BUILDING AND SUSTAINING A
WORLD CLASS SOFTWARE QUALITY
ORGANISATION

SUMMARY

The ultimate challenge for any software organization is to build a Quality Management system that can guarantee performance on key deliverables of quality, cost and schedule. A balanced approach of utilizing the three dimensions of process, people and technology is essential. This can be achieved by leveraging on the existing frameworks of ISO, SEI and Six Sigma. This keynote speech brings forward the essence of putting process in place, improving process maturity using SEI-CMM framework and driving continuous improvement using Six Sigma methodology. Leveraging on current technology to institutionalize the process and a very important aspect of building competency centric workforce practices to improve organizational performance is also discussed.

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1. INTRODUCTION

Software development is inherently intangible and dynamic in nature. It is also complex due to difficulties in requirement capture, changing requirements and challenges of software testing. Software project management also poses a challenge due to difficulties in software size, effort and schedule estimation, risk management and configuration management, especially in large projects. The people turnover adds a new dimension to software project organization’s problems. Notwithstanding above issues, there is an increasing expectation from customers to shorten the time to market, reduce costs and deliver higher quality products. This creates an immense challenge for software organizations, particularly large organizations to build a quality management system that guarantees perforce on key deliverable of Quality, Cost and Schedule.

2. THREE DIMENSIONS

The Three dimensions of software quality management are “Process”, “People” and “Technology”. Delivering consistently a good quality product in a complex and dynamic scenario without a strong Process focus is not possible. The software industry is people intensive, hence a mature workforce aligned to the organization goals is essential to ensure higher productivity and quality. Use of contemporary tools and technology helps the practitioners to apply the process with ease and provides effective institutionalization
2.1 THE PROCESS DIMENSION

Defining & implementing a process, improving its maturity to higher levels and sustaining through continuous improvement are the three functions of the process dimension.

2.1.1 PUTTING PROCESS IN PLACE

Foundation of world class software organization lies in putting an effective process, which is in line with business needs, and addresses all the important areas of the organization. Software engineering life cycle models for different types of projects needs to be made available to project groups e.g: life cycle models for development projects (Waterfall model, V process model, Iterative model etc), maintenance projects and conversion projects. These models are based on robust ETVX (Entry - Task - Validation - Exit) process standard which describes when process step will be initiated, what will be done in the step, How the output of the process step will be verified for quality and when it will be ready for next step along with life cycle models, procedures for different management functions e.g. software development planning, software quality planning, project tracking, risk management etc. needs to be defined. Additionally, procedures for support groups like HR, Materials, Logistics, Administration, Finance and Training etc are also required to be documented to help project groups deliver consistent good results. Formal procedures and techniques for all engineering activities e.g.: requirements capture and change management, design, implementation, testing etc, requires to be documented. The documented process helps the practitioners to use a repeatable process and assure good quality product consistently. ISO 9001 provides a comprehensive framework to address all areas of process definition. It also helps to monitor its compliance to ensure institutionalization.

2.1.2 ASSESSING AND IMPROVING PROCESS MATURITY

After institutionalizing a process, its maturity needs to be continuously assessed and improved.

The Capability Maturity Model (CMM) of the Software Engineering Institute, USA (SEI) provides a framework for assessing the software process maturity of the organization i.e. the extent to which the process are defined, understood and practiced. It gives a stepwise process maturity path. There are 5 levels of process maturing for SEI CMM. The initial level indicates that there is no process in an organization. At Level 2, the repeatable level, project management process is in place. At Level 3, the Defined level, an organization wide standard software process is established and is used by all projects by tailoring it to suit the specific business requirements. Instituting an organization wide process helps in process measurement and process improvement. An organizational process database which stores the quality metrics and best practices is an important activity at this level. This helps projects in better estimation, planning and risk management. As the organization process maturity improves, the focus shifts to quantitative control of process and product quality. This requires definition of suitable measures, collection of metrics, analysis and use of metrics in decision making for corrective and preventive action. This improves visibility and introduces objectivity in software engineering and project management. This is normally done at Level Four – The Managed Level. At the highest maturity level (Level 5), the organization focuses on casual analysis & defect prevention, continuous improvement of practiced processes and introduction of new tools & technology in a controlled manner to improve productivity and product quality.
2.1.3 IMPLEMENTING CMM

A Central Software Engineering Process Group (SEPG) is essential to address the process dimension. The group ensures the process definition & maintenance of quality system on a continuous basis to keep it in line with business needs and also facilitates continuous improvement. It drives the metrics program and ensures that right metrics set are defined, collected and used. It works as a custodian of organizational process database. SEPG is also responsible for introduction of new process and technology in a controlled manner for driving quality goals.

