Planning an Original Research Agenda
Projs 1 & 2
English 7701, Spring 2004
Dr. Sherry Southard

Problem
The organization that I am currently employed with, a public school system in central North Carolina, utilizes an online system to assist end users troubleshoot technology issues on their own. Contained within a knowledgebase are suggested resolutions that can be queried using keywords describing the problem. Utilizing these recommended solutions, an end user has the opportunity to resolve a problem without submitting a member of the technology department. If no resolutions are available in the knowledgebase for an issue, or if the returned results do not work, the system offers a means to report problems to the technology department through the submission of an online work order.

However, over the past six months customer satisfaction has decreased in regards to how technology problems are addressed and my department has received extremely high number of end user complaints. From research and customer feedback, it has been decided that the existing system does not have the design and functionality to adequately assist the customer’s with technology issues without typically involving submission of work orders to technicians. If this process is continued, the time of resolution will continue to increase, customer satisfaction will remain low or continue to decrease and technology assets will not be utilized to their full value in classrooms and offices.

Question
Would a redesign of the existing system and knowledgebase, taking into consideration the end users current needs, provide the necessary functionality and service levels to the customer?

Hypothesis
A redesign of the user interface and the system’s database structure, along with modifications to the process of inputting knowledgebase data, would provide a 25% increase in the number of issues customers can resolve on their own without escalation to a technician.

Defining Terms
At this point I feel some additional information is needed to explain the hypothesis. A redesign of the web interface would be intended to help the end user access additional resources for solutions and
enhance the capability to define search parameters. One possibility is the website would offer general troubleshooting suggestions to the user that can be attempted before submitting a search for resolutions. Another option is the addition of links to vendor websites or forums that the end user can utilize for additional information. The current system doesn’t contain either of these features.

The second portion of the hypothesis refers to modifying the database structure. Such a modification could ensure the integrity of the logical database components to provide streamlined information to the user. An example is the content of the database would be inspected to ensure that it pertains to the rules of normalization and doesn’t contain duplicate or overlapping information.

The final section of the hypothesis involves the input of knowledgebase information. Currently, any member of the technology department is able to add data based upon problems and resolutions they encounter in the environment. However, this process would be modified toward a more centralized approach that would fall to one or two members of the department. These team members would be solely responsible for adding new content, to ensure that a standard format for the data is followed and it would also provide a more structured approach to allow data entry in a timelier manner.

**Independent Variables**

- The primary independent variable for this research is the end user. The end users have various skill levels of technology use and any modifications to the user interface and database structure would need to take all of those levels into consideration.
- A second independent variable includes technology assets located in each of the schools. There are various models of workstations and Macintosh computers throughout the district and it is not uncommon to find a school with a large population of older machines. Because of a number of factors (age, component failure, warranty replacement plans), the type and quantity of certain computer assets in a school will influence whether users can resolve issues on their own or submit the problem to a technician. Older computers usually equate to more problems, with many that are non-repairable.
- The final independent variable consists of the student population at each school. In reviewing school grade levels, (elementary, middle and high) it has been discovered that there is a pattern as to how the student population can contribute to computer problems. Typically, the elementary schools have well supervised classes and the students are restricted to certain times of use on the computers along with what they are able to do. The next grade level, middle school, will find
students that are more involved with technology and the supervision in both classrooms and labs decreases.

Because of these variables, the number of calls potentially increases for a middle school compared to an elementary school of equal size. Finally, the high school grade level presents the largest section of computer related problems. These students are even more progressive in how they utilize technology and they take advantage of the latest software and hardware currently on the market. Students also have more autonomy for the use of technology (they are monitored even less than the middle schools) and the lack of supervision can lead to additional problems from vandalism, installation of unauthorized software, or just overuse of the asset.

**Dependent Variables**

The first dependent variable is the existing logical database structure, which would be modified to provide a more streamlined approach to providing query results for an end user. An example of such a modification would be displaying all resolutions within the database that pertain to the information the user is seeking instead of just one result. The user would then be able to select various items that may provide assistance, even if their query didn’t contain appropriately detailed information of the problem.

