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|  | | **School of Business, Law and Computing** | | |
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| **CO557 Software Engineering:**  **CW2** | | | | |
| **Module Title:** | Software Engineering | | **Module Code:** | CO557 |
| **Assignment No/Title:** | CW2 | | **Assessment Weighting:** | 50% |
| **Submission Date:** | **Friday 27th May 2022 by 23:49** | | **Feedback Date:** | + 3 Weeks |
| **M****odule Tutor:** | Mike Everett | | **Degree/Foundation:** | BSc Hons Cyber Security |
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| **Course:** | BSc. (Hons) Cyber Security | | | |

**Title**

**ELEMENT (1) - A Project Plan and Schedule, setting milestones, identifying resource usage, and estimated costs.**

The following areas should be included: -

a) Produce a Project Plan addressing the areas of:

* Introduction **(5)**
* Project organisation **(10)**
* Risk Analysis **(10)**
* Hardware and Software resources requirement **(5)**
* Work breakdown **(5)**
* Project schedule **(5)**
* Monitoring and Reporting mechanisms **(5)**

b) Critical Evaluation of the importance of creating a workable Project Plan. **(5)**

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## Introduction

This project plan will begin by discussing the Project Organisation techniques such as Work Breakdown Structure (WBS) used to break down a large task into smaller tasks which assists in creating a flowing development schedule. It justifies the appraisal for the project of £250k over 3 months including 5 employees, by breaking down each role of the employee and discussing how they will help achieve the overall goal of creating a functioning FASAM system.

It will discuss potential risk factors including Staff Turnover, Specification Delays and changes to requirements that will require a major design rework and discuss the in-place measures implemented to minimalize these risk factors.

It will then display a structured schedule including the task breakdown, deadlines, dependencies between tasks and employees required to complete the tasks. It will finish by exploring the monitoring system implemented to ensure the software application stays on-track to meeting the set deadline of 3 months.

## Discussion

Chart

Description automatically generatedA successful Project Organisation must consist of a clear and consistent scheduling, cost estimation and a structured development team. The Fire and Security Alarm Monitoring System (FASAM) being developed will cost a total of £250k over 3 months including 5 employees. The cost for the development of this software consists of four factors: Design (UI), Development, Hardware/Software and Quality Assurance. The breakdown of the division of the £250k is displayed below:

The Design (UI) department consists of a design and front-end development team and costs a total of £45k. The Development department consists of a team of coders to work on the functionality of the software and totals out at £80k. The Hardware/Software accounts for the office space, development environment, database software, design software, coding software and security applications used within the development of the application totalling to £62.5k. Quality Assurance is a fund of £62.5k to account for any changes required in the budget of the project to ensure that functionality does not differ from its standard.

To ensure the 3-month deadline for the development of the software is met, the larger task of creating a functioning Fire and Security Alarm System (FASAM) will be broken down via a Work Breakdown Structure (WBS) into smaller tasks with weekly deadlines set, this is to assist in both the monitoring in the flow of the development to meet the deadline (3 months) and to act as a clear guideline for each employees required tasks for the week. This will be discussed further in the work breakdown section.

As previously discussed, there are 5 employees within the development team for this project, the Design (UI) team consists of two employees: Lead Designer and Front-End Coder. The development team consists of three employees: 2x Full stack coders and a Junior Software Engineer. The payment for these employees is displayed below:

|  |  |
| --- | --- |
| Role | Payment |
| Lead Designer | £35k |
| Front-End Coder | £10k |
| Full Stack Coder | £30k |
| Junior Software Engineer | £20k |

The risks identified during the planning process of this software development project include Staff Turnover in which experienced staff will leave a project prior to its completion, Specification delays in which essential components of the project are not completed within their scheduled window, and changes to the requirements which requires a major rework of the design of the application.

