Software Development Plan

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CMIS 330 – Section 7980

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1. Overview

1.1. Project Summary

1.1.1. Purpose, scope, and objectives

This project will create a system for managing the reservations and finances of a bed and breakfast.

- The reservation system will respond to vacancy inquiries, store customer information, and hold reservations.
- The accounting system will contain information on expenses and profits

1.1.2. Assumptions and constraints

This project is constrained by the technical expertise of its team members, the expectations of customers and stakeholders, and the capabilities of any hardware and software devices chosen for his project.

1.1.3. Project deliverables

The project should produce the following deliverables:

- Software Requirements Specification
- Software Design Document
- Software Test Specification

2. References

IEEE Std 1058 – 1998, IEEE Standard for Software Project Management Plans

Jones, C. (1997). Programming Languages Table. *Software Productivity Research, Inc.* Retrieved from http://www.cs.bsu.edu/homepages/dmz/cs697/langtbl.htm

3. Definitions

Milestone – a stage in the project

Software Requirements Specification (SRS) – lists the requirements for the software product that will meet the needs of the customers and stakehoders

Software Design Document (SDS) – lists each step in the design process, including classes, objects, class diagrams, and process flow diagrams

Software Test Specification (STS) – lists the testing description, procedure, and process for ensuring that the product functions properly

Unit testing – tests the smallest components of code, such as objects and methods

Integration testing – testing code components from different sections of code, such as the interaction of objects from different classes

Validation testing – testing to see if software functionality meets the requirements set forth in the SRS and customer expectations

COCOMO (Constructive Cost Model) – estimation for determing the amount of effort, time, and manpower to complete a project

4. Project Organization

4.1. External interfaces

Project members will communicate with bed and breakfast owners John and Jane as well as any accounting and managerial staff with information pertinent to the project.

4.2. Internal structure

Project Manager

Customer Requirements Specialist

Design Specialist

Test Specialist

Computer Programmer

Database Administrator

4.3. Roles and responsibilities

Project Manager

- determines the amount of financial and personnel resources required to complete the project
- creates a schedule for project milestones and project review

- performs system analysis to determine relevant external and internal entities and systems

Customer Requirements Specialist

- interacts with customers to determine statement of need
- communicates with stakeholders to determine requirements for a successful product
- creates the Software Requirements Specification

Design Specialist

- determines the design of the Reservation and Accounting software and database systems
- communicates with Computer Programmer to determine appropriate programming language and tools for the project
- communicates with Database Administrator to determine a database management system and interface for the project
- creates the Software Design Document

Test Specialist

- performs unit, integration, and systems testing on the Reservation and Accounting software and databases
- creates the Software Test Specification
- creates Test Logs and Test Summaries

Computer Programmer

- creates the source code for the Reservation and Accounting software based on requirements and design specifications listed in the SRS and SDD, respectively
- communicates with Database Administrator to ensure proper communications between the software and system databases

Database Administrator

- designs the database infrastructure for the Reservation and Accounting databases

- creates the source code for the database interface
- communicates with the Computer Programmer to ensure proper interfacing with the Reservation and Accounting software

5. Managerial process plans

5.1. Work plan

5.1.1. Work activities

Analysis

- Customer meeting
- Stakeholder meeting
- SRS

Design

- Meeting with Computer Programmer and Database Administrator
- Meeting between Design Specialist and Customer Requirements Specialist → SDD
- Meeting between Design Specialist and Test Specialist → STS

Code

- Computer programmer uses SDD and SRS to create source code for software
- Database administrator uses SDD and SRS to create source code for database

Test

- Computer programmer performs unit testing throughout coding process
- Database administrator performs unit testing throughout database creation
- Test Specialist uses STS to perform validation testing

5.1.2. Schedule allocation

Using an architectural context diagram of the bed and breakfast system, a functional point analysis will determine the size of the software product. To calculate product size, the unadjusted functional point (FP) from Table 2 and the Total Grade Rating from Table 3 must be determined first.

