CHAPTER II

THEORETICAL ASPECTS AND LITERATURE REVIEW

2.1 Strategy

There are a variety of formal definitions for strategies, but everyone fundamentally agrees that a strategy is the answer to the question, "how?" Strategy is defined as a comprehensive action plan, which identifies long-term direction for an organization and guide resource allocation to accomplish goals with sustainable competitive advantage (Schermerhorn, 2002).

While, Professor J.B.Quinn (1988) defines strategy as: - "The pattern or plan that integrates an organizations major goals, policies and action sequences into a cohesive whole. A well formulated strategy helps to marshal and allocate an organization resources onto a unique and viable posture based on its relative internal competencies and shortcomings, anticipated changes in the environment and contingent moves by intelligent opponents."

By combining these two definitions, strategy is defined as a comprehensive plan of action that set a critical direction and guides the location of resources to achieve long-tem organizational objectives. It is an action focus that represents a "best guess" regarding what must be done to ensure continuing prosperity for the organization or any one of its subsystems.

In practice, the choice of strategy is a complex and even risk task. Any strategy defines the direction in which an organization intends to move in a competitive environment. It is the choice that specifies how managers plan to match the organization's strengths and weakness with opportunities and threats in the environment. (John R., 1996)

2.2 Strategic Management

W.F Gleuck (1980) defines strategic management as a set of decisions and actions, which leads to the development of an effective strategy or strategies to help achieve corporate objectives.

Schermerhorn (2002) defines strategic management as a process of formulating and implementing strategies to achieve long-term goals and sustain competitive advantage.

While, Higgen and Vincze (1992) gave a boarder definition as: - "the process of managing the pursuit of the organization's mission. While, managing the relationship of the organization to its environment, especially with respect to its environmental stakeholders, the major constituents in its internal and external environments that are affected by its actions".

By combining these definitions, Strategic Management is the process of formulating and implementing strategies to accomplish long-term goals and sustain competitive advantage by managing the pursuit of the organization's mission and managing the relationship of the organization to its environment, especially with respect to its environmental stakeholders.

2.3 Strategic Management Process

The strategic management process is the full set of commitments, decisions, and actions required for a firm to achieve strategic competitiveness and earn above-average returns (Hitt and Ireland, 2001).

Fred R. David (1986) describes the strategic management process as an objective, systematic approach for making major decisions in an organization. Strategic management is not a pure science that lends itself to a nice, neat, one-two-type approach. Rather, strategic management is an attempt to organize qualitative and quantitative information in a way that allows effective decisions to be made under conditions of uncertainty.

Strategic management is successful with organization, even those operating in environments of hyper competition, achieve sustainable competitive advantage and earn above-average returns. (Schermerhorn 2002)

2.4 Level of Strategy

There are three levels of strategy in organization: corporate strategy, business strategy, and functional strategy. (Figure 2-1)
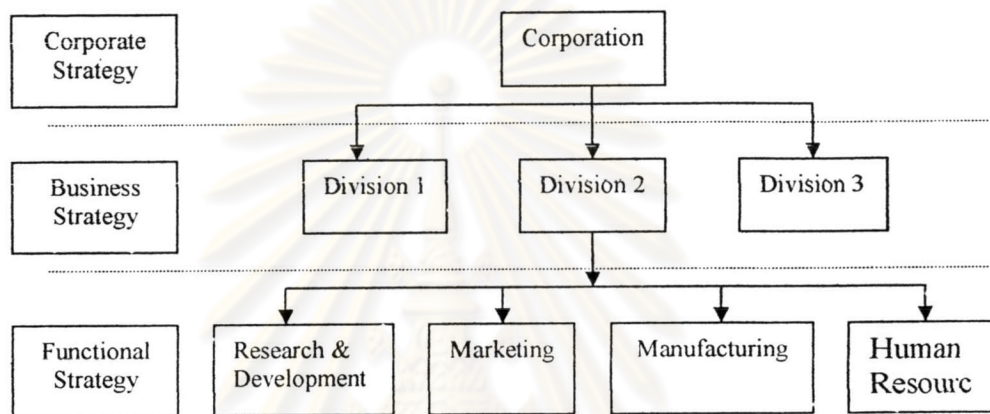

Figure 2-1: level of strategy in Organization (Schernerhorn.2002)

1. *Corporate Strategy* - **A** corporate strategy sets long-term direction and guides resource allocations for the entire enterprise. For a business it describes the scope of operations buy answering the following strategic question: "In what industries and markets should we compete?"

2. *Business Strategy* - In larger organizations the corporate objectives are handed down to the heads of the business units who must translate these into specific strategy for their business unit. It is a strategy for a single business unit or product line. It describes strategic intent to compete within a specific industry or market. The selection of strategy at the business level involves answering the strategic question: "How are we going to compete for customers in this industry and market?"

