

The HOB0 Project

Project Plan

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March 31, 2008

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Executive Summary

A few years back, the Goldstein Library at The Florida State University College of Information had problems with mold. After expensive repairs, the College of Information purchased an HVAC monitoring system. This system collects both temperature and relative humidity data and was put into place in effort to help with the early detection of mold. This system, so far, has collected a large quantity of data. However, there is no procedure in place that renders this information useful. As such, all of the money spent thus far has not yet produced usable results. Pam Doffek, the director of the library, needs simple procedures and documentation that will allow the staff to easily download, convert and determine out of range HVAC system occurrences. Out of range occurrences include any data point in which relative humidity (RH) is greater than 55%, the temperature is greater than 73 degrees Fahrenheit, or a combination of both. The long term goal of this project is to rid the library of all mold concerns. If the problem continues and the data remains just stuck on a hard drive, the library could once again have problems with mold.

Since I am the only person slotted to work on this project, I am responsible for all objectives. The main objective of this project is to develop a comprehensive system of data collection, organization and problem development determination for the Goldstein Library's HVAC monitoring system. Another objective is to write documentation for all processes. This includes documentation for capturing the data from the devices and the process behind extracting the out of range data points. A third objective is to create a new folder scheme to replace the current scheme. This project will also involve creating a map of the library that marks the location of each HOBO device and includes a legend that displays the name of the devices and any other key information. Finally, this project will determine how to put the two non-working data collection devices into commission, or provide a document estimating the cost of replacing the two devices.

With this project, I am making a few assumptions. I am also aware of the constraints. My biggest assumption is that I assume my project sponsor Pam will be there throughout the entire project. I also assume that the data the HOBO devices are collecting is accurate. I assume that anyone who runs the downloading procedures has the necessary basic Excel skills to follow the procedures. Finally, I assume the HOBO Shuttle and the devices will continue to function. If any devices were to fail, replacing them would be difficult due to constraints. One constraint is that the library is fighting with the budget they were given. They cannot afford to replace the devices should they fail. Finally, a constraint that I face is that I have to keep the procedures as simple and detailed as possible.

The information below describes this project, its objectives, my assumptions, and the constraints, all in greater detail. It also details all alternative solutions, and the proposed solution that I feel best solves the main objective. If I follow this plan properly, I will not only complete this project on time, I will develop procedures that will be simple, but detailed and will properly display vital information from the data collected. In the end these procedures should assist in maintaining and controlling all mold problems within the library.

Introduction

Who is the Project Sponsor?

The project sponsor is Pam Doffek, who is an Associate Librarian and the Director of the Goldstein Library located in the Louis Shores building at The Florida State University's College of Information. The mission of this project is to develop a comprehensive system of data collection, organization and problem development determination for the Goldstein Library's HVAC monitoring system. An objective is to provide the Goldstein Library Director and her staff a means to easily download, convert and determine out of range HVAC system occurrences on one page on a monthly basis. Out of range occurrences include any data point in which relative humidity (RH) is greater than 55%, the temperature is greater than 73 degrees Fahrenheit, or a combination of both. All data and conversions will be saved into a new folder organization system that is more logical, e.g. organizing it by year for previous and new data.

The sponsor works for a library in a university setting, so there is not much of a competitive environment. However, they are still striving to be a great source of knowledge for students and others, while maintaining a quiet, educational environment for all patrons. Therefore, they are doing all they can to continually improve the library so that they can compete with other libraries at other universities. The library is also looking for grants and other sources of financing to help bring in more books and technology. So even in the library setting there is still a certain competitive environment.

Who is the Project Team?

Currently, I am the only person slotted to work on this project and no others are expected to join during the project. I have a variety of skills that will help me with this project. I work on projects similar to this at my current job, so my work experience suits me well for this project. I work for a local real estate marketing company called Real Estate Data Services where I take home sales and listings data from thirteen Florida counties and I organize, filter, and set up the data for a printable product we call the Real Estate Report Card. My job involves heavy usage of Excel, including text-to-columns, pivot tables, and custom macros. I take very raw data and I organize it so that it can be put into a printable format that displays information such as sale date, sale price, appreciation rate, previous sale dates and more. I work with large amounts of raw data and I complete custom created procedures that make the data more useful. I hope to use all my skills to complete this project and I hope to learn new skills along the way.

What is the Business Problem?