The second dependent variable is the way content is added by members of the technology department. In an effort to ensure integrity of the data being entered, it would be necessary to reduce the number of personnel responsible for entry of the data. A standard format for content entry would also be needed, one that provides all of the details for a resolution that an end user can search for.

**Outcomes Expected**

Modifying the current user interface, combined with a restructuring of the perpetual database model, would provide the user with the capability to query the knowledgebase more effectively. The benefits of this streamlined approach would provide a 25% increase in the number of technology problems users would resolve on their own without having to escalate the problem to a district technician. The time saved on the reduction of onsite work by the technicians will allow them to concentrate on projects and additional assignments.
Design

The design for this study will involve two treatments, the current system and the revised system. The approach will primarily be quantitative with some qualitative aspects included. Once the database modifications are made, each of the treatments will need to be tested under similar conditions.

To test for the effects of a modified user interface and restructured database, a usability test will be performed for each treatment. Each test will be comprised of ten end users chosen randomly from within each of the grade levels, with possible overlap from the same schools. These end users will be contacted via e-mail with a request to take part in the test. If they respond that they are willing to take part, a second e-mail will be forwarded to them specifying the time and location of the test. If the invitation is declined or something occurs to prevent the user from attending the testing session, another end user will be randomly chosen.

The choice of participants in the test is going to be random with two people selected from the elementary school level for each test, two from the middle school and one from the high school. This will provide a total of eight elementary school personnel, eight middle school personnel, and four high school personnel. These quantities were selected because of the ratio of elementary and middle school faculty members to those in the high schools (there are far more elementary and middle school personnel than high school). Because this system is designed primarily for instructional personnel instead of support staff or administrators, only instructional faculty will be part of the population chosen to take part in the test.

Since there is such a broad range of technology skills and troubleshooting abilities among faculty members, there will be no criteria for what technological capabilities they have. This test is designed to range from those with limited or no skills to users that have a high degree of troubleshooting knowledge.

Technology department personnel will choose proctors for each test from among school personnel. These selections will include one proctor for each treatment test (a total of four proctors). Two will be chosen from the elementary schools, one from the middle schools and one from the high schools. Again, this is based upon the overall number of users represented in each of the grade levels. Using school personnel would avoid having technology personnel proctor the tests a situation that may be problematic because of their roles. If the selected personnel agree to help with the test, each will be trained on the treatment that they will be administering to. In addition they will be provided with an observation form to fill out for
each of the end users involved with their respective test. For the selection of the users, names will be chosen randomly from an overall list of district personnel in each of the grade levels.

At the beginning of the test I will provide all of the end users with the same instructions as to how the test will be conducted. Each user will be provided with a letter indicating the purpose of the test, a series of forms explaining five problem scenarios that they will need to search for resolutions on within their respective treatment, and a survey that will be filled out at the end of the session. The content of the scenario forms will contain questions that the user will answer based upon his or her research findings and the final survey will contain open-ended responses. Note that the scenarios are fictitious but would resemble problems experienced by end users throughout each of the grade levels.

The overall test will be a timed event but there will be no set limit for each of the scenarios; if the end user encounters problems searching for a resolution, they will be encouraged to move on to the next scenario and come back to the problem later. Once the test is complete, the end users will be asked to fill out the survey to indicate their opinion of the effectiveness of each treatment and provide suggestions for improvement to the system itself or the overall process. Finally each of the users will be thanked for their time and assistance and will be provided with a letter of appreciation.

During the test the observers will fill out one form for each user as they progress through the five scenarios. This form will record any issues that the end user may have and indicate how effectively they are working through the problems. If the user encounters a problem, the proctor will recommend moving on to the next problem and returning to the existing one later. However, the proctors will not be able to offer suggestions on how to define the end users query or answer questions concerning the functionality of the system.

Once each of the tests is completed I will collect the results and the data will then be analyzed. The primary analysis will involve the end user variable (nominal) as it relates to the database variable (also nominal). This analysis will be performed using a Chi Square analysis and will determine how the revised treatment compares with the original in the number of issues resolved by the end user.