3. *Functional Strategy* - In a traditional organization business unit or divisions might have been organized based on their function. Each division would be responsible for supporting all the products or services offered by the company. The organization would then need a strategy for each division, known in this case as function strategies. It guides the use of organization resources to implement business strategy. This level of strategy focuses on activities within a specific functional area of operations. The strategic question to be answered in selecting functional strategies becomes "How can we best utilize resources to implement our business strategy?"

2.5 Strategic Management System: Balanced Scorecard

The BSC was introduced as one of the newest management tools. The purpose was to allow organizations to be better able to use their intangible assets. The BSC is to be used as a supplement to traditional financial measures. It measures performance from three additional perspectives; customers, internal business processes, and learning and growth. The scorecard can help top-level management link the long-term strategy with the short-term actions. Managers using a balanced scorecard do not only have to rely on the short-term financial results as indicators of the company's progress. It brings in other indicators that provide information about how the short-term results have affected the long-term strategy.

Kaplan and Norton stated 1996 that the BSC introduces four new processes (Figure 2-2):

1. *Translating the vision* is a means of expressing the mission/vision statements with an integrated set of objectives and measures. This forces the top management to develop operational measures, which requires them to discuss, and eventually agree on, a means of achieving the goals of the company.

2. *Communicating and linking* is a process that facilitates the communication of strategies throughout the entire organization. Departmental and individual objectives must be aligned with the strategy through evaluation procedures and incentives. To have goal congruence between the individual employees

and the company, scorecard users engage in three activities: communicating and educating, setting goals, and linking rewards to performance measures which are in turn linked to the overall strategy.

a) Communicating and educating is achieved by maintaining policies that ensure all employees are aware of the strategies of the organization. Also, it is important for the lower level employees to be able to communicate upwards about whether or not the strategies are realistic from the competitive or operational perspective.

b) Setting goals alone is not sufficient to change employee's mind-set. One technique to ensure the objectives related to the goals are achieved is the use of a personal scorecard. It is simply a card that has information that describes corporate objectives, measures, and targets. Employees would carry it with them. This allows employees to better translate these objectives into meaningful tasks that will help reach these goals.

c) Linking rewards to performance is an important incentive to help an organization achieve its purpose. What the balanced scorecard adds to the traditional means of linking rewards to financial performance is that it takes a more holistic look at the organization. It ensures that the correct criteria are used as a measure of performance before rewards are given. The idea is that, if you are not using the correct indicators to evaluate performance, there is a high risk in rewarding this behavior.

3. *Business planning* is the third process used by managers with the balanced scorecard. By using the scorecard, businesses will integrate their strategic planning and budgeting processes. This makes sure that the budgets support the strategies of the company. The users of the scorecard pick measures that represent each of the four perspectives, and then set targets for each. Then they will decide which specific actions will help them in reaching those targets. Using short-term milestones to evaluate the progress toward the strategic goal is what results from using the balanced scorecard.

4. The fourth, and final, process is *feedback and learning*. With the balanced scorecard in place managers can monitor feedback and relate this to the strategy. The first three processes are very important, but they demand a constant objective. Any deviation from the plan is considered a defect. By adding the feedback and learning process, the scorecard becomes balanced by providing real time information to enhance strategic learning.
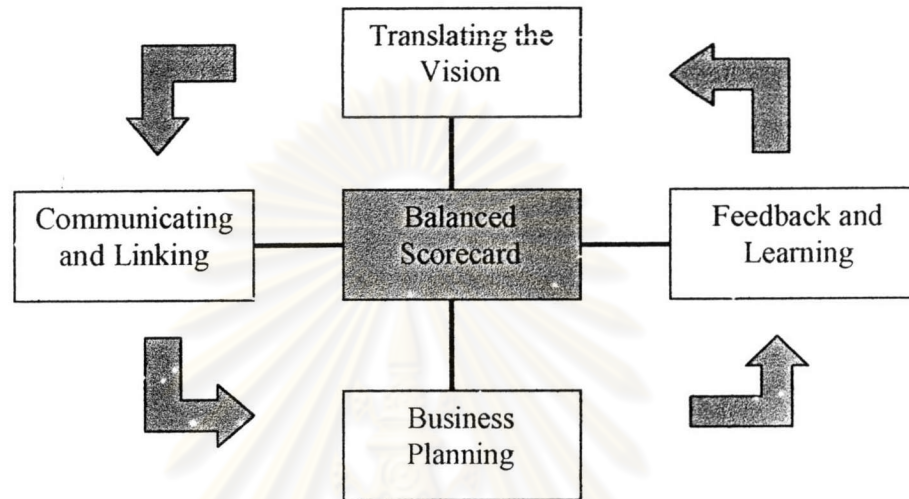

Figure 2-2: Managing Strategy: Four Processes (Kaplan and Norton. 1996)

2.6 Performance Management Technique: Balanced Scorecard

The performance management technique called BSC can be used to translate the organization strategy to every function in organization by setting objective of each function with working toward to the organization strategy (Kaplan and Norton, 1993). As stated by Kaplan and Norton in 1992, this performance management technique translates organization vision through a KPI, which can be used to evaluate and benchmark the performance of each function or very detail as each person perform.

