Project Plan

KSU Student Portal

Version 1.0

Submitted in partial fulfillment of the requirements of the degree of MSE

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1. Task Breakdown

1.1. Inception Phase

The inception phase will concentrate on the project’s overview and its requirements. This phase will include the production of a Vision Document, a Project Plan, a Software Quality Assurance Plan, and a simple prototype of the application. Each of the four works will be approved by the committee before continuing with the project.

1.1.1. Vision Document

This document will include the overall project description and the critical requirements. It includes its goals and purpose. Also it has graphical models that are used to describe the system, and use cases to illustrate the main functionality.

1.1.2. Project Plan

This document will include a timeline for the project and an estimation of the cost for completing the project. Cost estimates will be calculated using the COCOMO estimating methodology. The process will include the following phases: Inception Phase, Elaboration Phase, Production Phase, and the Transition Phase.

1.1.3. Software Quality Assurance Plan

This document will describe an outline of the documents required to ensure software quality. This document will outline project reviews and the responsibilities of those associated with the application validation.
1.4. Simple Prototype

A simple prototype will be developed to show at least some aspect of the software. This way we can find the errors before implementing the actual project.

1.2. Elaboration Phase

The elaboration phase is focused on the design of the application. This phase will include the production of an Architecture Design Plan, revisions to the Project Plan and the Vision Document, a formal specification, Test Plan, and two architecture inspections.

1.2.1. Architecture Design Plan

The Architecture Design plan will include appropriate UML diagrams such as class diagrams, use-case diagrams, and sequence diagrams necessary to describe the system.

1.2.2. Revisions of Project Plan and Vision Document

Appropriate changes suggested by the committee at the end of the first phase will be made to the Project Plan and Vision Document.

1.2.3. Formal Specification

A formal requirements specification will be developed for this project, probably using the Alloy Constraint Language.
1.2.4. Test Plan

In the test plan we will specify a complete testing procedure for the project. This will include test suites and appropriate procedures for reporting and correcting failed test.

1.2.5. Architecture Inspections

Two architecture inspections will be performed by MSE students at Kansas State University.

1.2.6. Second Prototype

An improved version of the first prototype will be implemented in this phase.

1.3. Production Phase

The production phase includes project implementation and testing.

1.3.1. Project Coding

Project coding will consist of all committee approved and designated tasks to be coded and developed. Both unit testing and integration testing will be performed throughout coding. Test cases will be developed according to the project requirements outlined in the project’s Vision Document.
1.3.2. Project Documentation

All aspects of this project will be well documented. Probably the next items will be provided:

- *JavaDoc* documentation to explain the source code
- Post test document with all results of the test plan. Including the solutions or corrections to the case of test failure.
- User manual that will include description of project installation, software usage requirements, and software usage.
2. Gantt Chart

In the next figure the Gantt diagram shows the initial planning of all the phases and its different tasks.
3. Cost Estimate

COCOMO

The COCOMO model is a software estimation model developed by Barry Boehm. It will be used to estimate project effort and time. The COCOMO model describes three different types of applications: Embedded, Semi-Detached and Organic. Since, the KSU Student Portal is a normal enterprise application with no special requirements it fits into the organic model. The COCOMO model provides the following equations to calculate effort and time:

\[
\text{Effort} = 3.2 \times \text{EAF (Size)}^{1.05}
\]

\[
\text{Time (in months)} = 2.5 \times (\text{Effort})^{0.38}
\]

To calculate effort one needs to estimate the Size and EAF values. The Size is measured in KLOC. The EAF value stands for effort adjustment factor and is the product of 15 adjustment factors. Each adjustment factor is classified as very low, low, normal, high, or very high. The value of each adjustment factor lies within a range and the classification will determine where on the range the value will falls.
The table below lists all the adjustment factors and their corresponding ranges.

