



Software Quality Management

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Abstract: *This paper describes problems associated with the software process improvements initiatives, discuss about Accelerating Process Improvement Method and finally about case study how to deal with process improvement.*

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I. INTRODUCTION

The paper focus on how APIM can be used for software process improvement. It focuses on how organizations can adopt APIM to improve their processes and solve the problems associated with the process improvement.

II. DESCRIPTION OF EXPERIENCE OF SOFTWARE ENGINEERING DEVELOPMENT PROJECTS

All the group members are lacking the industrial experience but during our academia we have gone through many Software development projects. We like to discuss one of the group members' experiences doing his thesis. The project was done in the field of image processing. The project title was "Constructing 3D Face from Orthogonal 2D Front Image". This project main aim was to construct 3 dimensional structures from 2 dimensional images. This system enables users to see whole structure of the face even when the face is partially seen in the 2D image. Thus, it allows security force to identify intruder quickly and easily. The software was built using Visual Basic 6.0, Visual C++ and Open Graphic Library.

There were no external stakeholders for the elicitation and acceptance of the project. The developers with the project supervisor were main stakeholders for the project. Thus, these three persons were mainly responsible for the elicitation and for the final acceptance of the project.

Project was highly affected by the changing requirements throughout the project. Agile method was used for the project having iterative development throughout the project. All the problems were solved by group consensus and mainly through high face to face meetings. The project team never followed one process; and they improved their process with the changes in the situation and new requirements.

III. PROBLEMS ASSOCIATED WITH SOFTWARE PROCESS IMPROVEMENT INITIATIVES

Many problems are associated with the software process improvement initiatives. If possible all the problems should be identified and solved to achieve success. Generally, every organization focuses on attaining certain level of process maturity in order to achieve the specified goal. According to our own experiences in the software development projects and through the academia, we can state critical problems associated with process improvement initiation. Some of them are given here under.

Lack of Executive Management Support

Executive management support is considered as the key factor for process improvement in order to achieve project goals as well as organizational goals. Without executive support, it is virtually impossible to run the process improvement at all. The lack of support may be due to a poor execution of process, communication gap between high level management with process improvement group, inefficient result, inadequate validation process, or unable to achieve the business goal^[1].

In order to achieve high executive management support, the process management team must engaged in frequent communication with top level management providing updates regarding improvements of the process management. The process improvement should always concern with attaining business goal thus the process management team should adopt process improvement methods according to the environment or situation. Executive management is more concerned with the benefits rather than technical things. So, it is necessary that the process management team should always ensure executive management that they will achieve business goal effectively and efficiently with high quality ensuring minimum budget and time.

Lack of Organizational Adaptability

An organization should be ready to adopt any changes to any improvement in order to reach the goal otherwise it will die, The lack of organizational adaptability may be due to selection of poor process, lack of capable resources, in

appropriate tools, techniques and methods, less training and due to inflexible project management style. An organizational process should be flexible to incorporate new changes whenever necessary with little maintenance. If it could not be able to be flexible to the new changes then it might be possible that organization have to change the complete process. Generally organization should be aware of technological factor such as tools, techniques and methods, as well as the market or key customers.

Gap between project goals with organization goals

Achieving project goals does not always ensure that the organizational goal has been met. In real life, there are many projects those are successful but could not achieve the organizational goal. It occurs when there is a gap between project goals and organizational goal. These gaps should be identified to get benefits from the project. The gap occurs due to lack of communication between project management and organizational management, not allowing organizational management involving in the stating scope of the project, not allowing marketing department to take participate during elicitation, Software Requirement Specification and during project acceptance, and using local functional metrics instead of global metrics in order to measure success ^[1].

To get rid of this problem, project should use both global metrics related to the organizations and local functional metrics related to the project, and these metrics should not conflict with each other. Thus, project should be ranked according to business goal having cause/effect matrix, and functional objectives. All the business requirements and project function requirements should be determined and these should be used to rank whole project ^[1]. Allowing marketing department during elicitation, SRS and project acceptance will help project manager to know about the market condition, competitors product, time to market or release planning, customers needs and expectations, etc.

Thus in order to achieve the organizational goal, project goal must satisfy all the organizational goals.

Lack of Qualified Human Resources

One of the influence factors of the process improvement is the lack of highly qualified human resources. An experience and qualified human resource helps in process improvement whenever necessary and can be one of the key players throughout the development and project management ^[2]. If any serious problem arise during implementation of process these resources values are rated high. The lack of competent human resource result in a poor process management, increases in budget and time, and may result in less chance in process improvement.

