoft Excel's Chart Wizard; Microsoft Publisher's PageWizard; Microsoft Access' Table, Query, and Form Wizards; Microsoft Word's Table and Résumé Wizard; Lotus Ami Pro's Mail Merge Wizard; Lotus Approach's Report Wizard and Meca Tax Cut's Tax Advisor. Subjects were to talk aloud while they used the wizards. A subjective rating scale measured each subject's preference and frustration levels. The following usability flaws were noted. Most subjects were not able to complete the tasks on their first run-through using the wizards. Users needed several trials to understand the wizard process. Once tasks were understood, users expected to "get back in" the wizard and complete the task or correct their mistakes. This "iterative refinement" was not possible with the wizards Spool studied. When users restarted a wizard, they were unaware that the wizard was creating a new project rather than editing an incomplete project. Users expected re-entrancy and the wizards did not allow it. Users found the deleting and starting of projects very frustrating. Spool recommended the following improvements in wizard design. The inclusion of a "roadmap" such as that shown in Figure 6 to orient users to the entry and exit of the wizard. Providing "bridges" for gaps in users' domain knowledge when a wizard does not complete an entire task. These "bridges" direct users to locations in the application where they can complete the task. Adding clearer prompts and diagrams to ensure instructional clarity, and re-entrancy. For those applications that have highly technical terms and complicated operations, wizards should provide

Figure 6. Microsoft Word's Résumé Wizard – an example of a roadmap.

additional information so that users do not mis-answer questions in wizard dialogue boxes. An example of this is illustrated in Figure 7 with the "more" button. This "more" button invokes, or links to detailed general knowledge in non-technical dialogue. Finally, wizard interfaces must have re-entrancy capability to allow for revisions without starting over in the project.

Spool's usability tests did not address user performance for similar tasks using non-wizard methods. Although design flaws within wizard interfaces are discussed, no comparative analysis is presented. The positive aspect of using a wizard contrasted with

Figure 7. Quicken's Wizard – an example of a more button.

the non-wizard interface was not provided. Krull and Dionne (1993) attempted such a comparison.

Krull and Dionne (1993) usability tested a mail merge wizard in Works for Windows. Fifteen computer literate subjects were assigned to one of three mail merge conditions. Subjects had to merge a list of names and addresses with a letter. Three different help conditions were available to them: a tutorial condition, a wizard condition, and a supporting materials condition. The tutorial condition trained subjects to perform the mail merge and allowed subjects to access the manual and on-line help. None of the subjects consulted either. In the wizard condition, subjects used only the wizard to complete the mail merge. In the supporting materials condition, subjects could consult

both online help and a manual to assist in the mail merge. Four of the five subjects consulted the manual and only two of the five subjects consulted both. The dependent variables were performance time to complete the mail merge; learning time to perform the task measured as time accessing the tutorial, and supporting materials; and task accuracy.

Figure 8 shows the learning time and performance time for the three experimental conditions. Subjects in the wizard condition had the longest performance time to

Figure 8. Figure adapted from Krull & Dionne (1993) Performance and Learning under three task conditions.

complete the mail merge. Note that there was no clearly identifiable learning time involved. Sixty-six percent of users in the wizard condition were able to complete the

task, compared to 88% in the help condition and 80% in the tutorial condition. These differences were not significant. Subjects in the wizard condition, did however, complete the task on the first trial whereas the other two conditions required a learning trial prior to a performance trial. The performance of the subjects in the wizard condition was not attributable to user competency since subjects were matched on computer literacy. Additionally, subjective ratings of the wizard interface by users were not favourable. Users rated wizards “low on usefulness, enjoyability, and ease of use” (p. 258). Users also indicated a sense of loss of control and puzzlement about what the wizard was actually doing (p. 258).

Synthesis and Summary of Literature

Based on the limited empirical studies on wizards and performance support, it is evident more research is necessary. As a performance tool, wizards are relatively novel interfaces whose utility has not been exploited. From the single study examined and two anecdotal investigations, wizards are not favourably evaluated; yet, few specific design improvements are given. The anecdotal studies examined dated wizards from 1993 and 1995. The intent of this research was to investigate more current wizards from 1998, to examine their limitations, and to make recommendations for areas of improvement.

Preliminary Study

A preliminary study of one wizard was conducted. Its purpose was to determine criteria for good wizards, and to determine minimum subject computer skills for the proposed thesis. A usability study of Microsoft Publisher’s 97 wizard was conducted.

Subjects

Four adult subjects were used. All subjects volunteered for the study. All were computer literate with word processing experience. Three subjects had Microsoft Windows 95 experience and one subject had limited PC experience but extensive Apple Macintosh experience.

Materials

An Intel 66 MHz 486 computer with a 14-inch monitor, and with Microsoft Windows 95 operating system was used for the study. The software used was Microsoft's Publisher 97 and Lotus ScreenCam. A tape recorder was used to record each subject's comments. Subject and experimenter were in an office with the computer and recording equipment on a desk. As each subject had the instructions read to him/her, task instructions were also presented in written form. A diskette with a text and graphic file, necessary for the task, was provided.

Task

Subjects were to create a two-page newsletter in Publisher 97 using the wizard. No layout criteria were specified, only that the length of the newsletter had to be two pages. As subjects moved through the wizard, they were to comment on what they thought the wizard was asking and doing and what the consequences of their selection in the dialogue boxes would be. Once out of the wizard interface, subjects were to import the text and graphic files to complete the newsletter. Standard Publisher online help could be accessed for assistance.

Procedure

Subjects had the task instructions read to them. Both Publisher 97 and the ScreenCam software were open and running prior to the test. ScreenCam software makes a video of a screen event as users interact with an application. A tape recorder and microphone were placed behind the computer. The tape was turned on prior to the start of the task. Mouse actions were recorded by the unobtrusive ScreenCam software.

Upon completing the experiment, subjects could listen to their tape recording and view the ScreenCam movie for additional comments and feedback. Each subject was thanked for participating in the experiment and debriefing was provided.

Results

None of the subjects was able to create a newsletter. The wizard provided a smooth sequence for creating a heading, column, and layout. However, once out of the wizard interface, users encountered problems. Inserting the text was difficult for most. Only one of the three subjects knew the "Insert Text" command. All subjects had problems with the "Text Flow" command that required users to specify how and where the entire text of the newsletter had to flow. Two subjects had problems with the "Insert Graphic" command. All subjects accessed online help, yet it provided little assistance. The hierarchical structure of the help system caused confusion and cluttered the workspace. Each subject had several tries at finding the correct command before the experimenter intervened. Mean execution time for the task was twenty minutes.

Discussion of the Preliminary Study

The poor performance of the four subjects using the wizard and online help

revealed the importance of computer skills of the subjects. Although these four subjects were experienced word processors, none had experience with page layout programs. None of the subjects had any experience working with graphics. Subjects wasted time accessing help for information on how to perform these two tasks. Subject selection for this study, therefore, included screening to assess subjects' computer competence on opening and closing files and working with text. However, assessing competency on working with graphics was not a requirement and would not reflect typical users.

The use of online help hindered two of the four subjects. This was primarily due to their poor search strategies, coupled with limited knowledge of standard application functionality. To minimize the need to use help once the wizard is finished, wizards suitable for study had to execute the process in its entirety or within near completion of the task.

Criteria and Selection Process of Wizards

Given the results of the preliminary study, four essential criteria of wizards were selected for this study. The purpose of the criteria was to find wizards that demonstrated good usability and affordance. The researcher conducted an evaluation using these criteria, which were: ease of use, simplicity of task through familiar mental models, task execution time, and task completeness. Forty-five application wizards (as listed in Table 1) were screened by the researcher in search of suitable wizards. A final selection of three materialized as meeting the criteria for this study.

Evaluation Scale

Wizards were evaluated on a two-point scale. If a wizard met a criterion, a

numeric value of one was given, and a zero was given if it did not meet the criterion.

Table 1 outlines the wizards evaluated and their scores. A composite score of four indicates a very suitable wizard.

Ease of Use

Commands and dialogues had to be easily understood. Additionally, wizards had to provide a coherent and logical framework in guiding the user through the process. Most wizards complied with simple and natural language and simple workflow criteria. Several wizards failed this heuristic. For example, Microsoft's Word Pleading Wizard used technical language familiar only to a lawyer, whereas the letter wizard had too many available choices on each of its screens. As many as eight options are available on each of its four screens. This range of choice might confuse the user.

Simple Tasks and Mental Models

The complexity of the tasks could not be beyond the scope of most users. A typical user is someone familiar with word processing, has some experience in creating tables, and other formatting functions, and uses the computer on a regular basis. Wizards in Microsoft's Access and Excel were ruled out because few users would understand databases and spreadsheets. Although Jamba's wizard is impressive in generating Java code for its applets, few users would understand what was happening or how to use the completed applet. Most users understand newsletters, résumés, and envelopes. Few users would be familiar with PowerPoint presentations.

Task Execution Time

Only tasks that could be completed within the proposed fifteen-minute testing

time were acceptable for the proposed study. This excluded such tasks as creating a database in Access, creating a mailing list in Word, creating a graph in Excel and setting up a personal business with Quicken's QuickBooks. The latter took over one hour to complete the "EasyStep Interview" with the business set-up wizard. Lengthy tasks received a score of zero.

Task Completeness

Wizards that complete the task to the most complete level were to be included. Few wizards met that criterion. Most completed the format of the task and users had to customize the template once created.

