CHAPTER II

LITERATURE SURVEY

2.1 Productivity and quality in the modern business environment

In this era of technological explosion, a company or organization, regardless of its size, faces four major problems. For any project there is a limited supply of resources, such as capital, materials, energy, and labor. Further, competitive environments demand a better quality product or service at the existing price or at a lower price. Survival through acceptable profit levels requires maintains the current market share or improving its as much as possible. In order to attain the end goal of profit, a business unit typically has multiple objectives. Problems arise when allocating scarce resources to the variety of alternative purposes competing for their use. Matching objectives with resources to attain end results is not an easy task. Only those organizations that manage productivity and quality as an ongoing activity will be able to deal with these problems.

At the global level, the problems of inflation, international trade competition, and unemployment are directly affected by the level of productivity growth and the quality of goods and services. The cyclic effects of a low productivity growth rate on the national economy are shown in Figure 2.1. The impact of poor quality goods and services on the survival of any economic unit is presented in Figure 2.2

In this age, every nation concerns itself with a high standard of living and better quality of work life and every organization concerns itself with high profit levels and an increased market share. For consumers who are concerned with the quality or fitness for use of the goods and services offered, therefore, productivity and quality management constitute the major driving force for survival.

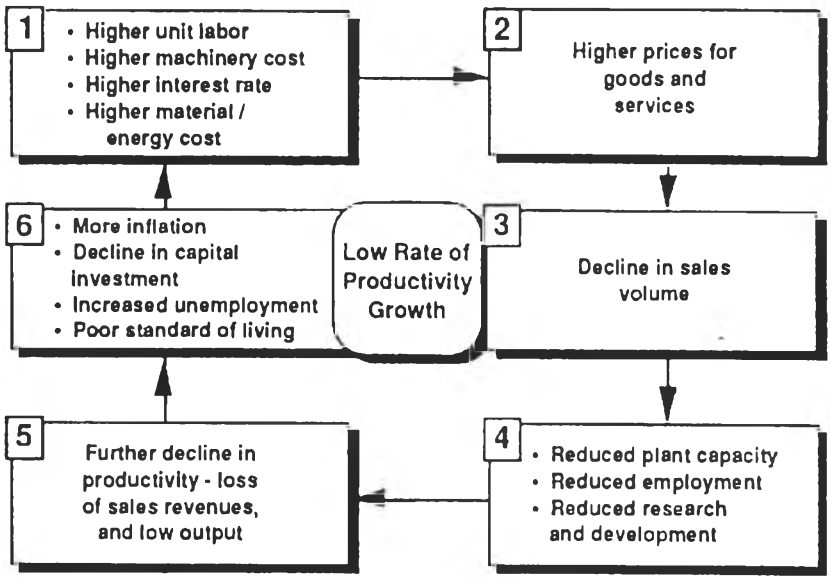

Figure 2.1 The cyclic effect of low productivity growth

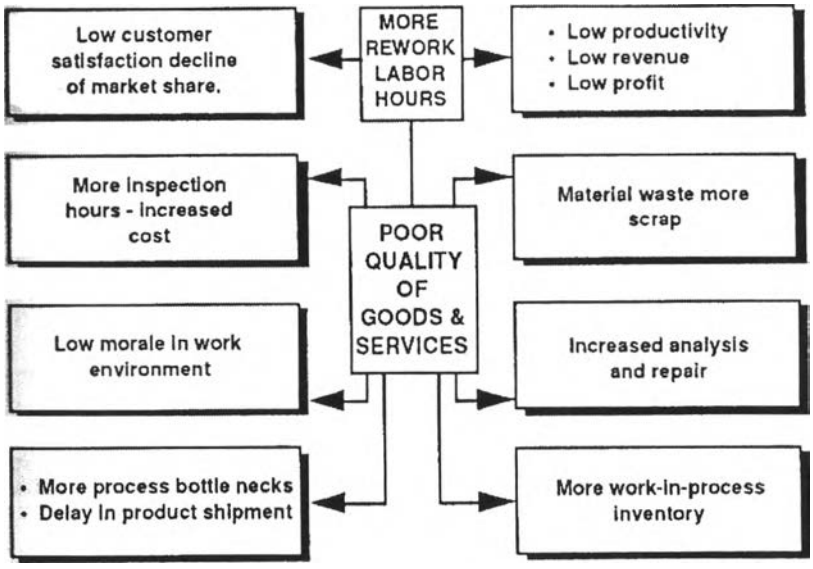

Figure2.2 The impact of poor quality in any economic unit

2.2 Basic definitions of Productivity and quality

Productivity

Productivity was mentioned for the first time in an article by Quesnay in 1776, and since then most authors have defined it in different ways. A careful examination of these definitions reveals that some authors have defined productivity in a vague manner and others, precisely. One major similarity that could be inferred from these various definitions of productivity is that most authors viewed productivity as a " measure " of output, to one input, two inputs, or total input.

The measure also pertains to how well resources are utilized. Three different forms of productivity have been accepted universally by most researchers and practitioners. For the purpose of this study, the three forms of productivity are presented as follows (Kendrick and Creamer, 1965:Edosomwan,1985b):

1. Total productivity is the ratio of total output to all input factors.
2. Total factor productivity is the ratio of output to the sum of associated labor and capital (factor) inputs.
3. Partial productivity is the ratio of total output to one class of input.

2.3 Quality

