ASSESSMENT OF HEALTHCARE WITH USE CASE POINT

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Abstract: Project plan plays a vital role in development of the software projects. The software projects can be successfully managed and controlled by managers with the help of effective effort, schedule and estimated size plan. Due to uncertainties in requirements, complexity and size of software systems increases. There are many methods for effective project management in context with measuring and commuting size and productivity. One of the method in this category is use case point .Use case point approach enables to produce a reliable estimate in the software development cycle at a very early stage. In this paper necessity of planning phase in SPM is shown. Requirement elicitation is done by discussion with stakeholders. Accordingly use cases are prepared. We have estimated the size of health care model using use case point.

Keywords : UCP, Use case, SPM.

I. INTRODUCTION

The important technique for increasing the new product design effectiveness is Project management. Basically project management means laying out tasks to make sure tasks are in sequence and dependency between tasks is clearly defined, making sure resources assigned to tasks are not overloaded, making sure enough contingency is put in place to cover various different risks. People, Product ,Process and Project are four p's of Project management [1][8] . The relationship is defined between them. Every project follows a process to develop a product by the people. To fulfill the requirements of stakeholder project manager should develop an effective project plan. There is dynamism in software projects [4]. Additional measures have to be added to the management and development of software projects due to change in technology and market scenario. An intelligent framework and appropriate solutions are required for development and management of software projects as complexity and uncertainties have increased a lot in software development of projects [9]. So planning phase of SPM is emphasized to resolve uncertainties and complexity of software projects. The four phases of Software project management process are initiation phase, planning phase, executing phase, monitoring and controlling phase. In initiation phase approval of the project is done. In the planning phase scope document is developed on the basis of collected requirements[6]. Scope document includes budget, time line, size, security initial review etc. In the executing phase communications and information distribution is done. In the monitoring and controlling phase performances are reported, final training, security final approvals are done. Also final budget and timeline approved changes are verified [14].

In this paper, at the initial stage of software project development we have shown the importance of planning phase For requirement elicitation we have used use cases. This paper is organized as follows: II section contains an introduction of planning phase; III section describes Use case point method. It also includes the formulas for calculation of software size. IV Section applies use case

point method for estimating size of cardiac medical system, V Section gives the conclusion.

II. PLANNING PHASE OF SPM

In planning and execution phase of SPM, various tasks are allotted to resources in order to achieve the timelines and budget related goals of the projects [11]. In planning phase various plans like project, resource, financial, quality, risk, communication and acceptance are prepared.

Basic theory concepts and approaches should be included in an intelligent and complete framework. So first of all planning of project is important [2]. After the initiation phase, the planning of project is done till an apt level of detail. The SPM planning phase involves creation of a scope document which helps and guides the team in other phases of SPM. The primary aim of planning phase is to plan time, cost and resources as shown in figure 1, to find the estimation of work needed and to effectively manage risk during execution of project.

An inadequate plan greatly reduces the development and completion of project successfully and thereby it stops initiation phase to accomplish its goals. The artifacts are gathered through the software development process. They are the evidence that the process is followed. The artifacts of planning phase are project team identified, business process mapping, current and planned Work Breakdown Structure, project plan, mitigation strategy, budget, resource, communication and change plan [7].

Project plan shows timeframes required to deliver the project, along with resources and milestones. A resource plan outlines the resource levels required for successful completion of project . A properly documented resource plan will specify the exact quantities of people, equipment and materials needed to complete your project. It helps in calculating efforts and creating schedule. The financial plan summarises the total expenses to be incurred across the project and this is treated as project budget. A quality plan assists to schedule tasks related to customer's needs. It makes sure that customer's needs are done. It consists of