Table 1

Evaluation criteria of wizards:

Application/Wizards evaluated	Criteria				
	Ease of use	Mental model	Task time	Task complete-ness	Total score
Microsoft Word 97					
Envelope wizard	1	1	1	1	4
Fax wizard	0	0	1	0	1
Letter wizard	0	1	1	0	2
Mailing wizard	0	0	0	1	1
Memo wizard	1	0	0	0	1
Agenda wizard	1	1	1	0	3
Calendar wizard	1	1	1	1	4
Résumé wizard	1	1	1	0	3
Web page wizard	1	0	1	0	2
Pleading wizard	0	0	0	0	0
Newsletter wizard	1	1	1	0	3
Microsoft Publisher 98					
Calendar wizard	1	1	1	1	4
Business card wizard	1	1	1	1	4
Microsoft Publisher 97					
Business card	1	1	1	1	4
Calendar	1	1	1	0	3
Newsletter	1	1	1	0	3
Seven business forms	0	0	0	1	1

(table continues)

Application/Wizards evaluated	Ease of use	Mental model	Task time	Task complete-ness	Total score
Microsoft Publisher 2					
Tape cassette cover	1	1	1	1	4
Video tape cover	1	1	1	1	4
Greeting card	1	1	1	1	4
Microsoft Access 97					
Address book	1	0	0	0	1
Music collection	1	0	0	0	1
Video collection	1	0	0	0	1
Wine list	1	0	0	0	1
Microsoft Excel 97					
Text import wizard	0	0	1	1	2
Chart wizard	0	0	0	1	1
Microsoft PowerPoint 97					
Auto content wizard	1	0	1	0	2
Save as HTML wizard	1	0	1	0	2
Microsoft Front Page 98					
Web site wizard	1	0	0	0	1
Web page wizard	1	0	0	0	1
Corel WordPerfect 8					
Newsletter template	1	1	0	0	1
Business card template	1	1	1	1	4
Corel Print House					
Certificate wizard	1	1	1	1	4
Aimtech Jamba					
Applet wizard	1	0	1	0	2
Lotus Word Pro					
Weekly calendar template	1	1	1	1	4
Monthly calendar template	1	1	1	1	4
Lotus Ami Pro					
Mail merge wizard	0	0	0	1	1
Sierra Print Artist					
Greeting card wizard	1	1	1	1	4
Norton's Utilities					
Space wizard	1	1	1	1	4
Speed Disk	1	0	1	1	3
Iomega Tools					
1 step backup wizard	1	0	1	1	3
Netscape Page Design Assistant					
Web page assistant	1	0	1	1	3
Quicken Quick Books					
EasyStep Interview	1	0	0	0	1
Alchemy Mindwork's GIF Construction Kit					
Animation wizard	1	0	0	0	1

Selected Wizards

Wizards that scored a possible four out of four were considered for this study. They represent tasks that involve formatting, such as setting up a table for a calendar or the layout of a greeting card. To examine only the efficacy of wizards as aids in formatting would not address the possibilities of the wizard interface. Many tasks beyond formatting are facilitated with wizards. Application set-ups, disk optimization, animated GIFs constructions, and online web presentations are but a few tasks that wizards assist. Therefore, wizards that entail some data entering and graphic manipulation are also included. They are the certificate wizard and business card wizard.

Three wizards were selected for the proposed study. They are: Corel Print House certificate wizard, Microsoft Word 97 calendar wizard, and Publisher 98 business card wizard. The latter was selected to test a new interface that addresses concerns in Spool's study, namely re-entrancy and a consistency with wizard and application interface. These tasks also vary in the degree of difficulty and were chosen to test the extent of user assistance wizards may offer. Each task required unique user skills. The calendar task required subjects to understand only how to use Microsoft Word table features. The certificate task was a more complex task and required graphics and editing knowledge, while the business card task was the most difficult task and required layout and graphics manipulation skills.

Method

Experimental Design

A 3 x 2 mixed factorial design was used for this study. The independent variables were Tasks, and Completion Method. Tasks was a between-subjects variables, while Completion Method was a within-subjects variable.

Subjects were assigned to one of three task conditions: the creation of a certificate, a calendar, or a business card. The within-subject variable, completion method, required subjects to complete the task with and without a wizard. To control for order and carryover effects, the order of completion method was counterbalanced. Half of the subjects completed the tasks using the wizard first and then no wizard; the other half used no wizard first and then a wizard. Five dependent variables were measured. Two scores were collected for four of the dependent variables, a score for completing a task with a wizard, and a score with no wizard. Two of these variables were performance measures: time to perform the task, and task accuracy. The other two variables were subjective measures: ease of use, and satisfaction ratings. For the fifth dependent variable, preference for wizard or no wizard, a single dependent measure was collected.

Six subjects were randomly assigned to each of the six between-groups treatment combinations of order and task as shown in Table 2.

Table 2

The Design showing participants by Experimental Condition:

Order	Application	Task	Ss	Performance task	
				Wizard	No Wizard
Wizard first	Corel	Certificate	N=6	_____→	
	Word	Calendar	N=6	_____→	
	Publisher 98	Business Card	N=6	_____→	
Wizard second	Corel	Certificate	N=6		_____→
	Word	Calendar	N=6		_____→
	Publisher 98	Business Card	N=6		_____→

Subjects

Thirty-six volunteers with Windows 95 experience were used. Half of these volunteers were first-year psychology students. The remaining students were from Carleton's academic community from all disciplines at both the undergraduate and graduate level. Subjects were recruited through advertising (Appendix A). Subject selection was based on a self-evaluation-rating questionnaire (See Appendix B). Subjects were screened and selected on their computer experience. Subjects needed to have basic competency in a Windows 95 operating system environment. Basic requisite skills were: opening and saving files, printing a document, and typing and editing skills.

Apparatus

A Pentium 133 MHz PC computer with Windows 98 as an operating system and 20-inch monitor was used. Installed were four commercial applications: Microsoft Word 97, Publisher 98, Corel PrintHouse, and SnagIt. A tape recorder and microphone were also used to record subjects' comments.

Materials

Subjects used Microsoft Word for both Wizard and No Wizard condition for two of the three tasks; the creation of a certificate and calendar. Microsoft Publisher 98 was used for the third task, the creation of a business card.

For the first task, subjects created a certificate. Written task instructions (Appendices C and D) provided the subjects with the necessary information of title of certificate, recipient and wording of the award. A sample certificate illustrated in Figure 9 (Appendix E) served as a guide.

Figure 9. Certificate example used.

This task was evaluated using the evaluation measure illustrated in Appendix F.

Subjects did not have to replicate the certificate, merely make one that satisfied the rubric.

In the calendar task, subjects made a calendar for the month of July. Written instructions for both conditions (Appendices G and H) and a sample illustrated in Figure 10 were provided. The evaluation measure for the calendar task is illustrated in Figure 11 and Appendix I.

July						
Sun	Mon	Tue	Wed	Thu	Fri	Sat
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

1998

Figure 10. Example of calendar.

Figure 11. Evaluation scale of calendar.

The final task was the creation of a business card. Publisher 98 was used for both conditions. Written instructions were provided (Appendices K and L) and a sample shown in Figure 12 (Appendix M) guided the user. The evaluation measure for the business card task is illustrated in appendix N.

Figure 12. Example of business card.

Subjective user rating scales (Appendices O, P, Q) were used to measure user opinion and satisfaction with the Wizard and No Wizard interfaces.

Procedure

Subjects were recruited from the academic community and from the Psychology 100 class. Notices were posted on bulletin boards throughout the campus. A computer experience questionnaire (Appendix B) was administered to all subjects. Subjects with computer experience in word processing, creating tables and some desktop publishing as well as experience with Windows 95, were selected for the study. Subjects were randomly assigned to one of six experimental conditions.

Subjects arrived to the experiment room with the computer turned on and the desktop available. Each application icon was on the desktop. Task instructions were read to the subjects (Appendices R, S, and T) and permission to tape the session was requested.

In the Task conditions, subjects had to complete either a certificate, calendar or business card. Subjects completed these tasks with the aid of a wizard and without a wizard. Task order for half of the subjects was Wizard condition first followed by the No Wizard condition and the other half was No Wizard condition first and then the Wizard condition.

For each task, subjects were shown a sample of a completed product (Figures 9, 10, and 12). Subjects had to replicate the calendar sample. Only a comparable business card and certificate, as the sample was required of the other two tasks. Subjects followed the written instructions (Appendices C, D, G, H, K, L). Subjects were encouraged to

comment aloud. After completing the two tasks, subjective rating of both interfaces was requested of the users in the form of a questionnaire (Appendices O, P, Q).

A limit of 15 minutes was allotted for each task. The dependent variables were mean performance time for task execution. If subjects failed to complete the task in 15 minutes, they were asked to stop the task and that time was their task performance time. Accuracy of task performance was measured as a final product that matched the provided sample. All projects were evaluated using an evaluation measure for each task. Appendices F, J, and N were used as evaluation criteria.

The final dependent variable was user satisfaction measured with a user opinion and satisfaction questionnaire (See Appendices O, P, Q). Screen video captures of user mouse action for both conditions were used to measure task time and user interface interaction. User error and task strategy were recorded through these videos. At the subject's debriefing interview, the video capture was shown to the subject. Subjects were asked to comment on their actions providing anecdotal information. From this, recommendations were made on how to use and design wizards effectively. The digital readout illustrated in Figure 13, provided an accurate measure of time and mouse action.

Figure 13. Screen Video Capture of user using a wizard.

Results

Subjects were assigned to one of three task conditions: the creation of a certificate, a calendar, and a business card. The within-subject variable, completion method, required subjects to complete the task with and without a wizard. To control for order and carryover effects, the order of completion method was counterbalanced. Half of the subjects completed the tasks using the wizard first and then no wizard; the other half used no wizard first and then a wizard. Thus, the design was analyzed as a mixed factorial, with type of task as a between-subjects variable, and wizard versus no wizard, as a within-subjects variable. Five dependent variables were measured. Two scores were collected for four of the dependent variables: a score for completing a task with a wizard, and a score with no wizard. Two of these variables were performance measures: time to perform the task, and task accuracy. The other two variables were subjective measures: ease of use, and satisfaction ratings. These data were analyzed using ANOVAs. A covariate, computer experience, was measured and ANCOVAs were used to analyze the effect of the independent variables on the four dependent variables with the effect of the covariate controlled. Statistical conclusions for ANCOVAs and ANOVAs were the same so the results for ANOVAs are reported. Homogeneity of variance and sphericity were examined and were not violated. For the fifth dependent variable, preference for wizard or no wizard, a single dependent measure was collected and was analyzed using a t test. For all analyses, alpha was set at .05.

Comparisons of Wizard versus No Wizard

Table 3 shows that performing tasks with wizards resulted in better performance and received higher ratings than performing without wizards.