Crosby (1979) defines quality as "conformance to requirements." This definition requires detailed clarification of all relevant quality characteristics and total evaluation and understanding of the entity involved. Quality when viewed as conformance to specification has great potential for being a very effective business strategy. However, this definition can result in a lack of commitment to quality by members of an organization that does not acknowledge the prescribed specification. There is also a danger of adherence to the specification even if is not the most productive method to accomplish the desired end.

Juran(1979) defines quality as "fitness for use." This unique aspect of this definition is the concept of the use. Quality is viewed as one that requires every member of the organization to provide the next person in the process with an acceptable product or service. This means that everyone is responsible to perform a task in such a manner that the product can be used immediately and in the most efficient. Juran further identified four important parameters of fitness for use as.

1. Quality of design
2. Quality of conformance
3. The abilities
4. Field service

The interrelationship among these parameters is presented in figure 5. Quality is a term that has valuable meaning to both producer and customer as shown in Figure 5. Quality is a term that has valuable meaning to both producer and customer as shown in Figure 6. The producer views fitness for use in terns of the ability to process and produce with less rework, less scrap, minimal downtime, and high productivity.

Such factors as training, the production process, motivation levels, procedures, and quality assurance systems can have an effect on the quality of conformance.

2.4 Strategies for implementing quality programs

There are seven different strategies being used in public and private organizations to implement continuous quality improvement.

1. The World-Class Company benchmarking Approach

This approach, individuals or organizational teams visit companies that are leaders in continuous quality improvement and determine what success they have had and how they have accomplished it. The individuals

or team would tailor and integrate learned ideas with their own and this develop their own organizational approach, which would be adopted for their own organization. This method is only effective when world-class quality companies are willing to share information on their programs and the recipients of the information are able to adapt lessons learned to their own culture.

2. The Guru Approach

This approach uses the theories, principles, teachings and lessons of a leading quality expert. The guru method used as a benchmark to determine organizational strengths and weaknesses. The danger in using this approach is that no guru has all the answers to organizational, cultural and business problems. However, the tools and techniques recommended by gurus can be effective in improving performances of systems, people and work processes.

3. The Employee Involvement-Based Approach

This approach focuses on using the strengths and suggestions of human resources approach, all employees are encouraged to practice creativity and practical risk taking during the execution of their jobs. People are treated as the greatest asset and empowered to make decisions to improve quality, productivity, and over all performance.