To prevent the risk of Staff Turnover, each employee’s salary is divided into monthly payments, each staff member will receive 26% of their salary per month totalling to 80% of their total salary over 3 months, they will receive the final 20% upon the completion of the FASAM. This will ensure the budget for the software development will not be significantly damaged if an employee decides to quit on the project, it also ensures employees will work to deadlines more consistently as 20% of their salary is reliant on them completing the FASAM within the scheduled window.

The risk of Specification Delays cannot be fully negated as it is unpredictable to what issues may arise, however the Junior Software Engineer employee’s main role in the organisation is to undertake a primary role of a Full Stack Developer and assist in developing the main functionality along with the other 2 Full Stack Developers in the event of a specification delay. This will increase production speed and therefore will help get the project back on track to retain the scheduling deadlines. This implementation of a third (backup) coder also creates redundancy in the workplace accounting for any staff illnesses within the development team that may arise preventing that risk from significantly affecting the production of the software.

The risk in which changes to requirements that will require a major design rework is handled by the Lead Designer employee. Within this role they are required to consistently review and report the design functionality to identify improvements that can be made. They are also required to regularly discuss the project with the developers to ensure they are familiar with the structure of the software and changes that have had to be made to present the Lead Designer with enough information required to adjust the design accordingly.

When developing software new risks are consistently encountered, therefore a risk documentation format has been developed as shown below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Risk | Potential Consequences | Plan | Resolved Y/N | Comments |
|  |  |  |  |  |

As previously discussed, the total cost for the Hardware and Software required to develop the Fire Alarm and Security System is £62.5k. The total cost for the Hardware is £46k and the total cost for the Software is £16.5k.

For the team to develop the software, they must have access to an office space. Therefore, the hardware budget accounts for the rental for an office space including 5 workstations and a conference area requires £5k monthly, over three months the total is £15k. The workstations and interior office space design combined cost £20k. This cost includes 5 PCs costing £2k each which includes the minimum specification requirements to run the hardware-intensive software used within the development of an industry standard application. The remaining £10k includes the network, internet, furniture, and equipment within the office space and a database.

The Software required to develop the application involves database software, development software, designing software, reporting tools and digital security software.

The database software overall costs £8k and includes the digital storage of data which must be paid to a large-scale data centre such as Microsoft Azure to ensure the data is kept secure. Physical security of the server and admin-privileged devices to the database and the digital security tests that will be undertaken externally to the development team of the software application.

The development software used within this application are mostly open-sourced software development tools including VS code. However, for a secure development process, SolarWinds Database Performance Analyzer (£1625) will be used during software development which is a database anomaly detector that identifies early arising issues within a database including attacks or issues with code harming the database.

A further £4k is spent on the software licensing rights for the commercial use of the tools Figma, GitHub Premium and Meisertask for all employees.

Figma is a digital whiteboard application in which a development team can all make real-time changes to brainstorm ideas, discuss development plans and exchange information. GitHub Premium is a reporting tool software which allows developers in a development team to structurally exchange the code between employees. Meistertask is an industry used tool to digitally manage the deadlines for tasks and visualise schedules.

The last piece of paid software required for the development process is Qualys Web Application Scanning (WAS) which is an automated security testing tool that scans a web application for vulnerabilities within the application including vulnerabilities to SQL Injections.

The work breakdown for each employee of the development team will now be discussed. Firstly, the Lead Designer is required to consistently review the software through both its user-interface and its functionality, this allows them to identify changes that need to be made. They are then required to format these required changes and forward them to the correct employee within the development team to implement the changes. The Lead Designer as will later be discussed is also required to submit a daily report of the work of the development team to ensure the project is on track to meeting deadlines and adjust accordingly if the project is not on track.

The Full Stack developers are required to have a deep understanding of the coding languages: Java, JavaScript, PHP, HTML, CSS, and MySQL. Their role is to code the key functionality of the project which involves developing a sensor system connected to a physical fire alarm, a monitoring environment to monitor the rooms of a building with each fire alarm sensor system installed and develop a database structure connected to the system to record all the previous history of each FASAM system alert.