Table 3

Results for main effect of Wizard versus No Wizard

Dependent variable	Mean Wizard	Mean No Wizard	$F(1, 33)$	p	η^2
Performance					
Performance time	7.7 min.	14.3 min.	121.75	$p < .001$	.79
Percent correct	93%	59%	58.33	$p < .001$	.64
Evaluation					
Satisfaction ratings <i>1=extremely dissatisfied, 7= extremely satisfied</i>	5.3	3.3	33.83	$p < .001$	.51
Ease of use ratings <i>1=extremely difficult, 7= extremely easy</i>	5.6	2.9	91.00	$p < .001$	.73

The four dependent variables are shown in the first column of Table 3, grouped in terms of performance and user ratings. The means for each measure, with and without the wizard, are shown in columns two and three, respectively. Performance time is time to complete the task with a maximum of 15 minutes. Task accuracy is number of correct steps taken to complete a task. It was measured as a percentage against a task rubric. Satisfaction is a rating on a seven-point scale with 1= extremely dissatisfied, 4= neutral, and 7= extremely satisfied. Ease of use is a rating on a seven-point scale with 1= extremely difficult, 4= neutral, and 7= extremely easy. The F s associated with the main effect of wizard versus no wizard and the corresponding probabilities are shown in

columns four and five. The final column shows eta squared, the proportion of variance in the dependent variable that can be attributed to the wizard versus no wizard manipulation.

The independent variable, completion method, Wizard versus No Wizard, was highly significant on all dependent measures. The proportions of variance in the dependent variables accounted for by completion method were all large, ranging from .51 to .79. Subjects were able to complete the task in a mean of 7.7 minutes when they used the wizard, while it took them a mean of 14.3 minutes to complete the task if they did not use the wizard. Mean time difference was 6.29 minutes.

Subjects in the no-wizard condition had difficulty completing the task in the allotted 15 minutes. Twenty-nine of 36 subjects in this condition did not complete the task, while only five failed to complete a task while using the wizard. Because so many subjects did not complete the task while using no wizard, the mean completion time of 14.3 minutes is low, artificially constrained by the 15-minute limit. Twenty-eight of the 36 subjects completed the task in the wizard condition in less time than the task in no-wizard condition. Wilcoxon's matched pairs, signed ranks test indicated that the probability of at least 28 of 36 subjects performing faster with the wizard if there was no effect of the wizard manipulation was low ($z = 4.56, p < .000005$). Wizard-enabled tasks resulted in 93% task accuracy, while tasks completed without the aid of a wizard resulted in 59% accuracy. Thirty-two of 36 subjects had greater task accuracy when they used a wizard, and their mean performance was improved by 34%. The probability of this improvement to be other than wizard based, is $< .0000008$, ($z = 4.93$).

Subjects were satisfied (mean rating of 5.3) with their ability to complete their task when using a wizard, whereas they were slightly dissatisfied (mean rating of 3.3) with their ability to complete the task when no wizard was available. (A score of 4 meant subjects were neither dissatisfied nor satisfied). There was a mean difference of 1.97 points between wizard satisfaction and no wizard satisfaction. Twenty-eight of 36 subjects were more satisfied with their ability to perform the task when they used a wizard than when they used no wizards, $p < .0002$.

Completing the task without the wizard was rated difficult (mean score of 2.9), while the wizard enabled tasks were rated easy (mean rating of 5.6) to complete. The probability of 28 of 36 subjects rating their task easier with a wizard by chance is very low, $p < .000004$.

Differences among tasks

Three tasks were selected for their varying degrees of difficulty. In advance, we felt that the simplest task was the creation of a calendar. It required subjects to understand only how to use Microsoft Word table features. The certificate task was more complex and required graphics and editing knowledge. The business card task was, by far, the most complex. Essential layout and graphics manipulation skills were necessary. The business card wizard interface was also different from the other two wizards. Whereas the calendar and certificate interfaces were self-contained, the business card wizard interface was re-entrant. Subjects could, during the task, move back and forth between the application and wizard. This re-entrancy provided an approach for users that

the other two wizards did not. For the certificate and calendar, once the wizard was started, subjects stayed under control of the wizard until the task was complete.

Analyses on task differences for the dependent variables was a between subjects' effect.

There were no significant differences in two of the four dependent measures: accuracy, $F(2, 33) = 2.10, p > .10$; and satisfaction $F(2, 33) = 2.50, p > .05$. Table 4 shows significant differences among the tasks on the other two dependent variables, performance time and ease of use ratings.

Table 4

Results for main effect of tasks on performance time and ease of use

Tasks	Mean Time (Minutes)	$F(2, 33)$	p	η^2
Certificate	10.15	10.32	$p < .001$	.38
Calendar	9.95			
Business card	13.27			
Tasks	Mean ease of use rating*			
Certificate	4.70	4.61	$p < .05$	.22
Calendar	4.45			
Business card	3.75			

*1=extremely difficult, 7=extremely easy

Tasks are shown in the first column of Table 2. Means for completion time and ease of use are shown in the second column. In column 3 are the F s associated with these measures, and in column 4 their probabilities. Column 5 shows the values for eta squared.

The main effect of tasks on performance time was significant, $F(2, 33) = 10.32, p < .001$, and accounted for 38% of the variance in the dependent measure. The effect of

task on ease of use rating was significant, $F(2, 33) = 4.61, p < .05$, and accounted for 22% of the variance. For task completion time, pairwise comparisons found no significant differences between the means of the certificate (10.15 min.) and calendar (9.95 min.), $F < 1$. Completing the business card took significantly more time (13.27 min.) than the certificate task, $F(1, 33) = 14.46, p < .01$ and calendar task, $F(1, 33) = 16.45, p < .001$.

The business card, which took the longest to perform, was also rated the most difficult. It was significantly more difficult than both the certificate task, $F(1, 33) = 8.57, p < .05$; and the calendar, $F(1, 33) = 4.68, p < .05$. The certificate and calendar tasks did not differ in rated difficulty, $F < 1$.

Task by completion method interactions

Significant interactions between task and completion method were found for all four dependent variables. These results indicate that wizards for some tasks did not help. The interactions are described below.

Performance time

Performance time results for task by completion method interactions are shown in Table 5.

Table 5

Results for Interaction of Task by Completion Method for Performance Time

Task	Mean Wizard time (minutes)	Mean No Wizard time (minutes)	$F(2, 33)$	p	η^2
Certificate	6.13	14.17*	24.65	< .001	.60
Calendar	4.90	15.00*			
Business card	12.89	13.65			

* $p < .05$

Wizard enabled performance times are shown in the second column; no wizard performance time results are shown in the third column. The F value, probability values, and eta squared values for the interaction are listed in the fourth, fifth, and sixth columns, respectively.

The interaction of tasks by completion method was significant $F(2, 33) = 24.65$, $p < .001$, and accounted for 60% of the variance in performance time.

The certificate task took a mean of 14.17 minutes to complete in the no wizard condition. This was reduced to 6.17 minutes when subjects used the wizard. This difference was significant $F(1, 33) = 66.09$, $p < .001$.

Using the wizard allowed subjects to complete the Calendar task in a mean of 4.90 minutes, while without the wizard, all 12 subjects failed to complete the task in the cut-off time of 15 minutes. This difference was highly significant $F(1, 33) = 104.37$, $p < .001$.

There was no difference in time to complete the business card task with and without the wizard, $F < 1$. Thus, the wizard reduced time to perform the calendar and certificate tasks, but it did not reduce time to perform the business card task.

Task accuracy

Task accuracy results for the task by completion method interaction are shown in Table 6. Wizard accuracy scores are shown in the second column; no-wizard accuracy scores are shown in the third column. The remaining columns show F value, probability value, and eta squared for the interaction.

Table 6

Results for Interaction of Task by Completion Method for Task Accuracy

Task	Mean Wizard accuracy (% correct)	Mean No Wizard accuracy (% correct)	$F (2, 33)$	p	η^2
Certificate	100	73*	6.5	< .005	.28
Calendar	98	41*			
Business card	81	62*			
$p < .05$					

The wizard versus no wizard by task interaction was significant, $F (2, 33) = 6.44$, $p < .04$ and accounted for 28% of the variance in accuracy. Significant differences were observed between wizard and no wizard performance for all tasks, all $ps < .05$. Using the wizard for the certificate task allowed subjects to complete the task with 100% accuracy, while using the no-wizard method for the task allowed subjects to complete the task with 73% accuracy. The calendar task was performed with 98% accuracy using the wizard, while without the wizard the task was completed with 41% accuracy. For the business

card, where the wizard did not reduce time, the wizard resulted in greater accuracy (81%) than with no wizard (62%).

Ease of use rating

Table 7 shows subjective ratings for the three tasks obtained on ease of using the wizard or not using the wizard.

Table 7

Results for Interaction of Task by Completion Method for Ease of Wizard Use Rating

Task	Mean ratings using Wizard	Mean ratings not using Wizard	$F(2, 33)$	p	η^2
Certificate	6.08	3.33*	13.71	< .001	.45
Calendar	6.67	2.25*			
Business card	4.17	3.33*			

* $p < .05$

Wizard ease of use ratings is shown in the second column while no wizard ratings are shown in the third column. F , p , and eta squared are shown to the right.

There was a significant interaction between task and completion method for the dependent variable ease of use, $F(2, 33) = 13.71$, $p < .001$, $\eta^2 = .45$. However, whether tasks were easier with the wizard depended on the task. Pairwise comparisons indicate that both the certificate and calendar task were rated easier to complete with the wizard, $p < .05$ for both tasks. No significant difference in rated ease of using a wizard over no wizard was found for the business card, $F(2, 33) = 2.96$, $p > .05$.

Satisfaction ratings

Subjective satisfaction ratings are shown in Table 8. Ratings for wizard task are shown in the second column and no wizard ratings in the third column. The F value,

probability value and eta squared value are in the fourth, fifth and sixth columns, respectively.

Table 8

Results for Interaction of Task by Completion Method for Wizard Satisfaction Ratings

Task	Mean Wizard satisfaction ratings	Mean No Wizard satisfaction ratings	$F(2, 33)$	p	η^2
Certificate	5.33	4.00	7.78	<.003	.32
Calendar	6.00	2.16*			
Business card	4.66	3.91			

* $p < .05$

There was a significant interaction between task and completion method for the dependent measure rated ease of use, $F(2, 33) = 7.78$, $p < .003$, $\eta^2 = .32$.

For the calendar and certificate tasks, subjects found using the wizards more satisfying than no wizards, $p < .05$. There was no difference between ratings for wizard and no wizard for the business card, $p > .10$.

