

CHAPTER 5

> A COMPARATIVE STUDY OF VARIOUS METHODS

5. A Comparative Study of Various methods

5.1 Merits and Demerits

More and more interest is being shown in the development of comprehensive strategic performance measurement approaches. Such as SEI-CMM based approach, ISO-9000 based approach, TQM based approach, Approach based on Data Envelopment Analysis, Bayesian approach etc. (as discussed in Ch.2). In the following section, the merits and demerits of the different approaches for measuring the performance measurement are described.

5.1.1 Performance Measurement and Software Engineering Institute - Capability Maturity Model

The first three levels of the SEI – CMM (i.e. Initial, Repeatable & Defined) are relatively simple to understand. The key process areas include practices, which are currently used in industry. There are, however, relatively few projects which operate at levels 4 and 5 (i.e. Managed and Optimizing) [Jalote, 2001]. Humphrey has described practices, which he considers appropriate for these levels [Humphery, 1988;1989]. The model is mostly used in software industries and the practices are so limited that it is difficult to say how effective they are problems at the higher levels do not negate the usefulness of the SEI model. Most organizations are at lower levels of process maturity. There are, however, three more serious problems with SEI model. These may mean that it is an

unreliable predictor of an organization's capability to produce high quality software. These problems are:

- The model focuses exclusively on project management rather than process control and product development.
- It does not take into account an organization's use of technologies such as prototyping, formal or structured methods, tools for static analysis and so on.
- It excludes risk analysis and resolution as a key process technology. The domain of applicability of the model is not defined.

There are practical as well as conceptual limitations of the CMM. Consequently, not all software development organizations use the CMM. Thus, the CMM is one of several prototypical applications [Singpurwala, 1999]. The authors of the SEI model [Humphery, 1989; Paulk et al. 1993] admit that the development focuses on schedules, standards and practices rather than on technology and the user abilities. Therefore, technology assessment was excluded because they could not find any standard way of assessing technology usage. Though the CMM framework specifies the process areas that should be improved to increase the maturity of the process, it does not specify how to bring about the improvement. That is, essentially a framework that does not suggest [Jalote, 1997] detailed prescriptions for improvement. The model is intended to represent the capabilities of organizations rather than the maturity of particular projects. This makes sense from a contractual

point of view but because an organization is rated at level 1(say), this does not mean that all of its projects are at that level. Within the organization, there may be particular projects or groups working at a much higher maturity level.

Capability assessment is based on a standard questionnaire that is designated to identify the key processes in the organization. This is applied during an evaluation visit where project managers from a number of different projects are interviewed. After discussion of their response to the questionnaire and refinement of these responses, an evaluation score is reached. Bollinger and Mc Gowen [1991] have criticized this evaluation process, these criticisms have been refuted by the model authors. Both the criticisms and the refutations are possible. This illustrates that the whole area of capability assessment is still immature and further studies and research is required. The principal problem with the current model is its stratification into levels and the judgmental association of numbers with these levels. The assessment guidance requires an organization to have all the practices at a particular level in place before it can be accredited at that level. Thus, an organization which has 80% of level 2 practices in place (say) and 70% of level 3 practices would receive a level 1 rating. Another limitation of the CMM is that all questions pertaining to a KPA are given equal weight. In actually, some questions are more important than other, and methods to accommodate such differences need to be developed [Singpurwala, 1999].

5.1.2 Performance Measurement and ISO-9000 Quality management System

It is true that ISO 9000 provides a concrete frame within which to grasp fuzzy concepts of quality. For many Indian companies, ISO 9000 provided a starting point as well as a focus. Every speaker in this issue, is pointing out that, in concentrating too narrowly on ISO 9000, companies are in danger of missing the wood for the trees [Abraham,1994]. ISO 9000 is a minimum requirement arrived at, by a consensus of group of countries.

It was intended for a contractual agreement between the parties [ISO-9001:1994; 2000]. It is a stepping stone to quality, not an end in itself. For goal oriented management as well as executives it is easier to say "We will try to achieve the certification" rather than to say "We will continuously improve our processes, products and people". There must be a separation between certification and the standard. The failure is not in the standard itself but in the fact that it is interpretable by consultants and companies. We have a situation where the people making the money are more aggressive than the people paying it. The quality Systems Accreditation committee of the ISO itself is grappling and trying to control this [Abraham, 1994]. Recently a survey of ISO certified Indian Companies has been carried and the findings of the survey is given in APPENDIX-I. It is revealed from the survey findings that the companies are interested for ISO certification because customer

demanding, prevent non-conformance etc. and continuous improvement is ranked at the last among the reasons. The results were also presented at the convention of the National Institution for Quality and Reliability at Bangalore, however there has been negligible impact. Therefore, it is the need for creating organizational conditions [Kondo, Yoshio, 1994] that are tolerant of individualism, so that innovative, continuous improvement can flourish.