To get rid of this problem, the organization should motivate the qualified human resources not to leave the job. The organization should be able to use qualified human resources in right way, and provide appropriate training and monitor for new and unqualified process improvement members, allowing them to become comfortable with the changes and even more productive ^[2]. The process improvement members should be aware of organizational structure, comprehend the management strategic plans, follows the direction suggested by senior management, and need to understand software support activities (Software Quality Assurance, Software configuration Management) in order to increase the possibility of attaining the goal or success ^[2]. Software Process Improvement members should be aware of technology changes, should work within organizational culture and should focus on team building concept allowing all to participate in the decision making ^[2].

Delegation of Authority

It is very necessary to identify level of authority at the beginning of the project. If all the power lies at the high level management, it is very hard to attain certain level of achievement. If a high level management is not technical persons then it is very hard for them to understand the needs of the project and the project managers may have to wait for long time to get the decision. Thus, it may result in increased in budget and time, and result in difficulties to attain certain level of process improvement.

As a solution for this, a high level management should allocated one highly qualified staff on which they can trust to get the job done ^[3]. By delegating authority, it enables managers to make decisions quickly without anyone obstruct to achieve the goal. All the managers should be given authority to make decisions for their team to resolve the issues as they arise ^[3].

Communication Style

It is considered to be most important activity for the development of any projects. There should be well defined communication channels in every level of the organization. The lack of communication between two parties may lead to the misconception and misunderstanding, affecting the achievement of goal in defined deadline with minimum cost.

The project manager should ensure two way communications with all key stakeholders throughout the development lifecycle. In order to achieve goal with in defined dead line and budget, all the stakeholders should be provided necessary information and should allow sharing their ideas democratically. The well established communication will reduce the personal conflict and sometimes acts as a problem solving techniques".

IV. MAIN PHASES AND STEPS IN APIM APPROACH

There are three phases in the APIM approach namely.

1. Pre-Maturity Phase
2. Maturity Phase
3. Post-Maturity Phase

Each phase as a step of procedures to be followed which are explained below.

4.1 Pre-Maturity Phase

This is the most important phase in the APIM which laid the strong foundation and basis for all future improvement efforts of the process. This contains the essential requirements which are desirable for the implementation to speed up process improvements. The preliminary work is done in this stage. This phase is considered to be a critical phase since it provides the strategy for organizations on the upcoming work on agile process improvements. Primary documentation and planning of the processes are carried out in this phase" There are two main steps in this phase namely.

1. Launch
2. Planning. These steps are explained below.

4.1.1 Launch

The importance and usefulness of process improvement is taught to the management of the Organization in this step. The long term goals or the short term goals are set at this stage. After setting of goals they are communicated to the staff with help of the communication mechanism. The primary resources, budgets and appointments are prepared in this phase. In this phase the members' activities are unplanned so that they can re-modify them to adjust to their future needs and requirements. An executive steering committee consisting of higher level stake holders of management are formed, which are responsible to keep a track on the improvement plans.

In addition to this two types of kick off meeting also take place in this level.

1. For the higher level management to resolve the higher level problems.
2. The lower level where the problems are resolved by the team members.

Thus the plan for launching the starting level projects related to agile process improvements are done at this stage.

4.1.2 Planning

This phase completely works on the details of the plans used for accomplishing process improvement goals. This process is repeated several times so that we don't fail to notice any details required. The plans which are developed during this phase are:

1. Action plan: Goal related activities are carried out in this plan
2. Communication plan: This plan is done for the communication establishment between the staff and management.
3. Data Management plan: Documentation of the project during the process.
4. Detail Master Schedule plan: Scheduling and conducting training.

These plans provide us channel for solving the forthcoming issues since they are communicated throughout the organization. This will be helpful for the stakeholders when they are not confident about their decision.

4.2 Maturity Phase

The most important work is done in this phase since it is the central part of the agile process improvements. All steps involved in this phase are done repetitively till the organization is set for the direct approach of the continuous improvement. Agile approach is followed while these steps are implemented the one with less time and effort is preferred. The below given are the steps in this phase.

4.2.1 Awareness

This phase helps in knowing the current position of the organization and where it goals are to be reached. Any small assessments are used to determine the overall awareness of the process. With the help of this we can spot out the weak area and concentrate on the efforts to overcome those weak areas. The confidence for the process improvements efforts are given to the management and the stakeholders by these results.