Preferences

Subjects rated their preference of task completion using a six-point scale. A one indicated they very much preferred no wizard and a 6 indicated they very much preferred a wizard. A mean preference rating of 4.5 was obtained. No significant differences in preference ratings were found among tasks, $F(2, 35) = 1.93$, $p > .10$. Twenty-six of 36 subjects rated their preference of using a wizard, with a score of 4 or higher. By the Binomial test, the probability of at least 26 of 36 subjects preferring the wizard was significant, $p < .02$. Single-sample t test, tested against a cut point of 3.5, indicating no

preference, found that a mean preference of 4.5 was significant, $t = 3.60$, $p < .001$.

Subjects rated their preference of task completion using a six-point scale. A one indicated they very much preferred no wizard and a six indicated they very much preferred a wizard. Table 9 shows correlations among the preferences

Table 9

Correlation between preference ratings and significant DVs

Dependent variables	Time	Difference measures	
	no wizard	Ease	Satisfaction
Preference ratings	.354	.545	.684
	$p < .04$	$p < .001$	$p < .001$

There is a significant correlation between preference and performance time when using no wizard, $p < .04$. Preference ratings are also highly correlated with difference measures in ease of use ratings and satisfaction ratings.

Comments

After completing the task using two methods, subjects filled out a user-satisfaction questionnaire and evaluated the wizard. Only 5 of 36 subjects wrote comments on this questionnaire. A post-experiment debriefing interview was audiotaped as subjects viewed the videotape of their task performance. Comments were elicited from subjects during this debriefing interview. The written comments and the verbal comments are summarized in Appendices U, V, and W.

From these comments, 27 of 36 subjects preferred wizards. Sixteen of these subjects gave specific reasons. Six subjects found using the wizard easier, four subjects

said they were faster with the wizard, four subjects found wizards helpful, one subject preferred the wizard product, and one subject felt more confident with a wizard.

Nine of 36 subjects preferred no wizards. These subjects gave 13 reasons why wizards were not preferred. Three subjects felt wizards are limiting and do not offer diversity of choices. Two users prefer to learn the task rather than have the computer complete it for them. Two users felt wizards connoted intellectual inferiority and were only for "old people" and were like "cheating." The other seven comments reflect the negative experience of using the MS Publisher's wizard. Comments from these subjects are indicative of the poorly designed wizard. These comments are "difficult to use", "found the wizard confusing," "this is hard," and "I had to learn how to use the wizard."

The two users who expressed a desire to create the product without a wizard were experts with computer experience ratings of 26 and 27 out of 28 and experts in PhotoShop, CorelDraw, and PageMaker. These subjects brought a pattern of task completion and were more comfortable in building and creating the product.

In the following sections, comments and preference are presented separately for the three tasks.

Comments on Certificate Task

The mean preference rating for the certificate task is 4.16, indicating a slight preference for wizards. The comments are reported in Appendix U for each individual, identified by preference rating, ease of use ratings and satisfaction ratings. Six of the 12 subjects, made positive comments. The wizard was easy, helpful and allowed users to finish the certificate task in less time and with greater product satisfaction. One subject

clicked on a button without reading what it would do. She ended up requesting a mail merge.

Comments on Calendar Task

Comments by subjects who completed the calendar task are listed in Appendix V. Subjects found this an excellent wizard. They made such comments as “awesome,” “this wizard was straightforward,” and “easy.” Eleven of 12 subjects made positive comments.

Comments on Business Card

The business card comments are not as favourable as the certificate’s and calendar’s. This was a flexible wizard. Subjects did not realize they were in a wizard, and some felt frustrated. Six of the 12 subjects preferred the wizard, while six subjects did not prefer a wizard, and those who preferred wizards made positive comments.

Business card comments are listed in Appendix W.

Summary of Results

Using wizards to complete computer tasks increases performance by reducing performance time and improving task accuracy. Twenty-eight of 36 subjects were faster with a wizard. Thirty-two of 36 subjects were more accurate. Thirty-one subjects rated wizards easier and 28 subjects were more satisfied with the wizard. Wizards received more favourable comments. As a performance tool, wizards enabled task completion and increased user satisfaction. Ultimately, the success of a wizard lies in the simplicity of its design. Subjects commented on lack of clarity, flexibility of a wizard, and complexity of wizard design, as areas where wizards could improve. Yet given these design flaws, wizards were preferred by 26 of 36 subject over completing the task without a wizard.

Discussion

The purpose of this research was to determine if computer tasks could be improved with the aid of a wizard. This hypothesis was realized. User task time was faster and subjects were more accurate. Users also experienced greater satisfaction with their performance, and they preferred completing a task using the wizard method to the no-wizard method. User comments and actions provide insight into what makes wizards effective and not effective.

How do Wizards Improve Performance?

Wizards enable performance by structuring the task into a series of steps. The wizard, not the user, hierarchically decomposes goals into sub-goals by displaying screens. Answering questions on the screens satisfies the sub-goals for the task. Users do not have to think about how to use the application to complete the task, nor do they have to recall how to perform it. They merely follow a sequence of questions, and the computer completes the task. This minimizes the cognitive load on the user, and lessens the possibility for error.

Human error occurs when "a person establishes an intention to act. If the intention is not appropriate, this is a mistake" (Lewis, C., Norman, D., 1995, p. 989). In this study, wizards improved subjects' task accuracy by 34 percent. Subjects' task performance time was improved by 46 percent. Wizard task construction may be credited for these improved performances. "When work is delegated to the computer, there are fewer opportunities for errors" (Bhavnani, S, John, B., 1998). Yet, the degree of task accuracy and improved task performance time were not consistent for all wizards.

Each wizard caused certain user problems, which are reflected in differences in task performance measures. These three wizards were chosen from a selection of 45 because I thought they possess all four criteria of good wizard design. Before the study, I thought they were easy to use, and subjects presumably had a mental model of the task. I estimated that all tasks were achievable in 15 minutes and it would be possible to complete the entire task with the wizard.

Differences among wizards

Each wizard was unique in how it structured a task. It was felt that these differences would reveal essential criteria to serve as guidelines for good wizard design.

Calendar task wizard

The calendar wizard had an announcing message on its first screen. The message contained a wizard title, a single descriptive sentence about the task, and a roadmap that illustrated the task structure (Figure 14). The "roadmap" had nodes, depicted as buttons, that could be used to jump to particular steps. No instructions were given to indicate that jumping was possible. One subject accidentally discovered this method of navigation, and moved through all other screens using the nodes. The announcing screen quickly oriented users, and they proceeded to the next screen.

Figure 14. Calendar Wizard introduction screen showing nodes.

Each screen presented a single concept, posed simple questions, and requested single answers. Solutions, provided through radio buttons and combo boxes, prompted users for answers. Users entered no data or text. They made choices by checking off selections (Figure 15). A preview accompanied most user choices. All, except one screen in the calendar wizard conformed to this rule. This screen presented two concepts and required two user decisions. Users decided on paper orientation and whether or not to include a graphic on their calendar. Several users missed the second question because they did not see it (Figure 16). The small radio buttons were lost in the large screen space of the first question. Some users did not understand the question and, without a preview to guide them, skipped it. A larger screen presence of the radio buttons, with a preview

Figure 15. Calendar Wizard illustrating radio buttons and combo boxes.

next to the choice offerings would have averted this problem. Most screens had thumbnails that provided appropriate feedback about available choices and what users selected. This wizard was not re-entrant, and users remained under the wizard's control until they left the wizard interface. There was no error recovery. If the project did not turn out as expected, users had to restart the wizard, and complete all the questions. Completing the task in the wizard took five screens.

Figure 16. Two choice offerings on a screen.

The Certificate Task Wizard

The certificate wizard lacked several effective design elements found in the calendar wizard. There was no announcing screen, no title for the wizard, and no roadmap to illustrate the task steps. Rather, users were greeted with a wizard screen that offered seven ways of working. Users selected their preferred work mode by checking a radio button. A short description of their selection appeared in a box beneath the radio buttons. The wizard method was the first radio button (Figure 17). Although this first screen had a preview window, the graphic was static and did not change with user selections. Thumbnail feedback was not consistent over wizard screens. Some screens showed previews, while others did not. The second wizard screen provided choices

Figure 17. Certificate Wizard's first screen.

Figure 18. Certificate Wizard screen showing multiple user feedback.

about document type. Text highlighted with user selection. The graphic window now illustrated a preview of what the user selected, and a text description was again given in the description box (Figure 18). It was not until the third screen, that users were in the task wizard. The certificate wizard eliminated all feedback that was provided on previous screens. Gone were the preview window and description box. Also lacking was a "roadmap" such as the one found in the certificate wizard. Users did not know how many screens were in the certificate wizard. Furthermore, jargon, rather than simple language, defined the task. For example, users were asked to type in a "headline," a term that was not understood by all users. This term was not explained, and no preview was provided. Both would have aided the user, and ample space existed on the wizard screen for both to occur. Even more compelling, users could not preview the sample because the wizard screen obstructed the view. Subjects could move the wizard screen to view the sample, but few users were aware of this since no instruction was provided (Figure 19). Once subjects typed in the headline and wished to see it on the project screen, it was not updated to reflect their entry. Users only saw the template of the certificate (Figure 20).

The text entry screens caused several problems. Since there was no task structure and the wizard did not forewarn users about subsequent screens, users worked ahead of their intended task. Users entered text on wrong screens, only to find out where it did belong when that particular information was requested in subsequent screens. Backtracking and correcting occurred. To compound the problem, the poor instructions provided on the text entry screens, and the large text field into which to enter text, had users guessing about what was requested (Figure 21). A command such as "Type the

Figure 19. Certificate Wizard's third screen obstructed the document.

Figure 20. Certificate Wizard showing template screen that has not been updated with user input screen.

text as you would like it to appear on the certificate” had users type all the text in this

Figure 21. Certificate Wizard screen showing ambiguous instructions.

text-entry box. Specific input demands specific prompting, and this command was too ambiguous.

The certificate wizard also had a second layer of complexity. Wizards within wizards were available to users to help them complete their task with saving and printing their work. This concept, although with possible merit, in this situation proved unproductive. Saving and printing are simple tasks that most computer users understand. Their mental model or schema did not match the schema of saving and printing the way the wizard structured it. "Schemata are packets of knowledge" (Driscoll, 1994, p 144). The wizard interface rearranged the packets of our concept of "save" and "print" and presented segmented views of the task. Moreover, users did not know they were entering wizards when they clicked on the "Save Project" or "Print Project" buttons. These buttons had no distinguishing features to indicate they were wizards (Figure 22). Once in the save or print wizard, users remained under its control unless they cancelled the task.