ISO only describes the system as a set of actions that efficiently transform a user's need into the solution. The development focuses on system, schedules, standards, and practices rather than on technologies and attributes of the people [Lesley et al, 1993]. The main thrust of ISO 9000 approach to quality management system is one of making activities explicit and formalizing them. This addresses possibly the single most contributory factor in human error. It also discourages use of unofficial, informal procedures as an alternative to those that are documented [John,1994]. ISO also sets requirements for competence and training, roles and responsibilities, and recording rather than remembering information. All of these do much to reduce risk of error. In practice however, implementation of these ISO requirements do not go far enough to achieve sufficient risk reduction to be fully effective. ISO 9004-2 gives some further guidance by pointing the need for identification of root cause of human error but stops short of suggesting how this might be achieved. Further, 1987 & 1994 versions of ISO did not suggest any

questionnaire with respect to the process areas. The 2000 version of ISO : 9004 has suggested the questionnaires[ISO-9004:2000] for the self appraisal. The need of the hour is to further work on this to put the weightage of the said questionnaire and make readymade format, with the guidelines for the evaluation of the maturity of the organization. Leaving to the self appraisal may be yield biased answer and, perhaps it would be difficult to draw the conclusion about the maturity of the organization. Without a Balanced Scorecard framework, performance measurement is also problematic at the operational level with questions about how best to measure performance in the context of efficiency, competitiveness and product and service quality. The Performance Audit must be carried out by "Peer Groups" [ISO-9004:2000] focusing on the development and use of performance measurement approaches at both the strategic and operational levels. There is a need to develop this approach to measuring and reporting performance, which are practical to apply in the industry and ISO can contribute to organizational performance if a climate of change is created [Mile & Danny, 1999]. However this is not yet happening on a widespread basis.

5.1.3 Performance Measurement and TQM

For organizations wishing to undertake Total Quality Management, one of the most important tools for organizational success is the measuring of its performance. Measuring requires an intimate knowledge of the workings of the organization. Performance management must be

supported by a well-designed information and analysis system. Emphasis is placed on the word information and not data. The transformation of data to information is key to understanding management in a quality environment. These systems are more than hardware and software. It includes the systems for collecting and disseminating information that engage employees, customers, investors and management in the giving and receiving of data about the company's activities and its products and services.

Using measurement information to manage, shifts organizational culture and management style. Reliance on information and facts about a company's performance replaces a reliance on supervising employee activities, the traditional management style in command and control environments.

Recently it was seen that TQM was using the "W-5" journalistic approach [Mik, 2001] to elicit the following facts based information to evaluate the performance of the organization.

- Why information is collected
- What information gets collected and what is it used for
- When to measure
- Where does the information come from
- How information is collected, analyzed and used in managing for quality
- Who collects the information and who uses the information

TQM does a lot to help [Oakland, John, 1993] to learn by :

- Developing a "No blame culture" whilst retaining accountability
- Helping organization to absorb new concepts and technologies
- Making process chain explicit
- Identifying error occurs and quantifying it
- Providing tools in identifying causes
- Improving communication channels
- Making continuous improvement everybody's business.

However, there are important areas in which the range of TQM tools and models need to be extended. Total Quality Management (TQM) is a philosophy for managing organizations as well as a set of tools for doing so. We must explore the historical development of this approach. Contrasting the new management model with traditional management methods. Exploring this radical new perspective of workplaces as systems. Understanding the system and how all of the activities, employees, customers, suppliers along with the machines and hardware form an integrated and interdependent whole. The goal of TQM is to constantly improve this system to create services and products that delight and exceed customer needs. The application of TQM approach must create whole and healthy organizations that understand themselves as systems that are a part of and interdependent on the individual systems of customers, suppliers, employees and the community around them. There are other problems too. For instance, looking at

benchmarking is a great problem [Zairi and Youssef,1995] because most organizations are closed to sharing information, especially with competitors and most benchmarking so far found had been in non-competing organizations. Therefore, most of the cases benchmarking is done not with a competitor but with people [Abraham,1994] with similar process, at process level. In India, Motorola has used only international benchmarks, and their Indian factories benefit from Motorola Centers of Excellence. Motorola worldwide has benchmarking trips to different companies to look at the areas of soldering or chip placement, sharing the results with their factories elsewhere in the world. And there is other option too. Companies with a foreign collaboration or parent can benchmark against division or companies overseas. But there is still some problems getting information from the principals since the merger is still young, but for most part one can compare without secrecy, get real time data .

