

Intelligent Software Project Management (ISPM)

Software Requirement Specification

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1. Introduction

1.1 Purpose

The main purpose of this document is to illustrate the requirement of Intelligent Software Project management system. This document describes high level architecture of the system and purpose and features of the system. and also describes function that are in the ISPM system and tasks of this system.

This document will provide a detailed description of the technologies that are going to use, research areas, functionalities and interfaces of this software product. and also, this document will specify the functional requirement and nonfunctional requirement of this system and discuss about the features of this system. This is developed after a thorough background study conducted by the project group regarding the requirements of the specified project. The final product of this project will meet the requirements specified in this document. The targeted audience of this document are the end users of Intelligent software project manager.

1.2 Scope

This SRS document will provide the requirements for developing the ISPM system that is able to help the person who developing system. This document describes the functionalities, technologies, software requirements, hardware requirements. And also provide goals, tasks, users and research areas. Functional requirements will specify the functionalities, tasks of the system and nonfunctional requirements will specify the performance of this system.

In here, we are going to develop web based application for the intelligent software project manager system. This application will use by the top management, employees and client. They are the uses of this system. This web application mainly contains a dashboard and ontology engine. Using this dashboard, we can preview lots of information about ongoing projects such as current progress of the project, finalized requirements, employees who are working on the project, allocated time for each tasks etc. purpose that are using the ontology engine is to create the set of unambiguous requirements.

Diagrams are the suppliers of the requirements to ontology engine. For this task, we use image processing technologies and information extraction technologies. But these requirements are ambiguous. this is one of the major issue, we are going to face. So we should gather the finalized requirements using these ambiguous requirements. For that purpose, we are going to develop an ontology engine. Using this ontology engine, we can gather set of unambiguous requirements. This is the one major advantage of this system. other major advantages are saving cost and time.

1.3 Definition, Acronyms, and Abbreviations

ISPM	Intelligent Software Project Manager
EMR	Extract Mentioned Requirement
JDK	Java Development Kit
SPT	Software Project Team
MySQL	My Structured Query Language

Table 1-Definition, Acronyms, and Abbreviations

1.4 Overview

1.4.1 Tasks and Users

Intelligent software project manager is built using automating the some of the software project management methods. In here mainly consider about gather the unambiguous requirements, reduce cost and time, risk analysis, current progress of the specified software product.in present time, requirements gathering, risk analysis are done by manually. This is the cost and time wasting way. ISPM system will be more reliable, efficient, secured for solve the above mentioned issues.

For building the new software product, first thing is to gather the clear unambiguous requirements. For that task we can use documents, diagrams, meeting with the client. Extract Mentioned Requirements function will handle that task. In here we consider only diagrams as the input of above mentioned function. First we need to separately identify inputted diagrams. For that, we can use unique shapes inside those diagrams. Unique shapes can be identifying by using the boundary line of the shapes. [1]

We need to extract information that are in the diagrams. because using that information we can generate requirements that useful for implementing the new software product. extraction of this information involves detection, localization, tracking, extraction and recognition of the text from given diagram image. [2] then using that extracted information, we are going to generate xml document. This xml document will be the input of Building up a knowledge base function of this ISPM system.

In this document we discuss about purpose, scope, functions, interfaces of this ISPM system. Employees, Top managers, client are the uses of ISPM system. Using this document, client, developers, top managers can get the clear idea about this ISPM system. Rest of the document will be discussed about what happen inside this ISPM system.

1.4.2 Main Goal of the software

Following are the goals that would be achieved at the end of this research.

- Find a better way to gather the unambiguous requirement.
- Reduce cost and time wasting for build the software products.
- Maintain performance of the employees who working with the software company.
- Increases the efficiency of building the software products.

1.4.3 Organization of the SRS

Section 1 describe the purpose of the preparing the System Requirement Specification document, the scope of the ISPM system and overview of the ISPM system including its tasks, goals, users.

Section 2 describe the overall description of the ISPM system with technical and nontechnical aspects. This section is created including the product perspective, product function, constrain, assumption and dependencies of requirements.

Section 3 describe functional and nonfunctional requirements with design constraint.

Section 4 describe contains supporting information for the reads of this document.