Figure 22. Certificate task's additional command buttons on application screen.

Saving the project, using the wizard, required answering questions over three screens. Saving the project without the wizard required three steps and one screen. Using the wizard did not make the task faster, easier, or less cognitively demanding. The wizard merely fragmented the task over three screens, and confused the user. Similarly, the print wizard had users navigate through seven screens specifying printer, size, layout, number of copies, and whether they wanted a mail merge. Those users who printed from the menu bar under "File" were able to do so with two selections, "File" and "Print," then check off the required information from the all-inclusive screen that followed (Figure 23). The wizard fragmented a simple and commonly understood task. Users became lost in the task structure the way the wizard presented it.

Figure 23. Certificate Task print screen.

Business Card Wizard

I selected this wizard because it was flexible and offered more user choice. However, this is the only wizard that did not outperform the no-wizard condition. Some users were overwhelmed by the many choices the wizard offered. They also found the visual computer displays distracting, and it hindered their performance.

Upon opening the application, users saw a window with four tabs. This window was the “Catalog” that offered three different ways to create a document, and one way to exit the application (Figure 24). The wizard method was the first tab, and the default setting for the screen. Once in the wizard, users scanned a list of possible documents.

Figure 24. Business Card announcing screen.

The list was not organized in any meaningful way. Web sites followed newsletters, which were followed by signs and postcard. Once the business card was selected, users had to decide on type of paper and a business card design. To aid the user, a preview screen provided six thumbnails, when in total, 19 samples were available. Some users thought they were limited to the six business cards shown in the preview screen. They missed the scrollbar that moved other previews into view. The thumbnails were large, and occupied a great deal of screen space. Perhaps smaller thumbnails so that all could be displayed, or

or a screen with tops of the remaining thumbnails, would have called their attention to the scrolling and would have avoided this problem.

Once inside the wizard, users had problems distinguishing the wizard from the preview screen. A small modal dialogue box introduced users to the wizard, however, most users missed it because it was so small and tucked away in the left corner. Most users clicked on the large inactive business card in the preview screen, thinking this was the wizard. The text on the wizard screen was too small and did not draw the user's attention. Most users also found it difficult to read. The distance of the navigation buttons from the text in the wizard provided no clue to users that they were in a wizard. Users scanned the entire screen in search of what to do, not knowing that the wizard was in control. In this instance, the wizard, the text, and the navigation buttons needed to be more visible (Figure 25).

Once the wizard was operational, users specified font, accent colours, and layout options. The wizard updated each request in the preview screen, and users could experiment with different combinations. Once the wizard questions, spanning three screens, were finished; the wizard completed the project. At any time, the wizard could be re-entered to change aspects of layout and design.

The final part of the task was customizing personal information. Users had a great deal of difficulty with this part of the task. Users customized the business card through a fly-out wizard called "Insert Component." These components were text boxes into which users typed name, address, and phone number. When a user requested a personal component, a text box would appear. It floated above the business card and was

Figure 25. Business Card Wizard's welcome screen.

ready to receive text. Some of the text boxes did not disappear to their proper location on the business card. Users were left with a stack of text boxes that cluttered the business card and obstructed the view (Figure 26). To solve this problem, users deleted the text boxes or moved them out of the way. To complete the task, some users built the business card as they would without the wizard. This wizard did not simplify the task and

Figure 26. Business Card Wizard showing text boxes and obstructed view.

pairwise comparisons found no significant differences between wizard and no wizard performance. Subjects rated the wizard as difficult as the no-wizard task.

The flexibility of the business card wizard allowed for more experimentation and feedback. Yet, when one considers that the wizard did not facilitate task performance, and users did not prefer the wizard to the no-wizard way of working, one questions the rationale behind flexibility.

Recommendations

My objective was to understand which wizard characteristics allow users to succeed, and which characteristics cause users to fail. The following recommendations, based on user comments, actions and errors, are offered to designers of wizards. Many of these recommendations are for good user interface design; here I have applied them specifically to wizard design guidelines.

1. *Make wizard icons unique and clear.*

1.1. Make visible icons that distinguish Wizards from other commands and files.

Wizards should be recognizable and readily available upon opening an application.

A poor example

In icons, a magic wand is a symbol often used to represent a wizard. As illustrated in Figure 27, Microsoft Word uses such a symbol. Word also uses icons with a “W” to symbolize a Word document and a “pad” to symbolize a document. Combined,

Figure 27. Microsoft Word's location of wizard methods.

these three elements create an icon that is difficult to read. Since users are in Word, their objective is to create a document. The pad symbol does not distinguish one document

from another. Users must read the caption next to the icon, to identify what type of document it is. Both the “W” and the “pad” symbols are redundant; nevertheless, they obscure the small wand which should be the most noticeable symbol for wizard tasks.

A solution

Although Microsoft creates icons as a set, in this situation the most important element in the icon, the wizard, is not very noticeable. The “W” and the “pad” are too dominant. Make the wand more visible to communicate a wizard method. A modification of the icon is illustrated in Figure 28.

Figure 28. A more noticeable icon for the wizard method.

- 1.2. Place wizards where users may locate them. Do not force users to search for wizards. Wizards should be readily available upon opening the application.

A poor example

Microsoft Word locates wizards under a tab according to document type. Although this is an effective location for task-oriented user, it is not for method-oriented user. In the

directory view, the wizard symbols are small and not very visible (Figure 29). Some users may not recognize wizards from non-wizards, and must read the caption to find the wizard.

Figure 29. Example of wizards organized according to document type.

A solution

Cross reference wizards, and organize them in two locations. For task-oriented users, organize wizards according to types of tasks. Conversely, for method-oriented users, organize wizards under a method of working. Figure 30 and 31 are two

Figure 30. Wizards organized under one tab.

illustrations of organizing wizards according to method.

1.3. Provide users the option to customize the location of wizards.

A poor example

Publisher 98 lists all the projects under a tab for wizards. Users must scan the entire list for a project of their choice (Figure 31).

Figure 31. Tab structure to group wizard according to a method of working.

A solution

Microsoft Works, by default, lists all wizards according to project type. Users have the option to change that organization to suit their style of working. The list may be organized according to category, alphabetical listing, most recently used documents, or by document type (Figure 32).

Figure 32. An example of providing user options to customize a wizard list.

2. Clearly indicate choices available in a wizard.

2.1. Make thumbnails large enough for users to see available choices.

2.2. Leave tops of thumbnails showing to indicate to users that more thumbnails are available and they must scroll down to see them.

A poor example

Microsoft Publisher 98 shows a poor layout for thumbnails (Figure 33). Spread out over a large area, six thumbnails occupy the entire preview window. The name for each thumbnail is located too far from the thumbnail. In this example, only six small

Figure 33. Example of poor layout for thumbnails.

thumbnails are possible and there is nothing to communicate that more thumbnails are available. The user must use the scroll bar to see if there are more thumbnails in the preview window.

A solution

Provide smaller thumbnails and place each thumbnail's name closer to its image. Decrease the space between each thumbnail so that more thumbnails are visible in the preview window. To indicate that more previews are available, only show the tops of thumbnails at the bottom of the preview window. Users are cued to scroll down to see these thumbnails (Figure 34).

Figure 34. Example of thumbnails that cue the user to scroll down.

3. *Clearly indicate when users are in a wizard.*

- 3.1. Make the wizard screen large enough to reduce user confusion about which screen is active and dominant.

A poor example

Microsoft's Publisher 98 serves as an example of poor wizard control. Obscured by the large passive application screen, users miss the small wizard located to the side. The wizard is not dominant, nor does it possess a separate identity (Figure 35).

Figure 35. Small wizard controls obscured by large preview screen.

A solution

Make the wizard interface the dominant screen. Conceal or visually minimize the background to force the user's eyes on the wizard (Figure 36).

Figure 36. Example of a neutral application background with the wizard as the focal point.

- 3.2. Limit user control. Make the wizard a modal screen. Provide consistent feedback to users so that they know the wizard is in control of the task.

A poor example

Figure 37 is an example of inconsistent user feedback about control. While the wizard screen is open, the user cannot access the menu bar. In this case, it is greyed. The toolbar with the exception of the key icon, that represents the wizard, also is not

Figure 37. Inactive greyed and inactive menu bar, not greyed and active tool bar.

accessible to the user. Yet, none of the tools is greyed. This inconsistency in user feedback is confusing and it does not assert the wizard's control of the task.

A solution

Both Microsoft Works and Publisher 98 inform the user when components are

inactive by greying them. Figure 38 shows both the menu bar and toolbar greyed while the wizard is modal. Conventionally, with modal screens, the menu bar and toolbar are not greyed. Feedback, through a beep, tells the user when something is selected while inactive. In the example in Figure 38, users receives two types of feedback telling them

Figure 38. Inactive menu bar and inactive toolbar.

that the wizard is in control of the task; a visual cue through a greyed menu bar, and an auditory cue, through a beep.

4. *Provide only context sensitive Wizard help.*

Comprehensive help about how to use the application is confusing and not applicable when a user requests help within a wizard.

4.1. Within a wizard, do not provide general help pertaining to the use of the application.

4.2. Provide help only on use of the wizard.

- 4.3. Provide a “More” button (Figure 39) for additional wizard-specific information for each wizard screen, or more detailed help with functions of a window

Figure 39. A “More” button that provides help with a particular screen.

Figure 40. An example of multiple help options with a wizard screen.

(Figure 40). Provide tool tips with mouse-over action over fields that may need clarification.

Make it easy for users to navigation through the wizard.

5. *Tell users how to move from screen to screen.*

- 5.1. Provide consistent feedback that communicates how to navigate through the wizard.
- 5.2. Provide buttons with affordance. Users should not have to scan a wizard screen and test whether an object is a button.
- 5.3. Make text large enough so that it can be read.
- 5.4. Place wizard instructions close to the navigation buttons so that users make an association between the text and the buttons.
- 5.5. Make buttons large so that users notice them.
- 5.6. Allow for back and forth navigation through the wizard. Provides buttons that take the user to the next screen or back a screen. Provide an exit button to finalize the task.
- 5.7. If users need to prepare for an upcoming task, then indicate what the next step will be. For example, the user may be advised to get a graphic or file to be able to complete the next step. This allows the user to prepare for the task.

