

CHAPTER 3

➤ PROPOSED DESIGN AND DEVELOPMENT DETAILS

3. Proposed Design and Development Details

The work described here is to develop an approach for a hierarchical classification problem that arises in the context of quality management, pertaining to the classification [Singpurwala, 1999] of manufacturing industries. The existing approaches classify an industry into one of the five maturity levels based on its quality performance. The classification will then serve as an input to any decision making process that is used to determine the relative degree of maturity of an organization's quality management system, to identify the main areas for improvement, to judge the effectiveness and efficiency of the organization and to facilitate the development of the quality management system towards world class performance. The proposed method provides guidance in the form of typical questions that the organization can ask in order to evaluate its performance.

The typical performance measurement system is based on weighted measures [Uede,2001] of eleven parameters. i.e. Leadership, Policies and Strategies, Human Resource Management, Resources, Design and Development, Processes, Improvement Processes, Customer Satisfaction, Employees' satisfaction, Impact on Environment and Society and Business Results. Each parameter can also have the sub-parameters as shown in Annexures. A numerical score / weightages is given to each parameter. The weightages assigned to each sub-parameter are also

shown. The weights, when suitably combined, yield a score for each parameter and also an overall score for the organization.

The overall score is used to classify an organization into one of the five levels. Classifications and comparisons that are based solely on this overall score. Of course, depending on the size and type of the organization and its needs and expectations, evaluation must be appropriately done. Our motivation for undertaking this activity is the Capability Maturity Model as a way to evaluate an organization's performances and for improving their practices and processes.

3.1 An Over view of the CMM

Based on a frame work envisioned by Philip Crosby [1979;1996], a manufacturing organization maturing through the five stages which he labels "Uncertainty" "Awakening" "Enlightenment" "Wisdom" and "Certainty". Indicators of these stages are attribute, quality organization status, problem handing, cost of quality as a percentage of sales, quality improvement actions and the like.

The need for long-range programs in quality can be deduced intellectually through the maturity grid. A manager of any operation can spend a few moments with the grid, recognize familiar events and pinpoint where the operation is at that moment. Then all that is necessary is to refer to the following stage of the grid in order to know what actions need to be taken for the improvement. And in cases where

an established program is now deteriorating, the grid can be read back wards one can see the last successful points and figure out how to get back there . It is also possible to identify his own situation in one of the five levels of maturity.

3.1.1. Proposed Maturity Levels

The proposed model is a strategy for improving the manufacturing process. It can also be used to assess the maturity of the processes of an organization and to identify the areas that are required to increase the maturity level of the organization.

The model is organized into five maturity levels [Crossby,1979;1996] and [ISO -9004 :2000] as shown in fig.1 below.

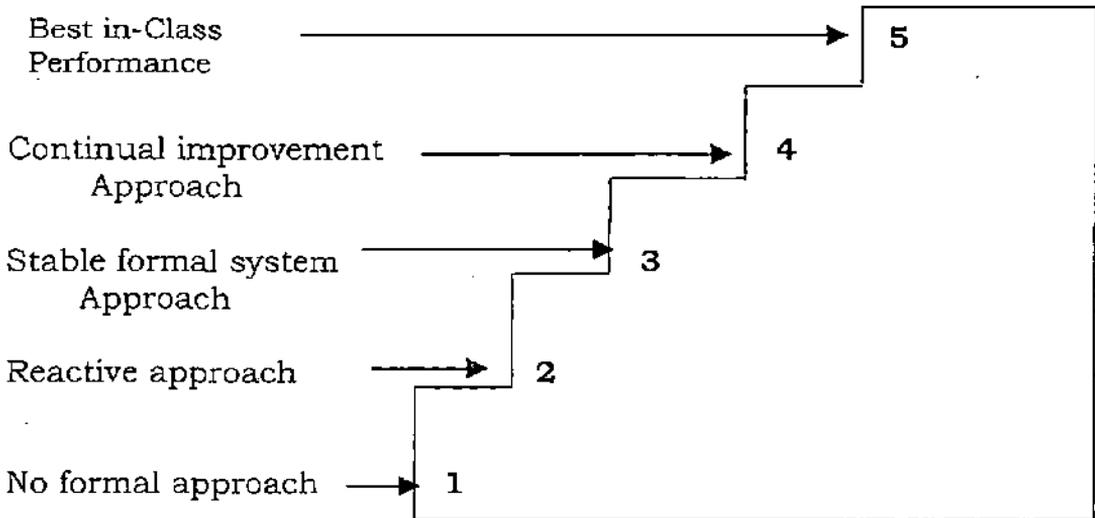


Fig. 1 - Maturity Levels

1. **No Formal Approach (Level 1)** : This is the lowest level, there is essentially no systematic approach existing in the organization. No results, poor results or unpredictable results, Everything is done on an adhoc basis [Crossby,1979;1996] and [ISO -9004 :2000].

It is indeed confused and uncommitted. Management has no knowledge of quality as a positive management tool. Management speak regularly of their quality function in terms of being the policeman whose job is to catch the criminals in the act. Problems of non-conformances are considered the fault of not being tough enough on the bad guys. No formal approach casually places the quality function deep in the bowels of one of the operating departments. Inspection is sometimes a separate operation and is assigned to the production people so they can have the tools to do the job. These restriction create the self-fulfilling prophecy that unsolved problem mile always be around.

Every problem will be considered unique, even if it has been encountered before problems breed problem and the lack of discipline in the method of openly attacking them breeds more problem. Personalities are the predominate factors in problem attacking as the result is emotion on the management level and the question becomes "who" rather than "what" caused the difficulty. This some times results in illogical firing and quitting as it becomes impossible to methodically examine a situation and solve whatever problems exit. The management of this type of company does not know much about the Cost of Quality.

