Wireless Sensor-based Application for Managing Theme Park

Project Plan

**By**

Pabhawee Chuacharoen 552115037

Department of Software Engineering

College of Arts, Media and Technology

Chiang Mai University

Project Advisor

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dr.Noppon Choosri

**Document History**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Version | Status | Change Context | Viewable | Reviewer | Responsible | | Date |
| V.1.0 | Draft | Introduction  Project overview | PC, NC | PC | | PC | 07/08/15 |
| V.1.1 | Draft | Infrastructure  Quality planning  Software standard  Estimate of Task  Version Control | PC, NC | PC | | PC | 08/08/15 |
| V.2.0 | Release | Change project name | PC, NC | PC, NC | | PC | 26/08/15 |
| V.2.1 | Draft | Reconstruct the contents | PC, NC | PC | | PC | 18/10/15 |

PC = Pabhawee Chuacharoen , NC = Dr. Noppon Choosri

**Table of Content**

[Chapter One | Introduction 3](#_Toc433151259)

[1.1. Project Overview 3](#_Toc433151260)

[1.1.1. Purpose 3](#_Toc433151261)

[1.1.2. Scope 3](#_Toc433151262)

[1.1.3. Acronyms and Definitions 4](#_Toc433151263)

[1.1.4. Work Product to be developed 5](#_Toc433151264)

[Chapter Two | Infrastructure 6](#_Toc433151265)

[2.1. Hardware/Software Acquisition Plans 6](#_Toc433151266)

[2.1.1. Hardware 6](#_Toc433151267)

[2.1.2. Software 6](#_Toc433151268)

[2.2. Project Specific System Administration Support Needed 6](#_Toc433151269)

[ Software needed: 6](#_Toc433151270)

[2.3. Development Model 6](#_Toc433151271)

[Chapter Three | Management Procedures 7](#_Toc433151272)

[3.1. Project Team Structure 7](#_Toc433151273)

[3.2. Software Monitoring and Controlling Mechanisms 8](#_Toc433151274)

[3.2.1. Project Meeting 8](#_Toc433151275)

[3.2.2.Project Meeting 8](#_Toc433151276)

[Chapter Three | Quality Planning 8](#_Toc433151277)

[3.1 Quality Standards 8](#_Toc433151278)

[3.1 Responsibilities 8](#_Toc433151279)

[3.2 Quality Factors 8](#_Toc433151280)

[Chapter Four | Software Standard 9](#_Toc433151281)

[4.1 Software Development Standard ISO29110 9](#_Toc433151282)

[4.1.1 Project Management (PM) process PM purpose 10](#_Toc433151283)

[4.1.2. Software Implementation (SI) process SI purpose 10](#_Toc433151284)

[Chapter Five | Estimated of Tasks 12](#_Toc433151285)

[5.1 Estimated Duration 12](#_Toc433151286)

[ Progress I: 12](#_Toc433151287)

[5.2 Estimated Effort and Cost 12](#_Toc433151288)

[ Cost of time 12](#_Toc433151289)

[ Cost of money 12](#_Toc433151290)

[Chapter SIX | Version Control 12](#_Toc433151291)

[6.1. Software Configuration Management 12](#_Toc433151292)

[6.2. Version Control Strategy 13](#_Toc433151293)

[ Naming Convention 13](#_Toc433151294)

[6.3. Change Management 13](#_Toc433151295)

# Chapter One | Introduction

In order to create uniqueness for the theme park, this project will focus on using wireless technology with the help of Arduino microcontroller integrated sensors and Wi-Fi module to collect and monitor data. The main task of the application is to accumulate information such as the number of guests that get on a ride in each day, guest's heart rate and data from the sensors through the devices, which will be attached to places within the park and guest, then display them on the website for further benefit of the guests and theme park company themselves.

## Project Overview

Wireless sensor-based application for managing theme park is a web application for accumulating and displaying data that were collected from the guests via environmental sensors e.g. temperature sensor, accelerometer sensor, pulse sensor, and RFID technology with the help of Arduino microcontroller.