The balanced scorecard enabled companies to track financial results while monitoring progress in building the capabilities they would need for growth. Therefore, the BSC allows managers to look at the business from four important perspectives and it provides answers to four basic questions as follows: (Figure 2-3)

- *How do customers see us? (customer perspective)*

Many companies today have a corporate mission that focuses on the customer. Therefore, how a company is performing from its customers' perspective has become a priority for top management. Most customers' concerns tend to fall into four categories, which are time, quality, performance and service, and cost. Therefore, at this perspective, customers' satisfaction is measured based on the four categories.

- *What must we excel at? (Internal Business perspective)*

Customer-based measurement must be translated into measures of what the company must do internally to meet its customers' expectation. Therefore, managers need to focus on those critical internal operations that enable them to satisfy customer needs. The internal measures for the balanced scorecard should come from the business processes that have the greatest impact on customer satisfaction such as factors that affect cycle time, quality, employee skills, and productivity.

- *Can we continue to improve and create value? (Innovation and Learning perspective)*

Due to the rapidly change of business environment of competitive market, intense global competition requires that companies make continual improvements to their existing products and processes and have the ability to introduce entirely new products with expanded capabilities.

- *How do we look to shareholders? (Financial perspective)*

Financial performance measures indicate whether the company's strategy, implementation, and execution are contributing to bottom-line improvement. Therefore, typical financial goals have to do with profitability, growth, and shareholder value.
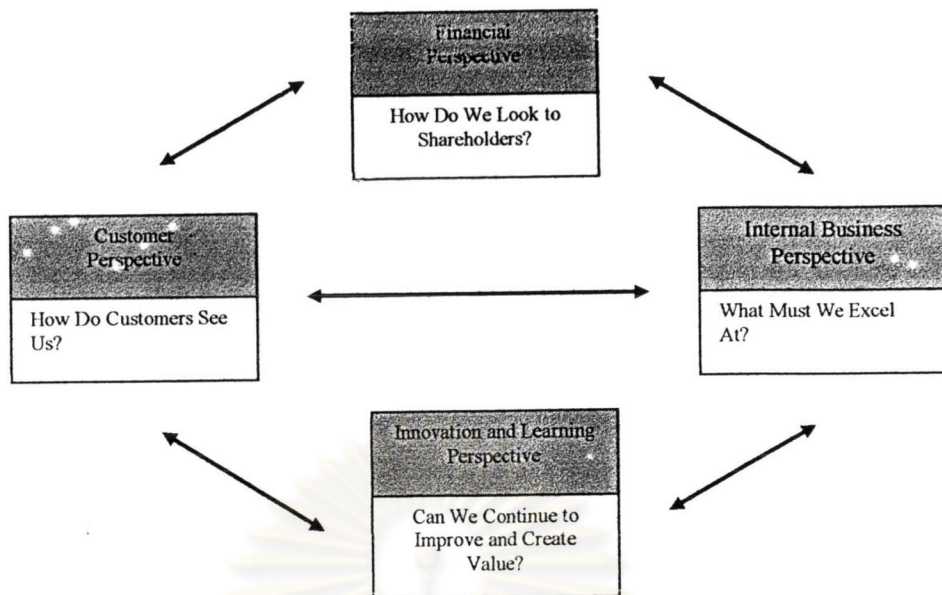
Figure 2-3: the Balanced Scorecard Links Performance Measures (Kaplan and Norton, 1992)

2.7 Critical Success Factors

The most effective shortcut to major success appears to be, to jump quickly to the top rank. By concentrating major resources early on a single strategically significant function, become really good and competitive at it, and them move to consolidate a lead in the other functions by using the profit structure that the early top status has made possible. All of today's industry leaders, without exception, began by bold deployment of strategies based on Critical Success factors."(Kenichi Ohmae1983)

Rockart (1979) defines Critical Success Factors (CSFs) as 'for any business, the limited number of areas in which results, if they are satisfactory, will ensure successful competitive performance for the organization. They are the few key areas where "Things must go right" for the business to flourish. If results in these areas are not adequate, the organization's efforts for the period will be less than desired.'

As a result, the critical success factors are areas of activity that should receive constant and careful attention from management. The current status of performance

in each area should be continually measured, and that information should be made available.

In practice the technique involves interviewing individual managers in order to establish those factors that are critical to achieving organizational goals. The interview then proceeds to identify key information needed to ensure successful performance in these areas. An assessment is then made of the existing provision of information. Information that is irrelevant to the critical success factors should be questioned. Where information is unavailable new systems need to be put in place.

2.8 Key Performance Indicator (KPI)

Generally, KIPs is used to describe a particular value or characteristic designated to measure input, output, outcome, efficiency or effectiveness. They are composed of a number and a unit of measure. The number provides the magnitude (how much) and the nit is what gives the number its meaning (what).

