**Capstone: Asset Management Application**

**Task 2 - Section A**

**Western Governors University**



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**Project Table of Contents**

Project Overview 3

Customer Overview 3

Problem Summary 3

Proposed Solution 4

Project Rationale 6

Project Requirements 8

Project Environment Costs 8

Human Resource Costs 9

Project Planning 11

Development Methodology 11

Goals, Objectives, and Deliverables Table 13

Goals, Objectives, and Deliverables Details 14

Project Timeline, Dependencies & Milestones 18

Project Execution 20

Project Implementation 20

Outcome & Validation 21

# Project Overview

## Customer Overview

Pinnacle Technologies is a new up-and-coming startup based in the heart of Silicon Valley. The company prides itself on its mission statement: “We are going to meet the technology needs of the future, today!” Pinnacle Technologies plans on accomplishing this monumental task by unifying their staff of highly skilled software engineers and trained Futurists to develop a suite of innovative hardware and software tools that the market doesn’t even know they need yet. The organization just released its first public facing product last month and it has taken the world by storm. Venture capital firms are now lining up at the door to invest in the next big idea that Pinnacle Technologies is planning. While the executives of Pinnacle Technologies have their eyes and ambitions set 10 years in the future, the IT infrastructure within the company is starting to crumble under the notable growth that the startup has experienced after the most recent round of funding. What started as a humble IT infrastructure team of four people supporting a single campus, is now forced to rapidly expand and accommodate three new campuses recently added to the organization’s portfolio to support an ambitious set of upcoming projects.

## Problem Summary

Last week the Director of IT received approval from the finance department to purchase any new infrastructure equipment necessary to build out the three new campuses. The Director quickly called an all hands meeting with her staff to begin the process of scoping out what is needed in order to fulfill this request. During the meeting, one of her team members quickly reviewed the spreadsheet the team uses to track all of the companies IT assets. After careful inspection, the team realized that their spreadsheet was not up date. Many newly added assets had not yet been added to the spreadsheet, and older assets that had been decommissioned were still included in the reference.

The Director’s inventory assessment request at the all hands meeting exposed an inventory management problem. This issues is a weakness in the company that could prevent scaling growth of the IT department and leave the department unable to match the dramatic growth of the organization overall. With the new offices of Pinnacle Technologies scheduled to open in only three months, the IT infrastructure team established that they needed to identify an efficient and effective asset management solution and implement it quickly. The team agreed that they had the ability to create an in-house solution, custom built around the needs of the organization rather than shoe horning the organization into a pre-existing rigid asset management product from the open market. The in-house solution would also be cheaper for Pinnacle Technologies than an open market solution, saving the organization money long-term. The IT team brought their idea for an in-house asset management solution to the attention of their Director. Having faith in her team to produce results, she partnered with Pinnacle Technology’s executive leadership to procure funding and invest in a pilot program to build the new asset management solution.

## Proposed Solution

Once the project was green lit by the executive team, a project meeting was called between the various stakeholders and the members of the IT team. The purpose of the meeting was to define the the scope of the project and the related development decisions around the new asset management solution. The first topic that was addressed was whether the product should be developed in-house or if Pinnacle Technologies should outsource the build to a third party company. Pinnacle Technologies has prided itself on having some of the best software engineers in Silicon Valley, the organization planned to utilize this strength and dedicate its own group of engineers within the organization to design and implement the solution in-house. Once the labor source for the project was decided, the team discussed the two main weakness the the current asset management solution exhibited in order to define the parameters of a proper solution. An effective solution must 1) allow the IT team to input data into the database no matter where they were located, and 2) ensure that the data inserted into the database is accurate.

The IT team needed to understand what hurdles they faced that prevented team members from updating asset information in the spreadsheet. After taking feedback from the IT team in the meeting, the problem was apparent. End users did not have an easy way to input data while moving around the campus. This problem would be addressed by designing the application in a mobile format, allowing end users to quickly input data buy simply brining up the application on their phones. Users would have access the local database on their phones and be able to quickly insert or query asset information. The asset management solution would allow every end user of the IT team to query and modify data from any new or existing campuses of the organization.