An example

Jamba's E-mail wizard forewarns the user that certain resources will be required for the next step in the task (Figure 41). This allows users to gather the information and proceed with the task.

Figure 41. Example of informing users what resources are necessary for next wizard screen.

5.8. Provide default settings upon opening an application. Meaningful default settings when an application is opened assist users in correctly placing text and information. They serve as prompts and a template, so users may customize the project.

5.9. Provide the capability to save default setting upon closing an application so that the last information entered remains stored. There is no need to redo parts of a task if they are acceptable.

A solution

Publisher 98 allows the user to skip wizard questions. The project opens with settings saved from the last completed task. A scaled-down wizard is available to change

any of the previously saved information. The wizard does not force the user to follow the linear steps to complete the task. The user thus has two methods of working (Figure 42)

Figure 42. Example of skipping wizard steps.

Make it easy for users to navigate through the wizard.

6. Provide a task structure or a "roadmap."

Indicate the number of steps in a task. For complicated tasks, provide a brief explanation of what each step is. Explanations of steps allow the user to conceptualize the task and prepare answers to questions on the wizard screen.

A poor example

Some of Microsoft Works's wizards have numerous screens that unfold when users make decisions (Figure 43). With each decision, a hierarchy of steps is presented. Yet, none of these wizards provide a task map or outline the number of screens required.

Figure 43. An example of a wizard screen with no indication of number of steps in wizard.

A mere task structure shown as one step out of a total number of steps provides limited information (Figure 44). Although the user knows how many steps are in the task, there is no indication what those steps are.

Figure 44. An example of a list of steps to guide the user.

A solution

Provide the user with both a visual map of steps in a task see Figure 14 as well as an outline of what will be accomplished in those steps (Figure 45). This allows the user to conceptualize the task and prepare for questions that arise on the wizard screens.

Figure 45. An example of two forms of task structure feedback.

7. Provide simple wizards within wizards.

7.1. Provide wizards within a wizard only for complicated tasks.

A solution

Figure 46 illustrates an example of a wizard within a wizard. Publisher 98 provides within the business card wizard, a wizard to create an icon. The icon wizard imports and scales a graphic and places it into the document. Once the wizard-within-wizard task is completed, users return to the main wizard at the point where they entered the secondary wizard.

Figure 46. An example of a wizard within a wizard.

8. *Limit the information presented on a screen and use simple language.*

Do not overload the user with too much information on a screen. Present information in short sentences so the user may scan for information. Use simple language, never jargon. Group conceptually related information sorted alphabetically. Present solutions

to decisions through radio buttons or combo-boxes. If an alternate decision is required, such as in the wizard-within-a-wizard decision, flatten the secondary hierarchy to one level. Upon completing the alternate decision, return users to the point of entry of the secondary hierarchy. A wizard should always perform the task in fewer steps than the number of steps it would take to do the task without a wizard.

8.1. Use minimum number of words to explain the task and ask questions.

A poor example

Figure 47 illustrates a wizard screen that requires too much reading. Two sentences require the user to read information about how to use the wizard and obtain background information on graphics. A “More” button would be a more economical way

Figure 47. Example of wordy instructions and question prompting.

to inform the user of issues that are unknown and necessary for a decision.

A solution

Prompt the user into a decision with short imperative sentences. The prompt should elicit a response. Provide solutions to choices though combo-boxes or radio buttons. Don't make users who are well informed, read unnecessary information.

8.2. Use a diagram to help explain a concept.

A poor example

Use diagrams to explain a concept or aid in decision-making. Figure 16 includes an example of a vague concept that is poorly explained. Users are asked whether they want to leave room for a picture. Users missed this radio button, because they did not understand what the question was asking.

A solution

Have one question on a screen and make users decide on each issue.

8.3. Limit and organize the decisions a user must make on a screen.

A poor example

When single linear response screens make no sense, such as in the letter wizard in Figure 48, chunk answers to screens so that users make decisions about similar issues. The example in Figure 48 has users make 21 possible decisions. Although, spread over four screens, each screen requires too many decisions about how to set up a letter. To force the user to move through 21 screens likewise would be illogical.

Figure 48. A wizard screen showing too many choices.

A solution

Fewer decisions on a screen, and screens with more diagrams would alleviate the cognitive load for the user. Create a linear flow to detailed decisions, yet limit the steps by chunking alike issues. Limit the information presented on a screen to ensure that users attend to all the information.

- 8.4. Chunk conceptually related decisions on one wizard screen. Do not spread decisions over many screens when it makes more sense to group them.

A poor example.

Conversely, to recommendation 8.3, recommendation 8.4 addresses an oversimplification of grouping concepts per screens. The print wizard in Corel's PrintHouse extends print decisions over seven screens (Figure 49). Each screens deals with one concept. Most users have a conceptual model of printing. To fragment that concept across seven screens makes no sense. Decisions that comprise a unit are best

Figure 49. Example of one out of seven screens from a print wizard.

perceived holistically. If the task is presented as a check-off list, users mentally go through the process of checking off steps as they normally would outside a wizard.

Moving through many screens to make simple decisions is tedious. The wizard, in this instance does not simplify the task; it merely draws it out, and fragments it.

A solution

When does it make more sense to group information and when should one fragment information and decisions? Foremost, designers should group conceptually alike information and decisions with a minimalist approach. Avoid display density to maximize task efficiency (Mullet and Sano 1995). Economically organize information to communicate the task and elicit correct user response. Stimulus overload may cause users not to attend to all the information and possibly make errors of omission. Apply the rule of “progressive disclosure.” Show only relevant questions and expand decision-making only after a user selects an option. Avoid screen clutter, yet provide sufficient information for users to make informed decisions. Allow for coherent decision-making. Use graphics as aids and use words sparingly. Allow for glancing rather than reading of information.

9. Limit user data entering.

When possible, provide radio buttons or combo boxes rather than text-entry fields. It is easier for users to recognize an input than recall it. Selecting is more accurate and generally faster than typing.

9.1. Prompt the user with accurate cues for data-entry fields.

9.2. Match the text field size to the text that is be entered.

A poor example

Figure 50 illustrates a poor example of a text-input box. Users are prompted to “Enter the text as it would appear on the Certificate.” When the entire certificate is text, this type of prompting is confusing. The text-field box is large enough to accept a

paragraph. In this example, it is meant to hold a sentence.

Figure 50. An example of text-input box that is too large for the intended text.

A solution

Provide specific prompts for specific information. Open-ended prompting does not facilitate task completion. The user guesses about the required action and the correctness of the output. In Figure 51, the prompting is specific. This letter wizard has a bold title. It is asking for the recipient's name and address. It also instructs the user on how to enter the text.

Figure 51. Text-input box requesting specific information.

A poor example

Most users find entering dates confusing and do not know the specific order of entering day or month. Mistakes on date entering are made when vague instructions are provided. The example in Figure 52 illustrates this point.

Figure 52. An example of poor data-input prompting.

A solution

Two date prompting inputs are possible to clarify the correct order of entering of a date. The first is a date prompt with day, month, and year illustrated as “dd/mm/19yy” in the text-entry field (Figure 53). Users type over the date prompt and insert the appropriate date. A second type of prompting is a drop-down calendar for users to select the date. Users scroll up or down in years and months to select a date. The correct date is inserted when the user selects a date (Figure 54).

Figure 53. An example of date prompting for text-entry fields.

Figure 54. Example of a drop-down calendar for date input.

10. Design for error.

Users will omit data and skip essential steps. Design for that occurrence. Warn users about omissions and direct them to the mistake.

- 10.1. Prevent the user from moving to the next screen if required text or data fields are left blank.
- 10.2. Correct user's mistakes through highlighting the area or having a warning sign come up if inappropriate input occurs.

A poor example

Microsoft Word's Envelope Wizard (Figure 55) allows the user to leave both text entry fields blank, and still print the envelope. The print operation should not be allowed with such an error.

A solution

Figure 55. Envelope wizard illustrating a poor example of error prevention.

Do not allow users to continue in the task if vital information or input is missing. Draw the user's attention to the error, and allow for correction. The tax program illustrated in Figure 56 does not allow the user to continue until all the text fields are filled in. An error notice informs the user of the omission of information. A bold red arrow is animated as it draws the user's attention to the text field where the mistake

Figure 56. Example of error recovery.

occurs. The error is explained in the instruction area at the top of the page, and a solution is provided.

11. Brief the user with a status report on what has been selected and will be implemented.

11.1. Provide for the user, as a confirmation of the task, an outline of what specifications the user has selected in the wizard.

11.2. If the choices are correct, allow the user to finalize the task. If changes are needed, then allow the user to go back in the wizard.

- 11.3. Provide a finalize screen that dismisses the wizard, but also provides a return to the wizard button for possible changes the user may want to make. The return to wizard should return users to the main wizard screen, not the last wizard screen, to avoid backtracking through a series of screens.

An example

Microsoft Works verifies the user's choices before finalizing the wizard task. From this "Checklist" screen, users verify choices, and are able to return to the main wizard screen to make changes if they are needed (Figure 57). If no changes are necessary, users create the document.

Figure 57. Example of verification of user choices prior to exiting the wizard and completing the task.

12. *Save default settings. Save last worked on settings as opening settings to allow saving in steps at task entry.*

12.1. Save last worked on settings as opening default settings.

An example.

The save default settings in Publisher 98 saves the content of the last document worked on. Content such as name, address and business name appears on new document when the wizard opens any new project. The illustration in Figure 58 is of the wizard in a modal state; yet, the business card contains content from the last saved project. Users edit the content of the business card by moving through the wizard, or optionally,

Figure 58. Example of project with default settings of a last saved project.

skipping wizard steps, and editing on the card itself.

12.2. Provide more than one exit point from the wizard. Users may not need to move through all the steps in a wizard.

12.3. Provide flexible wizards for accomplished users who may wish to skip steps for parts of a task they do not need wizard assistance with.

A poor example

Users of Corel PrintHouse are forced to move through all wizard screens.

Although default text entry is present from the last saved project, users must confirm the content as they move through each screen. This wizard does not allow skipping of steps and multiple exit points (Figure 59).

Figure 59. An example of a linear wizard without multiple exit points.

A solution

Figure 60 serves as an example of multiple exit points. Users have the option to change all or some of the aspects of the letter. Previous entries remain as the default settings and users are not required to move through many wizard screens where none of the information needs changing.

Figure 60. An example of multiple exit points.