KPIs are linked to a business goal. They typically consist of anything else that is deemed critical to a company's success and used to measure the progress that the company is making. In general, every KPIs will have a target value that may change over time. The actual value of the KPIs is compared to the target value to determine how much progress has been made towards achieving the business goal.

2.9 Definition of Quality

Several gurus had pronounced the term quality differently and that the reader must aware of the variations in definition:

- *A degree of excellence* - The concise Oxford Dictionary
- *The totality of features and characteristic that bear on the ability of a product or service to satisfy a given need* - **British Standard 4778**
- *Fitness for purpose* - **Dr. J. M. Juran**

- *The total composite product and service characteristics of marketing, engineering, manufacture, and maintenance through which the product and service will meet the expectations of the customer -* **Dr. A. V. Feigenbaum**

- *Conformance to requirements -* **P Crosby**

2.10 Continuous Improvement

Continuous improvement is a business philosophy. The concept was popularized in Japan where it is known as kaizen. Many of Japan's economic advances over the past 20 years have been attributed to kaizen.

Continuous improvement creates steady growth and improvement. It does this by keeping a business focused on its goals and priorities. Although continuous improvement is steady, it can produce 'quantum leaps' when cumulative improvements 'synergize'. This simply means that the sum of all the small improvements can cause a profound net effect greater than the sum of all the small improvements.

The following are some key points when looking at your continuous improvement plan:

1. Continuous means ongoing. The process never stops.

2. Once a year, have an outsider review your business. Outsiders can often see what you cannot.

3. Do the simple and cheap things first and quickly. This builds credibility, momentum and commitment with your people. It also gives you practice.

4. Have a formal suggestions system for your employees.

5. Do not try to do it all at once. Set up a plan and do it in stages.

6. Try to work on two or three top priorities. Working on more than that can diffuse effort, energy and resources.

7. Celebrate, acknowledge and reward accomplishment. This creates a positive environment for improvement. By creating a positive environment for improvement you can get employee participation.

8. Bring up continuous improvement issues in your production and business meetings.

9. Make certain your improvements involve your customers. Focus on delivering increasing value. This means getting regular feedback on how your business is performing and what your customers want and need.

10. Look for breakthrough improvements. One of the added benefits of continuous improvement is: everything is on the table. Some small improvements can turn out to be major improvements. Often these breakthroughs are not known until tried. Be aware breakthroughs exist and always look for them. This is a real benefit of using a continuous improvement process.

11. Develop a continuous improvement system that works for your business. Do not copy without trying – what works for one business may not work for another.

12. Look inside your industry at your competition and best practices. Competitors can often show you a better way. If it works, use it!

13. Use a cost-benefit analysis if you have difficulty setting priorities.

14. Look outside your industry to see what other industries are doing. It is likely you will find more improvement ideas outside your industry than in it.

15. Be hungry for new ideas and ways to improve. Make this a part of your business culture. Set the example and your people will follow.

Continuous improvement is a business philosophy that has proven results. The main idea behind continuous improvement is constant focus. By focusing on your business you can not only find out what is wrong but how to improve it. Continuous improvement can give your business a long-term competitive advantage. Lies at the heart of the continuous improvement philosophy are ongoing four stage activities to

get from 'problem-faced' to 'problem-solved', which is referred to as **PDCA cycle** or is also known as the **Shewhart cycle** and the **Deming cycle** (or Wheel).
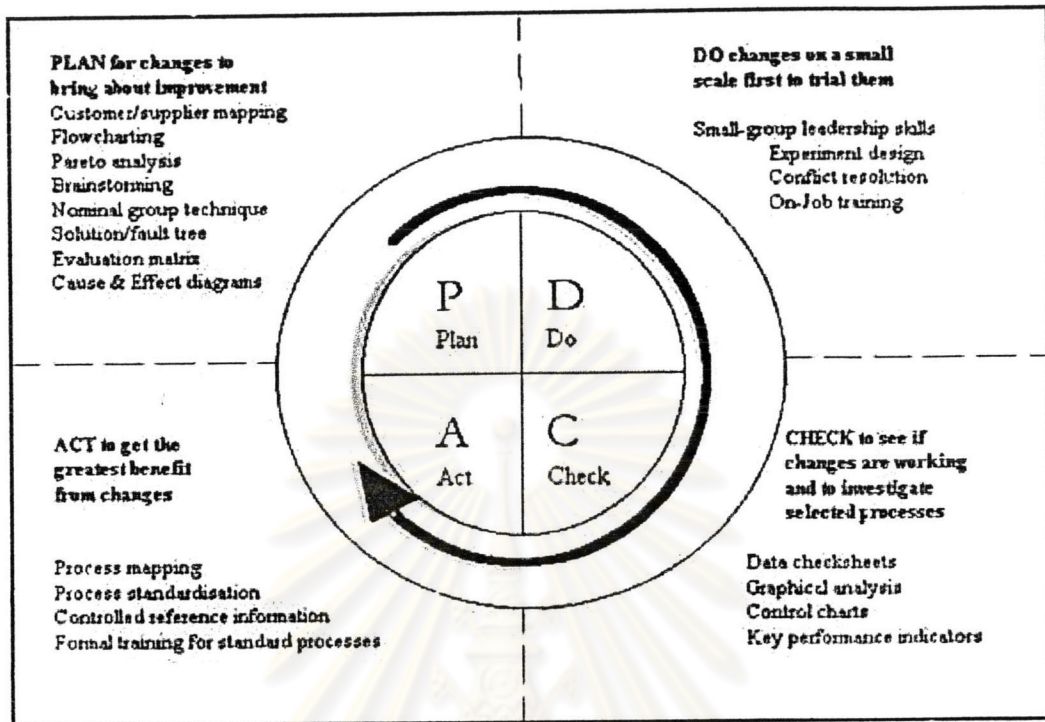