### Purpose

The project plan specification involves the evaluating and scheduling of a project and purposing to manage the development process of the project. There are the details of the project, which includes scope, risks assessment, team structure and estimated duration of task. The project plan intended to help to track and control the developing process of the project. In order to achieve the goal of the project plan the team member needs to follow the project plan.

### Scope

Main feature of Theme park management system are listed as follow:

#### Ticket seller

* + Register guest into the system.
  + View guest information from the system
  + Edit guest information from the system.
  + Delete guest information from the system.

#### Admin

* + View attraction information from the system
  + Add Attraction information into the system.
  + Edit attraction information from the system.
  + Delete attraction information from the system.

#### Guest

* + Log in into the system.
  + Log out from the system.
  + Enter the entrance gate by scanning the VIP pass.
  + Exit the exit gate by scanning the VIP pass.

### Acronyms and Definitions

#### Acronyms:

* RFID: Radio frequency identification
* WSAT: Wireless sensor-based application for managing theme park
* AC: Activity Diagram
* SDD: Software Design Document
* SPMP: Software Project Management Plan
* SRS: Software Requirement Specification
* UC: Use case
* UI: User Interface

#### Definitions:

#### Definition IEEE

Institute for Electrical and Electronics Engineers. Biggest global interest group for engineers of different branches and computer scientists. [IEEE90]

#### Integration Testing

The progressive linking and testing of software components in order to ensure their proper functioning in the whole system. [IEEE90]

#### Milestone

A significant event in the project, usually completion of the main deliverable. [IEEE90]

#### Plan

A documented series of tasks requires meeting an objective, typically including the associated schedule, budget, resources, organizational description and work breakdown structure. [IEEE90]

#### Project management

The application of knowledge, skills, tools, and techniques to project activities in order to meet or exceed stakeholder needs and expectations from a project. [IEEE90]

#### Project plan

A formal, approved document used to guide both project execution and project control. The primary uses of the project plan are to document planning assumptions and the decision, to facilitate communication among stakeholders, and to document approved scope, cost, and schedule baseline. [IEEE90]

#### Risk

An uncertain event or condition that, if it occurs, has a positive or negative effect on a project’s objectives. It is a function of the probability of occurrence of a given threat’s occurrence. [IEEE90]

#### Risk management

The systematic application of management policies, procedures and practices to the tasks of identifying, analyzing, evaluating, treating and monitoring risk. [IEEE90]

#### System testing

Testing conducted on a complete and integrated system for evaluate the system’s compliance with its specified requirements [IEEE90]

#### Traceability

The ability to trace the history, application or location of an item or activity, or work products or activities, by means of recorded identification. The establishment and maintenance of relationships between such items. Horizontal traceability describes the relationship between work products of the same type (e.g. Customer requirements). Vertical traceability describes the relationship between work products, which build or derived from each other (e.g., from customer requirements to qualification test cases). Bidirectional traceability allows to directly following relationships in both directions. [IEEE90]

#### Validation

Confirmation by examination and provision of objective evidence that the particular requirements for a specific intended use are fulfilled (“doing the right thing”).Part of quality control. [IEEE90]

#### Verification

Confirmation at the end of the process by examination and provision of objective evidence that specified requirements to the process have been fulfilled (“doing things right”). Part of quality control. [IEEE90]

#### UML Unified Modeling Languages

Standardized notation for modeling design descriptions, architectures or scenarios. Not depending on a specific method. Issued and maintained by the object Management Group (OMG). [IEEE90]

#### Unit test

A test of individual programs or modules in order to remove a design or programming errors.[IEEE90]