quality assurance plan and quality control plan. A risk plan helps to identify risks and identify actions to prevent them from plan is occurring .An acceptance plan contains deliverables produced by the project. It is an agreement with the customer. Customer gives its concern for schedule tasks. A communication plan recounts how it is intended to send right messages at the right time to the right people [3].
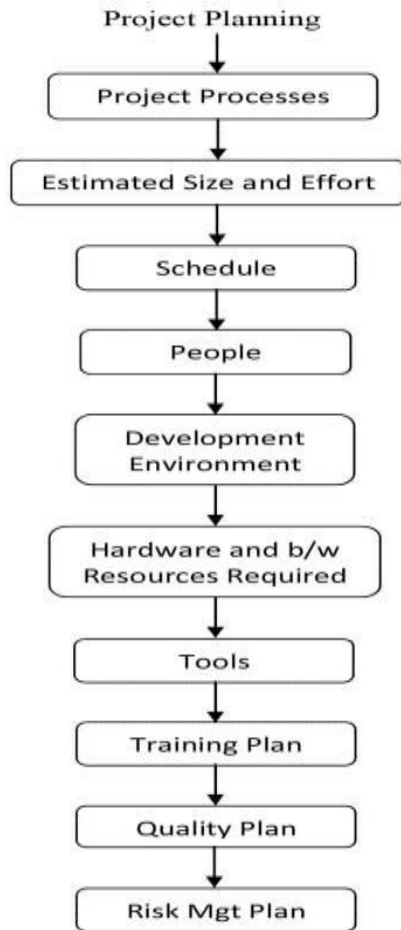

Fig. 1 Project Planning

III. USE CASE POINT APPROACH

In initial phase of software development life cycle, software effort estimation requires large amount of time[5]. Large amount of efforts should be calculated accurately to avoid underestimation and overestimation. Use Case Point (UCP) approach is developed by Gustav Karner [12]. Requirements are represented by using use case diagrams .The purpose of use case approach is measure projects at their initial stage.

The use cases are to be treated as building blocks for any software effort estimation method based on use case point model. A use case diagram is composed of use cases and actors. Each use case is represented by a use case scenario. In use case point method the software size is calculated according to the number of use cases and actors in a use case diagram multiplied by their complexity factors. The classification of different levels of use cases is done on the basis of number of transactions in a use case. Use Case point method calculates size through two stages [10].

1. Calculation of Unadjusted Use Case Point (UUCP)

2. Calculation of Adjusted Use Case point (AUCP)

Terms used in Use Case point approach are defined as follows:

1) UAW- UAW represents unadjusted actor weight. There are three classification classes on the basis of type of interaction with the system. They are: Simple, Average and Complex. In simple class simple programming is used for communicating with the system.

2) UUCW - UUCW represents unadjusted use case point approach. Use Cases are classified as simple, average and complex. The UseCase classification is shown in table 1.

Table 1 Use case Classification

Use case	Transaction	Class
Simple	less than and equal	Less than 5
Average	between 4 and 7	between 5 and 10
Complex	greater than 7	greater than 10

3) UUCP - It represents Unadjusted Use Case Point. Sum of Unadjusted Actor Weight (UAW) and Unadjusted Use Case Weight (UUCW) gives UUCP.

$$UUCP = UAW + UUCW \qquad (1)$$

4) AUCP - It represents Adjusted Use Case Point. It is equal to the product of UUCP, TCF (Technical Complexity Factors and ECF (Environmental Complexity Factors).

$$AUCP = UUCP * TCF * ECF \qquad (2)$$

The imperative role is played by software in medical domain. The health care system is very important for benefit and safety of People. Health care model of Cardiac department is shown in fig. 2.where