Figure 2-4: Evolution of the PDCA cycle

1. Plan:

 a) Improvement team begins by realizing that there is a need for an improvement on process (or for example; activity, method, machine, or policy and etc)

 b) Analyze and document selected process

 c) Sets qualitative and/or quantitative goals for improvement

 d) Formulate various strategies and pick one to achieve the goals

 e) Develop a plan with quantifiable measures for improvement.

2. Do:

 a) Plan on the scale of implementation/experiment to minimize disruption

 b) Improvement team implements the plan and monitors progress

3. **Check (or Study):**

    a) Analyze the data collected during the *Do* step, finding out how the outcome goes as according to the goals set in the *Plan* step.

    b) If the solution proves ineffective, the team returns to the *Plan* stage and repeat the process.

4. **Act:**

    a) If the measurable outcome proven to be effective, the team update documents the revised process so that it becomes the standard procedure.

    b) Perform training as necessary to ensure that the new standard procedure is fully integrated.

2.11 Problem Solving Process

The process for solving problems composes of the following logical and sequential activities. At each stage of the activities there are several effective techniques that are believed to be the most effective technique employed at each individual stage. The figure below indicates a generic approach to problem solving.

In order to make a sensible stab at installing a complete, workable solution in the first attempt, the series of stages must be followed closely and relatively inflexible. The reason behind this inflexibility is rather similar to all Quality issue that there is no easy path and any possible shortcuts tend to have a negative rather than positive effect on the outcome. Thus best to follow those systematic steps logically, for example, to fully define the problem before thinking in terms of solutions to avoid incomplete response to the issue. Similarly, prior implementing a solution, perform a proper planning to minimize any possible trouble that is likely to occur later in the future. Furthermore, the techniques applied at each stage (as listed beside at each stages in the figure), are suggested as a sensible some may not be necessary in situations
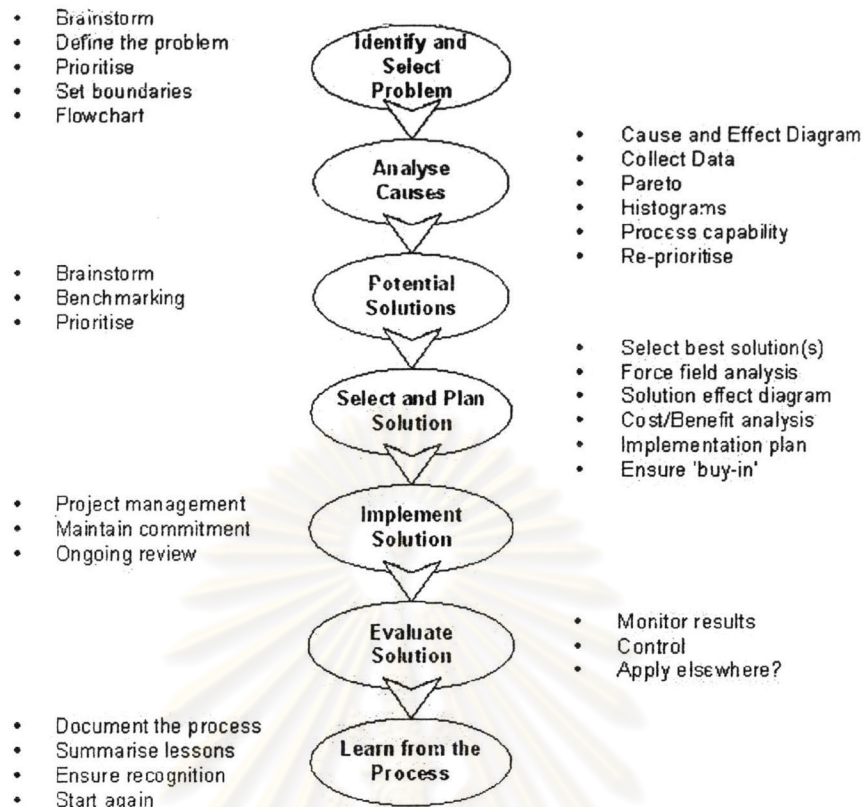
Brainstorm
- Define the problem
- Prioritise
- Set boundaries
- Flowchart