### Work Product to be developed

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| No. | Deliverable | Media | No. Of Copies | Date |
| 1 | Project Proposal | Document | 3 | 1 July 2015 |
| 2 | The Progress report I  -Project Management Plan  -Software Requirement Specification  - Software Design  Document  - Test Plan  -Test Record  -Traceability Record | Document  Document  Document  Document  Document  Document | 3  3  3  3  3  3 | 29 July 2015 |
| 3 | The Progress report II  -Project Management Plan  -Software Requirement Specification  - Software Design  Document  - Test Plan  -Test Record  -Traceability Record | Document  Document  Document  Document  Document  Document | 3  3  3  3  3  3 | 22 Oct 2015 |

# Chapter Two | Infrastructure

## Hardware/Software Acquisition Plans

### Hardware

#### RFID tag

Radio-frequency identification (RFID) is the wireless use of [electromagnetic fields](http://en.wikipedia.org/wiki/Electromagnetic_field) to transfer data, for the purposes of automatically identifying and tracking tags attached to objects. The tags contain electronically stored information.

#### Arduino

Arduino is an open-source computer hardware and software company, project and user community that designs and manufactures kits for building digital devices and interactive objects that can sense and control the physical world.

#### Computer

Computer is necessary equipment for accessing to the theme park management system.

### Software

#### Internet

Internet is necessary by accessing the system through the web browser.

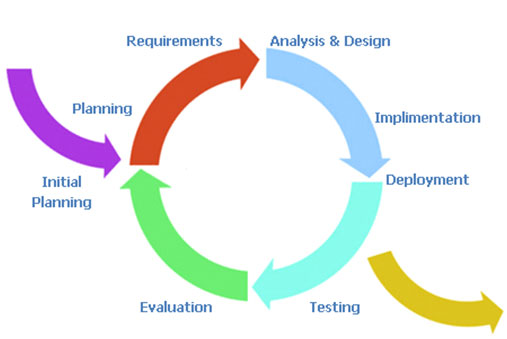
## Project Specific System Administration Support Needed

### Software needed:

* Photoshop
* Visual Paradigm for UML
* Netbeans
* Microsoft Word
* Web Server
* Arduino Sketch

## 

## 2.3. Development Model



##### Figure 1: Iteration Model

**Iteration Model**, shows in Figure-1, is one of the popular system development life cycle models for software engineering and used in software development process. The iteration model process is starting with Initial Planning, Planning, Requirement, Analysis & Design, Implementation, Deployment, Testing, and Evaluation. The advantage is reliable user feedback. When presenting sketches and blueprints of the product to users for their feedback. The disadvantage of this model is that each phase is rigid with no overlap, costly system architecture or design issues may arise because not all requirements are gathered up front for the entire lifecycle.

# Chapter Three | Management Procedures

## 3.1. Project Team Structure

Project team member:

1. Miss Pabhawee Chuacharoen 552115037

|  |  |
| --- | --- |
| Responsibility | Participant |
| Project proposal | Pabhawee Chuacharoen |
| Project plan and quality plan |
| Requirement specification |
| Design document |
| Implementation |

## 3.2. Software Monitoring and Controlling Mechanisms

### 3.2.1. Project Meeting

|  |  |
| --- | --- |
| Participants | Roles |
| Pabhawee Chuacharoen | Development team member |
| Dr. Noppon Choosri | Project advisor |

### 3.2.2.Project Meeting

|  |  |
| --- | --- |
| Participants | Roles |
| Dr. Noppon Choosri | Project advisor |
| Pabhawee Chuacharoen | Project developer |

# Chapter Three | Quality Planning

## Quality Standards

**• ISO 29110 for Very Small Entity (VSE)**

ISO 29110 is a software processes and guidelines for very small entities. A very small entity is mean an enterprise, organization, department or project having up to 25 people. The guide are based on subsets of appropriate standards elements, referred to as VSE profiles. The purpose of a VSE profile is to define a subset of ISO/IEC standards relevant to the VSE.