The second hurdle the team faced was maintaining accuracy of the data entered into the spreadsheet. The project team wanted to ensure that the application would work alongside its users and ensure that users would be able to insert as much data as they needed to. A set of common fields for each asset would be created and the solution would include an ability to create additional notes on the product if the provided fields are not adequate enough to capture all of the information. For fields common between assets, a type of data validation would be implemented within the code to ensure that the fields housing information such as dates and phone numbers were uniform. This would prevent users from entering information inaccurately.

The final hurdle to manage was agreeing on a database solution that could provide a strong backbone for the application and enable future expansion of the product. To meet this requirement the team decided on utilizing the SQL standard. This would allow the team to quickly export the current excel spreadsheets into the new database, as well as to easily migrate the data into a more robust tool if needed to in the future.

## Project Rationale

The primary focus of this project was to provide a modern asset management solution that would support Pinnacle Technologies substantial growth. The organization is looking to increase its volume of office space to accommodate the the next wave of employees hires. The current system of storing assets and and their related information is to rudimentary and will not be able to scale with the organization.

The Asset Management Application project will provide a tool custom-built around the needs of Pinnacle Technologies and can grow at the same pace as the organization. The application will have a streamlined user interface that will provide the end users the ability to input data easily and accurately. The tool will have built in data validation tools to ensure the data entered is as accurate as possible, which will ensure reliability and integrity within the database. Through utilizing a standardized version of SQL, the database can easily be exported to a more robust cloud server. This with allow multiple devices to connect to it at the same time in the future. Having the application deployed on a mobile device will provide portability by allowing end users to access the database via their mobile device from any of the campuses within the organization.

Currently Pinnacle Technologies does not have much in the way of budget contractions, but the organization is currently operating on a very strict time table. The grand opening of their three new campuses is fast approaching. The new application will need to be developed and tested in a timely manner to ensure the prototype can be used to track inventory on the new campuses. In order to meet these strict time deadlines, the team has chosen to utilize the Waterfall project deployment methodology. Since the project has predefined deliverables, the team can focus more on implementing the product then designing and iterating on an idea which would be defined by an agile methodology. The completion of this project will provide Pinnacle Technologies with a robust and expandable inventory management system that can provide up to date and accurate assets information and pave the way for a mort robust tool in the future.

# Project Requirements

## Project Environment Costs

The following assessments reflect the costs of software tools and the licensing expenses needed by various members of the team to complete the Asset Management Prototype project.

**Integrated Development Environment:**  The Asset Management Prototype application will be developed for the Android operating system using Android Studio. Android Studio is a IDE provided by Google in collaboration with IntelliJ that has no licensing fees or reoccurring costs.

**Programming Language:** The team member dedicated to the application programming has decided to to develop in Java over the alternative choice of Kotlin. While Kotlin is considered a higher level language and provides an easier way to code, the programmer assigned to this project prefers the fine grain control and longe term stability that Java offers.

**SQL Database:** SQLite has native integration with android studio, which makes it ideal for this project. SQLite is an open source application that is available at no cost to the organization, and will create a simple yet easily expandable database solution.

**Distribution:** Since this Asset Management Prototype application only needs to be distributed internally to employees within the organization, no additional android licensing or related fees to the Google Play store need to be paid. A single .APK file can be generated and distributed to the employees phones using the company’s Mobile Device Management software, which is already installed on their devices.

## Human Resource Costs

The following assessments reflect the human resources necessary to accomplish the Asset Management Prototype project.

Project Manager: The Project Manager will be assigned to the project part-time but will be involved in each of phases of development. Throughout the lifecycle of the project, the PM will be self-directed and balance their time in relation to the various projects in their portfolio. They will be expected to invest 60 hours total over the span of the project, at a cost of $75 per hour, totaling $4,500.