2. Overall description

2.1 Product perspective

ISPM provide a web application to achieves above mentioned goals. The main purpose of the Intelligent software project manager is to maintain the software projects more efficiently and effectively without involving software project managers. Software companies can reduce lots of cost and time by using this system. This product can provide the finalized requirements to developed any software product by using client documents, diagrams etc. and also, this system can predict group members that are participating to implement the software system, time duration for developing process, cost etc.

Text mining system considers about tasks related to the documents side of a software project such as summarizing documents, search specific information from documents, check finalized requirements are matching with the client requirements, storing documents, how to synchronize documents to the project management system. now look at about above mentioned tasks.

This ISPM system allows to take documents from client. But this ISPM system handle several projects at once. So system should store those documents according to the project. For that task, system use an algorithmic approach. And also system use an algorithmic approach to retrieve stored document when it is needed by users. This is handle by storing document sub function.

After store the documents, those document should be synchronized with the ISPM system. because other functions of the ISPM system are needed information that are in stored documents. This task will handle by sub function called synchronize documents with the project management system.

These sent documents have useful information and useless information. Users should have checked all the pages to get useful information. If system can be summarized those document, users can easily get clear idea of the information. For that task, ISPM system has summarizing sub function.

ISPM system use ontology engine to generate finalized requirements for software project that are handle by ISPM system. finally, ISPM system should check finalized requirements are matching with the requirements that are in the documents. This is done using matching final information with the client requirements task.

ISPM system use diagrams to gather requirements. This will handle by Extract mentioned requirements function. There are three tasks in EMR. In here, we are going to provide description about those tasks.

- Diagram Identification

Diagrams are the inputs to this function. These diagrams are get from the documents that are sent to the ISPM system. these diagrams can be use case diagrams, activity diagrams etc. first we need to separately identify those inputted diagrams. these diagrams build using some shapes. We can use these shape for identification of the diagrams. first we need to identify shapes that are in the diagrams. for that task, boundary line of the shapes can be used [1]. Then using that identified shapes, we can separately determine which type of diagram is. Diagrams identification is important part of the ISPM system. because, using this diagrams we can gather requirements for building software product. for that, we need to extract information from those diagrams.

- Extract information from diagram

Information extraction will be handle by under the extract information from diagrams function. Some information is in the shapes that are in the diagrams and some are in the outside of the shapes. So we need to extract all the information from diagrams. extraction of this information involves detection, localization, tracking, extraction, enhancement and recognition [2]. In here we use information extraction technologies.

- Store extracted information in xml document

In here, we are creating xml document templates for each diagram type. Then store extracted information in above mentioned xml template according to diagram type. Actually, we use xml documents to avoid misplacing information error. Then this xml documents will be the input of the building up a knowledge base system function in ISPM system.

Main purpose of this function is to generate unambiguous requirements. To giant that purpose, we are going to build a knowledge base ontology engine to ISPM system. we can use this ontology engine to identify unique unambiguous user requirements. Ontology is supporting for the knowledge extractions to build up our final product. in here we can identify three key areas. First one is knowledge extraction tool. This key area used to extract the appropriate data together with

paragraph and sentence from the documents. Second key area is, separated details are send to knowledge base system with metadata derived from the vocabulary of the knowledge base system. managing information and storing data is the major tasks in this key area. Third key is narrative generation.

We use OWL ontology language to build an ontology engine. This language is use for define web ontology. Reason of using OWL ontology language is, open and extensible, can distribute among many systems and matching with web standards.

Using this ontology engine, we can generate finalized set of requirements. It will help for the client, developers and top managers. Because these requirements not changing time to time. This is the main research part of the ISPM system.

Prediction is one of the major thing in this research. In here, we consider about several tasks such as

- Total estimated budget
- Who are the suitable developers to the project
- Risk analysis
- Total duration to complete the project
- Success rate of the project etc.

For implement above mentioned tasks, we need lots of historical data about project completion, organizational culture, inadequate skills, the complex and nature of projects. [3] this historical data can be extremely valuable to the estimating of process.