## Responsibilities

|  |  |  |  |
| --- | --- | --- | --- |
| No. | Stage | Review Item | Responsibility |
| 1 | Requirement gathering | Project Proposal | PC , NC |
| 2 | Project Planning | Project Plan | PC , NC |
| 3 | Requirement Analysis and Specification | Software Requirement Specification | PC , NC |
| 4 | Architecture and Detailed Design | Software Design Document | PC , NC |
| 5 | Software Implementation | Code | PC , NC |
| 6 | Unit Testing and Software Testing | Test Plan, Test Record | PC , NC |
| 7 | Project Monitoring and Control | Traceability Record | PC , NC |

PC = Pabhawee Chuacharoen , NC = Dr. Noppon Choosri

## Quality Factors

According to McCall’s factor model, the Senior Project Management system should meet these following factors:

#### Product operation factors

* + Correctness

The software should be able to provide more than 95% correctness of data from user traditional request.

* + Reliability

The software should be able to handle more than 95% of traditional activity with less than 5% of software’s failure.

* + Integrity

The software should be able to identify between authorized and unauthorized person.

#### Product revision factors

* + Testability

The software should able to be tested 100% of it defined routine and functionality.

#### Product transition factors

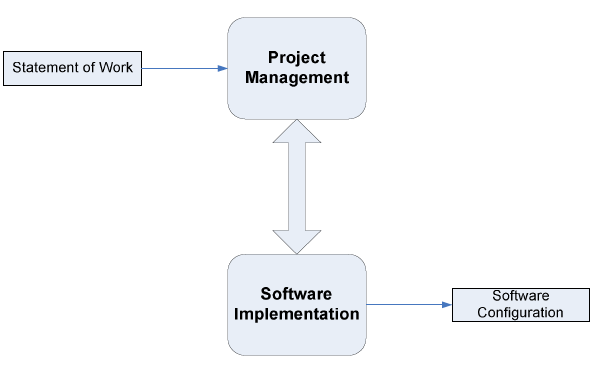
* + Reusability

More than 20% part of finished software should able to be reused in future development

# Chapter Four | Software Standard

## Software Development Standard ISO29110

ISO 29110 is a guide applies to Very Small Entities (VSEs), enterprise, organization, department or project up to 25 people, dedicated to software development. The Guide provides Project Management and Software Implementation process which integrate practices based on the selection of ISO/IEC12207- Systems and Software Engineering –Software Life Cycle process – guidelines for the content of software life cycle process information products (documentation) standards elements.

****

##### Figure 2: Basic Profile Process

### 4.1.1 Project Management (PM) process PM purpose

The purpose of the Project Management process is to establish and carry out in a systematic way the tasks of the software implementation project, which allows complying with the project’s objectives in the expected quality, time and costs.

#### PM Objectives

**PM.O1.** The Project Plan for the execution of the project is developed

**PM.O2.** Progress of the project is monitored against the Project Plan and

**PM.O3.** The Change Requests is addressed through their reception and

**PM.O4.** Review meetings with the Work Team and the Customer are held.

**PM.O5.** Risks are identified as they develop and during the conduct of according to the Statement of Work and validated with the Customer. The tasks and resources necessary to complete the work are sized and estimated recorded in the Progress Status Record. Corrections to remediate problems and deviations from the plan are taken when project targets are not achieved. Appropriate treatment is taken to correct or avoid the impact of risk. Closure of the project is performed to get the Customer acceptance documented in the Acceptance Record analysis. Changes to software requirements are evaluated for cost, schedule and technical impact.Agreements are registered and tracked the project.

**PM.O6.** A software Version Control Strategy is developed. Items of

**PM.O7.** Software Quality Assurance is performed to provide assurance Software Configuration are identified, defined and baselined. Modifications and releases of the items are controlled and made available to the Customer and Work Team including the storage, handling and delivery of the items that work products and processes comply with the Project Plan and

#### PM Activities

The Project Management Process has the following activities:

**PM.1** Project Planning

**PM.2** Project Plan Execution

**PM.3** Project Assessment and Control

**PM.4** Project Closure

### 4.1.2. Software Implementation (SI) process SI purpose

The purpose of the Software Implementation process is the systematic performance of the analysis, design, construction, integration and tests activities for new or modified software products according to the specified requirements.