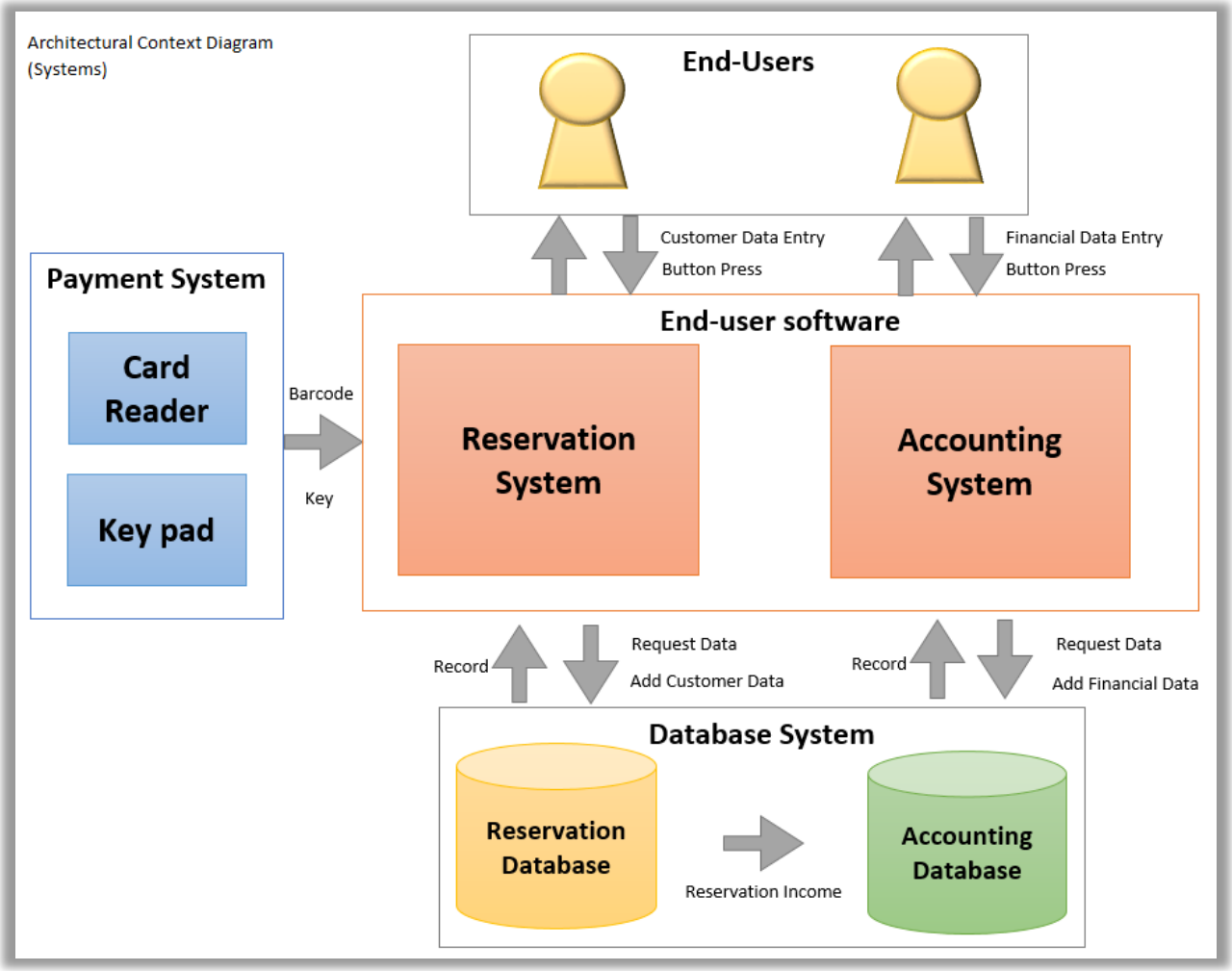

Figure 1. Architectural Context Diagram

External Inputs: Barcode, Key, Customer Data Entry, Financial Data Entry

External Inquiries: Button, Request Data (Reservation Database), Request Data (Financial Database)

Internal Logical Files: System configuration file

External Interface Files: Reservation Database, Accounting Database

Unadjusted Functional Point

Domain Value	Less Complex	Average	More Complex
External Inputs	1	2	3
External Inquiries	1	2	3
Internal Logical Files	4	5	6
External Interface Files	4	5	6

Table 1. Weighting Factors for Domain Value Complexity

Domain Value	Quantity	Weighting Factor	Total
External Inputs	4	1	4
External Inquiries (Button)	1	1	1
External Inquiries (Request Data)	2	2	4
Internal Logical Files	1	5	5
External Interface Files	2	5	10
Total			**24**

Table 2. Functional Point Calculations used to determine Unadjusted Function Point