ISPM system analyze final requirements and compare with past project's data. Using this comparison, system can predict some of the above mentioned tasks. At the beginning it will show above mentioned predictions and possible outcomes by using several datamining algorithms and after that ISPM system will automatically begin to manage the project. This function has notification system. that system will send notification to the respective developers by mentioning his / her tasks and the time period for complete those tasks. And also time to time, it will send notification to the top managers about current situation of the ongoing projects. So top managers can get clear idea of ongoing projects. Most important thing of this these prediction is predicting

the success rate of the project. Other important thing is timeline of the project. ISPM system use charts to visualize success rate and timeline of the ongoing projects.

Using the following image, you can get the clear idea of ISPM system.

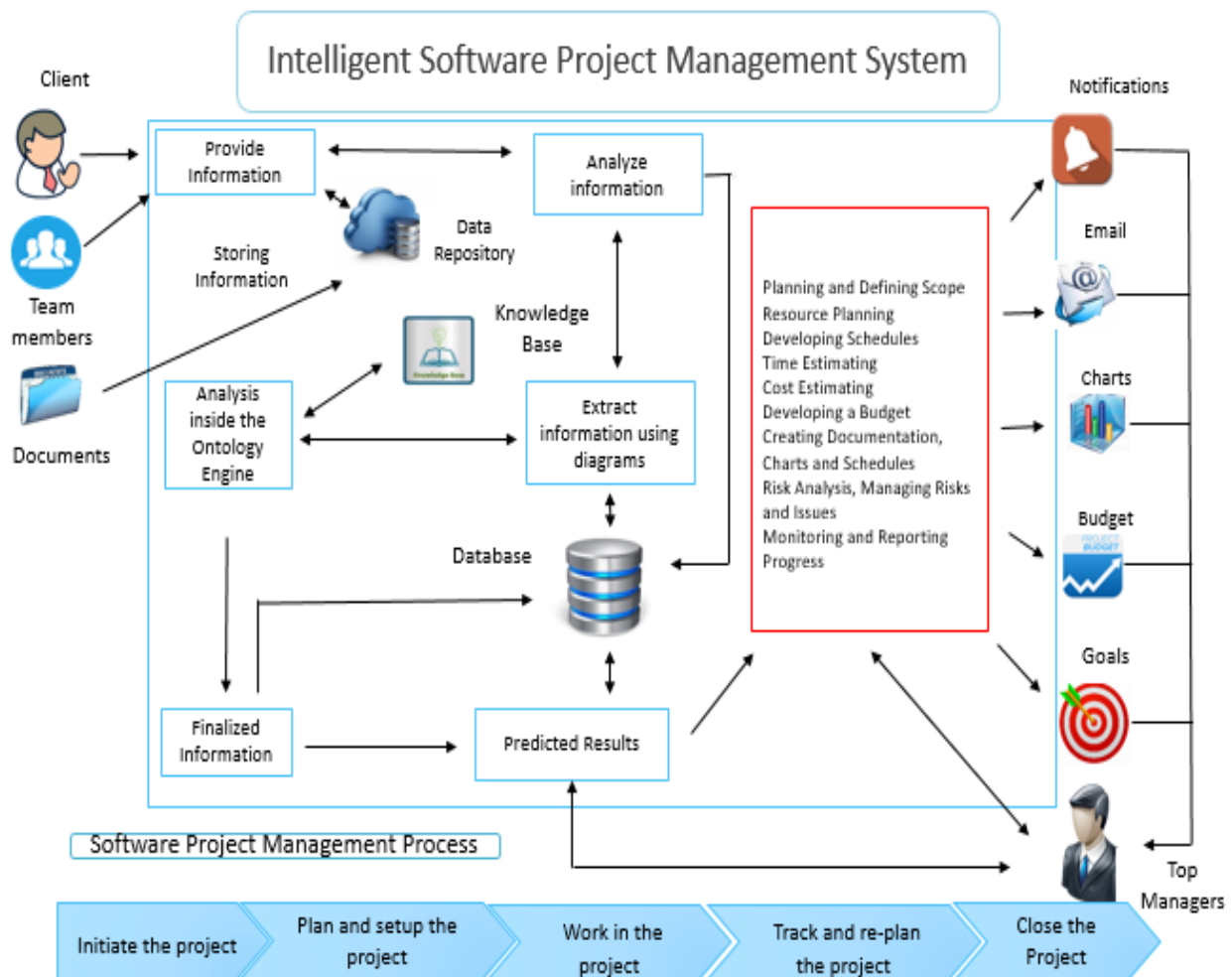


Figure 1-structure of the system

Features	Current Applications	Our application
I. System runs without having a software project manager	X	✓
II. User can provide the requirements to the system easily.	X	✓
III. Scanning and extract user requirements.	X	✓
IV. Maintain the knowledge based system for extracting appropriate data.	X	✓
V. Identify and avoiding the similar user requirements. Finalize the unambiguous user requirements.	X	✓
VI. Estimate budget, risk analysis, duration to complete, success rate of the project.	X	✓
VII. Defining the milestones for each and every tasks and visualize the progress of each and every tasks.	X	✓
VIII. Sending emails, notifications to the users. Provide user friendly and attractive environment.	✓	✓
IX. Users (sponsors, client, developers) can access to the system and gain the progress of the each and every tasks.	✓	✓

Table 2-different between current application & over application

2.2 Individual perspective

There are several software project management methods that use in software companies such as waterfall, Agile etc. In here, we are going to automate some of that project management methods. When we consider about this methods, project team members prepare some UML diagrams. As an example, think about use case diagram. Suppose team has five members and they prepare use case diagram for same function but these use cases are different from each use cases and different use case diagrams can have same information. In here, what we are going to do is, scan all the diagrams and extract information from those diagrams, then compare this extracted information to identify the duplicated information (requirement). That mean this is not based on the type of the UML diagram.