A few years back, the library apparently had problems with mold. In an attempt to monitor the situation, the College of Information purchased an HVAC monitoring system, which included small devices called HOBOS. HOBOS are devices that are stationed throughout the library that collect both temperature and relative humidity data. A previous group had begun work on this project. The group developed procedures to pull the data off the devices, and by using the software that came with the system, they were able to get the data into two columns in an Excel spreadsheet. However, from there, the group was unable to do anything with that data. There is where the project currently is at this time. The major business problem is that there is all of this data but there no use for it and as such, all of the money spent thus far has not produced concrete results. This project is going to make use of the money spent on these devices to better the library and detect anomalies to help avoid mold. With this project, there are also other business problems and or needs to consider such as profitability, survival and growth.

This project reduces the potential costs that could occur from a mold problem. The costs of fixing a mold problem are extremely high and this project hopes to eliminate this threat. To give some context, the last time the library had problems with mold, it cost them roughly \$65,000 to simply replace the carpet with rubber flooring. This does not even include other damage to walls and books. Since this problem has occurred in the past, there is a high likelihood that it could happen again. These devices will help control all mold problems and in turn reduce these high repair costs.

If mold is detected, the only real way to fix it is to repair walls and any damage done to the building. If mold occurs, the library would probably have to close and thus there will be downtime and the library will not be able to serve its purpose. Not mention the fact that mold puts the library's substantial collection of books in jeopardy. The cost of replacing all of the books would be very high. In fact, Pam did some research to find out how much the collection is worth. Based on the average prices of IT and technology related books, an estimated replacement cost of the Goldstein materials is approximately \$3,435,126.89. Needless to say, this project is hoping to avoid this catastrophic problem so the contents of library remain protected and that the library can remain open and continue to serve its patrons.

This project should help reduce possible costs and can allow the library to focus their efforts elsewhere rather than worrying about mold problems. So this project has the ability to let the library grow as the money saved from no mold problems could be used for other projects.

Why is it Important to Solve the Problem?

If the problem goes unsolved, there is a chance mold problems could return. The HOBOS devices were put into place to help with early detection of environmental factors that are conducive to mold growth. As such, if the data the devices give are not put to use, the devices are not serving their purpose. If the problem continues and the data remains just stuck on a hard drive, the library could once again have

mold problems. This is obviously a major concern, so if this project cannot be completed, it could be very costly for the library.

How Does the Project Solve the Problem?

The long term goal is to rid the library of all mold concerns. By ridding the library of mold it can remain operational and can be available for all its patrons. To do this, the project will take the data from the HOBO devices and make it useful. Once there is a procedure in place to make the data useful, documentation will be needed so that the necessary staff members can complete the procedures themselves. Once the data is made useful, it can be used however needed to avoid future problems. This project will be aligned with the overall goals of the library. They want to create a clean, quiet environment for staff and students so that they can research, study and or complete work. This project would keep the library operating and which would allow the patrons to continue to use the library for those needs. Also, since the library has a very large investment in a variety of books and other materials, this project will help protect those assets. The project also organizes the data in a logical fashion. Libraries are renowned for information organization and the data in this project should be organized to maximize usefulness. Also, all documentation should be clear but thorough so that the goals of the project can be continually reached by any future library staff.

When Will I Deliver the Completed Project to the Sponsor?

By Friday, March 28, 2008. I will have all objectives and requirements completed by this date. All documentation will be turned over to the project sponsor, with copies being made in case of emergencies.

Objectives

Primary Objective: The main goal of this project is to develop a comprehensive system of data collection, organization and problem development determination for the Goldstein Library's HVAC monitoring system. The objective is to provide the Goldstein Library Director and her staff a means to easily download, convert and determine out of range HVAC system occurrences on one page on a monthly basis. Out of range occurrences include any data point in which relative humidity (RH) is greater than 55%, the temperature is greater than 73 degrees Fahrenheit, or a combination of both. This objective is complete when I can demonstrate that the procedures make use of the HOBO data. The project sponsor must agree that the procedure is effective and gives the needed results. Once the data is deemed useful and the procedures are agreed upon, this project is complete. Given the time constraints, this is a realistic objective. The costs are very low since the devices and the materials required have already been purchased. This objective must be completed no later than March 28, 2008.