Functional Point Calcultion

Number	System Characteristic	Rating
1	Data communications	3
2	Distributed data processing	3
3	Performance	4
4	Hardware configuration	4
5	Transaction rate	3
6	Online data entry	4
7	End-user efficiency	4
8	Online update	3
9	Complex processing	2
10	Reusability	3
11	Installation	1
12	Operations	1
13	Multiple sites	3
14	Facilitate change	3
Total		**41**

Table 3. Total Grade Rating of Bed and Breakfast Software

$$FP = unadjusted\ FP \times \left[(0.65 + 0.01) \times \sum F_i\right]$$

$$FP = 24 \times [(0.65 + 0.01) \times 41]$$

$$FP = 649.44$$

Lines of Code Calculation

The functional point of 649.44 refers to the size of the bed and breakfast software product. Using Java as the programming language for the software product, there are 53 source statements for each function point on average (Jones 1997).

$$Estimated\ Lines\ of\ Code\ (LOC) = Average\ Source\ Statements * Function\ Points$$

$$LOC = 53 * 649.44$$

$$LOC = 34{,}420.32$$

Based on functional point analysis and estimated lines of code, the bed and breakfast software is estimated to contain 34,420 lines.

Project Duration and Effort

From the total LOC, the duration, effort, and staff size can be calculated using COCOMO. Using the COCOCO mode of semidetached because the bed and breakfast system contains databases, the effort, project development time, and average staff size can be calculated with the following equations.

$$Effort(E) = 3.0 \times (thousands\ of\ LOC)^{1.12}$$

$$E = 3.0 \times (34.42032)^{1.12}$$

$$E = 157.89$$

$$Project\ development\ time\ (TDEV) = 2.5 \times E^{0.35}$$

$$TDEV = 2.5 \times 157.89^{0.35}$$

$$TDEV = 14.7$$

$$Average\ Staff\ Size\ (SS) = \frac{Effort}{TDEV}$$

$$SS = \frac{157.89}{14.7}$$

$$SS = 10.7$$

According to COCOMO, the project is estimated to last for almost 15 months with an average staff size of 11 people to complete 34,400 lines of code.

5.1.3. Resource allocation

Staffing

To meet the staff size recommendation of 11 people, the team will consist of one (1) project manager, one (1) software requirements specialist, one (1) design specialists, two (2) test specialists, three (3) computer programmers, and three (3) database administrators.

