

## **C868 – Software Capstone Project Summary**

### **Task 2 – Section A**



**Capstone Proposal Project Name:** \_\_\_\_\_ Tool Calibration Log

**Student Name:** \_\_\_\_\_

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## Business Problem

### The Customer

Wallenius Wilhelmsen Solutions is a logistics company that serves automotive manufacturers, rolling industrial equipment manufacturers and the breakbulk shipping industry in the US and overseas. WWS handled 7 million vehicles across 71 processing facilities in 2019. Their scope of work contracted with these companies often goes far beyond just shipping units. Often, they are responsible for final inspection of vehicles coming off assembly lines, accessorizing vehicles coming off the line, and repair of damaged units before final delivery.

The team at WWS prides themselves in their commitment to reduce waste in the supply chain process. To improve efficiency, they continuously analyze their processes to find cost cutting measures that maintain industry best practices.

### Business Case

As a result of their customer base, WWS is held to very strict standards on their quality control. Every install must be made with precision, accuracy, and consistency. Therefore, every tool that is in use must meet calibration standards on a monthly basis. Any tool that does not pass calibration must either be repaired and retested, or that tool needs to be taken out of service.

The volume of equipment that some of the larger sites must constantly keep track of can be a daunting task for most supervisors/team leads. This leads to tools consistently missing their scheduled calibration time which can lead to costly mistakes during installations. A solution needs to be implemented to help management spend less time keeping up with equipment calibration schedules and more time refining processes with their employees.

### Fulfillment

By utilizing a Java application coupled with a SQL database, tool calibration logs can be stored for all sites in a centralized location. Calibrations will be able to be performed and recorded in a more consistent manner. Alerts will notify the appropriate users of upcoming tool calibrations. Reports can be pulled effortlessly by auditors, supervisors, and corporate administration to ensure standards are being met.

## Existing Gaps

Currently all sites at WWS use an ad hoc approach for tool calibration scheduling and logging. Some sites use Excel spreadsheets to record each test, some use Word documents, and others use handwritten documentation. Many issues stem from this lack of standardization. Reporting calibration activity to internal and external auditors has at best been adequate, and at worst, completely unavailable. Supervisors and Leads can become overwhelmed with tracking tool calibration status due to the volume of tools in their possession and the disconnect between the owning supervisor and the maintenance team responsible for performing/recording calibrations. Often the supervisor ultimately responsible for the tools has little to no visibility on the outcomes of the tool calibration.

## SDLC Methodology

The Waterfall Method will be utilized for this project. The requirements are well established for what the application must accomplish. The project itself isn't very long and therefore can benefit from the straightforward approach of the Waterfall Method. Also, the members of the company that would normally be available for testing during the development cycle are on furlough due to Covid-19 so an Agile approach would be a little more difficult to achieve.

### Requirements Phase

This phase begins with the discovery of the clients needs. Meetings are held to determine what objectives need to be set to ensure that the software achieves the purpose intended. This phase produces the project requirements document which should be approved by all stakeholders before kicking off the design phase.

### Design Phase

In the design phase, the application starts taking shape in the form of mockups and diagrams. The wire frame is created to demonstrate application flow. The prototype is a visual representation of how the application should look in its end state, but without the logic to drive the data. This phase also contains deliverables such as, database diagrams to show relations between data objects and testing plans to show how the product will be validated.

### Implementation Phase

This is the phase where the documentation from the previous phases are brought together and used as a guideline on developing the application itself. Developers and designers collaborate to ensure that the objectives from the requirements document and design principles from the previous phase find parity in the end product. The key deliverable for this phase is software that meets this criterion.

### Testing Phase

The testing phase helps ensure that the previous phase made good on its promise to meet the customers requirements. A team of quality assurance members will rigorously test the application to find any software anomalies and document the bugs. These documented issues will be sorted by severity and resolved by the development team in a timely manner.

### Delivery Phase

Once testing has been completed, the product is ready to be delivered to the customer. This involves the application being put into a production environment. This phase can take extensive coordination depending on the scope of the project and what it's replacing.

### Maintenance Phase

Often the testing phase can't catch every issue that could arise in an application. Therefore, the final phase in this methodology is the maintenance phase. During this phase, customer discovered bugs will be cleaned up and undesirables patched. The timeline for this phase depends on the contract for such services.

## Deliverables

As described in the SDLC Methodology section above, the Waterfall Method has a list of deliverables that should be produced during each phase. These can be further broken down into the categories of project deliverables and product deliverables.

### Project Deliverables

These consist of items that are part of the Project Manager's realm of responsibilities.

- Project Requirement Document
  - A detailed list of what the application must achieve to be considered a success for the customer. The requirements should be descriptive enough to make them unambiguous, but they should not contain technical details on how to execute the solution. This document will serve as the guideline for resource needs.
- Project Schedule
  - This will breakdown each stage of the project into tasks with estimated timelines for each.
- Wireframe
  - The wireframe is a low-fidelity mockup that is used to showcase the workflow of the application.
- Prototype
  - A more robust version of the wireframe. This will contain design elements of a finished product. It will have the appearance of a finished product, even going so far as having tables with data in it; however, the data will just be a placeholder as no logic will have been built yet to interface with external sources.
- UML Database Diagram
  - Shows the database layout for how objects are modeled. It also shows how each of the entities are related to each other.
- Testing Plan
  - Functional tests will be used to test that key functionality from the requirements document have been implemented appropriately. Test procedures will be clearly documented and performed by the QA team.

### Product Deliverables

Product Deliverables represents what is produced to deliver to the customer.

