

Software Development Process by a Logical Approach to Quantify the Throughput by Balancing Time and Cost

Praveen Naik¹, Dr. Shantharam Nayak², Vandana Reddy³, Ambika Naik⁴

¹ Assistant Professor, Computer science & Engineering, Acharya Institute of Technology, India

² Professor, Information Science & Engineering, R.V College Of Engineering, India

³ Lecturer, Computer science & Engineering, Acharya Institute of Technology, India

⁴ PG Student, Industrial Electronics and Engineering, VDRIT, India

Abstract: Q-SPIM is an organized advance and incessant progress to enhance software organization's ability throughput quality software that balances time and cost [2]. Such a model developed is verified and validated by the researcher in the course of this research. To improve the overall throughput this approach proves to be a good software up gradation model. This paper work concentrates on upgrading the process as well as organization through Quadrant based approach. This model depends upon the experience on research of software companies and plots the same in different quadrants. The ultimate aim is to develop of a model which would be useful in practice for software development companies to develop quality product. The principle of models for improvement and software process improvement model is described in this paper. The purposed model is a generic model which is beneficial for small firm as well as large firm.

Keywords: CMM- Throughput, Capture maturity model, Q-SPIM : Quadrant based Software process improvement model

I. Introduction

1. Quadrant based Software process improvement model:

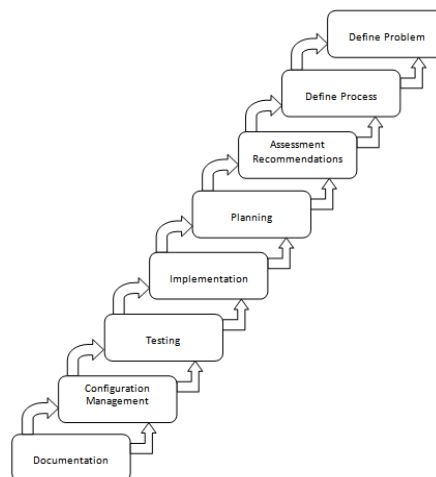


Figure 1. Software Process Improvement Model

It is an approach through which there is an improvement in the process and give good results when compared to the results given by a normal process. Software process improvement ensures a better and high quality product that satisfies constraints for budget and time.

The researcher suggests Quadrant based Software process improvement model (Q-SPIM). This model is an iterative and cyclic model.

This model consist eight steps. These are following

- Problem define
- Process define
- Recommendation and Assessment
- Planning
- Implement
- Inspection/Testing
- Configuration

- **Documentation**

Then it is possible to find the drawbacks in the process and why the process was unable to give a better quality or why it was not possible to complete the project within the time as given by the client. So the first step understands the process. A number of development process model exist. For example if the project is time constrained, RAD model is best suited. A number of models are available for software process: Waterfall model, spiral model, iterative model, hybrid model etc. The process should be analyzed and the drawbacks are identified.

1.1 Problem Define and Process Definition

A doctor can prescribe the medicine only when he is aware about the patient's diseases. Similarly any process improvement model can work in an accurate way if the exact problems in process are known. Therefore the main issue is to state the problem clearly. When the problem is understood clearly then a solution can be found for the problem. What processes are applied for the development of the project may be number of reasons for the project being unsuccessful.

- Lack of management
- Lack of well communication
- Lack of well communication between client and organization
- Technical problem and lack of resources
- Lack of skilled man power
- Not provided a good training
- Ego power
- Working in an adequate way

1.2 Lack of management

This may be the major reason for the unsuccessfulness of a project. This may prove fatal to the project. Lack of management arises because, may be the project manager is not well qualified or he cannot hold the team and cannot inspire the team, due to ignorance of senior management

1.3 Lack of well known communication

Suppose an employee is specialized in a particular domain or module of a project but he is assigned a different domain or module. Then it may not possible for him to perform well. If every member of team contributes well to the project, then the project will be of expected results.

1.4 Well communication between client and organization

Well communication is based on the deal between organization and the costumer. Customer must provide the requirement specification. This specification must be calculated according to the size, cost and time. If the organization fails to calculate in a correct way, then project cannot give a good quality result. Because organizations cannot cross the budget limits which results in poor outcome

1.5 Lack of skilled man power

Lack of man power may also be one of the reasons for unsuccessful project. For example a project demands 100 men but there may be availability of only 50 people due to some reason. Reason may be anything like lack of financial resources, or because the size of the project demands the much more man power. In this situation its not possible to complete the project on time.

1.6 No proper training

Organization should provide a good training to each member of team. Without which they can't perform well. The high level of professional maturity cannot be obtained without training. The team members are trained to satisfy the real needs of the organization.