$$TCF = 0.6 + (0.01 * TF) \qquad (3)$$

$$ECF = 1.4 + (-0.03 * EF) \qquad (4)$$

$$TF = \sum (Factor_i * Weight_i) \qquad (5)$$

$$EF = \sum (Factor_i * Weight_i) \qquad (6)$$

Health care job is a complex, highly supported, time-pressured process. The health system checking should be very appropriate and it should have well planned, well-defined and Factors and weights are considered of both technical environmental factors. There are total 13 technical factors and 8 environment factors as suggested by Karner[12].Values taken by factors vary from 0 to 5. Their significance is shown in Table 2 below:
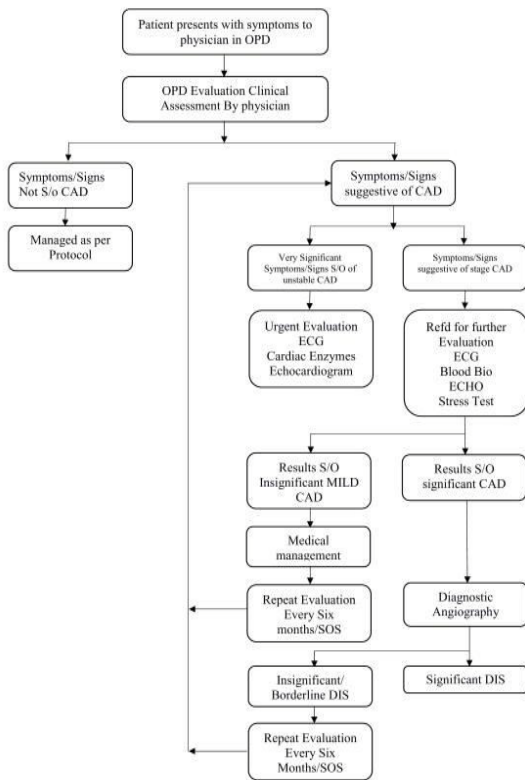
Fig.2 Health care model

Table 2 Significance of Factor continuous improved processes for success.

UseCase No.	Description	Complexity
1	OPD Appointment	Medium
2	Disease Confirmation	Comple
3	Update Information	Medium
4	Appointment for	Comple
5	Patient History View	Comple
6	Test Performance	Simple
7	Admission in Hospital	Comple
8	Update Patient Details	Medium
9	Update Hospital Details	Medium
10	Maintain account	Comple
11	Payment By patient	Simple
12	Surgery Details	Comple
13	Discharge Process	Comple
14	Next Appointment	Simple
15	Clear Accounts	Medium
16	Update patient file	Medium
17	Send message	Simple

Table 3 Use cases for health care system

Factor Values	Significance
0	No significance
1	Insignificant effect
2	Moderate influence
3	Intermediate effect
4	Significant influence
5	Very strong influence

The weights and factors are assigned below in a health care model.

IV. HEALTH CARE MODEL

On the basis of requirements elicited from cardiology department in reference to health care system ,for different scenarios different use cases are prepared [13]. Classification for 17 use cases shown in Table 3 is done as 4 simple, 6 medium and 7 complex. In reference to user tasks for system development scenario preparation is a basic element.

Scenario preparation as a top down approach starts with the requirement elicitation process. It identifies the properties and limitations of domain to be worked upon [14]. We have shown use cases in figure 3 and figure 4 for different scenarios.
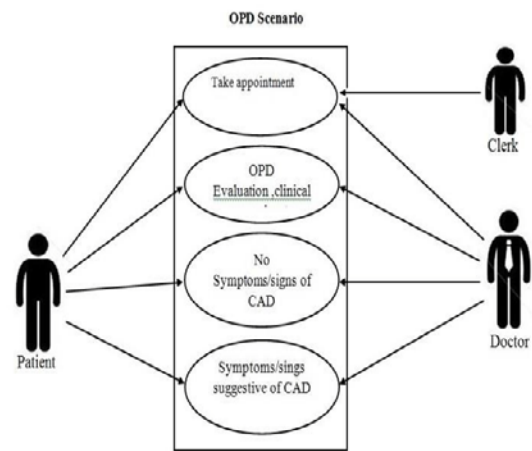

Fig. 3 OPD Scenario

Use Case Title: Patient for OPD visit
Actors: Doctor, Admin, Patient
Preconditions: The Patient has heart(cardiac) problem
Main Success Scenario:-