Schedule

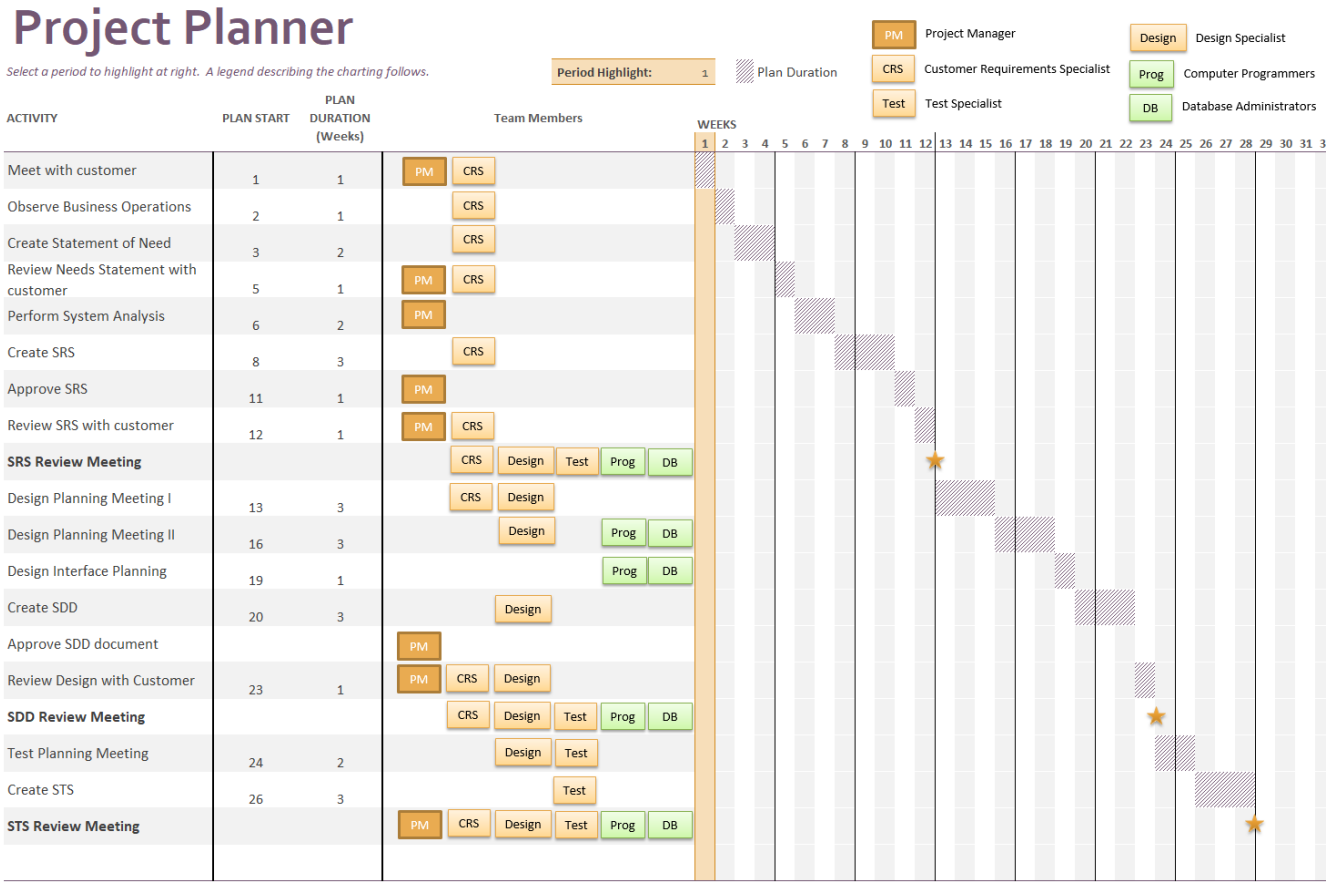

Figure 2. Project Plan for the Requirements, Design, and Testing Phase. Each numbered column on the right half of the figure represents 1 week in the 60-week, or 15-month, plan.