1.7 Ego problem

Each and every member of the team should contribute his best to the company for overall success of the project. Ego problem in the employees may hinder the development.

	Cause of problems	Category out of 5 scale (1 rated as least)
1	Lack of management	4
2	Lack of well communication	3

3	Lack of well communication between client and organization	3
4	Technical problem and lack of resources	4
5	Lack of skilled man power	3
6	Not good training	3
7	Ego problem	2
8	Working in an adequate way	2

Table I. Categories The Problem

2. Assessment And Recommendation

Once the problem is defined, the area that needs improvisation may be easily found out and then according to problem a team of assessment is formed with recommendation of higher authorities. Team depends upon the higher management and size of problem. Sometime software improvement is not much effective because it can't ensure that applied technique or method can improve the culture of project. So if area of improvement is smaller than the size of risk is reduced by time. But if area of improvement is of higher level then it may be a great risk. In such a case it may cost lot of time for a project/organization for improvement but still have no guarantee for success, but only probability for the success. So at this condition it is better to have a third party sponsorship. But it requires consent from the higher authorities'. They can take decision about timing of sponsorship needed. They have a meeting with senior management of the organization about the improvement of process and about the members of the assessment team for improvement process. Member of the team must be certified by software engineering institute as only then they can take better decision in critical situation.

RISK α (Size of the area + β) / (δ + S).....(1)

Where,

β = Improvement

δ = Time

S= Success

3. Planning

After formation of assessment team, the work on the project is started. They make plan and prepare strategy about how can they improve process by finding changes required. For this first the problem statement is clearly understood and defined. Team now makes a questionnaire for the members coming from different level in organization. The current situation is analyzed based on their previous year experience and a profile is prepared about the future of the company. If there is more than one strategy for any process improvement, then they choose one which produces the better result. With the approach defined, a detailed implementation plan can be developed by taking consideration of all the factors like, technical and non technical.

Now here we explain the process of planning in terms of Quadrants as follows:

Planning is done in 4 quadrants.

1st quadrant: RISK

2nd quadrant: RESOURCE

3rd quadrant: COST

4th quadrant: PRODUCT

Process under RISK quadrant:

From the equation 1 we get all the parameters to evaluate the RISK factor. With this as an outcome we can assess the risk involved in the project. This quadrant will be shown as Green only if the risk factor is low, if not the quadrant is colored in Red depending on the fault made by high risk and this applies for all the quadrants.

Process under RESOURCE quadrant:

Here in this quadrant we have two divisions:

1. Technical
2. Non-Technical

In the technical division we deal with experience of employees, platforms to be chosen, software availability and so on.

In the non-technical division we deal importantly with infrastructure required for the project.

Process under COST quadrant:

Cost estimation strategy will be used to estimate the cost in two ways. We use CBR technique to estimate the cost of the project or use cost estimation tools.

Process under PRODUCT quadrant:

Here we plan about the deliverables that has to be completed within stipulated days and dispatched to the client.

When the team completes the plan, they have a meeting with the senior management and the same is presented before them .By doing this they reduce risk level. At this situation assessment team is not responsible for any casualty. If the plan is approved by the senior management then only team would be allowed to proceed with the plan. If there is no approval for the plan by the senior management then an alternative plan must be prepared and should be presented before them.

4. Implementation

When the plan is established according to problem, then create the solution according to quadrant based plan. First make a paper solution on basis of knowledge, experience and skill of the assessment team. If there are any suggestions for modification in the solution, then modify the plan accordingly and if the senior management approve the solution then start the implementation. Whole of the solution cannot be applied in a single step. It is a step by step process. It makes a baseline after every step and takes a pilot test and check the result if the result is satisfactory then the solution is continued.

5. Inspection and Configuration Management

An inspection is generally an organized examination or a formal evaluation exercise. It involves the tests measurements and gauges applied to certain characteristics in regard to an object or activity. The results are usually compared to specified requirements and standards for determining whether the item or activity is in line with these targets. Inspections are usually non-destructive [3]. It does not guarantee that the work plan and implementation are up to the mark. An inspection a team is formed, which consists of moderator, reader, and inspectors as their members. A formal meeting is conducted and role of each member is defined. Role of the moderator is to organize the meeting and ensure the subject of the meeting. Role of the moderator is to lead the inspection team. So it requires moderator to be highly qualified and skilful. Moderator tells the team how the inspection starts and leads them. Inspection team interviews the assessment team. They make a questionnaire for every member of team. The work done by all the members is reviewed and the results are analyzed. Result after process improvement is expected. Review all the factors of the technique. Main motive of the inspection is to find the defect in the module. If there is any problem in the technique then the area of the problem is found out. What change should be done in process? They specify where the changes are need. This work is handled by the configuration management.