4.2.2 Triage

Prioritizing the actions is done in this phase and the priority is made based on the selected goals like business goals, process goals and project goals. Any decision made must consider the organizational structure, the resources and the budget. The prioritizations of the actions are taken care in all aspects which are done by conducting the group meeting. This helps in achieving the goals with limited resources which is the main goal of the agile process improvement.

4.2.3 Resolution

The process action team formed by the process group performs all the actions which are prioritized. This team will guide the others who have less understanding and teach them for carrying out the actions. A check list is provided to the PATs in order to keep a track of the action plans allocated to them since they are usually complex and they require more effort to perform. The elimination of the added technical barrier in PATs working is the main objective of the agile working is always considered. The team is formed with the confidence that it can resolve the problems better than the individuals. The PATs status is accounted on the regular bases.

4.2.4 Training

All training process is carried out in this step. Once the methods are prepared the staff s are trained by these methods. The training methods are usually based on the needs of the processes and then customized for the organizational requirements. After the training the assessments are conducted to ensure that whole thing is according to the plan. If any

further training is required then the necessary actions are taken. The process is made friendlier with the help of the training. This ensures that the process moves towards its requirements rather than moving back to its previous habits.

4.2.5 Deployment

The efficiency of the process is verified before the real running. An individual or a project will act as a lead for this process. The outcomes of the entire method are accounted in order to formulate the improvement to the process. Once the changes are made it is then send back to the lead for additional cross verifying. This step will continue until the effectiveness of the process is achieved.

4.2.6 Trail

The process is sent for approval to the process groups once the pass through the PTAs and the leads. Here the panel reviews the standards set the PTAs and the leads and the process is evaluated on the efficiency of the organizations. The evaluation is done against the risk factors. After the approval the process is used in the organization and accounted for the forth coming development and keep away from related fault in the future.

4.3 Post Maturity Phase

This phase comes in to play after the end of the maturity phase where the organization decides that there is no more need of the agile process improvement and moves to more straight forward continuous improvement methods" At this stage the organization considers the following two things

1. Auditors assessment of the processes Focus on the continuous improvement on the previously accepted process.

4.3.1 Assess

The assessments of the process are decided before the start of the improvement actions by the company. The current position of the process is considered before taking any decisions. The decisions will be kept on hold if the process need more time and effort before the start of the assessment or else a best alternative method is chosen to recognize the strength and weakness of the process In addition to this the maturity level of the process is also determined which assist the company to re-describe its focus.

4.3.2 Improve

Although the process has reached its maturity level to a point yet there is necessity for the improvement. The energy which takes the teams to work on the process must continue and steps are tackling to avoid the repetition of the old habits. The known weaknesses in the assess phase should be given priority and efforts should be made to overcome those.

The process assets are strengthened and the staffs are made to work individually by providing the training to the new staff The plans that were made at the beginning of the process improvement will be re-evaluated and re-structured considering the current position of the process. Hence the major objective of this step is to maintain the efficient work done and in addition progress the organization.

V. REDUCTIONS OF PROBLEMS

The main objective of the APIM is to decrease the issues present in conventional process models" It gives answer to the frequently occurring issues which lead to the obstacles in process improvement. The three major reduction issues are described as follows

5.1 Managements Lack of Interest

This issue is handled by APIM in the pre-maturity phase. The benefits of the process improvement are influenced to the management by the executive Management Buy in [3] step. For any process improvement plan to proceed we need the support of the management which is gained by producing the results of the already improved process. Hence the initial step of the APIM is to prove to management first and then later proceed to the other steps. As the days roll on the management may lose its interest. To overcome this APIM approach engages in conducting the meetings at each stage and forms an executive steering committee" This committee helps in maintaining the interest with the management.

5.2 No Proper Training Facility

In any organization if the work need to complete in an organized manner require proper training The APIM approach suggests two stages of training to overcome the problem.

1. Organizational Training at Pre-Maturity Phase
2. Training at Maturity Phase

In these two stages the staffs are trained in accordance with the needs of the process. The usability characteristics of the process during the training help in improvement of the process" Since the improvement is a continuous process after the maturity phase the rationalized methods are taken in to account when the training of the new members take place" These are the main facts that decrease the problems occur in training during the process development.