Another imported buzzword is empowerment. Often it stumbles against the harsh reality of cynical managers and strong unions who use it as bargaining chip. Most problems originate with management, not workers [Abraham, 1994] and therefore, solutions also ultimately depend on management . That is of course, a chicken and egg question of whether lack of empowerment leads to bad worker relations or whether poor relations make management reluctant to empower workers. However empowerment can take a different form. It might mean negotiating a

settlement that lets workers share in gains made through quality improvement or productivity. Similarly, "Continuous improvement" is also a management function. Management must practice it or it is difficult to preach. The overall direction for any quality movement must come from the top, even if it doesn't necessarily begin there. Management has to make clear to employees, suppliers, customers and the world exactly where it stands on quality. It is not enough to lay out stirring words like "Continuous improvement" or TQM. Neither ISO nor conventional application of TQM give organizations enough guidance about how to deal with human factors [Cardy, 1998; Deming, 1986; Ghorpade et al, 1995] that in turn has a direct impact on productivity and quality. Little research focuses on the assessment of the performance appraisal systems in a TQM context. More specifically, little empirical research has been conducted in quality management that aims to shed light on the following three questions: What are the key generic criteria of a quality-driven performance appraisal? Does 'best practice' TQM-based performance appraisal exist? Do the current performance measurement systems in TQM organizations meet both TQM demands and employees' expectations in order to maximize customer satisfaction? Research must be made to investigate these questions by examining critical quality management practices as well as performance appraisal criteria. The researcher has identified that there is a lack of informative research on employee performance measurement in TQM-focused

organizations. It is also believed that there is no pre-packaged standard approach to employee performance evaluation or performance improvement that fits all the requirements of different TQM organizations so efforts may be made to identify and develop the most important quality-driven performance measurement criteria in TQM organizations. This will help to determine what criteria shape the acceptance and success of quality programmes efficiently and cost effectively.

Prof. Yoshio Kondo [1994] has rightly pointed out to the need for creating organizational conditions that are tolerant of individualism, so that innovative, continuous improvement can flourish. This is only likely to be achieved where mechanisms of inherent human vulnerability are well understood and accommodated, when processes and systems are designed and developed. In addition to system factors, Cardy and Dobbins[1994] argue that another important issue in regard to appraisal is the measurement of person factors. According to them, the content of HR performance evaluation can be divided into one of the three categories : traits based measures [Fisher et al,1996; Ghorpade et al, 1995; Torrington, Hall , 1998], result based measures [Cardy and Dobbins,1994; Fisher et al, 1996] and behavioral measures [Cardy, 1998]. These must be considered and integrated if a compatible assessment leading to rational approach to performance improvement to be made.

In industry, a lot of confusion exists about measuring effectiveness by TQM. Further work may be done to provide a new insight into how managers not only cope with apparent mismatches between TQM practices and performance evaluation criteria, but also utilize the system to both organization and customer's advantages.

Moreover, the "biased" responses received from the organizations during interviews, based on the structured questionnaires may be misleading. The industries find difficult to implement the system without the proper guidance and they are not able to make significant contribution to its quest for continuous improvement. Further, it may not be out of place here to mention that there is no procedure to categorize the industries based on the responses. One can only come into the conclusion whether TQM is being followed or not.

5.1.4 Performance Measurement and DEA

Data Envelopment Analysis (DEA) is an approach to measure and compare the efficiency of similar organizational units, called decision making units (such as local authority departments, schools, hospitals, shops, bank branches and similar instances where there is a relatively homogeneous set of units) that use the same inputs to produce same outputs. DEA [Boussofiene, Dyson, Thanassoulis, 1991] takes the observed input and output values to form a production possibility space, against which the individual units are compared to determine their efficiencies. The output efficiency of a unit measures the amount by

which the output of that unit can be increased without the need to increase the inputs. The input efficiency is defined likewise.

DEA has become tremendously popular relative performance evaluation tool [Thanassoulis, Boussofiane, Dyson, 1996]. Many of these have been published in high quality international journals. The relative performance evaluations are advantageous in several sectors. DEA solves some of the fundamental information asymmetry problems in real evaluation. The DEA approach captures [Sarrico, Dyson, 2000] what the units having performed the best using the least inputs to produce the largest amounts of outputs – have been able to achieve. This is attractive since the methods and procedures of the best units are more likely targets to other units.