Identify and Select Problem

Analyse Causes
- Cause and Effect Diagram
- Collect Data
- Pareto
- Histograms
- Process capability
- Re-prioritise

Brainstorm
- Benchmarking
- Prioritise

Potential Solutions

Select and Plan Solution
- Select best solution(s)
- Force field analysis
- Solution effect diagram
- Cost/Benefit analysis
- Implementation plan
- Ensure 'buy-in'

Project management
- Maintain commitment
- Ongoing review

Implement Solution

Evaluate Solution
- Monitor results
- Control
- Apply elsewhere?

Document the process
- Summarise lessons
- Ensure recognition
- Start again

Learn from the Process

Figure 2-5: A Quality Improvement Process

The problem solving process can be implemented together with the Quality Circles (PDCA cycle). The logic behind the process remains the same but only the people take part that changed. Always remember the KISS acronym, it is the principle of "Keep it Simple, Stupid!" at all times and appropriately design suitable analysis to support the data.

2.12 Related Analytical Tools

1. *Flow Chart* - A flow chart is defined as a pictorial representation describing a process being studied or even used to plan stages of a project. Flow charts tend to provide people with a common language or reference point when dealing with a project or process.

   Four particular types of flow charts have proven useful when dealing with a process analysis: top-down flow chart, detailed flow chart, work flow

diagrams, and a deployment chart. Each of the different types of flow charts tends to provide a different aspect to a process or a task. Flow charts provide an excellent form of documentation for a process, and quite often are useful when examining how various steps in a process work together.

The following steps should be followed when flow charting a process:

a) Clearly define the steps in the process from beginning to end.
b) Identify each step by the simplest symbols possible.
c) Determine how the steps flow, including any backward flow that may result from outcomes of certain activities.
d) Add all lines and arrows to indicate the relationship between steps and the direction of flow.
e) Complete the first draft and have if reviewed by those most familiars with the process.
f) Modify the Process Flow Chart as necessary.

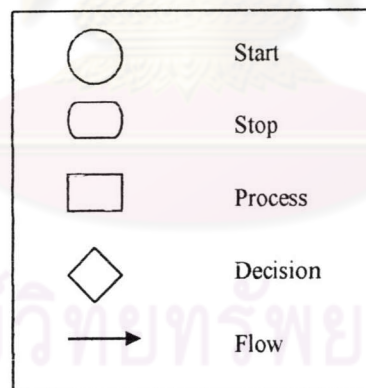The standard flow charting symbols are show 2-6 below.

Figure 2-6: Standard flow charting symbols (Quality Management & Techniques, 2003)

To support improvement activities it may be necessary to go to a further level of detail in describing the process. This would involve using an extended set of symbols to define the type of activities occurring in line with the categories identified in Figure 2-7 below.
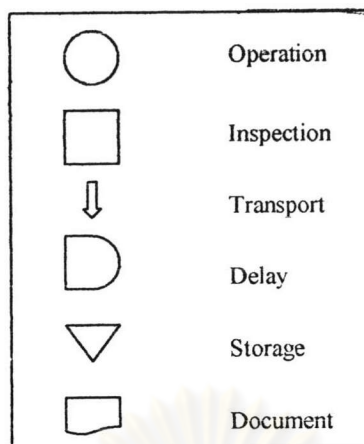
Figure 2-7: Detailed process flow symbols (Quality Management & Techniques, 2003)

2. ***Work measurement(time study)*** - A work measurement technique designed to establish the time for a qualified worker to carry out specified elements under specified conditions at a defined rate of working, recorded by direct observation of the times, using a time measuring device & the ratings for individual elements

This approach was adopted from the inherited system of Scientific Management, established by **Frederick Winslow Taylor (1911)**, and also recognized as the Taylor system or Taylorism. His theorem placed an impact on management service practice as well as on management up to the present days, which has carried out in many of America's Fortune 400 companies. Taylor was a perfectionist, always looking for the *"one best way"* to do job. Taylor wanted everybody to be a *"rate-buster"*, where work is to be investigated on a scientific basis in order to establish laws, rules and formulate governing the best methods of working and to establish what constitutes a fair day's work. He hated *"soldiering"*, which was the term used in those days to describe workers, who were just doing work inefficiently (no rate-busting). Time study rate system – a "scientifically" recruit, hire and train, in search for the fastest worker or specialist, who is known as the fastest *"rate-buster"*. Taylor would then examine that person's movements on the task, suggestion toward eliminating unnecessary movements would also be suggested, which was timed. The speediest rate performed by this particular "first class person"

(specialized workman) set the highest standard of that task, which then made other workers accountable for it (allowance for adjustment on the newness to the job, rest period, and unavoidable delays).