- Graphical user interface that mirrors the prototype
- Workflow that matches the design of the wireframe
- Relational Database whose schema follows the design of the UML Diagram
- Assistance with initial data import
- Secure Global Admin accounts for key individuals
- Complete application that meets all requirements

## Implementation

During the requirements phase, we will gather requirements data from the management at WWS. This will include an initial one-hour video conference session to discover requirements needed for a successful project. An additional one-hour follow-up session will be scheduled to review the initial findings and add any additional requirements that may have been realized since the initial conference to finalize the list.

Once the wireframe is finished it will be validated by the Quality and Maintenance teams at WWS since they will be the primary end users. Once approval of the wireframe has been established a prototype will be created with a follow-up trial with Quality and Maintenance. This approval will kick-off the implementation phase where we'll become autonomous and WWS shouldn't need to be involved again until the testing phase. This is also where we deliver the data import spreadsheet template for WWS to fill out for each of the sites. This will allow us to assist with the initial database import during the delivery phase.

The testing phase will begin with a QA team testing every aspect of the application, reporting any bugs on a bug report. Our development team will rank the severity of bugs and tackle them from most to least severe. Once the QA team is confident the application is working as intended the application will go into user acceptance testing. A final signoff will be done upon completion of the acceptance testing.

Now begins the delivery phase. WWS already maintains a centralized virtual environment that can host the application and store the database securely with minimum resource cost. No disruptions will be caused during deployment since the application and database will be hosted on a new virtual machine. WWS will provide the virtual environment with MySQL and we will provide the DDL script to build the schema. Using the template that WWS filled out we will work with the WWS team to ensure the data is clean and will create import scripts to upload a good baseline of data.

## Validation and Verification

Our Quality Assurance team will use the requirements documentation to define a suite of functional tests to ensure the application has achieved its objectives. They will also rigorously test input validation and other aspects of the application where bugs can permeate.

Once the application is validated through functional testing it moves on to the most important step. User acceptance testing is performed by the customer to demonstrate (hopefully) that the application is ready for the daily tasks demanded by WWS. As the name describes, the user must approve the state of the application before this step is complete and the application can move to production.

## Environments and Costs

### Programming Environment

The application has been developed entirely in Java making it compatible with Windows, Mac, and Linux clients utilizing Java Runtime Environment version 8. This application will be tied to a MySQL database via a JDBC library. The application and MySQL database will be hosted on WWS's centralized virtual environment in which all their sites have access to within their network.

## Environment Costs

Initial costs for the new virtual machine will be minimal as WWS pays a per socket license for its Xen Server hypervisor. The WWS IT support staff are most familiar with the Windows environment, so the operating system for hosting the database will be the costliest part at \$501 for Windows Server 2019 Essentials. The opensource community edition of MySQL has no upfront or recurring costs. No recurring hardware or software costs exist.

## Human Resource Requirements

The project team consists of a project manager, a designer, a developer, and a quality assurance specialist. The project manager will be very active during each phase with the only exception being the development, or implementation, phase. Estimates put the project manager at approximately 80 hours for the entire project. Our PM's rate is at \$50 per hour, costing right at \$4000. Our designer will primarily operate in the design phase taking approximately 32 hours at a rate of \$60 per hour, or \$1920. The developer will operate during the longest phase, implementation, and will therefore need 120 hours. Our developer's hourly rate is \$75 per hour which comes out to \$9000. Our quality assurance will operate at no more than 40 hours at \$50 per hour, or \$2000 in total. Please see the table below for a cost breakdown:

Role	Rate	Time	Total
Project Manager	\$50/hr	80 hours	\$4000
Designer	\$60/hr	32 hours	\$1920
Developer	\$75/hr	120 hours	\$9000
Quality Assurance	\$50/hr	40 hours	\$2000
<b>Grand Total</b>			<b>\$16920</b>

## Project Timeline

Phase	Milestone/Task	Deliverable	Description	Dates
<b>Requirements</b>	Task 1 / Discovery	Requirements document & Schedule	Virtual Meetings to discuss objectives/requirements.	5/4/2020, 5/8/2020
<b>Design</b>	Task 2 / Wireframe and Prototype	Low-Fidelity Wireframe & High-Fidelity Prototype	Design the UI elements to simulate the flow and visual appearance of the application.	5/11/2020 – 5/14/2020
<b>Design</b>	Task 3 / UML Diagram	Database UML Model	Schema will be modeled to demonstrate database design and relationships between entities.	5/11/2020 – 5/13/2020
<b>Design</b>	Task 4 / Testing Plan	Testing Plan	Developers and project manager will define plan for functional and user acceptance testing.	5/14/2020 – 5/15/2020

## Tool Calibration Log

<b>Implementation</b>	Task 5 / Application	Release Candidate 1.0 of the Application	Utilizing the requirements and design documentation the developer will build the application to meet the specifications.	5/18/2020 – 5/29/2020
<b>Testing</b>	Task 6 / Functional Test	All functional tests complete	QA performs testing to verify that requirements are met from initial document.	6/1/2020 – 6/5/2020
<b>Testing</b>	Task 7 / Acceptance Test	All user acceptance tests complete and customer signoff	Customer performs testing to verify that all requirements are validated.	6/8/2020 – 6/10/2020
<b>Deployment</b>	Deploy Application	Application deployed to production server	MySQL and application hosted on production server. MySQL schema populated.	6/15/2020 – 6/16/2020
<b>Maintenance</b>	Maintenance Plan	Maintenance contract	Define terms of service for ongoing maintenance.	6/17/2020