5.3 Lack of Planning

In many cases the organization the work will be unplanned [4]. In APIM approach planning is an important factor. Every action must be planned and this planning involves from risk analysis to data management. All these activities are given in the tanning step in the pre-maturity phase. This helps in working out the action plan in agile way and stick on to the well defined procedures. Every plan considers the strength and weakness of the organization.

VI. TOOLS AND THEIR APPLICATIONS IN APIM

We have already described more than 25 tools in the previous section. Few of these tools are explained below.

6.1 Work Breakdown Structure

This is useful in the planning phase which defines the responsibilities or the procedures which is needed in every process at every stage of the company development. The planning step is available in the pre-maturity phase where WBS plays the important role by explaining the process.

6.2 Process Group Meeting Minutes

The minutes of meeting are useful to communicate the decisions taken in the meeting to the employees" In addition to it this creates a feel of rights for the process due to the fact that the decisions are taken as joint approach to the issue.

6.3 Wide band Delphi estimating method

The effort calculation of a particular activity is usually a problem. This method overcomes this problem and used in APIM to calculate the effort required [6]. This tool gives us an idea how to estimate the effort without the wastage of effort and resources.

6.4 Scheduled Checklist

The schedule that is made during the planning of any activity is usually unclear [5] and neglects the required details. This checklist gives clear information on all the major portion of file schedule development.

6.5 Budget Checklist

This tool is very useful to the decision makers to keep a tract of record of the budget assigned the information that is available in this checklist fulfills the importance of the stakeholders of the project. This provides the outline overview of the budget expenditures.

6.6 Initial Executive Managers Kickoff meeting's Agenda

These lists of meetings are very helpful for the management to look over the important issues without wasting time by focusing on the unnecessary issues. The important decisions will be made related to the issues by the help of these meetings. In this the managers will discuss about the important things in an agile way.

VII. CASE STUDY

According to the description of the case study the quality manager of the consultant found that the customer satisfaction has decreased due to lack in process maturity monitoring and administering of the hiring companies" The problem is that if consultant companies does not solve this problem and increase the customer satisfaction then they will not allow improving the processes of the organizations they are hired by. This problem is out of the hands of quality managers, but the quality managers can take certain steps letting the hired companies to improve their process improvement" The recommendation for quality manager can be

- * Quality managers should establish good channel of communication between two companies and should clarify why the problem is problem, what and where the source of problem is and should recommend appropriate solutions for the problem.
 - * The good communication will build the trust and remove misunderstanding between the companies and allow to share their problems and allow to take participate in the software process improvement.
 - * Quality manager should assure the hiring companies that there is no problem in the process adopted by consultant companies, have qualified resources and tools and techniques.
 - * Quality managers can take participate in the software process improvement of the hiring company and let them know about problems they are facing"
- In order to deal with these problems consultant companies should take certain initiative such as
- * Introduce APIM that uses agile method. APIM assist in building team concepts, support iterations development, delivering quality of services, process adaptability and collaboration throughout the development lifecycle of the project.
 - * Collaboration and joint team work can be one of the solutions to improve the trust between the companies.
 - * Introduce agile development that will help both companies to have face to face meeting at any stage of the development lifecycle thus ensuring trust and removes misunderstanding.
 - * Revealing status of the process improvement regular span of time.
 - * Preparing well defined plans for all the milestones with appropriate resource time and budget allocations.
 - * Following appropriate international standard for process improvement, documentation, tools, techniques and methods.
 - * Configuration management and change management should be well document.
 - * All the agreements and decisions should be well documented It will be useful when written evidence is required during conflict resolution.

Proper follow up the recommendations given above certainly allows the consultant to increase the customer satisfaction and build the trust.

VIII. CONCLUSION

From this paper, one can understand the various aspects of process improvement, and problems associated with the process improvement.

REFERENCES

- [1] <http://www.stsc.hill.afmil/crosstalk/2004/03/O4O3Jacobs.html>
- [2] <http://www.stsc.hill.af.mil/crosstalk/2000/O8/kasse.html>
- [3] D. Jacobs "Accelerating Process Improvement using Agile Techniques", Auerbach Publications, 2006.
- [4] R. Dion, "Process Improvement and the Corporate Balance Sheet", 1993.
- [5] W.S. Humphrey, "Three process perspectives: Organizations, Teams and People", Kluwer Academic Publication, 2002.
- [6] B. Thompson, "Better estimates with Wideband Delphi Method", 2008"