The data collected will be qualitative in nature and will reflect what resolutions the user was able to locate using the knowledgebase. They will be required to briefly describe the solution for each of the scenarios that were provided. This data will then be evaluated to determine if the users located sufficient information to allow them to resolve the problem within the scenario. Note that there is not necessarily a
single right answer for each scenario. It is possible that the user arrived at the correct resolution from reviewing a number of different entries in the knowledgebase. The intention when reviewing the data is to determine if the final result would fix the problem.

As mentioned previously, an analysis will be made comparing the original treatment with the one that is revised. Each answer by the test participants will be examined to determine if they arrived at a resolution but in the end they would have either been able to fix the problem or not. This will be noted for each treatment and the number of issues that were resolved or not resolved will be presented for both treatments together.

Once the analysis is complete, a final determination will be made as to whether there was an increase in the quantity of problems users found resolutions for using the modified knowledgebase. In addition, their evaluations will be reviewed to determine if an overall improvement to the user interface of the modified knowledgebase exists, compared to the current system. These results will then be presented to the Director of Technology for the school system who will make a determination if we will move forward with the project.
Attachment 1
Initial e-mail to participants in the usability test

To: (Username)
From: Jim Mattison; Department of Media and Technology

Dear (Username),

My name is Jim Mattison and I am a Technician III with the Department of Media and Technology. In an effort to improve the response time to resolve technology problems in the schools and provide end users with the opportunity to address issues on their own, my department is pilot testing a revised online knowledgebase and work order system. Our belief is that by providing end users, such as yourself, with extended capability to research technology resolutions online using the knowledgebase, combined with a streamlined work order system will result in a larger number of issues can be addressed rapidly and efficiently.

However, it is necessary to determine if the new system will meet the needs of all users within the school system. To accomplish this we are conducting a usability test with personnel randomly chosen from all grade levels. You have been selected as one of those candidates to take part in this evaluation.

If you agree to take participate in the test, you will be asked to address five technology problems using the online system. The intention is to see if you are able to resolve these issues using information from the system’s knowledgebase and if not, submit a work order to the technology department for assistance.

The usability test will last only one hour and will be held on May 15, 2004 at the Professional Development Center. The test will begin at 3:30 in the afternoon. If you are interested in taking part in this test please respond to this e-mail by May 5th. If I do not receive a response from you by then or if you indicate that you cannot take part in the test, I will submit a request to another member of your grade level. In any event, I appreciate your time and have a great day.

Regards,
Jim Mattison - Technician III
Union County Public Schools
Appendix 2
Follow up e-mail to test participants.

To: (Username)

From: Jim Mattison; Department of Media and Technology

Dear (Username),

This e-mail is a reminder that you are signed up for a usability test of the new online technology knowledgebase and work order system. The test will be held on May 15th at the Professional Development Center in the computer lab. When you arrive at this location and enter the building, inform the receptionist that you are taking part in the usability test and she will direct you to the computer lab.

The test is scheduled to only take one hour and will begin at 3:30 PM. Refreshments will also be served before the test.

If you are unable to attend this test please contact me at jim.mattison@ucps.k12.nc.us or by phone at (704) 296-3143. In the event you cannot attend, I will attempt to find a replacement depending on how close to the test date we are.

I would like to thank you in advance for your time and participation in this test. Have a great day.

Regards,
Jim Mattison - Technician III
Union County Public Schools
Appendix 3
Usability test for the new technology knowledgebase and work order system
- Proctor's Observation Form

Each proctor will complete a copy of this form during the usability test for the school system personnel they have been assigned to work with (five per proctor). For each individual testing, there is a series of questions below that must be answered as the test progresses. The proctor must ensure that every question for each participant is answered.

Note for the proctor:
If a test participant is having trouble resolving one of the five scenarios, do not offer any suggestions on how they should research the problem. Instead, suggest that they move onto the next scenario and come back to the problematic one at a later time. The intention is to determine how the participants can resolve these issues on their own.