The Junior Software Engineer is also required to have a strong understanding of the same coding languages as the Full Stack Developers as their role is to consistently communicate with the Full Stack developers and review the reports created by the Lead Designer to identify all the bugs, issues and improvements that have arisen in the development process of the FASAM system. They are then required to append each bug, issue, or improvement to ensure the development of the software product (FASAM) stays on track to being completed within its scheduled 3-month window.

The Front-End Developer must have an advanced knowledge and creativity within the coding languages: HTML, CSS and JavaScript. They will be required to design a user-friendly, interactive, informative, and structured front-end UI for the FASAM system application. They will work directly with the lead designer to ensure the UI functionality matches that of the outlined UI from the customer.

Each employee’s role dependencies within each task will now be discussed within the ‘Role Dependency’ section of the table in the project schedule below.

To confirm the project will be completed within 3 months, each employee involved in the physical development is given a strict schedule of tasks and deadlines throughout the process of the development of the FASAM system software application. The schedule consists of 8 weeks of development (2 months) leaving a flexible 4-week window to account for any issues that may impair the development process for the application. Each individual task also includes their dependencies meaning the tasks that must be completed prior to the development of the current task, this adds further structure and context to the employee of their current task.

|  |  |
| --- | --- |
| FS1 | Full Stack Developer 1 |
| FS2 | Full Stack Developer 2 |
| FE | Front End Developer |
| JSE | Junior Software Engineer |

Each employee is given an ID, as shown below:

## 



Table

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The monitoring system of the development process will ensure to keep everyone on track to meeting the 3-month deadline no matter the issues that arise. As previously discussed, the primary employee that will ensure this is the Junior Software Engineer by filling the gaps and working on problems with code and functionality that are encountered. It is therefore important to have a format for bug and error reports that can be directly made when a bug or error is encountered to structurally communicate these issues throughout the team, the structure for this documentation is displayed below:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Bug/Error | Potential Cause | Actual Cause | Resolution | Comments |
|  |  |  |  |  |

As previously discussed, and displayed in the risk section, there is a format for submitting risk factors that have been encountered.

Another factor that accounts for the work ethic of the employees that was previously discussed is their salary in which they only receive the final 20% of their salary upon the completion of the FASAM system application, this is a motivational tool inspired by the bug-bounty program which software engineers commonly take part in allowing them to earn money based on their performance.

The Lead Designer is the final assurance that all deadlines are met, they are the cornerstone for the communication and documentation within the development team. This role is utilized to take over the majority of the non-code-based assignments required to keep the project ongoing, therefore relieving the duty from the developers allowing the developers to focus solely on the software product.

## Evaluation

Overall, it is important to create a structured plan prior to the development of a software application to allow for the estimation of pricing, scheduling and workforce required to develop when presenting a customer with an appraisal and offer.

The Work Breakdown Structure (WBS) process of dividing a larger overall goal into smaller tasks allows for a complex project to be simplified and approachable, these smaller tasks can also then be structured into a schedule which is essential when working to a deadline of a software application. These structured schedule plans can also be utilized to identify the job roles that need to be recruited to ensure the development is possible and capable within a set window of time and budget.

It is also important to both identify the risks prior to creation and document risks encountered when developing a software application, as adjustments can be made to minimalize the potential damages of the risks, therefore increasing the likelihood of a successful application.

Listing out all software and hardware enables a clear-cut calculation of the budget that is required to be allocated to that sector of the project, however a development team should always be required to have a back-up fund which acts as a Quality Assurance measure to ensure that the quality of the product will not be impaired by the miscalculated budget of the product.

Identifying the employees job specification requirements also allows for the correct recruitment of professional assistance needed when developing a software application, this should always be done prior to recruitment as the application can be significantly damaged by the interference of an employee without the correct professional knowledge of the tools used.