Objective 1: Develop documentation of all processes including capturing data and downloading it to a designated computer and conversion of the native data from the Boxcar software to other standard formats as necessary such as .txt, .xls, or .pdf. All documentation will be provided in electronic format, preferably in Word 2007 or Word 97/2003 format. This objective is complete when the documentation is complete and is in handed to the sponsor in both printed format and electronic format. The sponsor will review the documentation and agree upon its completion. All stakeholders agree that the documentation is a crucial objective. This objective is reasonable as all documentation can be written as the project goes along. This objective will span the entire project, but is still realistic and will cost very little. Most of the costs will come from time, labor and the cost for any printed material. This objective will span the entire project. However, it must be completed by March 28, 2008.

Objective 2: Create a new folder scheme to replace the current scheme. The old scheme is cluttered and disorganized. I will create a new folder scheme that organizes the data by the year and month in which it was downloaded. If the data is downloaded on January 28, 2008, it will be placed in the January folder inside the 2008 folder. All newly downloaded data will be placed into this folder scheme. I will have achieved this objective when the folder scheme is in place and is ready for use. All parties have agreed that this new folder scheme is a better way to organize the data. This objective should be completed in no longer than a week and should only have costs related to time and labor. This objective should be completed as soon as possible as other objectives will have to include the new scheme. Since this objective is realistic and can be completed relatively quickly, it should be completed no later than February 1, 2008.

Objective 3: Create a map of the library that marks the location of each HOBO device. This map should be as accurate as possible and should have a legend that displays the name of the device and any other key information. I will have achieved this objective when the map is completed and can be printed and understood by the project sponsor or others involved. All stakeholders agreed that this map will make it easier for future parties to find and download the data off the HOBO devices. This objective is also realistic. The library already has a map in place and all that is required is to make any necessary changes to the map and to mark off each location. This map can be completed any time during the project as it is not required immediately. However, if the map can be completed and be out of the way early, I can focus on other objectives. Since the objective is relatively quick and simple, it should be completed no later than February 10, 2008.

Objective 4: Determine how to put the two non-working data collection devices in commission, or provide a document estimating the cost of replacing the two devices. The goal here is to return the number of devices to six, either by fixing the other two, finding two more, or replacing the two non-working devices. This objective will be completed when the other two non-working devices are properly functioning, or when I have given the project sponsor the cost estimate of two new devices. If the estimate is acceptable and two more devices are purchased, I will need to have those devices working for the objective to be completed. I will have completed this objective either way when the device count has returned to six. However, if the non-working devices cannot be fixed, and if two more devices cannot be purchased by the project sponsor, then the objective is still considered complete. All project stakeholders have agreed that this objective is not critical, but should be completed if time permits it. This objective is achievable as well given the time constraints. However, if new devices need to be purchased, then I may not be able to get six functioning devices due to money constraints. This objective could be completed at any point during the project, but it would be easier to get it out of the way earlier so that all devices can be functioning and can be ready for the other objectives. Therefore, this objective should be completed no later than February 8, 2008.

Assumptions

In every project you make assumptions. Sometimes these assumptions are things you do not even stop to consider. For example, you generally just assume that everyone you are working with will be there till the end, so you do not even think about it. However, that is not always the case. In this project, since I am alone, I do not have to worry about any of my teammates leaving. However, there are still many other assumptions that I am making throughout this project. Below is a list of the assumptions I am making for this project:

- **I assume that my project sponsor Pam will be there throughout the entire project.** This is biggest assumption I make. It is most certainly the most important assumption anyway. I assume that Pam will be there throughout the project. I do not see her leaving, but it is something I must consider. If Pam were to move on to another position or were to leave her position for one way or another, my entire project could be compromised. The new director that would come in would probably know very little about my project, and may not even be told of it. The new director may very well just call off the entire project until further notice. So I am making a very large assumption here and I must always keep in mind that Pam may not be available throughout the entire project.
- **I am under the assumption that the HOBO devices will remain in our control.** This is something I must also take into consideration. The library paid for and has the devices in their possession already, but they could very well be moved somewhere else. The devices have been around for three years and there is still no solid procedure for downloading the data off the devices. So these devices really have not served a purpose yet. So, someone else may need the devices more than we do and as such, they could be moved for one reason or another. Granted the new recipients of the devices will probably still need data downloading procedures, so this would not end my project, but it would definitely affect the project greatly.
- **I think the HOBO Shuttle and the devices will continue to function.** I rely heavily on the HOBO shuttle. It is what allows me to take all the data off the devices and put them into one easy storage unit. Then from there I can hook up just the one shuttle and download all of the data at once. Now, if the shuttle were to fail, I could still download the data, but it would take far longer as I would have to download the data off each device individually. Also, I would have to create new downloading procedures as there are different steps required to download data off the individual HOBO devices rather than the shuttle. Now I also assume the devices will continue to work. Two of the devices already have stopped working. So if more of the devices continue to fail, the project would be less effective as there would be less data to work with and the devices would now cover less area than before.
- **I assume that the BoxCar software will continue to function and be available.** I never installed the BoxCar software and I do not know where the installation media is. So, if it were to fail or if the computer it is on were to fail, this would set my project back a bit. I would then have to