2.1.4 DRIVING CONTINUOUS IMPROVEMENT – THE SIX SIGMA WAY

The process maturity, improved through the SEI CMM framework needs to be sustained through continuous improvement process.

“Six Sigma” provides an easy to use methodology to drive continuous improvement. Because of ease of use and applicability to all areas of an organization, it helps in total quality improvement. It provides a structured methodology based on measurement to ensure that critical business processes are improved in a quantitative/objective manner. The framework provides to drive and measure large improvement e.g.: 3-sigma quality level (66807-defects/million opportunity) to 6-sigma quality level (3.4 defects/million opportunity). It provides a simple six-step process namely:

2.1.4.1 Identification or product/service
2.1.4.2 Identification of customers & their critical to quality requirements
2.1.4.3 Identification of needs to follow the process
2.1.4.4 Process definition
2.1.4.5 Mistake proofing the process
2.1.4.6 Ensuring continuous improvement

Thus, the process dimension can be addressed by leveraging on existing frameworks of ISO, SEI CMM and Six Sigma. Using these frameworks, comprehensive & robust process can be defined, institutionalized and continuously improved.

2.2. TECHNOLOGY DIMENSION

Effective use of technology is essential, especially in a large organization, to support the process dimension. It reduces the effort required from practitioners in using processes and also helps SEPG in making available the improved process for the benefit of entire organization. A web based quality system is recommended for a large organization. The success of metrics program in an organization is directly related to the effort spent on metrics collection and analysis. A tool is essential to capture defects and effort metrics, analyze and use them effectively.

A tool based online intranet system is very useful to develop organizational process database of metrics & best practices. It also helps in easy availability of information on software engineering tools that have been evaluated and found to be effective.
2.3 PEOPLE DIMENSION

While process and technology are essential for software project management, the ultimate success of a software organization depends on its ability to attract, train, motivate, align and retain its workforce. This can be achieved by building competency centric work force practices. In this approach, clear roles & competencies required for these roles are defined. The competency management would comprise of identifying the competency, imparting the competency assessment of employees and finally linking the evaluation to human resource practices like compensation etc.

Competency is defined as behavior cluster that leads to success in a job. Main constituents are “Personality”, “Ability”, “Knowledge & skill” & “motivation and interest”. An example of identifying competency and behavior for a project manager (PM) role is:

- Competency required for PM: Planning & delivery, Problem solving, Teamwork etc;
- Behavior for planning & delivery competency: “produces detailed project plan in which objectives are clearly defined and action steps for achieving them are clearly specified”, “Establishes clear priorities”, “Schedules activities to ensure optimum use of time & resources”, “Monitors performance against objectives” etc.

Broad steps for instituting competency centric approach are:

- Understand vision & values of company
- Define key roles
- Identify behaviors that will lead to success in present and future roles
- Tailor this behavior to address organizational behavior cluster
- Map it into specific roles
- Define measurement & assessment tools
- Apply it to people functions by linking it to HR (human resource) practices and provide training support.

Competency model should address the entire cycle of workforce i.e. Selection, Organizational alignment, Development, Performance measurement, Recognition & rewards and Succession & career planning.

The People Capability Maturity Model (PCMM) developed by the Software Engineering Institute (SEI) provides a structured framework to measure and improve workforce practices in steps. PCMM level 3 provides good guidance on identifying core competencies and aligning workforce activities with them.

2.4 SUMMARY

A world class software quality organization can be built addressing the three dimensions or Process, People and Quality. Strong process foundation aided by latest technology to help institutionalization of the process and competency centric work force management is recommended. These three dimensions can be built & sustained utilizing the existing frameworks 6of ISO, SEI and Six Sigma.