Finalizing the task

13. *Allow users to view the document before they exit the wizard.*

13.1. *Provide a final preview of the project.*

- 13.2. Make the preview of the final project large enough to allow critical viewing.

Recommendations for wizard rationale

14. Design wizards for any computer task provided it warrants a wizard.

Wizards are warranted if they are faster, better, and can perform some tasks that are too demanding.

- 14.1. Design wizards for complicated tasks.
- 14.2. Design wizards for tasks with repetitive steps.
- 14.3. Design wizards for tasks that are rarely done.
- 14.4. Design wizards for lengthy tasks.
- 14.5. Design wizards for tasks-oriented jobs where the objective is to get the job done, not learn how to do the task.

15. Do not design wizards for tasks that do not warrant wizards.

Do not create a wizard for simple tasks. If doing the task is simpler without a wizard, then a wizard is not warranted.

- 15.1. Do not create wizards for simple tasks such as opening and closing files, saving and printing files, or any simple one-step tasks.

Conclusion

Wizards provide unique approaches to task automation. This study demonstrated that wizards improve performance through faster task time and greater task accuracy. Given the fact that interfaces are difficult to design, and difficult to use, wizards seem promising. Increasing worker productivity by 46 percent in task time and 34 percent in task accuracy, would result in huge company savings. Designing effective application

interfaces may be difficult and “although the benefits of usability engineering are clear, no-one believes that this solves the problem of making interfaces easy to use” (Myer, M., 1993, p. 3). The wizard may not make the interface easy to use. It does solve the problem of difficult interfaces when it comes to completing specified known tasks. Although no application could ever package enough wizards to represent the numerous ways a user might use an application, some function for building wizard components should be offered in user preferences. Future research into the area of wizard design could address this issue.

The utility and usability of customizable wizards needs to be addressed. Users currently find wizards limiting and most applications have a limited number of wizards. Software developers must find ways for users to specify tasks, their parameters, and aspects of the task that need automation. Each user brings a novel approach to computer interaction, and no commercial application could ever package all the ways a user may need assistance. Customizable wizards could be designed through some drag-and-drop wizard builder where users build components for their automated task. Another way to customize a wizard would be through a macro recorder. The macro could model a task from an expert’s keystrokes. This recording could act as a template for the wizard builder. Each user could specify personal differences for his or her wizard. The desktop assistant may take on a new image – that of a wizard – an agent that monitors its user’s habitual computer interactions and act as a personal assistant.

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Appendix A

Subject recruiting announcement

(This page layout has been modified to accommodate portrait page orientation)

Wizard Interface Experiment

Subjects with Windows 95 experience are required for a 30-minute psychology experiment. Subjects are required to perform two computer tasks

Contact: Rita Jacobs
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Appendix B

Computer user experience survey

Name: _____

Phone Number: _____

Please answer how experienced you are with the following:

How experienced are you using Windows 95 for the following:

	Novice user	Intermediate user	Expert user	Power user
opening files				
saving files				
moving between applications				
using graphics				
creating tables				
word processing				
Microsoft Word				
Microsoft Publisher				
other				

Appendix C

Certificate instructions using the wizard in Corel PrintHouse

- 1) Your assignment is to create a certificate
- 2) Open the application "Corel Print House" and select "Use The Quick Way" and follow the Wizard.
- 3) Your certificate must have the following criteria, however the design is entirely yours:
 - (a) Size: full page, orientation landscape
 - (b) A border
 - (c) Award title
 - (d) Recipient of award
 - (e) A statement of commendation
 - (f) Names of two people giving the award
 - (g) Two lines for signatures of award givers
 - (h) Date of award
 - (i) Line below date of award
 - (j) A graphic
- 4) Save your certificate to the file A:certificate2
- 5) Print your certificate

Appendix D

Certificate instructions using Word

- 1) Your assignment is to create a **certificate**.
- 2) Open the application “**Word**” and go to **File | New | Blank Document**

Your certificate must have the following criteria, however, the design is entirely yours:

- a) Size: full page, orientation landscape
 - b) A border
 - c) Award title
 - d) Recipient of award
 - e) A statement of commendation
 - f) Names of two people giving the award
 - g) Two lines for signatures of award givers
 - h) Date of award
 - i) Line below date of award
 - j) A graphic
- 4) Save your certificate to the file A:certificate2
 - 5) Print your certificate

Appendix E
Example of Certificate

Cool-Dude Award
Jim Nosweat

Congratulations on maintaining your cool during July 1998

Sally Soak

Fred Drip

July 1998

Appendix F

Evaluation of certificate

- ☐ landscape paper orientation
- ☐ border
- ☐ title of award
- ☐ font enhancement
- ☐ justification
- ☐ name of recipient
- ☐ font enhancement
- ☐ justification
- ☐ commendation
- ☐ font enhancement
- ☐ justification
- ☐ line for 1st signature
- ☐ left justification
- ☐ name of 1st person giving award
- ☐ font enhancement
- ☐ left justification
- ☐ line for 2nd signature
- ☐ left justification
- ☐ name of 2nd person giving award
- ☐ font enhancement
- ☐ left justification
- ☐ date
- ☐ font enhancement
- ☐ right justification
- ☐ line below date
- ☐ right justification
- ☐ graphic
- ☐ alignment of graphic

Total score: _____/28

Subject _____

SS# _____

Date: _____

Appendix G

Calendar instructions using the wizard in Word

- 1) Your assignment is to create a calendar for the month of July.
- 2) Open the application “Word” and go to **File | New | General | Calendar Wizard**.
- 3) Create a document that is a calendar matching the sample
- 4) Your calendar must have the following form:
 - a) Size: **full page, orientation landscape**.
 - b) Month: **July 1998**
- 5) Save your calendar to the file A: calendar2
- 6) Print your calendar

July						
<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Appendix H

Calendar instructions using Word

- 1) Your assignment is to create a calendar for the month of July.
- 2) Open the application “**Word**” and go to **File | New | Blank Document**
- 3) Create a document that is a calendar matching the sample
- 4) Your calendar must have the following form:
 - a) Size: **full page, orientation landscape.**
 - b) Month: **July 1998**, see guide for dates
- 5) Save your calendar to the file A:calendar1
- 6) Print your calendar

July						
<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

Appendix I

Sample of calendar

July						
<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

1998

Appendix J

Evaluation of calendar using Word

July						
<i>Sun</i>	<i>Mon</i>	<i>Tue</i>	<i>Wed</i>	<i>Thu</i>	<i>Fri</i>	<i>Sat</i>
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

- ☐ landscape paper orientation
- ☐ table with 7 columns
- ☐ table with 7 rows
- ☐ border around table
- ☐ grid inside table
- ☐ days across top
- ☐ dates within table
- ☐ text boxes for month and year
- ☐ fill within text boxes
- ☐ white text in filled boxes

Total score _____/10

Appendix K

Business Card Instructions using no wizard

- 1) Your assignment is to create a **business card**
- 2) Open **Publisher 98**
- 3) From the **Catalogue**, select | **Blank Publications** | **Business Card**
- 4) Create a business card
- 5) Your **Business Card** must have the following criteria, however the design is entirely yours:
 - a) Font: **your choice**
 - b) Orientation: **landscape**
 - c) Logo: **singer (on diskette – file A: singer.jpg)**
 - d) Colour scheme: **your choice**
 - e) Information:
 - i) Music Limited
 - ii) Mel Spice
 - iii) Singer
 - iv) Tape Street
Tone, Ontario
AAA BBB
 - v) Phone: 111-2222
 - vi) spice@music.com
 - f) Plus two graphic elements to add to the visual appeal of the business card. Any graphic element such as lines, boxes, shapes like the ones below are suitable. The choice is entirely yours.

- 6) Save your business card to C:music
- 7) Print your business card

Appendix L

Business Card Instructions using the wizard

- 1) Your assignment is to create a **business card**
- 2) Open **Publisher 98**.
- 3) From the **Catalogue**, select | **Publication by Wizard** | **Business Card**
- 4) Use the wizard to create a business card.
- 5) Your Business Card must have the following criteria, however the design is entirely yours:
 - a) Font: **your choice**
 - b) Orientation: **landscape**
 - c) Logo: **singer (on diskette – file A: singer.jpg)**
 - d) Colour scheme: **your choice**
 - e) Information:
 - i) Music Limited
 - ii) Mel Spice
 - iii) Singer
 - iv) Tape Street
Tone, Ontario
AAA BBB
 - v) Phone: 111-2222
 - vi) spice@music.com
 - f) Plus two graphic elements to add to the visual appeal of the business card. Any graphic element such as lines, boxes, shapes like the ones below are suitable. The choice is entirely yours.

- 8) Save your business card to C:music
- 9) Print your business card

Appendix M

Sample of business card

Appendix N

Business card evaluation form

- ☐ landscape orientation
- ☐ text box for Title of Company
 - ☐ font enhancement
- ☐ text box for Name
 - ☐ font enhancement
- ☐ text box for Singer
 - ☐ font enhancement
- ☐ text box for address
 - ☐ font enhancement
- ☐ text box for phone
 - ☐ font enhancement
- ☐ text box for e-mail
 - ☐ font enhancement
- ☐ 1st graphic element
- ☐ 2nd graphic element
- ☐ graphic picture of singer

Total score _____ /16 _____ %

Subject _____ Ss _____

Trial _____

Date _____

Appendix O

User-Satisfaction Questionnaire for creating a certificate

For the following statements, check the ☒ appropriate response. Indicate your experience creating a certificate with and without a wizard.

How easy was it for you to create a certificate?

	Extremely difficult 1	Very Difficult 2	Difficult 3	Neither difficult nor easy 4	Easy 5	Very Easy 6	Extremely Easy 7
Using the wizard							
Using the application							

Rate your satisfaction using

	Extremely dissatisfied 1	Very Dissatisfied 2	Dissatisfied 3	Neither dissatisfied nor satisfied 4	Satisfied 5	Very Satisfied 6	Extremely Satisfied 7
The wizard							
The application							

Rate your preference using the wizard.

- ☐ Very much prefer wizard
- ☐ Prefer wizard
- ☐ Slightly prefer wizard
- ☐ Slightly prefer no wizard
- ☐ Prefer no wizard
- ☐ Very much prefer no wizard

Appendix P

User-Satisfaction Questionnaire for creating a calendar

For the following statements, check the ☒ appropriate response. Indicate your experience creating a calendar with and without a wizard.