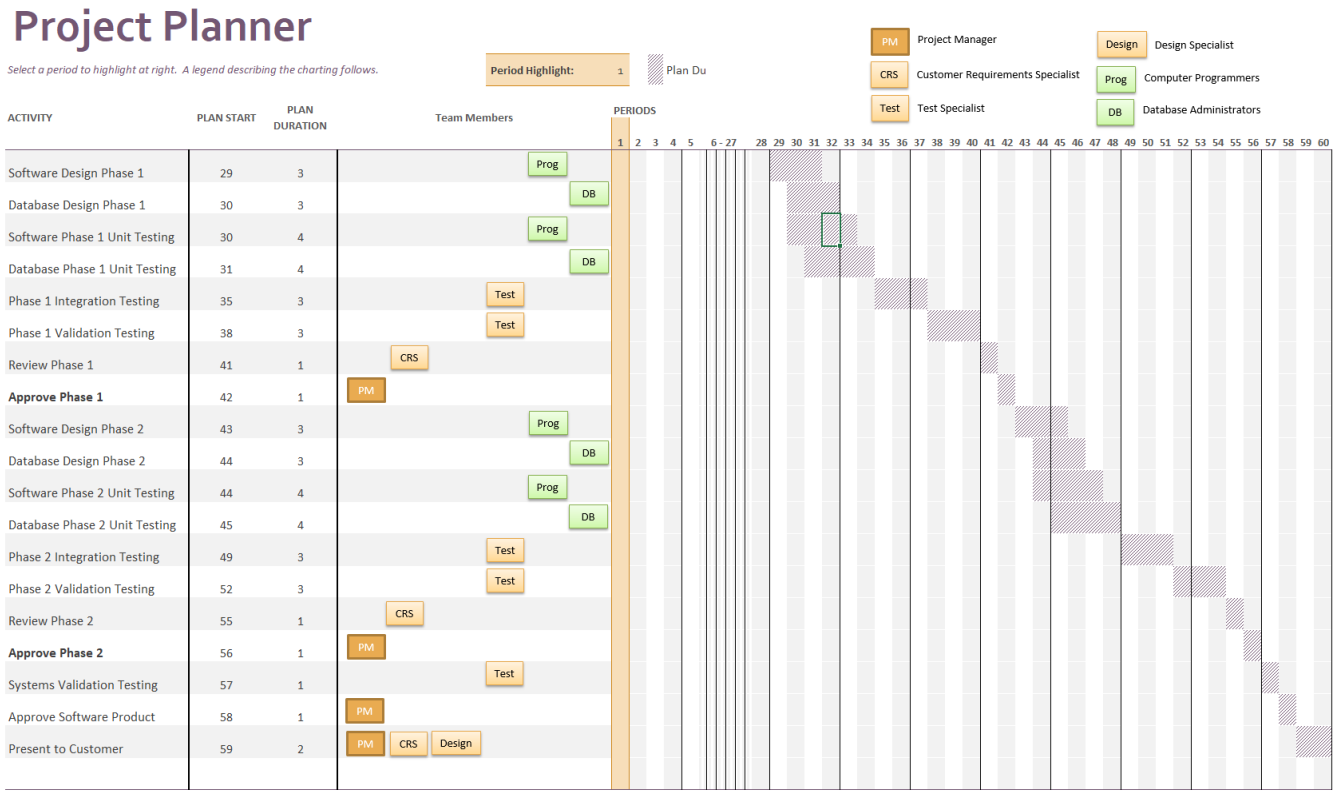

Figure 3. Project Plan for the Software Coding Phase of the project. Weeks 1 through 28 have been condensed for easier viewing.

5.2. Risk management plan

5.2.1. Possible Risks

Possible risk factors in the software development cycle for the product are listed in the following table.

Risk	Probability	Loss (Days)	Overall Risk
Customer-Related			
Difficulty achieving approval from customer (e.g. needs statement, requirements specification, and/or software design)	0.5	15	7.5
Customer or project member(s) unavailable for planned interactions	0.1	5	0.5
Lack of agreement amongst stakeholders	0.5	5	2.5
New requirements or changes demanded late in project schedule	0.2	20	4
Team Difficulties			
Communication difficulties	0.6	20	12
Failure to meet deadlines	0.3	10	3
Insufficient technical expertise	0.2	50	10
Software Product			
Does not meet SRS	0.1	20	2
Excessive troubleshooting required to fix bugs	0.2	20	4
Meets SRS, but fails validation testing	0.1	20	2
Deficiencies realized late in the project schedule	0.1	30	3
External Risks			
Equipment Malfunctions during coding and testing	0.1	5	0.5
Changing stakeholders or decreasing stakeholder interest	0.3	30	9
Bankruptcy or dissolution of Bed and Breakfast business	0.01	300	3

Table 4. Potential risks during the software development phase

5.2.2. Mitigation Strategy

According to the risks in Table 4, the largest risk factor for the project is communication difficulties. This is most likely to occur when larger groups of team members must agree on an appropriate course of action. The meetings which require cooperation among the largest amount of people is Design Planning Meeting II, which occurs during Week 16, and involves seven individuals: the Design Specialist, three Computer Programmers, and three Database Administrators.

The following strategy will be applied to assuage any risk:

- Assign a Senior member to each group. The two new positions will be titled Senior Computer Programmer and Senior Database Administrator.

- Senior members will attend the majority of planning meetings and make the most input into planning decisions with the Design Specialist
- Non-senior members will participate in smaller group communications amongst their group and with their senior member. This will occur weekly.
- Senior members will act as liaison between the Design Specialist and non-senior members

6. Technical process plans

6.1. Process model

This project will follow the linear-sequential process, or waterfall, model. Each phase must be completed, tested, validated, and approved before continuing on to the next phase. There is mild overlap between unit testing of the software system and the database system.

Project Phases

Preparation	
Weeks 1 – 8	Analysis
Weeks 8 – 13	Requirements Specification, Approval, and Review
Weeks 13 – 20	Design Planning
Weeks 20 – 24	Design Document, Approval, and Review
Weeks 24 – 26	Test Planning
Weeks 26 – 29	Test Specification, Approval, and Review
Design and Testing: Reservation System	
Weeks 29 – 33	Software/Database design
Weeks 30 – 35	Unit Testing
Weeks 35 – 38	Integration Testing
Weeks 38 – 41	Validation Testing
Weeks 41 – 43	Phase 1 Review and Approval

Design and Testing: Accounting System

Weeks 43 – 47	Software/Database design
Weeks 44 – 49	Unit Testing
Weeks 49 – 52	Integration Testing
Weeks 52 – 55	Validation Testing
Weeks 55 – 57	Phase 2 Review and Approval
Week 57 – 58	Systems Validation Testing
Week 58 – 59	Software Product Approval
Week 59 – 60	Present to Customer

6.2. Methods, tools, and techniques

The following will be used in the project

- Programming Language — Java 8
- Database — Oracle PL/SQL