Many years of his employment experience as a manager and as a consultant, at Bethlehem Steel he achieved a 200% increase in productivity with only a 50% increase in wages. The work of Frederick Winslow Taylor legitimized the use of inspectors to ensure adequate quality of finished product. Taylor was the father of Scientific Management, his theory was to emphasize on work output, labor efficiency, and hence introduction of motion and time study.

There are various ways in which work can be measured in order to establish a **standard performance BSI 3138: 1979**. The basic procedure consists of three stages:

a) An **analysis** phase in which the job is divided into convenient, discrete components, commonly known as elements;

b) A **measurement** phase in which the specific measurement technique is used to establish the time required (by a qualified worker working at a defined level of performance) to complete each element of work;

c) A **synthesis** phase in which the various elemental times are added, together with appropriate allowances to construct the standard time for the complete job

3. E-C-R-S (Eliminate combine rearrange simplicity)

Eliminate – elimination of unnecessary activities

Combine – combining activities together to reduce activities, time, waste etc.

Rearrange – rearranging activities thus facilitate discrimination

Simplicity – reducing the number of operations, reducing or eliminating delays and storage or minimizing transportation (Work In Progress)

4. *Cause and Effect Analysis* - Kaoru Ishikawa the Japanese pioneer quality management processes in the Kawasaki shipyard was the developer of the Cause and Effect diagram, which he became one of the founding fathers of modern management. Various names that cause and effect diagram are commonly called: Ishikawa diagram, fishbone diagram or Ishikawa fishbone diagram. The diagram helps to determine the main causes and sub-causes that have resulted in an effect (symptom) or quality problem such as defects. It had been used as management aiding tool to trace customer complaints, which track down directly to the operations that were involved. However, other operations that have no bearing on a particular defect are left out from the diagram for that defect (cause).
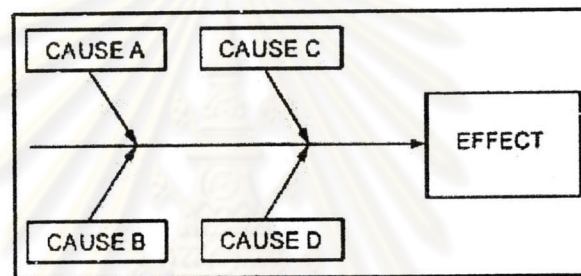
Figure 2-8: Basic layout of Cause and Effect Diagram

The construction of such diagram involves an analyst identifies all the major categories of potential causes for the quality problem. Causes in a cause and effect diagram are frequently arranged into these four default major categories; however these categories can be anything. For example, the use is with manufacturing four major categories are: manpower (personnel), methods (processes), machines, and materials; the use is with administration and service: equipment, policies, procedures, and people.
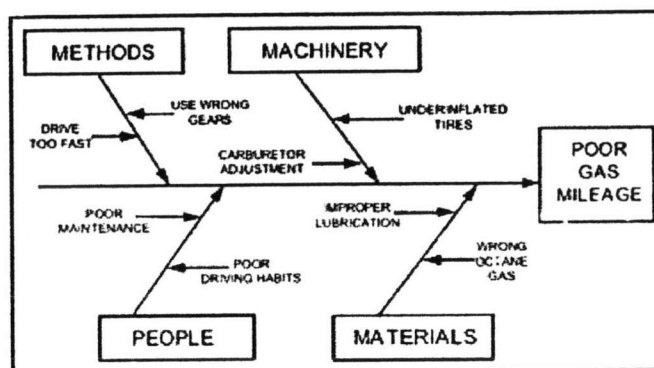
Figure 2-9: Identify causes and influencing effect (Main Category)

Under each major category a single effect (or output/outcome) the analyst lists down the potential or real causes (or input) of the quality problem, for example under Manpower category (personnel) the suspected causes may be listed "lack of training", "poor communication", and "absenteeism". Brainstorming by making list this way helps the analyst to identify and properly classify all suspected causes, which the analyst then systematically investigates the causes listed on the diagram for each major category, and update the chart as new causes became apparent. The process of constructing a cause and effect diagram calls management and worker attention to the primary factors affecting product or service quality.

5. ***Why-Why Analysis*** - is a process of asking *Why?* at least five times in a row in which it helps to structure brainstormed ideas towards the root causes of a particular problem or situation on a single diagram. This method of asking *Why?* Enables the analyst to use higher order thinking skills that cuts through layers of bureaucracy to find the true meaning.
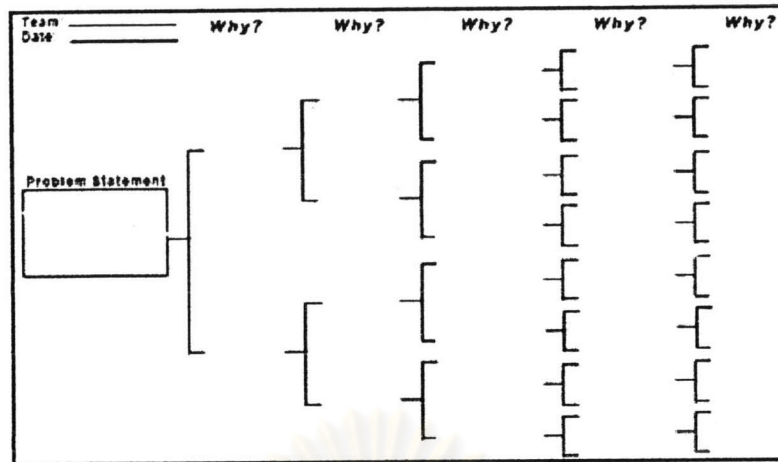
Figure 2-10: Basic Layout of Why-Why Analysis