Android Developer: Of all the team members, the Android Developer will be billing the greatest amount of hours to the project . They will be working along side the Project Manager, Database Developer and UI/UX designer to bring the application into existence. The Android Developer is expected to invest 120 hours total over the span of the project, at a rate of $80 per hour, totaling $9,600.

Database Developer: The Database Developer will be in charge of designing the Entity Relationship Diagram and physically implementing it into the database. The Database Developer is expected to perform their tasks at the beginning of the project and is expected to invest a total of 40 hours into the project at their current salary is $60 per hour, totaling $2,400.

UI/UX Designer: The UI/UX designer will be tasked with creating a user friendly interface for the application. The UI/UX designer will work closely with the Android programmer and Quality Assurance team member to provide a effective user interface and experience. The cost of the staff UIX/UX designer is $50 per hour and they are expected to invest 40 hours on the project, totaling $2,000.

**Quality Assurance:** The team members assigned to the project from QA team will be tasked with ensuring the over all quality of the project. They will be tasked with testing the application along the various phases of the project. The quality assurance team will dedicate 40 hours to the project at a rate of $25 dollars per hour, totaling $1000.

**Cost Overview:** The following table represents the rates and time invested of each of the members of the project. The project will take an estimated total of 300 hours, totaling $18,500 to complete.

| Employee Resource | Cost Per Hour | Time in Hours | Cost |
| --- | --- | --- | --- |
| Project Manager | $75 | 60h | $4,500 |
| UI/UX Designer | $50 | 40h | $2,000 |
| Android Developer | $80 | 120h | $9,600 |
| Database Developer | $60 | 40h | $2,400 |
| Quality Assurance | $25 | 40h | $1,000 |
| Total Cost: |  |  | $19,500 |

# Project Planning

## Development Methodology

Pinnacle Technologies utilizes a variety of different project deployment methodologies within their company, matching the methodology to the needs of the project. Due to the project’s small scale and clearly defined deliverables derived from the scoping meeting, the asset management project team members have chosen to employ the Waterfall methodology for this project. The waterfall methodology is a sequential process where the project team moves from one phase of the project to the next once all of the deliverables for the current phase have been delivered. This deployment process will allow the engineering team behind the asset management project to provide concrete deliverables to the stakeholders on a consistent basis.

The waterfall methodology itself is made up five steps that will guide the project from the initial scoping through to production deployment. Each of the deliverables within a phase must be completed before the project can move to the next phase. Once a phase has been completed, the team working on the asset management project will have a meeting to discuss the best way to approach the next phase of the project. A detailed timeline, including the list of deliverables for each phase, is available in the *Project Timeline and Milestone* section of this document.

**Analysis Phase:** During the analysis phase of the waterfall methodology, the stakeholders and the IT infrastructure team will work in collaboration to determine what problems the organization is currently facing. Using the collected information, the team will define the scope and requirements of the project and use this information to craft the deliverables for each of the realigning phases of the project.

**Design Phase:** During the design phase, the engineers create the various outlines and documentation that is necessary for the application. This process will include, but is not limited to, creating an entity relationship diagram (ERD) in collaboration with the IT team that will use the application, designing a unified modeling language (UML) document for the Java classes, and designing an architecture diagram to illustrate the flow of the different views within application. Each of these documents must be approved by the various members of the project.

**Implementation Phase**: Once the ERD, UML and architecture diagrams have been approved by the team, the software engineer assigned to the project will start transforming the elements into Java and SQL code in the implementation phase. This phase will focus on producing the deliverables that were agreed upon during the scoping of the project. This phase of the project will have three main objectives: 1)design a relational database for the application that can be integrated with the application, 2) implement the design outlined by the architecture design document, and 3) implement an easy to use graphical user interface that allows the the users to query and view data from the database.

**Testing and Verification Phase:** Once the deliverables from the implementation phase have been created, they will need to be tested for functionality in the testing and verification phase. This phase will test the android application produced by the engineer to verify that it meets the requirements set forth during the original scoping meeting. The testing will include unit testing for each of the various classes, as well as performance testing of the application on android device simulations. After the testing has been completed and the team has verified that the application meets the requirements, the project is ready to move the final phase: the maintenance phase.