reinstall the BoxCar software and set it up so that it could download the data. This would not be a major concern, but I do assume the software will continue to work and this is something I should keep in the back of my mind.

- **I assume that I will continue to be given access to the HOBO devices and the necessary computer when needed.** I generally work on this project at the same time and days on a consistent basis, but unforeseen forces could stop this. Perhaps another project may need that computer during those times slots. That project may be of more importance, so I would have to find another time to work on this project. This would affect my work as I would find it hard to fit this project into another time slot. Also, I assume I will continue to be allowed to work on the computer and access the devices. This assumption goes hand-in-hand with my project sponsor staying. If Pam were to leave I may be denied access to the devices and the computer. Also other reasons beyond Pam's control may hinder me from using the devices and the computer. I do not expect this to occur, but it is definitely an assumption I make.
- **I assume I will be given till my completion date to complete all objectives.** I set a date with my project sponsor and I am under the assumption I have till that time to complete all necessary objectives. I have planned my project schedule with that date completion date in mind, so if this date needs to be moved up, it could cause problems. I do not see me needing all of the required time I gave myself, but there could be outside forces that could delay me. This is why I gave myself extra time. If I were to lose this extra time I would be under heavier constraints and the project may not be completed as well as it could have been. I do not foresee my completion date being altered, but it is something that I must consider. It could very well be moved for one reason or another.
- **I am under the assumption that anyone who runs the downloading procedures has the necessary basic Excel skills that are required.** Even though I will do my best to write the procedures so that they are as simple as possible, the person running the procedures will still need to have basic Excel knowledge. The procedures will include importing text files and running macros, so the person downloading the data will need to at least know what those are and how to navigate through Excel. As mentioned, I will make sure the procedures include what the user will need to do, making sure to include all buttons and check boxes that need to be clicked off and to notify the user of all messages to look for. However, there are still basic functions that I will assume the person will know. I should be aware of this when making the procedures.
- **I assume that the data the HOBO devices get are accurate.** This is actually a very big concern. How do I know the devices are accurate? I assume they are functioning properly, but I must make sure that the data they pull is relatively consistent. What if for some reason the sun ends up on one device, causing the temperature rating of that device to go up. This is a very interesting assumption. My objective is to find the outlying points in the data, but how do I know that the data is accurate? There is no real way to determine if the temperature and relative humidity the device pulls is correct, so I assume it is. This is something I should pay attention to. If I notice

extreme outlying points with one of the devices or if there are major trends in the data, there may be an error with the device.

- **I am under the assumption that the data will continue to be available to me on the network drive.** The data that is pulled off the devices is saved to a network drive. I assume that this data will stay there. When I write the procedures, I will have to reference the save location to this network drive. So I need to make sure that when writing the procedures that I write down a note saying that it may change at some point. Also, I assume that the data will be safe there. That network drive could fail and I could lose some data. Another assumption I make is that this data is backed up. So if the network drive was to fail, most of the data will be recovered. However, any recent changes to the data may not. So I need to make sure that any new changes are backed up elsewhere just in case, especially if it is anything in regards to those new procedures, maps and other new documentation.