6. Documentation

Documentation is an umbrella activity in this model. It should be continued side by side throughout process. In each phase documentation is needed. Documentation is needed for the future work so that it becomes easy for further reference. Documents associated with a software project and the system being developed has a number of associated requirements:

- They should act as a communication medium between members of the development team.
- They should be a system information repository to be used by maintenance engineers.
- They should provide information for management to help them plan the budget and schedule the software development process.

Some of the documents should tell users how to use and administer the system [2].

The work presented in this research paper provides a software process improvement model. It is an iterative model. The main objective of this model is to accomplish software process improvement by stepwise. First define the area of process improvement and then understand the process. A lot of problems may arise, which may cause the project unsuccessful. Unsuccessful project refers to if there is either depletion in quality or if the budget and time constraint is are not satisfied. First the problem is clearly defined then next step is making an assessment team for improvement according to the size of project. This team must be well qualified and skilful. The team starts its work on the process improvement. They would have done planning for process improvement for the areas which needs improvements or changes are required. When the plan is completed, it is submitted to higher management for approval. Create the solution according to the plan. If there are more than one solution exists for single problem then chooses the best of one for implementation. Applying the whole solution in a single step is not suggestible. Make the base line and take a pilot test at every step and analysis the

result at every step. After implementing the plan next phase is inspection. Inspection is basically a testing phase, which is used to find the defect. A formal meeting is conducted in which members of inspection team takes interview of the assessment team. If there are modification are needed then modifications are done. This work is done by the configuration management. .

II. Comparison Of This Model To Other Model

This model is different from other models. Its working methodology differs with other models.

2.1 Comparison Between CMM And Q-Spim

1. CMM does not specify the implementation. In Q-SPIM model implementation is defined and a proper document is prepared for every process
2. CMM works on software. Q-SPIM model works on both software and organization.
3. CMM is a goal. Being used just as stamp of approval. Q-SPIM model is a quadrant based method.
4. CMM is works on only repeating task. But Q-SPIM model works not only on repeating task but also whole.

2.2 Comparison Between Ideal Model And Q-Spim

Ideal model is also a continuous model. But it is a full method such that there is no recovery. Means either it is successful or fail. Whereas Q-SPIM model is a cyclic model. It works until sole improvement is achieved.

2.3 Comparison Between Six Sigma And Spim

1. Six Sigma is a statistically-based process improvement methodology that aims to reduce defects to a rate of 3.4 defects per million .Q-SPIM model is a quadrant based planned methodology of continuous improvement.
2. Six Sigma is iterative methodology reduced the defect in each step. Q-SPIM model is a quadrant based and iterative model that improves the process by each step. After completion of last step if further improvements are needed then the cycle is started again.
3. Six Sigma methodology works on two approaches DMAIC, DMADV. Q-SPIM works as a full flash model.
4. Six Sigma focuses on prioritizing and solving specific problems which are selected based on the strategic priorities of the company and the problems which are causing the most defects. SPIM model does not focus on prioritizing and solving problems. SPIM model solve all types of problems.

III. Conclusion

The Q-SPIM software process improvement model improves the process in a traditional way. This model is an iterative model. The Q-SPIM model improves the process stepwise. It covers user requirements, software quality assurance, and organization point of view. Many of the factors can be found in the organization from the SPIM model like management commitment and teamwork were strengthened. This model provides a balanced time and cost utility to the entire project and thus effective compared to other models.

Q-SPIM model covers the some limitation of existing models (SPIM,CMM, SIX SIGMA, and IDEAL). For example, the main limitation of CMM is key practice describes “what to do” but does not prescribe “how to do”. Q-SPIM model describe the implementation and prescribe how to do.

Q-SPIM model is a flexible model. If there is a change in the process, it can accommodate all the aspect of the changing of process due to cyclic model.

IV. Future Work

This model is a purposed model. Success of this model depends on the survey which should be done in future. The key process area and capability area of SPIM model also defined in future.

SPIM model reduce the risk as much as possible but it has also some limitations. As this model works basically on meetings and presentations of the plans , it consumes a lot of time.

References

- [1] Jesper Arent, Jacob Nørbjerg, Software Process Improvement as Organizational Knowledge Creation: A Multiple Case Analysis, Proceedings of the 33rd Hawaii International Conference on System Sciences – 2000.
- [2] Ian Sommerville, Lancaster University, UK, “Software Documentation, Printed 7/11/01.This paper is a revised version of Chapter 30 from my book Software Engineering, 4th edition, published by Addison Wesley in 1992”.
- [3] <http://en.wikipedia.org/wiki/Inspection>.