**Maintenance Phase:** During the maintenance phase, the asset management application will be pushed out to the users on the IT Infrastructure team. The application will require constant support and maintenance by the team to ensure the product preforms well for the end users.

## Goals, Objectives, and Deliverables Table

| Goal | Objective | Deliverable |
| --- | --- | --- |
| Deliver an android-based asset management application | Create a SQLite database within the android application | Create an ERD for the Mobile Application Database. |
| Create SQLite Database Classes within Application. |
| Create DAO objects to integrate the framework and SQL Tables. |
| Create the framework and associated views. | Create UML Digram for the Mobile Application. |
| Create Architecture Diagram for Mobile Application. |
| Implement the five classes from the UML Diagram with Java. |
| Implement the fragments based on the Architecture Diagram. |
| Integrate SQLite database with Java Code. |
| Create the graphical user interface components | Implement the Create Views from the Architecture Diagram. |
| Implement the Detail Views form the Architecture Diagrams. |
| Create Home Screen for Mobile Application. |
| Implement miscellaneous features | Create Suite of Application Icons. |
| Create Application Notifications |
| Create Application Maintenance User Guide. |
| Create End User Application Guide. |

## Goals, Objectives, and Deliverables Details

**Goal**: Deliver an Android-Based, Assessment Management Application.

**Objective 1:** Create a SQLite Database within the Android application. This objective includes the process of designing and implementing a SQLite database that can be used by the Android application. The objective will be completed when the tables outlined in the Entity Relationship Diagram have been created and the application is in a state where information can be queried and saved within the database from the framework layer. To complete this objective each of the following deliverables must be completed:

**Deliverable 1**: Creation of a ERD for the Mobile Application Database. The ERD will contain all of the tables, attributes and relationships that will be needed to properly implement the database using SQLite.

**Deliverable 2**: Create SQLite database classes within the application. After the ERD document has been approved by the stakeholders, the implementation of the SQLite database will be completed using Java to create a database class, as well as a schema class for each entity with associated attributes, keys, and relationships.

**Deliverable 3**: Create Data Access Object classes to integrate the framework and SQL tables. In order for the SQLite database to communicate with the Java code, abstract Data Access Object classes must be created for each of the database entities.

**Objective 2**: Create the framework and associated views. The framework of the application will act as the middle layer between the User Interface and the undying SQLite database. The completion of the framework will be done when the software layer has the ability to accept input from the UI layer and is able to pass it to the SQLite database. This objective is dependent on the following five deliverables:

**Deliverable 1**: Create an UML digram for the Mobile Application. An UML diagram will be created prior to designing the application’s framework in order to understand each of the required Java classes and their variables.

**Deliverable 2**: Create an architecture diagram for Mobile Application. After the approval of the UML diagram, an architecture diagram for the application must be created. This architecture diagram will incorporate the requirements from the UML diagram, as well as the ERD in order to design the various views of the UI and navigation elements for the application.

**Deliverable 3**: Implement the five classes from the UML diagram with Java. After the approval of the UML digram, the Java classes that were outlined will need to be created within the application. These classes act as entities for the SQLite database within the Java code.

**Deliverable 4**: Implement the fragments based from the architecture diagram. The Mobile Application will utilize an Android navigation element called fragments in order to move between UI elements. This section will be completed once the application has the ability to move between the different view fragments via user input on a simulator.

**Deliverable 5**: Integrate the SQLite database with Java code. The framework layer must be able to accept data from the UI elements and pass it to the SQLite database. This will be complete once data can be pulled from Java Objects and pushed into the SQLite database via SQL and vice versa.