#### SI Objectives

**SI.O1.** Tasks of the activities are performed through the accomplishment of the current Project Plan.

**SI.O2.** Software requirements are defined, analyzed for correctness and testability, approved by the Customer, base lined and communicated.

**SI.O3.** Software architectural and detailed design is developed and base lined. It describes the software items and internal and external interfaces of them. Consistency and traceability to software requirements are established.

**SI.O4.** Software components defined by the design are produced. Unit test are defined and performed to verify the consistency with requirements and the design. Traceability to the requirements and design are established.

**SI.O5.** Software is produced performing integration of software components and verified using Test Cases and Test Procedures. Results are recorded at the Test Report. Defects are corrected and consistency and traceability to Software Design are established.

**SI.O6.** A Software Configuration, which meets the Requirements Specification as agreed to with the Customer, which includes user, operation and maintenance documentations are integrated, base lined and stored at the Project Repository. Needs for changes to the Software Configuration are detected and related Change Requests are initiated.

**SI.O7.** Verification and Validation tasks of all required work products are performed using the defined criteria to achieve consistency among output and input products in each activity. Defects are identified, and corrected; records are stored in the Verification/Validation Results.

#### SI Activities

The Software Implementation Process has the following activities:

**SI.1** Software Implementation Initiation

**SI.2** Software Requirements Analysis

**SI.3** Software Architectural and Detailed Design

**SI.4** Software Construction

**SI.5** Software Integration and Tests

**SI.6** Product Deliver

# Chapter Five | Estimated of Tasks

## Estimated Duration

### Progress I:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Task Name | Duration | Start Date | | End Date | |
| Project Management Plan | 5 | 19/06/15 | 23/06/15 | |
| Software Requirement Specification | 4 | 23/06/15 | 26/06/2015 | |
| Software Design   Use Case Diagram   Class Diagram   Class description   Sequence Diagram   Entity Diagram   UI Design | 4 | 29/06/15 | 02/07/15 | |
| Implementation   Guest information management   Attraction information management | 12 | 06/07/15 | 17/07/15 | |
| Test Document   Test Plan   Test Record | 3 | 20/07/15 | 22/07/15 | |
| Progress I Submission |  | 29/07/15 |  | |
| Progress I Presentation |  |  |  | |

## Estimated Effort and Cost

### Cost of time

Due to the need for hardware devices in this project, The first step we have spent lots of time to research about these hardware. Then the software process we also spent a lot of time in the literature review as well as to make the concrete and the precise in the project plan we also need some duration to discuss. Finally we come up with this project plan and the other documents.

### Cost of money

Due to the need for hardware devices in this project, We spend most budget into hard copy of documents and hardware.

# Chapter SIX | Version Control

## 6.1. Software Configuration Management

Software Configuration Management can coordinate the software management, which can minimize the confusion in the development. It is a set of activities designed to control changes by identifying the parts of the development that is likely to be changed, establishing relationships among them, defining mechanisms for managing different versions of them, controlling the changes imposed, and auditing and reporting on the changes made. In a word, Software Configuration Management is a methodology to control and manage a software development with its configuration. It can determine what to change and who to be responsible for the change when something goes wrong.

## 6.2. Version Control Strategy

### Naming Convention

#### Project Plan:

WSAT\_PP[Version]. [File format]

#### Software Requirement Specification:

WSAT\_SRS\_[Version]. [File format]

#### Software Design Document:

WSAT\_SDS\_[Version]. [File format]

#### Test Plan:

WSAT\_TP\_[Version]. [File format]

#### Test Record:

WSAT\_TR\_[Version]. [File format]

#### Traceability Record:

WSAT\_TRC\_[Version]. [File format]

## 6.3. Change Management

We have the strategy for managing the changes by following these steps:

* Analyzing the change
* Designing the change plan
* Requesting the change with the project advisor
* If the change is approved: implementing the change in project from change request form.
* If reject: Continue in the project and find the way to solve a problem.
* Analyze the result from changing and modify the document or system to match the change.