2.5 Productivity and Quality Improvement techniques

Sumanth (1984,pp.318-319) reported 50 different techniques of productivity improvement that were obtained from an a survey of the literature. These techniques are listed below:

1. Technology-base techniques
   - 1.1 Computer-aides design(CAD)
   - 1.2 Computer-aided manufacturing (CAM)
   - 1.3 Integrated CAM

1.4 Robotics

1.5 Laser beam technology

1.6 Energy technology

1.7 Group technology

1.8 Computer graphics

1.9 Emulation

1.10 Maintenance management

1.11 Rebuilding old machinery

1.12 Energy conservation

2. Employee-based techniques

2.1 Financial incentives (individual)

2.2 Financial incentives (Group)

2.3 Fringe benefits

2.4 Employee promotions

2.5 Job enrichment

2.6 Job enlargement

2.7 Job rotation

2.8 Worker participation

2.9 Skill enhancement

2.10 Management by objective (MOB)

2.11 Learning curve

2.12 Communication

2.13 Working Condition improvement

2.14 Training

2.15 Education

2.16 Role perception

2.17 Supervision quality

2.18 Recognition

2.19 Punishment

2.20 Quaility circles

2.21 Zero defects

3. Product-based techniques
   - 3.1 Value engineer
   - 3.2 Product diversification
   - 3.3 Product simplification
   - 3.4 Research and development
   - 3.5 Product standardization
   - 3.6 Product reliability improvement
   - 3.7 Advertising and promotion

4. Task-based techniques
   - 4.1 Methods engineering
   - 4.2 Work measurement
   - 4.3 Job design
   - 4.4 Job evaluation
   - 4.5 Job safety design
   - 4.6 Human factors engineering (ergonomics)
   - 4.7 Production scheduling
   - 4.8 Computer-aided data processing

5. Material-bases techniques
   - 5.1 Inventory control
   - 5.2 Materials requirement planning (MRP)
   - 5.3 Materials management
   - 5.4 Quality control
   - 5.5 Material handling systems improvement
   - 5.6 Material reuse and recycling

2.6 Solving and preventing problem

Even the best manage organizations have problem. A problem is any situation in which what exists dose not match with is desired. The greater the disparity between the two, the greater the problem. Problem solving in a total-

quality setting is not just putting out fires as they occur. Rather, it is one more way to make continual improvement in the workplace. The model for problem solving is Demming Cycle.

2.7 The Deming Cycle

The Deming Cycle is the name given by the Japanese to the continual improvement model developed by total-quality pioneer Dr. W. Edwards Deming. It consists of four major components. Each of which can be subdivided into step-by-step activities. Deming disciple William W. Scherkenbach explains the model as follow:

- Plan: Develop a plan to improve. Even before problems occur, create a plan for improving your area of responsibility, particularly the processes in that area. Then, when problems occur, they can be handled within the context of Deming's modelfor continuos improvement. Developing such a plan involves completing the following four steps
  - Identify opportunities for improvement.
  - Document the current process.
  - Create a vision of the improved process.
  - Define the scope of the improvement effort.

- Do: Carry out the plan. Implement the plan for improvement. The recommened approach is to first implement on a small scale over a specified period of time. This is the equivalent of developing and testing a prototype of a design before moving to full production.

- Study or check: Examine the results. Examine and record the results achieved by implementing the plan. The recorded results form the basis for carrying out the steps in the next component.

- Act: Adjust as necessary. Make adjustment as necessary based on what was learned in the previous component. The repeat the cycle for the next planned improvement by returning to the first component of the model.

2.8 QC tools

Statistics is the collection, organisation, analysis, interpretation and presentation of data. The body of knowledge of statistical methods is an essential tool of the modern approach to quality. Without it, drawing conclusions about data becomes lucky at best and disastrous in some cases. The 9 basic QC Tools engaged to solve quality problems include :-

- Parento Diagram
- Cause and Effect Diagram
- Checksheet
- Histogram
- Scatter Diagram
- Control Chart
- Graph

Pareto Chart

The Pareto shows the distribution of items and arranges them from the most frequent to the least frequent with the final bar being misc. The tool is named after Wilfredo Pareto, the Italian economist who determined that wealth is not evenly distributed. Some of the people have most of the money. This tool is a graphical picture of the most frequent causes of a particular problem. It shows where to put your initial effort to get the most gain.