**Objective 3**: Create the Graphical User Interface components. The graphical layer of the application will accept input from the user and the application will move that data into the framework of the application. Each of the views will need varied input fields able to validate the data input from the user. The objective will be met when a user can view, add, and modify each of the entities within the database. This objective is dependent on the following three deliverables:

**Deliverable 1**: Implement the create/modify views from the architecture diagram. In order for any objects to be created in the Mobile Application, the end user must have views that create the ability to input data. These views will allow users to create each of the objects outlined in the UML diagram.

**Deliverable 2**: Implement the detail views form the architecture diagrams. Users will need the ability to view data that has been created and stored within the SQLite database. These views will allow users to view the details of the objects as well as any related objects outlined in the UML diagram.

**Deliverable 3**: Create a home screen for Mobile Application. While not a required view for the application, a home screen will provide an entry point into the application. The home screen will be opened by default once the application is initiated.

**Objective 4**: Implement miscellaneous features. Objective 4 is the collection of additional features that either supplement the usability of the application or are features that improve upon the applications functionality. Features within objective 4 improve the overall functionality of the asset management application.

**Deliverable 1**: Create a suite of application icons. Additional steps will be included to improve the overall usability and appearance of the mobile application. This phase will see to the creation of an icon for each of the different objects within their respective views and fragments, as well as the creation of the mobile application’s main icon.

**Deliverable 2**: Create application notifications:.During the requirements gathering phase of the project, stakeholders requested that the application send notifications though the phone based on dates associated with specific objects. The notifications deliverable is complete when the application can push notifications to the user based on campus audit dates and warranty expiration dates.

**Deliverable 3**: Create an application maintenance user guide. A guide will be created outlining development on the codebase. When the application is approved for development, additional engineers will be working on and with it. This guide will provide a overview for how engineers should interact with the mobile application.

**Deliverable 4**: Create end user application guide. When the application is approved for development, users will be working with it daily. A guide on use for users will be created on how use the application.

## Project Timeline, Dependencies & Milestones

The following table represents the Asset Management Application's projected timeline based on the data gathered from the project goals, objectives and deliverables. A single programming resource will be utilized to implement the code on this project with other members providing support during each of the phases. Each of the durations noted in the chart are based on an an 8-hour workday, not including weekends and holidays.

|  | Objective | Duration | **Start Date** | End Date | Dependency |
| --- | --- | --- | --- | --- | --- |
| 1 | Requirements Gathering Meeting/Team Sync. | 4 Hours | 9/2/2019 | 9/2/2019 | N/A |
| 2 | Project Stakeholder Kickoff Meetings | 2 Hours | 9/2/2019 | 9/2/2019 | N/A |
| 3 | Creation ERD for the Mobile Application Database. | 1 Day | 9/3/2019 | 9/3/2019 | N/A |
| 4 | Create UML Digram for the Mobile Application. | 1 Day | 9/3/2019 | 9/3/2019 | N/A |
| 5 | Create Architecture Diagram for Mobile Application. | 1 Day | 9/3/2019 | 9/3/2019 | N/A |
| 6 | Implementation Phase Transition Meeting/Team Sync. | 2 Hours | 9/4/2019 | 9/4/2019 | N/A |
| 7 | Implement SQLite Database Class within Application. | 1 Day | 9/5/2019 | 9/5/2019 | 3 |
| 8 | Implement the 5 Classes from the UML Diagram. | 4 Hours | 9/6/2019 | 9/6/2019 | 4 |
| 9 | Create DAO objects to integrate the Classes and SQL Tables. | 1 Day | 9/9/2019 | 9/9/2019 | 7,8 |
| 10 | Implement App Drawer based from the Architecture Diagram. | 2 Days | 9/10/2019 | 9/11/2019 | N/A |
| 11 | Implement the Fragments based from the Architecture Diagram. | 1 Day | 9/11/2019 | 9/11/2019 | 5 |
| 12 | Implement the Create/Modify Views from the Architecture Diagram. | 1 Day | 9/12/2019 | 9/12/2019 | 5 |
| 13 | Implement the Detail Views form the Architecture Diagrams. | 1 Day | 9/13/2019 | 9/13/2019 | 5 |
| 14 | Create Suite of Application Icons. | 8 Hous | 9/16/2019 | 9/16/2019 | N/A |
| 15 | Create Home Screen for Mobile Application. | 4 Hours | 9/17/2019 | 9/17/2019 | N/A |
| 16 | Create Application Notifications | 2 Days | 9/18/2019 | 9/18/2019 | 9 |
| 17 | Verification Phase Transition Meeting/Team Sync. | 2 Hours | 9/19/2019 | 9/19/2019 | N/A |
| 18 | Create Unit Test Design and Diagram | 4 Hours | 9/20/2019 | 9/20/2019 | 17 |
| 19 | Implement Unit Test based from Design Diagram. | 4 Hours | 9/20/2019 | 9/20/2019 | 18 |
| 20 | Create Application Maintenance User Guide. | 2 Days | 9/22/2019 | 9/22/2019 | 17 |
| 21 | Create End User Application Guide. | 2 Days | 9/23/2019 | 9/24/2019 | 17 |
| 21 | Deployment Phase Transition Meeting/Team Sync. | 2 Hours | 9/24/2019 | 9/24/2019 | 18,19,20 |
| 23 | Create Android .APK file to push onto Phones | 2 Hours | 9/24/2019 | 9/24/2019 | 21 |
| 24 | Install .APK file on end users phones. | 4 Hours | 9/24/2019 | 9/24/2019 | 23 |
| 25 | Test Android Application in real world environments | 3 Days | 9/24/2019 | 9/26/2019 | 24 |