If necessary use the bottom of each page for additional notes and observations.

Participant 1

Place a check besides each scenario where you observed a resolution by the participant.

Scenario 1 _____
Scenario 2 _____
Scenario 3 _____
Scenario 4 _____
Scenario 5 _____

If the participant was unable to complete a scenario was he or she able to successfully submit a work order to the Media and Technology Department for that scenario.   Yes   No

Make a note beside the scenarios the participant was not able to resolve.

Did the participant ask for assistance at any point during the test?   Yes   No
Participant 2

Place a check besides each scenario where you observed a resolution by the participant.

Scenario 1 _____
Scenario 2 _____
Scenario 3 _____
Scenario 4 _____
Scenario 5 _____

If the participant was unable to complete a scenario was he or she able to successfully submit a work order to the Media and Technology Department for that scenario.  Yes  No

Make a note beside the scenarios above the ones the participant was not able to resolve.

Did the participant ask for assistance at any point during the test?  Yes  No

Participant 3

Place a check besides each scenario where you observed a resolution by the participant.

Scenario 1 _____
Scenario 2 _____
Scenario 3 _____
Scenario 4 _____
Scenario 5 _____
If the participant was unable to complete a scenario was he or she able to successfully submit a work order to the Media and Technology Department for that scenario.  Yes  No

Make a note beside the scenarios above the ones the participant was not able to resolve.

Participant 4

Place a check besides each scenario where you observed a resolution by the participant.

Scenario 1 _____
Scenario 2 _____
Scenario 3 _____
Scenario 4 _____
Scenario 5 _____

If the participant was unable to complete a scenario was he or she able to successfully submit a work order to the Media and Technology Department for that scenario.  Yes  No

Make a note beside the scenarios above the ones the participant was not able to resolve.

Did the participant ask for assistance at any point during the test?  Yes  No
Participant 5

Place a check besides each scenario where you observed a resolution by the participant.

Scenario 1 _____
Scenario 2 _____
Scenario 3 _____
Scenario 4 _____
Scenario 5 _____

If the participant was unable to complete a scenario was he or she able to successfully submit a work order to the Media and Technology Department for that scenario.  
Yes
No

Make a note beside the scenarios above the ones the participant was not able to resolve.

Did the participant ask for assistance at any point during the test?  
Yes  No
Appendix 4
Letter of introduction for each participant

To: Usability Test Participant

From: Jim Mattison; Department of Media and Technology

Re: Introduction to the usability test of the modified knowledgebase.

I would like to start by thanking you for taking part in this usability test of the revised technology knowledgebase. As I had mentioned in my earlier e-mails, my department has made modifications to our existing online work order system in an effort to improve the number of technology issues customers can resolve on their own.

The modifications to the knowledgebase provide a streamlined capability for all faculty and staff members to search for problems and resolutions on technology related issues. If implemented, this knowledgebase will constantly have updates performed on it by designated technology personnel in an effort to record the resolutions to problems found either by themselves or school personnel.

Another modification made to the knowledgebase is an improvement in the ability for an end user to submit a work order to a member of the Technology Department. This functionality exists in the current system but the revised version involves a redesign of the user interface as well as some structural modifications which will help facilitate the entry and delivery of work orders.

The revised knowledgebase is further designed to optimize the troubleshooting process and provide the end user with a degree of autonomy in locating a resolution. Please note that use of this system by end users is not mandatory and if someone is uncomfortable troubleshooting a problem, they won’t have to. They will still have to option to forward a work order to the Technology Department or request assistance from designated members of the schools staff.

The intention of this test is to determine if the revised system provides the necessary functionality for all end users compared to our current system. You have been randomly chosen to take part in the test without any knowledge by myself, or my department, of your technology skill level or troubleshooting abilities.

You will be divided into four groups of five participants apiece. Two will be from the elementary school level, two from the middle school, and one from the high school. Each group will be observed by a member of the personnel who act as first responders in the
schools. He or she is there to note if you were able to successfully complete the test and answer basic questions you may have.