First step is to store the unique shapes in the database according to the UML diagrams. This stored shapes are encoded. They must be decoded to detect their features like edge information [4]. Then input the image of the UML diagram and identify the shapes boundaries and generate query data. Identification of the shape is done by using the boundary line of the shape [1]. For that task, we use canny algorithm. Canny algorithm is an edge detection algorithm. Process of canny edge detection algorithm has 5 steps.

- Apply Gaussian filter to smooth the image in order to remove the noise
- Find the intensity gradients of the image
- Apply non-maximum suppression to get rid of spurious response to edge detection
- Apply double threshold to determine potential edges
- Track edge by hysteresis

Shapes can be square, oval, arrow, diamond, circle etc. Then these identified shapes compare with the unique shapes that are stored in the database to determine which type of the UML diagram is, such as activity diagram, use case diagram, class diagram etc. this is done by compares the query data with encoded data of a shape read out from an image database [4].

According to the UML diagram, extract the information (text) that are inside the shapes. Text data present in UML diagram images contain useful information (requirements) to develop the software product. Extraction of this information involves detection, localization, tracking, extraction,

enhancement and recognition of the text from given images of UML diagrams [2]. Final outcome will be the type of the UML diagram and extracted information (requirement).

Then we need to store this extracted information. For that task, we are going to use XML templates. This XML template are created according to the diagram type. After store the extracted information in XML document, we can store that XML template in database. The following image will show you flow of Extract Mentioned Requirement function.

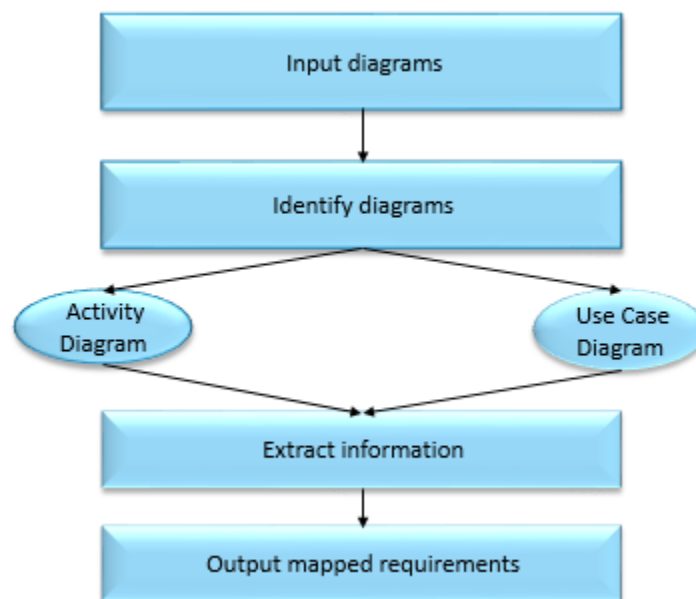


Figure 2-flow of EMR

2.2.1 System interface

the proposed system will be run on java environment and it will connect with MySQL database. System uses python language for text mining part and information extraction from different diagrams and prediction will be implemented by using java language. Developing ontology use protégé platform which runs on the java environment. Java EE provide an advanced API for developing the system. This system has static database to improve the accuracy of the system which is developed using MySQL. MySQL work bench will be used to do the modification in the above database.