# Project Execution

## Project Implementation

The Asset Management Application project will not effect the day to day work of the IT infrastructure team, but it will influence changes the team can make. Due to the advantages of the waterfall methodology, the project will adhere to strict timelines that will be used to determine key dates for project milestones. In the first week of the project, set aside as the design phase, the database designer will work with the IT team to create a logical database schema for the Asset Management Application based on data stored in the spreadsheets. Once the schema is defined, the IT team will not allow any asset attributes columns be added to the spreadsheets without notifying the Database Designer. If additional columns are added to the database, thenthe project will need to return to the design phase of the waterfall method and account for the changes in the underlying schema.

During the second and third week, the Database Developer, the Android Developer, and the UI/UX Designer will work to produce the deliverables that outlined during the project scoping meeting. As the project nears completion the QA team will provide a team amber to assist with the testing of the application. Feedback will be provided by the QA team to the Android Developer and the UI/UX designer so they can make final adjustments to the application and ensure a smooth launch.

The cutover to the Asset Management Application will occur in the final week of the project, once the database has been populated with up-to-date information from the IT infrastructure team’s spreadsheets. Once this data migration occurs, the spreadsheets can be archived and the user will be expected to use the Asset Management Application going forward.

## Outcome & Validation

The outcome for the Asset Management Application project will be considered successful if the end users for Pinnacle Technologies can easily update the assent inventory with a strong focus on keeping clean data. There are two markers for success with the Asset Management Application project, 1) a strong end user engagement and 2) accuracy of the data entered into the database. The project will only be considered a success if both of the these criteria are met.

The first measurable factor is the end users application usage. This can be measured by the amount of edits that are made to the database via the application. Previously, users complained about and their inability to easily access and update the spreadsheet stored on the company’s server. With the new mobile-based application, users will be able to update information in the database from their own phone. Application usage can be monitored by tracking the number of table edits preformed on a week to week basis. Metrics will be gathered each week for one month moth. This application will be considered a success if the amount of table edits generated by end users regularly increases each week.

The second metric used as a benchmark of success will be the accuracy of the data inserted into the database. As information is migrated out of the IT team’s spreadsheets and into the application’s database, it will be audited for accuracy. A benchmark of how accurate the data is will be generated after the importation. After one month of application use, the IT team will perform the first audit of assets deployed on the three new campuses. By utilizing the same audit standards used to measure the accuracy of the data as it was being imported into the database, a second metric will be created at this point. This metric will be considered successful if the amount of errors found in the database are less then when the database was first imported into the application.