But there is a recognized need for appropriate performance evaluations and regulatory mechanisms. The conception evaluation and characterization of such systems from an empirical or theoretical economic viewpoint have also attracted a fair amount of interest from the academic community. The strength of DEA are [Agrell, Bogetoft, 2002] :

- Requires no or little preferences, price or priority information
- Requires no or little preferences, technological information
- Handles multiple inputs and multiple outputs
- Identifies best practices
- Uses minimal extrapolation
- Supports planning, learning and motivation

The weakness of this approach [Agrell, Bogetoft, 2002] are:

- The non-availability of correct data and selection of both input and output as well
- If one has access to relatively high quality data but a complex technology with considerably uncertainty about the structure of the input – output correspondences, DEA is preferable. However, in case of a simple technology and very noisy data, the use of parametric statistical models are preferable .
- Relatively weak theory of significance testing (sensitivity, re-sampling, bootstrapping)
- Environmental factors, which add resource, must be incorporated in efficiency measurement.
- Lack of focus of organizational goals and objectives.

5.1.5 Performance Measurement and Bayesian approach

The Bayesian approach used as a probabilistic hierarchical classification model and applied for the classifications of software houses [Humphery and Sweet, 1987; Singpurwala, 1999] supplier rating [Lindley,1982] and defect classification, personnel management, educational placement and health care industries. What distinguishes this probabilistic scheme from the prevailing deterministic ones is that, there is a probability that an item belongs to a particular class and these probabilities are spread out

among all classes. Such probabilities reflect the inherent uncertainties behind the underlying statistics that are used to make the classification. Further, the model based on binary responses to the questionnaire and weightages are not given [Singpurwala,1999] in proportion to their importance. These are the limitations of this existing classification scheme and evidently the proposed method does not make the decision process easier, nor it can be claimed that the process [Singpurwala,1999] necessarily leads to correct decision.

Moreover, the organization must be equipped with the personnel with sufficient knowledge of statistics and a lot of assumptions to be made to apply the model thus the approach is difficult to use in the real industrial scenario.

5.1.6 Proposed approach

The accomplishments of this model in promoting management innovation with a widespread view those industries should aim for quality enhancements not only in products and services, but also in the quality of their overall assessment.

The system is aimed at awarding companies that have a “management system with excellent performance” and that continue to create new values driven by customers through self innovation so that they can improve the quality of organizations towards globally competitive management systems.

The framework consists of the core values and measures taken to achieve management innovation, which create performance excellence through quickly responding to business environment or market changes. This system includes a wide range of corporate activities, such as management that combines work activities and processes to meet the demands and expectations of customers and markets, along with the necessary recruitment and training of employees.

A mature organization has high overall management capability. They implement strategic elements into management, define clear processes to achieve customer value, follow this planned process, and understand the results. They know the goals and results at all times using data and are continuously learning how to effectively improve management. The different management capabilities of organizations are expressed in five different levels as depicted in Fig.1

A low maturity organization cannot turn around and become a high maturity organization in the short term. Organizations set goals for the next level of maturity and achieve higher maturity levels by continuous improvement. If an organization with a low maturity level tries to copy an organization with a high maturity level, they will not succeed since they do not have fundamental management activities.

Scoring Guidelines indicate which level an organization should aim for as an improvement goal. The theory of maturity level is based on the principles of management quality that have been utilized widely for the

past years. Specifically, these are the principles of statistical quality control, which were developed by Walter Shewhart, W. Edwards Deming, and Joseph M. Juran.

Based on the consensus review and/or site visit review findings, comments and scores are reviewed and a feedback report is prepared and submitted. The feedback report is a description of the strengths and suggestions for improvement based on the consensus comments for every assessment item. The applicant then utilizes the feedback report to plan and implement improvements.

The proposed model is better than other approaches for the following reasons :

- ❖ It provides a simple, easy-to-use approach
- ❖ It determines the relative degree of maturity of an organization's quality management system
- ❖ It helps to identify the main areas for improvement.
- ❖ It takes account of all the critical factors that contribute to business risk and hence enables more informed decision making.
- ❖ It also provides fact-based guidance to the organization regarding where to invest resources for its improvement.
- ❖ The model can be applied to the entire organization or part of the organization's quality management system or to any process.

- ❖ The proposed method may be applied to the various sectors such as education, medical and healthcare, and government or public service.
- ❖ It also helps to identify and facilitate the prioritization of opportunities for improvement, and maturing of the quality management system towards world-class performance.
- ❖ The results monitored over time can be used to appraise the maturity of an organization.