2.2.2 User interface

ISPM system will provide attractive interfaces for users. This is a web base system and client, employee and top managers are the users of this system. These users can access the following interface.

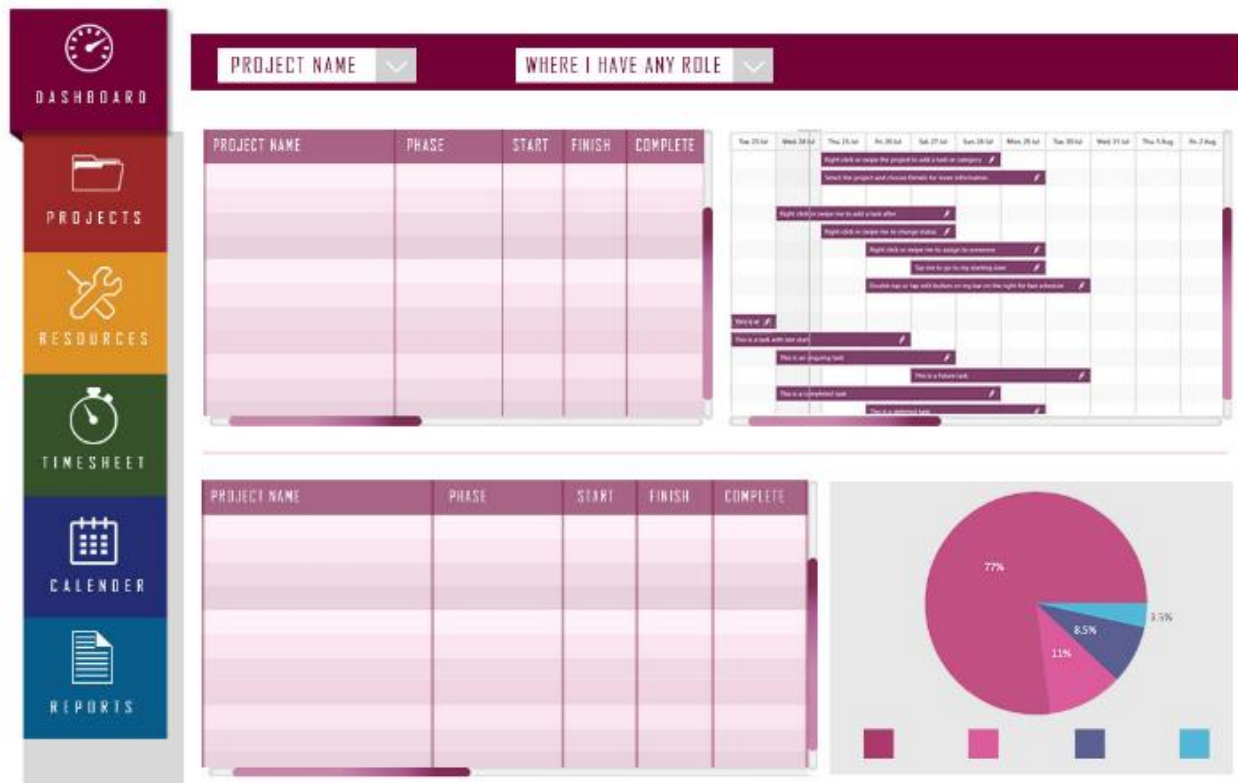


Figure 3-Dashboard

2.2.3 Hardware interface

We will build ISPM system as a web application. In order to use this web application, a computer is needed.

2.2.4 Software interface

There are several software interfaces are needed for implement the ISPM system. For the development of the Extract Mentioned Requirement, NetBeans 8.0.2, JDK and javacv is needed. To create the Ontology engine, Protégé 4.3.0 version will be used. For the creation of the database, MySQL server 2012 will be used.