Constraints

In every project there are constraints. There is always something that stops you from doing everything you want, and sometimes these constraints make it very hard to just complete the project. It can be from lack of money to time or even such constraints as manpower and office size. In this project there are a few constraints that I have to work under and that I have to take into consideration throughout the project. Here is a list of the constraints that I will be facing:

- The library is fighting with the budget they were given, much like other departments. In fact, Pam has told me upfront that they do not even have money in the budget to buy new HOBO devices, which run at roughly one hundred dollars per device. So, if anymore of the devices are to fail, the library and this project would be limited to the ones that were remaining. Money is the biggest factor in most projects and for this one it is not a major factor, but it is something that is a constraint. The project could be completed with everything that is already in place, but there is no option for upgrading to new devices or software, so we are limited to how much the project can accomplish. If the devices can continue to work for a while this project can cost little to no money at all and if it can avoid mold problems for the library, it can also save money.
- As mentioned in the last constraint, I am working with what I have. There is no new money for new software or devices, so I am working with what is currently there and that is it. Some of the software options could hinder me from completing the task sooner. Perhaps newer versions of the devices or the software could speed up the project. Newer software may have better ways of downloading the data. Newer software could let you set a preferred temperature point and it will notify you if any of the data points are above that. Also newer devices may be more accurate and may let you keep even more data or record different things. Also, the computer that is running the software is not the “best-of-breed.” So it is slower than newer computers and could slow me down, but is not a major constraint.
- A constraint that I face is that I have to keep the procedures as simple and detailed as possible. This will make it take longer to complete the procedures since I need to make them simple. Since the staff and the project sponsor is not extremely technical, the procedures will need to include non-technical language. This constraint will make the procedures longer and more difficult to prepare.
- Time is always a constraint in every project. As mentioned, I set time away just in case something was to go wrong, but there is still always that time constraint. Also, since I have a busy schedule outside this project, there are time constraints from sources outside the project as well. So, something catastrophic could happen during the project and that would set me back. Time is something I should still always consider. So when I think maybe I can take certain time off or wait on doing something, I should make sure to think about the possible time constraints on me and make sure I that I actually do have time for that break.

Alternative Solutions

The priority of this project is to fix the problem with the lack of usefulness of the data being downloaded from the HOBO devices. There have already been solutions to gather the data, but there have been no sound solutions for making use of all of the data. There are a few options available that would help alleviate the problem with the data. These solutions aim to make the data pulled from the devices as useful and easy to follow as possible. This in turn should help control and monitor all mold problems.

Before I can describe each solution however, I must first describe the format the data is in currently. First off, the data is currently held in four different Excel spreadsheets, one for each device. The number of devices could change down the line (see objective four) and there will be a need for two more spreadsheets. The data inside these spreadsheets consists of three columns. There is a column for date and time, which are combined into one column. Then there is the column for the temperature and the column for the relative humidity. For each month there is about 1500 or so data points, each with those three columns. So there are the four spreadsheets with three columns in each. This is currently how the data is stored. This is the format I will be working with to determine the alternative solutions.

My plan with these solutions is to separate the out of range points based on the date and time and then map those points to their proper device. This would allow anyone to see which device, on a certain date and time, registered an out of range point. This would certainly make the data useful. You could know where in the library there were temperature differences and or high relative humidity. Since each device is downloaded to its own spreadsheet, you already know which data points belong to which device. However, I need to determine how to get the data into a format that will display this information. The solutions below outline some of the ways that you can take the data in the three columns and get them into a format that will be useful.

It should be noted that the solutions below are a few possible ways to solve the problem. In the past, for my previous experiences with similar data problems, I have created solutions such as these. I would come up with a possible solution ahead of time, start using it, and then end up finding out it was not a complete solution or found an even easier solution in the process. So, these solutions below are solutions that will complete the problem, but could also lead to other, newer solutions. However, by following these solutions you will get an answer to the problem.

Solution One

After completing the downloading procedures there will be spreadsheets for each device, with each one having those three columns. This solution suggests that you combine all of the spreadsheets into one master spreadsheet. In this spreadsheet there will be individual sheets for each device. Now you have all of the data in one spreadsheet, which will be easier to work with. From there it will start a macro that will sort the data in each sheet by temperature in descending order. This will show you the highest

temperatures recorded for each device. Then the macro will go through each record to see if the temperature is above 73. If a record is above 73, it will copy out the date, time, and temperature and it will paste them to another location. Then, it will sort by relative humidity, and then copy out the ones that are above 55%. Once that is completed, it will create two sections in the sheets for each device, one for temperature and one for relative humidity. So once you run the macro, it would set everything up and would require little effort from the user. From there you now have what time and day that a particular device registered a high temperature or a high relative humidity.