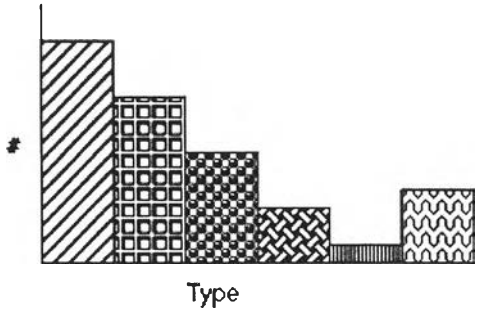

Figure 2.3 Pareto Chart

Cause and Effect Diagram

The cause and effect diagram is also called the fishbone chart because of its appearance and the Ishakowa chart after the man who popularized its use in Japan. Its most frequent use is to list the cause of particular problems. The lines coming off the core horizontal line are the main causes and the lines coming off those are sub causes.

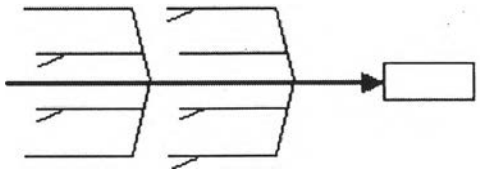

Figure 2.4 Cause and Effect Diagram

Histogram

The histogram is a bar chart showing a distribution of variables. An example would be to line up by height a group of people in a course. Normally one would be the tallest and one would be the shortest and there would be a cluster of people around an average height. Hence the phrase "normal distribution". This tool helps identify the cause of problems in a process by the shape of the distribution as well as the width of the distribution.

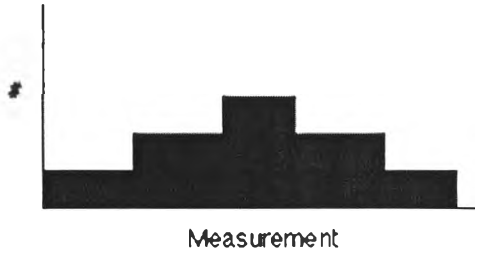

Figure 2.5 Histogram

Scatter Diagram

The scatter diagram shows the pattern of relationship between two variables that are thought to be related. For example is their a relationship between out side temperature and cases of the common cold? As temperatures drop, do colds increase. The closer the points hug a diagonal line the more closely there is a one to one relationship.

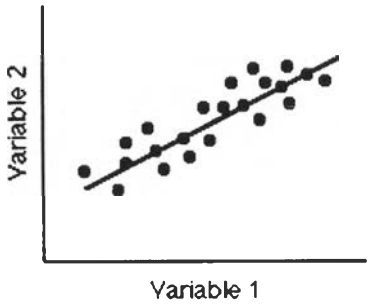

Figure 2.6 Scatter Diagram

Control Chart

The control chart is a line chart with control limits. It is based on the work of Shewhart and Deming. By mathematically constructing control limits at 3 standard deviations above and below the average, one can determine what variation is due to normal ongoing causes (common causes) and what variation is produced by unique events (special causes). By eliminating the special causes first and then reducing common causes, quality can be improved.

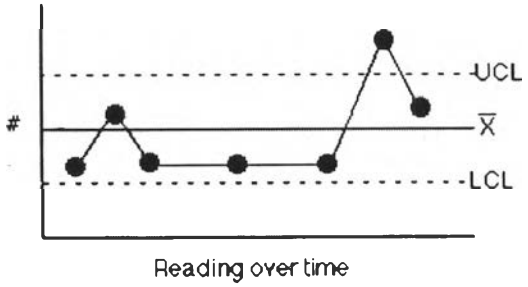

Figure 2.7 Control Chart

Graph

The graph shows the history and pattern of variation. It is helpful to indicate on the chart whether up is good or down is good. This tool is used at the beginning of the change process to see what the problems are. It is used at the end (check) part of the change process to see whether the change has resulted in a permanent improvement.

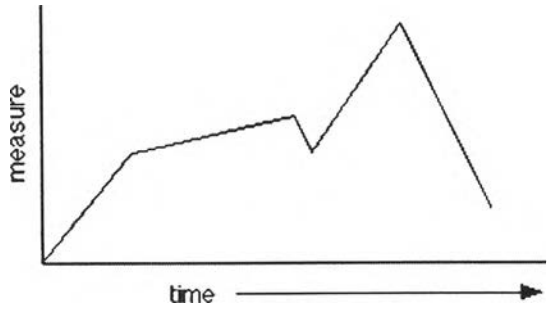

Figure 2.8 Graph