2.2.5 Memory constraints

For the centralized server which will store the knowledge base and web application, 10GB will be required.

2.2.6 Operations

Extract mentioned requirements is one of the important of this research. We decide to use diagrams for this function. This function can divide into Four parts.

- Identify the shapes in the diagram
- Identify type of the diagram such as Activity diagram, use case diagram etc.
- Extract information from diagrams
- Store extracted information in XML diagram

First part we use for shapes identification. This is done using boundary line of the shapes, in here we use canny algorithm for this task. Shapes identification is most important in ISPM system because in second part we need to use above identified shapes for diagram identification. Diagrams are build using shapes. And some shapes are unique for specific diagram. Using this unique shapes, we can separately identify diagram type such as Activity diagram, Use case diagram etc. after identify the diagram, we need to extract information from diagram. Then extracted information are stored in XML document template and store in database.

2.2.7 Site adaptation requirements

Pre requirements packages will provide better result to the ISPM (intelligent software project management system). therefore, it contains PROTÉGÉ, OWL, SWRL, JAVA JDK, MYSQL sever. This will help to provide successful outcome of the knowledge acquisition and knowledge extraction process.

NetBeans IDE for java EE Developers

- Open the URL <https://netbeans.org/downloads/>
- Select java EE
- Select windows 32|64
- Download it
- Then install it in the PC

2.3 Product Functions

This use case diagram illustrates the EMR function

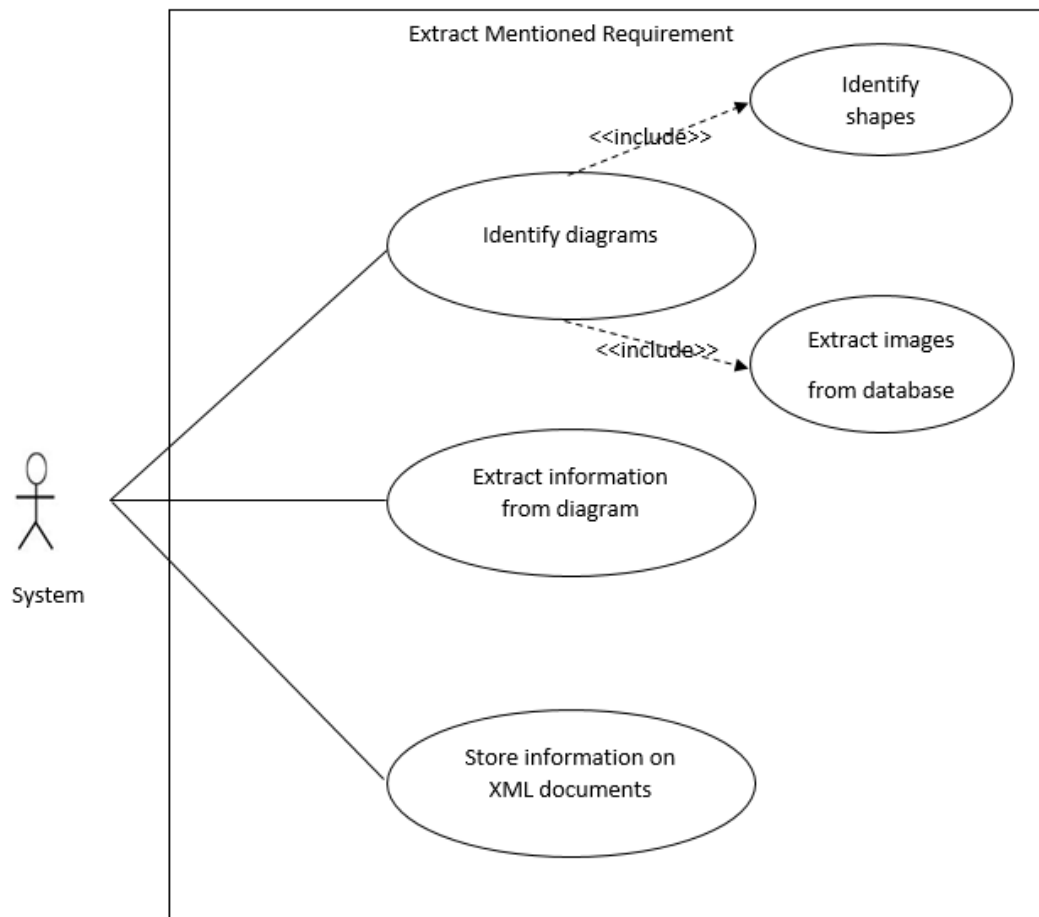


Figure 4-Use case of EMR

Extract image from database

Use case Name	Extract image from database
ID	UC01
Description	Get image from documents
Scope	Scan the documents and get diagram images from it.
Primary Actor	System
Pre-Condition	We need to have documents of the software project.
Success End Condition	Move to identify shapes
Failed End Condition	Show error message