Quality improvements will never be a part of the organization and it is not considered as an option. At this level the companies know that they have problems but do not know why, although they do know it is not because they are not working hard. Everyone in this level perhaps work hard, and most are frustrated at the amount of brute force it takes to keep the operation moving.

2. **Reactive approach (Level 2)** : At this level organization is more pleasant but no less frustrating . Here the management is beginning to recognize that quality management can help, but is unwilling to devote the time and money to make it happen. A stronger quality leader, who understands professional quality is appointed for management strengthening the quality operation.

At this stage [Crossby,1979;1996] and [ISO -9004 :2000] inspection and testing and performed more often and problems are identified earlier in the manufacturing process. This cuts rework costs a little while permitting some attention to resolving problems. The chronic problems are listed and assigned to teams for action but the prime attention is paid to keep the product moving. Team set up to attack the problem accomplish quite a bit. Though the corrective base systematic approach is found at this level however minimum data on improvement result are available. The scope is limited to the near future and long range solutions are not considered.

3. *Stable formal system approach (Level 3):* At this level , the standard processes for both engineering and management processes across the organization is documented . This level appears with the decision to go ahead [Crossby,1979;1996] and [ISO -9004 :2000] and really conduct a formal, regulation, card-carrying quality improvement program. At this level, organizations can be summarized as “Standard” and “Constituent” because both engineering and management activities are stable and repeatable. Organizations establishes its quality department as a balanced, well organized, functioning unit. This department has to lead the crusade and it must have the capabilities and resources to do so. All inspection and testing, quality engineering, data reporting and similar activities must be included. One of the most recognizable changes in this stage involves the approach to problem resolution . Facing problems openly, without searching for individual to blame, produces a smoothly functioning system for resolving the problems. Corrective action communication is established. Data are available on conformance to the stated quality objectives. Management is committed to the quality and existence of improvement trends is seen.

4. *Continual improvement approach (Level 4):* At this level, the organization sets quality goals for both products and processes . Productivity and quality are measured for all important processes activities [Crossby, 1979;1996] and [ISO -9004 :2000] throughout the organization as part of the organizational measurement program.

Meaningful variations in process performance can be distinguished from random variations, particularly within established product lines. Problems are identified early in their development. All functions are open to suggestions and improvements. Prevention becomes a routine part of the organization. Level 4 organizations can be summarized as "predictable" because the processes are measured and operate within measurable limits. It allows an organization to predict trends of processes and product quality within quantitative bounds of the limits. When these limits are exceeded, action is taken to correct the situation and therefore the products are predictably of high quality. Improvement processes are in use, good results and sustained improvement trends are noticed.

5. *Best-in-class performance (Level 5):* At this level, the organizations consider quality management as an essential part of the company system. Entire organization is focused on continuous process improvement [Crossby,1979;1996] and [ISO -9004 :2000]. The organizations have the means to identify weaknesses and strengthen the process proactively, with the goal of preventing the occurrence of defects. Except in the most unusual cases, problems are prevented. Data of the effectiveness of the processes are used to perform cost benefit analysis of new technologies and proposed changes to the organization's process. Innovations that exploit the best engineering practices are identified and transferred throughout the organization in an orderly manner.

Organizations at this level can be characterized as “continuously improving” because they are continuously striving to improve the range of their process capability, thereby improving the process performance . Improvement occurs both by incremental advancements in the existing process and by innovations using new technologies and methods and best-in-class benchmarked results are demonstrated.

Guidelines for Assessment :

APPROACH	EXTENT OF IMPLEMENTATION	SCORE
No formal approach	Ineffective, Major gaps in implementation which inhibit achieving desired goals	0-20%
Reactive approach	Partial implementation	20-40%
Stable formal system approach	Implementation in most of the areas and activities with few major gaps	40-60%
Continual improvement approach	Effective implementation in most of the areas and activities with minor gaps	60-80%
Best in-class performance	Very effective implementation in all relevant areas and activities, emphasizes on continuous review and improvements	80-100%

RESULTS

<ul style="list-style-type: none">- No results or poor results in many areas and activities reported- Results not reported in many key areas and activities	0-20%
<ul style="list-style-type: none">- Improvement trends reported in few areas and activities- Good performance in some areas- No evidence of adverse trends	20-40%
<ul style="list-style-type: none">- Improvement trends reported in some of the key areas and activities- Good performance in most of the key areas and activities	40-60%
<ul style="list-style-type: none">- Current performance is very good in some key areas and activities- Evidence of improvement trend in most of the key areas and activities.	60-80%
<ul style="list-style-type: none">- Current performance is excellent in most key areas and activities- Excellent improvement trends in most of the areas and activities- A strong evidence of industry and benchmark leadership in most of the key areas and activities	80-100%

Consistency in Assessment :

There is a need for consistency in assessment [ISO -9004 :2000] and scoring. It is desirable that the variation in scores assigned by different assessors for the same item / parameter is minimum for achieving consistency. For the purpose whenever the difference of scores assigned by different assessors is more than 10% efforts should be made to bring it down through discussion.

Evaluation Proforma :

The format of the **Evaluation Proforma** based on the documents is given in **Annexure I**. The score assigned shall be based on the average score of different assessors for each characteristic. It shall then be converted into weighted score according to the assessment criteria. The **Summary of Assessment Form** is given in **Annexure II**. The proforma given in **Annexure I and II** shall be used for giving scores during fact finding and evaluation. Further guidelines are also provided in **Appendix B** that can be referred by the assessors during assessment. The last column of **Annexure II** will give the score obtained by the industry separately for each parameter of assessment criteria, as well as total score obtained out of the maximum score of 1000. The organization will be placed in one of the five maturity levels discussed above based on the score obtained.