Now this does come with a risk. Since it checks for temperature and relative humidity separately, there is a risk of duplicates. If the data point has a high temperature and a high relative humidity it will be pulled out twice. The risk of duplicates could be frequent to almost non-existent. It all depends on the data that is collected. There could be some data sets that have more duplicates than others and there may be some that have none at all. If there are duplicates, a way to get rid of them would be to combine the temperature and relative humidity columns and do a filter, or use Excel 2007's new duplicate record function. So although this solution runs the risk of duplicates, it does fix the problem. It takes the data for each device and pulls out the out of range points and sets them aside. From here you can take out that data and view the highest temperatures per device and when they occurred. You then can see which ones have high relative humidity.

This solution has certain benefits. This solution is probably the most self automated. You would literally just have to put the device spreadsheets into the master spreadsheet and then just run the macro. It would automatically sort all of the sheets and pull out all of the data. Since it is automated, it would be the quickest method and therefore would require less time to complete. The time saved could be used elsewhere on other tasks. Also, this solution would make it easy for any of the staff members to follow the procedure. However, you take a great cost with this solution. It is not a financial cost, but in order to complete this quickly, you sacrifice some data integrity. Granted duplicates in this case are not catastrophic as you still get to see that there are out of range points, but it will lead you to believe that there are more than there really are. This in turn would create a longer list of data points to look at which would cost more paper if it was printed and would cost more in time since you would have to look at a longer list. However, if there are no duplicates, this cost would be low. So, this solution runs a decent risk of duplicates, but there is a chance there may be no duplicates at all. So there is a high risk cost you could say with this solution. Overall, though this solution would get the job done, and relatively quickly.

Solution Two

This solution starts out similarly to solution one. After completing the downloading procedures you will have the separate spreadsheets for each device. Like in solution one, you will combine all of the spreadsheets into one master spreadsheet. This time however, you will combine all of the data into just one sheet. When you copy the data into this one sheet, you have to mark which device the data comes from. For example, if you copy over data from device 1, you need to place L1 next to each record for

that device. Then you would do the same for subsequent devices. This connects that device to its records. So now all of the data is paired to its device and is all in one sheet. From there you can run another macro, but this time it will do a little more work.

This macro will sort this one sheet by temperature and then relative humidity. This macro will eliminate duplicates. It will first check to see if the data has a temperature above 73, if it does, it will then check to see if it has a relative humidity greater than 55%. If it has both of those, it will copy it out and put it into a new sheet, making sure that it copies out the device number. If its temperature is higher than 73 but its relative humidity is not 55%, it will still copy out to that sheet. If its temperature is not higher than 73 but its relative humidity is above 55%, it will also copy out. This will remove duplicate records. In solution one it checked to see if the temperature was above 73. If it was, it copied it out. Then later it did another check on those same records to see if its relative humidity was above 55%. If it was, it copied it out again. This led to the duplicates. This one will check both conditions at once. If it has both, it will be copied out only once. If it has one or the other, it will still be copied out, but it will never go back to that record again since it was coded to already check for the other condition. Once completed, all of the out of range data will be in one sheet, mapped by the device ID written in by the user prior to running the macro

This solution would cost a bit more in time than solution one. This solution involves a little more interaction from the user. It requires that they copy the data in and add the device name to its corresponding records. This would require a little more time and would keep the user from completing other tasks. Also, since it has to go through more checks to rid out duplicates, it will take far longer to run the macro. So, this solution has a higher time cost. However, it does not come with the duplicate risk that is in solution one. It sacrifices speed for accuracy. It may take longer to complete, but the benefit of that is a more accurate, duplicate free representation of the data. Also, with this solution, all of the data is in one sheet. With solution one, the data is in separate sheets. Granted you could copy that data from solution one into its own sheet, but then you would lose the identity of the records because the sheets are the unique identifiers for that data. In this solution all of the data is there in one sheet and you can sort it all together to see which devices are continually having an issue and which ones are not. In solution one, you could really only see that a certain device was having problems. It did not make it easy to compare the devices to see where the biggest problem is occurring.

There are still risks in this solution as well. The user could enter in the incorrect device name for its records and the record would get mixed up. This would not be a major error as you could still see that there were out of range points, but now you do not know where in the library these points are. The occurrence of this risk should be relatively low since there are only at most six devices and you copy them in separately from a sheet that has the devices name. However, a fix for this would be to incorporate this step into the downloading procedures. Instead of having the user add in the device ID while copying it over, you can add this part to the downloading procedures. So when the user downloads the data into each separate file, they can add the ID in then. When downloading the data you will know which device you are working with because you have to work with each device separately. So the user will know which device number to put in the column.