Table 3-Use case scenario-Extract image from database

Identify shapes

Use case Name	Identify shapes
ID	UC02
Description	Using the canny algorithm
Scope	For this identification, we can use boundary line of the shapes. This boundary line identification done using canny algorithm
Primary Actor	System
Pre-Condition	Extract image of the diagrams to the system from database
Success End Condition	Move to identify diagram function task
Fail End Condition	Show error message

Table 4-Use case scenario-Identify Shapes

Identify diagrams

Use case Name	Identify diagrams
ID	UC03
Description	Using the shapes that are in the diagram
Scope	First identify shapes that are in the diagrams and using those shapes we can separately identify diagrams.
Primary Actor	System
Pre-Condition	Identify the shapes
Success End Condition	Move to the information extraction function
Failed End Condition	Show the error message

Table 5-Use case scenario-Identify diagrams

Extract information from diagrams

Use case Name	Extract information from diagrams
ID	UC04
Description	Get text information from diagrams
Scope	Extract all the text from diagrams that are inside and outside of the shapes
Primary Actor	System
Pre-Condition	Identify the diagrams
Success End Condition	Store data in XML documents
Failed End Condition	Show error message

Table 6-Use case scenario-Extract information from diagrams

Store information on XML documents

Use case Name	Store information on XML document
ID	UC05
Description	Store extracted information on XML document
Scope	Identify Actors, use case, activities etc. and store on XML document.
Primary Actor	System
Pre-Condition	Extracting information
Success End Condition	Store XML document in database.
Failed End Condition	Show Error Message

Table 7-Use case scenario-Store information on XML document

2.4 User Characteristics

There are basically three users in this system

1. SPT
2. Client
3. Senior Management

This final product is really intended for the software development companies which is willing develop and manage a software project without having a Software Project Manager. That is the main task of this product. Client and SPT can access to this system. Client can visualize each and every tasks which is completed by developers, milestone, time periods which are allocated for each and every task, notification and emails. Not only that client and project team can visualize the progress of the development. Project team can identify each and every tasks that they have to complete and allocated time duration.

2.5 Constraint

System shall run on Windows 7 or above edition with a minimum of 2.4 GHz. Java will be the implantation language and NetBeans 8.0.2 will be the developing IDE

2.6 Assumption and Dependencies

We assume the user has a sufficient knowledge of using the computers and also a sufficient knowledge in using common internet services such as email.

2.7 Apportioning of requirement

The requirements described in sections 1 and 2 of this system requirement specification are referred to as primary specifications. Those in section 3 are referred to as functional requirement specifications. The two levels of requirements are intended to be consistent. Inconsistencies are to be logged as defects. In the event that a requirement is stated within both primary and functional specifications, the application will be built from functional specification since it is more detailed. The requirements declared in section 3 are to be implemented for this ISPM system. Desirable requirements are to be implemented in this release if possible, but are not committed to by the developers.