Two groups will be utilizing the existing knowledgebase and the other two will be working with the new one. Note, that we will not inform you which version you are working with. You will be presented with five fictitious problem scenarios that you will attempt to find resolutions on using the knowledgebase. If you are unable to find a resolution, then you can submit a work order to the technology department. If you find yourself stuck on a scenario, please move onto the next one in the list. The observers cannot offer suggestions on how to use the knowledgebase and they will also suggest that you leave the problem scenario behind and move onto the next one.

The test will last one hour with it concluding at 4:30PM. Once the test is complete you will be presented with a survey to fill out before you depart.

If you need to use the restroom please do so now and there are refreshments on the side table. Please let me know if you have any questions or concerns at this time. Thank you again for your participation.

Regards,
Jim Mattison
Department of Media and Technology
Appendix 5
Usability Test Survey

To: Usability Test Participants

From: Jim Mattison; Department of Media and Technology

Re: Survey of the test

Please take a moment to answer the questions below. For each question there is a scale from 1 to 5, with 1 representing (I Absolutely Disagree) and 5 as (I Absolutely Agree).

The search features for the knowledgebase were easy to use and intuitive

1 2 3 4 5

I was able to locate resolutions for the scenarios with minimal problems

1 2 3 4 5

I would be able to use this troubleshooting system effectively in my school or office

1 2 3 4 5

I feel that the system offers a beneficial resource that can potentially help troubleshoot technology issues

1 2 3 4 5

I would encourage my coworkers to use this system first if they have any technology problems.

1 2 3 4 5

In the space below please include any additional comments or suggestions on the overall process or functionality and design of the system.
Appendix 6
User scenarios for the usability test

For each of the scenarios below use the knowledgebase to search for a potential resolution. In the space below each, briefly describe resolution. If you are unable to locate a resolution forward a work order to the Technology Department for that problem. But this is to be done only if you are unable to locate any information on the problem.

Scenario 1

You are using an application in your class called Accelerated Reader, which the students utilize to test reading and comprehension. Recently you have been receiving an error message whenever you or a student opens the software. The message states that there are no classes to choose from and indicates you need to enroll students. However, a few days ago you were using the software with no problem and know for a fact that there are classes and students in the system.

Locate any information on how to restore the classes and students and continue using the software.

Scenario 2

In this scenario you have a printer in your room that is consistently locking up and will not print any of your documents. It is directly connected to your computer and when a problem occurs, you note that the printer has been taken Offline in the Printers folder.

Research what resolutions are available to prevent this from continuously occurring.
**Scenario 3**

A new semester has begun and you need to setup a grade book for each of your classes within Integrate (the grading software used throughout the district). In the past there was always one faculty member in your school that configured everyone's grade books for them. Unfortunately, that person has retired last semester and is no longer able to help. You're on your own.

Research what you must do to configure a grade book for a class.

**Scenario 4**

One of your monitors in your classroom is not displaying anything on the screen. The power light comes on indicating that the monitor is functioning and the computer is on, but you still have no picture.

Locate a resolution for first evaluating your monitor and then how to restore the picture.

**Scenario 5**

The final scenario is another hardware problem. On one of the computers in your room a CD-ROM disk is stuck in the drive. You know that the disk is in there and it just continues to spin. However, you're unable to open the CD-ROM drive, clicking on the Open/Close button on the front of the drive doesn't do any good.

Research a solution on how to open the drive and retrieve the CD-ROM disk.
Appendix 7
Thank you e-mail for each participant

To: (Username)

From: Jim Mattison; Department of Media and Technology

Re: Thank you for taking part in the usability test

Dear (Username),

I would like to thank you again for your participation in the usability test on May 15th of the modified knowledgebase. Your time and effort is greatly appreciated along with the comments and suggestions that you have provided.

We are in the process of evaluating if the revised knowledgebase would be beneficial to implement in the district and we hope to have a decision within the next month. Without your feedback it would not have been possible to properly evaluate the system and its potential value to the district.

Please let me know if you have any questions or concerns and have a great day.

Regards,
Jim Mattison
Department of Media and Technology