How easy was it for you to complete the calendar?

	Extremely difficult 1	Very Difficult 2	Difficult 3	Neither difficult nor easy 4	Easy 5	Very Easy 6	Extremely Easy 7
Using the wizard							
Using the application							

Rate your satisfaction

	Extremely dissatisfied 1	Very Dissatisfied 2	Dissatisfied 3	Neither dissatisfied nor satisfied 4	Satisfied 5	Very Satisfied 6	Extremely Satisfied 7
Using the wizard							
Using the application							

Rate your preference using the wizard.

- ☐ Very much prefer wizard
- ☐ Prefer wizard
- ☐ Slightly prefer wizard
- ☐ Slightly prefer no wizard
- ☐ Prefer no wizard
- ☐ Very much prefer no wizard

Appendix Q

User-Satisfaction Questionnaire for creating a business card

For the following statements, check the appropriate response. Indicate your experience creating a business card with and without a wizard.

How easy was it for you to complete the business card?

	Extremely difficult 1	Very Difficult 2	Difficult 3	Neither difficult nor easy 4	Easy 5	Very Easy 6	Extremely Easy 7
Using the wizard							
Using the application							

Rate your satisfaction

	Extremely dissatisfied 1	Very Dissatisfied 2	Dissatisfied 3	Neither dissatisfied nor satisfied 4	Satisfied 5	Very Satisfied 6	Extremely Satisfied 7
Using the wizard							
Using the application							

Rate your preference using the wizard.

- ☐ Very much prefer wizard
- ☐ Prefer wizard
- ☐ Slightly prefer wizard
- ☐ Slightly prefer no wizard
- ☐ Prefer no wizard
- ☐ Very much prefer no wizard

Appendix R

Instructions for the certificate task read to subjects prior to experiment.

Your task is to create a certificate (at this point the experimenter shows the subject the sample) that looks something like this. You will be using Corel PrintHouse and Word to complete your task. Do you see both these applications on the desktop? (Subject is asked to locate the Print House and Word icons)

Wizard first condition

1. You will first complete the task using a wizard and then complete the task without a wizard.

No Wizard first condition

2. You will first complete the task using no wizard and then complete the task using a wizard.

You have 15 minutes to complete each task. After which I will ask you to stop. While you are doing your task, I will have a screen-cam software running in the background that will videotape your mouse action. At the end of the session, we will look at the videos and I will audiotape your comments. I want you to tell me what you were trying to do. I have instructions for each task and I want you to read them and ask me any questions about things you do not understand. When you have read the instructions and understand them, I want you to tell me to begin the timer and we will start the tasks. Do you understand?

Appendix S

Instructions for the calendar task read to subjects prior to experiment.

Your task is to create a calendar (at this point the experimenter shows the subject the sample) that looks exactly like this. You will be using Word to complete your task.

Do you see Word on the desktop? (Subject is asked to locate the Word icon)

Wizard first condition

3. You will first complete the task using a wizard and then complete the task without a wizard.

No Wizard first condition

4. You will first complete the task using no wizard and then complete the task using a wizard.

You have 15 minutes to complete each task. After which I will ask you to stop. While you are doing your task, I will have a screen-cam software running in the background that will videotape your mouse action. At the end of the session, we will look at the videos and I will audiotape your comments. I want you to tell me what you were trying to do. I have instructions for each task and I want you to read them and ask me any questions about things you do not understand. When you have read the instructions and understand them, I want you to tell me to begin the timer and we will start the tasks. Do you understand?

Appendix T

Instructions for the Business Card task read to subjects prior to experiment.

Your task is to create a Business Card (at this point the experimenter shows the subject the sample) that looks something like this. You will be using Publisher 98 to complete your task. Do you see Publisher 98 on the desktop? (Subject is asked to locate the Publisher 98 icon)

Wizard first condition

5. You will first complete the task using a wizard and then complete the task without a wizard.

No Wizard first condition

6. You will first complete the task using no wizard and then complete the task using a wizard.

You have 15 minutes to complete each task. After which I will ask you to stop. While you are doing your task, I will have a screen-cam software running in the background that will videotape your mouse action. At the end of the session, we will look at the videos and I will audiotape your comments. I want you to tell me what you were trying to do. I have instructions for each task and I want you to read them and ask me any questions about things you do not understand. When you have read the instructions and understand them, I want you to tell me to begin the timer and we will start the tasks. Do you understand?

Appendix U

Comments on Certificate Wizards

Preference	Ease of use	Satisfaction	Comments
6 Very much prefer wizard	7 Extremely easy	7 Extremely satisfied	I found the wizard within wizard confusing. I found the wizard had too many buttons. Whenever there is a click, I usually click on it. I didn't look at the picture. I was so eager to print. I didn't read text.
	6 Very easy	6 Very satisfied	The "next" command (in the wizard) was confusing.
5 Prefer wizard	7 Extremely easy	7 Extremely satisfied	I have used wizards before for graphs. It's much faster. I would prefer the wizard to show the product as it was creating it. Should also have a back and next button.
	6 Very easy	5 Satisfied	I would use a wizard if I needed to make something simple. I would like to see more choice.
5 Prefer wizard	5 Easy	6 Very satisfied	I prefer more options. Need more selections, only 3 certificates available. It saves a lot of time. It puts everything where I want it. I would use a wizard to save time.
	4 Neither easy nor difficult	6 Very satisfied	Never used a wizard before. It is good for someone like me. It helped a lot.
4 Slightly prefer wizard	7 Extremely easy	5 Satisfied	I am pleased with the product. I would use this wizard.
		4 Neither satisfied nor dissatisfied	Corel slide creation wizard and this wizard are very similar. It makes life so much easier. I just have to type in the information that I want.
	6 Very easy	4 Neither satisfied nor dissatisfied	The wizard was quick. If you wanted to append, then it would take you longer. Wizards are very limiting. The choices are good, but not too many sub choices. I know what I have in my mind and I like to put that on the page.
2 Prefer no wizard	7 Extremely easy	6 Very satisfied	I prefer to learn the task. I would like to see more choices. Wizards are OK. I don't use them that often. They're an easy way to get things done. I like to learn how to use a computer. It (wizard) is too simplified.

Table Continues

6 Very easy	2 Very dissatisfied	Wizards are for old people. Wizards are like cheating. I like to think and I like control. I like control 'Big Time'. I find wizards very limiting. Wizards are like paint-by-numbers. Wizards are really the worst. It is better to use a manual.
5 Easy	6 Very satisfied	I like to play around. I like more options.

Appendix V

Comments on Calendar Wizards

Preference	Ease of use	Satisfaction	Comments
6	7	7	I was pleased with the wizard.
Very much prefer wizard	Extremely easy	Extremely satisfied	I have used "Voice chat" wizard and it's really good. A wizard is so much easier. The format is already there.
		6	Never used a wizard before. It's awesome. I like it. I would like it for agenda's and my weekly plans.
		Very satisfied	I didn't get frustrated with it either. I like the wizard. I'd use it. I like the map, I assume it tells me where I'm going next.
			I think what they are doing with the wizard is pretty good for tables. I've tried using wizards for other things like cover letters and résumés and find that you spend more time deleting empty boxes or checking boxes.
	6 Very easy	5 Satisfied	This is simple. It did not take long. I like it a lot; I think it is a great program.
		7 Extremely satisfied	It made me feel pretty confident. Would absolutely use a calendar wizard. The task was easy.
		5 Satisfied	The only difficult part in using the wizard was in saving the file.
5 Prefer wizard	7 Extremely easy	6 Very satisfied	Too much information on the screen, I didn't see the bottom button. I like to edit the calendar. I didn't get the calendar I wanted so I had to start over.
		7 Extremely satisfied	Used a wizard for a résumé and it was pretty good. I liked it. Makes it so much easier. I would like a wizard for formulas to calculate certain things.
4 Slightly prefer wizard	7 Extremely easy	4 Neither dissatisfied nor satisfied	This wizard was very straightforward, easy to follow. Easy to quickly complete the task.

Appendix W

Comments on Business Card Wizards

Preference	Ease of use	Satisfaction	Comments
6 Very much prefer wizard	7 Extremely easy	6 Very satisfied	It was easy with the wizard, but not as easy as it could be. I like to start with something that looks good.
	5 Easy	7 Extremely satisfied	Oh, it would've been nice if it could talk to me. If it could walk me through it, and say if it was really sweet and polite and just ask me different questions about the business card that I would like.
		6 Very satisfied	I use wizards for memos and it speeds up my work a lot. It makes it "memos" a lot easier. It cuts my time in half. Using the wizard was less frustrating in completing the task. I would not be able to produce a product such as this without a wizard.
6 Very much prefer wizard	5 Easy	6 Very satisfied	Wizard is good for me a first-time user of Publisher 98. It helps me with layout - it makes things easier. I can change things like colour. If I were an experienced user, I might not need a wizard. I sometimes use a wizard to learn how to use the application.
	3 Difficult	4 Neither satisfied nor dissatisfied	I like the wizard way of doing things - it is more direct. The wizard had everything in place, where you had to put your name, address etc.
5 Prefer wizard	5 Easy	6 Very satisfied	It's not bad. It's a lot easier than the other way. It's very, very straightforward. Have more success; they serve as a guide.
3 Slightly prefer no wizard	5 Easy	3 Dissatisfied	The publisher 98 interface is not typical of a wizard interface, not like the old check boxes wizards. There is no need to be able to edit the business card while in the wizard. Wizard within wizard does not help.
	4 Neither difficult nor easy	5 Satisfied	Wizards are not helpful, they are restricting. I like to move things around. This wizard did not look like a wizard. The logo-insertion wizard caused me a bit of trouble. Too many layers, I did not know what I was putting on page. It is cluttered.

(Table continues)

2 Prefer no wizard	3 Difficult	4 Neither dissatisfied nor satisfied	Had to learn how to use the wizard. Did not know I was in a wizard. I noticed the buttons on the bottom only after a while.
			I sort of like them. They are good for setting up everything for you. Like to control things. This is hard.
2 Prefer no wizard	3 Difficult	3 Dissatisfied	I do not like them. Would prefer to blunder through and learn a task. Wizards are too linear and restrictive. Must learn how to use a wizard. Did not know I was in the wizard.
	2 Very difficult	4 Satisfied	I found the wizard confusing. It had too many layers and text boxes.