Proposed Solution

Solution Two

Both solutions mentioned will solve the problem as needed. Solution One is a bit quicker, but loses some quality with the risks of duplicates. Solution Two is a bit slower and would cost more time and man power, but the data is in one sheet and is more accurate. I propose that solution two be used. Although it may take more work and would take longer to run, it is far more accurate and it will give you a more accurate picture of what is occurring. However, as mentioned in the summary before I described each solution, there are times when a new solution will be developed while working through the planned solution. So, solution two could be implemented only to find a third possible solution, or there could be an unforeseen problem with solution two that requires us to rework the solution or revert to solution one. With that said, solution two seems to me to be the best choice. I will choose solution two and will work with this solution. Should problems arise, or a new solution is found, I will revisit the possible solutions again to see what solutions is the best option for this project.

Work Breakdown Schedule

- 1. Create a new folder scheme for K:\HOBO Data**
 1. Backup the old folder scheme. Copy contents of K:\HOBO Data\ and paste it into a backup folder
 2. Create folders for the years, 2005, 2006, 2007, and 2008 in K:\HOBO Data
 3. Create individual month folders for all previous data inside the year folders
 4. Make sure month folders are in numerical order. Add the month number (IE 01 - Jan...)
 5. Move data from old folders into the new folder scheme (Leave old scheme in backup)
- 2. Put the two non-working HOBO devices into commission**
 1. Either fix the devices, or write up a cost estimate to replace the devices
 2. If fixed or replaced, update the devices using the BoxCar Pro software.
 3. Update the new devices so that they download data every 30 minutes.
 4. Update the descriptions for each new device
- 3. Create a map of the library that pinpoints the HOBO device locations**
 1. Create or obtain the a map of the library
 2. Determine the locations and names of the devices
 2. Draw the device locations on the map including the exact device names (found in BoxCar)
- 4. Develop documentation for downloading the data off the HOBO devices**
 1. Go through the downloading process and write down every step (take screenshots)
 2. Download the data from the devices to the HOBO Shuttle
 3. Create the new folder for that month in the current year folder
 4. Using the BoxCar Pro software, download the data from the HOBO Shuttle
 5. Export the data to an Excel Spreadsheet, saving it into the new month folder
 6. Move the Autosaved BoxCar.dtf files (in K:\HOBO Data\), to the new month folder
 7. Prepare the documentation in both electronic and print format
 8. Have the documentation reviewed by Pam
- 5. Write documentation for the procedure that extracts the out of range data points**
 1. Determine an algorithm or method for extracting the out of range points
 2. The algorithm must put the out of range points, for all devices, on one sheet
 3. Out of range points must be associated to their corresponding download time and device
 4. Test the algorithm using test data
 5. Review this algorithm with Pam to see if it meets the requirements
 6. If it does not, determine a new algorithm and repeat task 30. If it does, document every step
 7. Prepare the documentation in both electronic and print format
 8. Have the documentation reviewed by Pam
- 6. Completely run through all procedures and documentation to ensure functionality**
- 7. Have Pam run through all procedures to ensure they are easy to follow**
- 8. If necessary, make changes to the documentation**

Cost Estimate

Estimated Human Resources Costs:

Team Member	Role	Number of Hours	Cost Per Hour	Total Cost
Andrew Bertino	Project Lead	40	\$10	\$400.00

Estimated Project Costs:

Resource	Subtotal
Human Resources: Please see estimated human resources costs.	\$400.00
Hardware : HOBO Devices x 6, HOBO Shuttle x 1, Workstation x 1	\$1,200.00
Software: Microsoft Office 2007, BoxCar Pro 4.3 w/ Serial cable.	\$325.00
Other: Paper, labels, toner.	\$10.00
Total Cost of Project:	\$1785.00

Ongoing Project Costs:

Resource	Subtotal
Human Resources: 1 hour per month for downloading the data at an estimated \$20.00 an hour over 1 year.	\$250.00
Hardware : Batteries for the HOBO Devices and shuttle for 1 year.	\$15.00
Software:	\$0.00
Other: Paper and toner for any printed documents over 1 year.	\$35.00
Total Ongoing Cost of Project (for 1 year):	\$300.00

Project Team Contact Information

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