1. Check if patient has taken token.

2. Check if patient has symptoms of heart problem.

3. Check if patient has come for routine check up

4. Check if patient has come for follow up .

5. Check history of patient.

6. Check the tests if recommended in previous visit , identify the problem and treat.
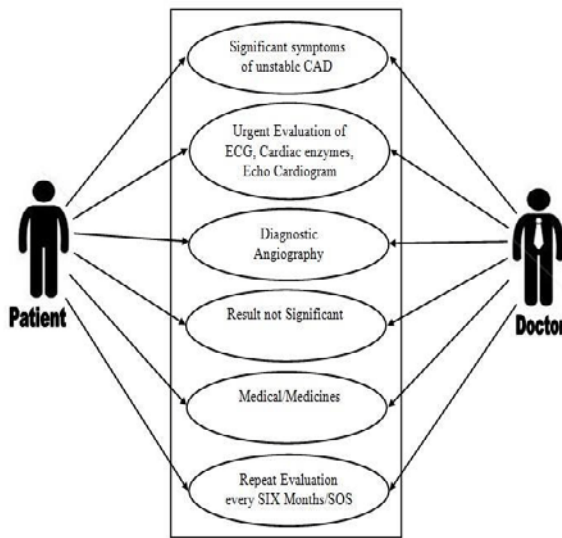
Fig. 4 Diagnose disease

Extensions:

1 a: If patient hasn't taken an appointment token then: 1a.1 Notify the patient to meet the clerk.

2a: If patient have symptoms of Heart problem then: 2a.1 Send to emergency for heart check.

Post Condition: The patient has been treated in OPD. Similarly there are 15 more use cases for different scenarios.

Use case point approach is applied on health care model. The weights assigned for technical and environmental factors are shown in Table 4 and Table 5.

Table 4: Technical Factor Weights

Factors	Score	Weights	Total
Distributed system required	3	2	6
Response time is important	3	1	3
End user efficiency	5	1	5
Complex Internal Processing required	3	1	3
Reusable code must be a focus	4	1	4
Installation ease	5	0.5	2.5
Usability	5	0.5	2.5
Cross-platform support	0	2	0
Easy to Change	4	1	4
Highly Concurrent	1	1	1
Custom Security	4	1	4
Dependence on third party code	0	1	0
User Training required	5	1	5
			40

Technical factor = 40, Using eq. 3, we get

TCF = 0.6 +0 .01 * 40 =**1.0**

Table 5: Environment factors

Factor	Rating	Weight	Total
Rational unified process familiarity	3	1.5	4.5
Application Experience	1	0.5	0.5
Object Object Oriented programming exp.	3	1	3
Lead analyst capability	4	0.5	2.0
Motivation	5	1	5
Stable Requirements	5	3	15
Part Time Staff	0	-1	0
Difficult programming language	3	-1	-3
			26

Using eq. 4, we get

Environment Factor= 1.4+ (-0.03*26) = **0.62**   (5)

Using eq. 2, we get

UCP = 107 * 1.0 * 0. 62 = **66.34**   (6)

The effort is assessed by multiplying UCP and standard effort rate(ER) in person-hours/UCP. Generally the researchers use ER=20 person-hours per UCP, Effort is assessed as:

Effort = UCP * ER   (7)

Using Eq.7, and considering 9 hours per day we get

66.34 * 20 = **148** Person-Days

On considering 8.5 hours per day we get **157** person-days

The size is reliable and closer to the efforts applied iteratively. Thus in the very early stage in the development cycle the size is assessed of model of health care.

V. CONCLUSION

The importance of planning phase of software project management is shown in this paper.. Requirements are elicited by using use cases for different Scenarios. On the basis of Project plan tasks, resources, schedule is planned. Project Plan helps to review actual against planned .Weights between 0 and 5 are assigned to existing factors for health care model. Then efforts are estimated using use case point approach. It is mandatory to evaluate the weights properly as the weighted values influence each factor. The weights will vary according to the type of Project. Many factors including technical and political have impact on the software development process. The estimation at initial stage can decrease error.

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