3. Specific Requirements

3.1 External Interface Requirements

3.1.1 User Interface

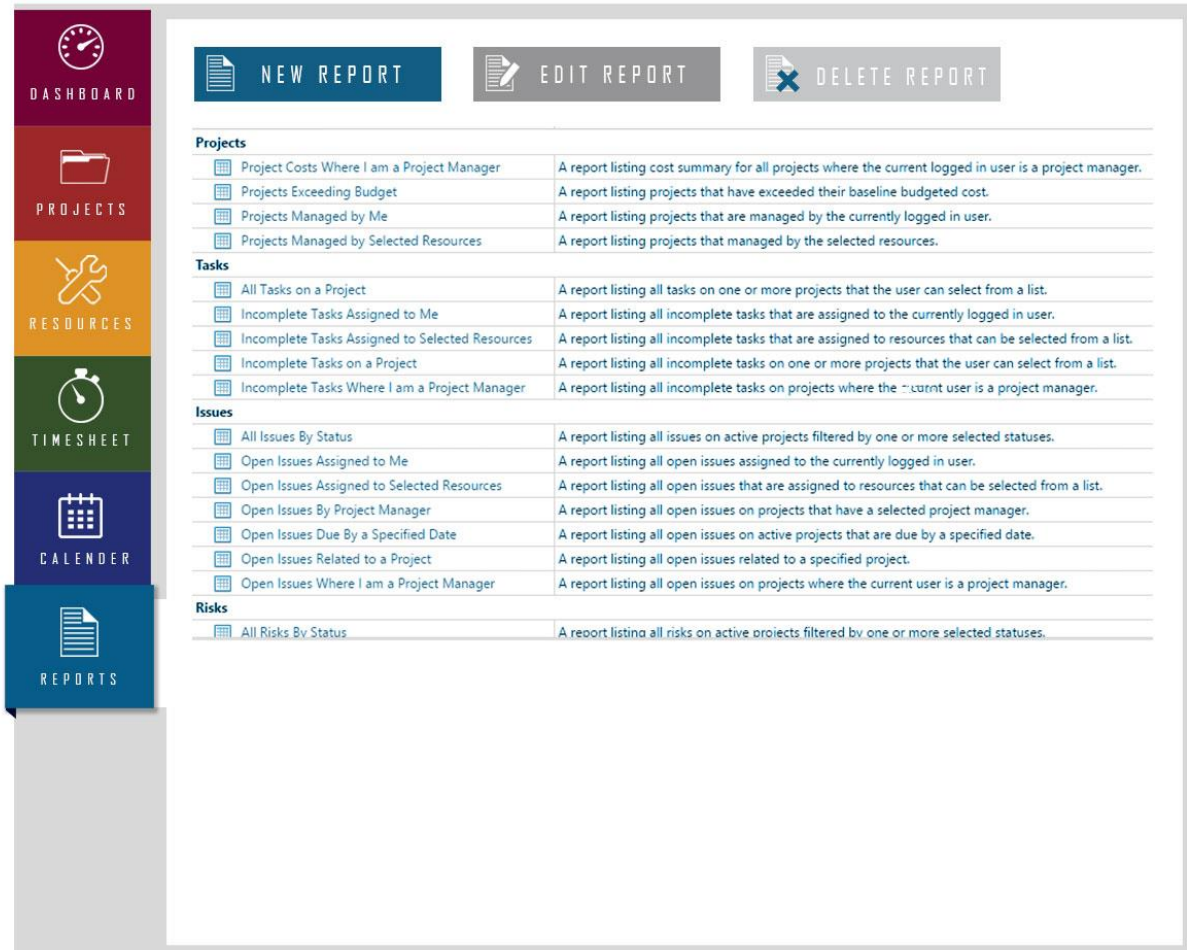


Figure 5-User interface

3.1.2 Hardware Interfaces

- 60-inch TV screen

3.1.3 Software Interfaces

- NetBeans 8.0.2
- Java JDK 8.1

3.2 Software System Attributes

3.2.1 Reliability

This system is not like other systems, because this system will deal with the lot of employees and reliability should more high and advanced when dealing with the system. As people are aware of the results occur due to outputs of the system, it should maintain and build a trustful relationship with the user.

3.2.2 Availability

System Should be available every time to fulfil user requirements.

3.2.3 Security

System should be secure. Therefore, we use separate account for login to the system.

3.2.4 Maintainability

System will be maintained by research team and new releases released with updates and new functionalities.

4. References

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- [3] Ondiappan Arivazhagan, "Ari", Honors graduate in Civil / Structural Engineering from University of Madras.He is a certified PMP, PMI-SP, PMI-RMP from PMI, USA. 26 March, 2015, <http://blog.minitab.com/blog/statistics-in-the-field/making-better-estimates-of-project-duration-using-monte-carlo-analysis>
- [4] Makoto Sato “Image retrieval by comparing wavelet encoded database images with input shapes” U.S. 6 532 307 B1, March 11, 2003.