<table>
<thead>
<tr>
<th>IDENTIFIER</th>
<th>EFFORT ADJUSTMENT FACTOR</th>
<th>RANGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>RELY</td>
<td>Required reliability</td>
<td>0.75 - 1.40</td>
</tr>
<tr>
<td>DATA</td>
<td>Database size</td>
<td>0.94 – 1.16</td>
</tr>
<tr>
<td>CPLX</td>
<td>Product complexity</td>
<td>0.70 – 1.65</td>
</tr>
<tr>
<td>TIME</td>
<td>Execution time constraint</td>
<td>1.00 – 1.66</td>
</tr>
<tr>
<td>STOR</td>
<td>Main storage constraint</td>
<td>1.00 – 1.56</td>
</tr>
<tr>
<td>VIRT</td>
<td>Virtual machine volatility</td>
<td>0.87 – 1.30</td>
</tr>
<tr>
<td>TURN</td>
<td>Computer turnaround time</td>
<td>0.87 – 1.15</td>
</tr>
<tr>
<td>ACAP</td>
<td>Analyst capability</td>
<td>1.46 – 0.71</td>
</tr>
<tr>
<td>AEXP</td>
<td>Applications experience</td>
<td>1.29 – 0.82</td>
</tr>
<tr>
<td>PCAP</td>
<td>Programmer capability</td>
<td>1.42 – 0.70</td>
</tr>
<tr>
<td>VEXP</td>
<td>Virtual machine experience</td>
<td>1.21 – 0.90</td>
</tr>
<tr>
<td>LEXP</td>
<td>Language experience</td>
<td>1.14 – 0.95</td>
</tr>
<tr>
<td>MODP</td>
<td>Use of modern practices</td>
<td>1.24 – 0.82</td>
</tr>
<tr>
<td>TOOL</td>
<td>Use of software tools</td>
<td>1.24 – 0.83</td>
</tr>
<tr>
<td>SCED</td>
<td>Required development schedule</td>
<td>1.23 – 1.10</td>
</tr>
</tbody>
</table>
According to the characteristics of my project I choose the following values:

- RELY as \textit{normal} and a value of 1.10
- DATA as \textit{normal} and a value of 1.05
- CPLX as \textit{normal} and a value of 1.4
- TIME as \textit{normal} and a value of 1.28
- STOR as \textit{low} and a value of 1.1
- VIRT as \textit{low} and a value of 0.95
- TURN as \textit{low} and a value of 0.9
- ACAO as \textit{high} and a value of 0.8
- AEXP as \textit{low} and a value of 0.9
- PCAP as \textit{normal} and a value of 1.1
- VEXP as \textit{normal} and a value of 1.0
- LEXP as \textit{high} and a value of 1.0
- MODP as \textit{high} and a value of 0.88
- TOOL as \textit{high} and a value of 0.9
- SCED as \textit{high} and a value of 1.16

Using the factors described above the \textbf{EAF} value will be 1.416. I estimated the size to be 3500 LOC based on the current prototype and similar examples. The effort evaluates to:

\[
\text{Effort} = 3.2 \times (1.416 \times 3.5)^{1.05} = 17.1 \text{ staff months}
\]
The time can now be calculated as:

\[ \text{Time} = 2.5 \times 17.1^{0.38} = 7.3 \text{ months} \]

The 17.1 months for effort seems a little high for a MSE project, but this is due to the fact that COCOMO is focused on big and “real” projects where there are more security and reliability constraints plus there are more people involved. This project will only have one developer and will not rely on any other applications to function, so I would guess that 8-9 staff months for Effort would be a more realistic value.
4. Architecture Elaboration Plan Completion Criteria

The following items must be completed before the second presentation.

4.1. Revision of Vision Document

Changes will be made in the original Vision document and will be compiled in the Vision Document 2.0 as suggested by the committee.

4.2. Revision of Project Plan

Project Plan 1.0 will be revised and compiled into Project Plan 2.0. The time and cost estimates will be revised using a bottom-up approach based on project progress. The revisions will contain a complete listing of project requirements and contain changes suggested by the committee members following presentation one.

4.3. Architecture Design

This is a critical phase in the project where the design of the application will take place. UML diagrams will be used to describe the system architecture in the most accurate way, documenting all the models.

4.4. Development of Prototype

Prototype 1.0 will be enhanced to Prototype 2.0. The prototype will demonstrate the critical requirements (defined in the Vision document) to demonstrate they can be implemented. It will include all the improvement suggested by the committee.
4.5. Test Plan

A test plan will document the tests that are to be performed to ensure the requirements are met.

4.6. Formal Technical Inspections

Two MSE students, Patrick Gallagher and Jacek Brydak, will provide input into the testing of this project by completing a formal technical inspection. It will include a function testing checklist so that the requirements outlined in the Vision Document may be evaluated. The formal technical inspection list will be prepared and will be approved by the major professor.

4.7. Formal Requirements Specification

At least one part of the project will be formally specified using a methodology such as Alloy.