Procedure to Why-Why Analysis: -

a) Identify a problem, situation to be analyzed (problem statement);

b) Ask *Why?* – For example, what are the first level that causes of the problem;

c) Breakdown the resultant causes from the main problem and write on the diagram;

d) For each cause ask *Why?* again and write the next cause in the next column, linking to the previous cause;

e) Continue asking the *Why?* question until no more causes can be suggested and that analyst and those involved in the analysis are satisfied at the outcome root cause;

f) Use the causes listed at the very last level of the diagram to generate possible solutions to the cause of the problem;

g) Review data for evidence of which causes are most important and gather fresh data if necessary.

6. ***Pareto's Principle: The 80-20 Rule*** - In 1906, the Italian economist and avid gardener, Vilfredo Federico Damaso Pareto studied the distribution of wealth in Italy as well a variety of countries in which he noticed an unequal distribution of wealth in his country and in most countries that 80 percent of

the land was owned by 20 percent of the population. Pareto later observed this noteworthy disproportion/ratio applies to other parts of life for example gardening: 80 percent of his peas were produced by 20 percent of the peapods. Pareto called this a "predictable imbalance", which over time this concept became better known as "The 80:20 Rule", "The Pareto's Principle", and "The Pareto's Law". Dr. Joseph Juran, who recognized this universal principle while working in the US in 1930s and 40s, he called this "The Vital Few and Trivial Many". This principle of 80:20, the inverse proportion is shown below by a simple symmetry, where the smaller first part increases to the larger second part as shown by the shaded areas. Ones might quibble about the 80:20 ratios (80% to 20%) it may sometimes be 60:40 or 90:10, the most important concept of this however must be recognized and that being two individuals are inversely proportional to one another.
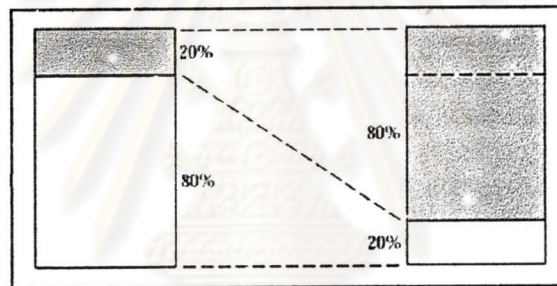

Figure 2-11: A simple symmetry representing the 80:20 ratio

7. ***Mean, Median and Mode*** - *Mean* or arithmetic mean is used to describe the middle of a set of data that does not have an outlier, where outlier is a data value that is much higher or lower than the other data values in the set. By calculating the mean of a set of data, you take account of the data spread. Hence mean is often referred to as the average and is given by this formula:

Mean = Sum of the data items / Total number of data items

Median is the middle value in a set of numbers when are arranged in order from least to greatest. Median is usually used to describe the middle of a set of

data that does have an outlier. The median provides statisticians with a quick way of estimating the average (arithmetic mean).

Mode is the number/value/item that occurs/appears most times (also called as frequency) in a set of data. It is possible for a set of data to have no mode (when all numbers appear once), one mode, or more than one mode (when 2 or more numbers appear most). Mode is often used for so called qualitative data that is data that describes qualities rather than quantities.

2.13 Literature surveys

<u>Development of performance measurement and indicator:</u>

AHMAD, I. (1990) proposed the thesis about the development of performance measurement in organization in order to indicate the low performance and suggest how to improve it. The performance measurement system that used in this thesis is Performance Objectives, which weight each factor in order to show the most important factor for the organization.

KAPLAN AND NORTON (1992) have devised a framework "Balanced Scorecard" for an integrated performance measurement system for strategic, operational and financial measures. The balanced scorecard provides answers to four basic questions: How do customers see us? (Customer perspective); what must we excel at? (Internal perspective); Can we continue and create value? (Innovation and learning perspective); and How do we look to shareholders? (Financial perspective). The balanced scorecard includes financial measures that tell the results of actions already taken. And it complements the financial measures with operational measures on customer satisfaction, internal processes, and organization's innovation and improvement activities-operational measures that are the drivers of future financial performance.

KHEMTHONGVONGSA, S. (1999) proposed the thesis about Lean management system. The result of the system can develop performance indexes in order to make customer satisfaction and improve production process quality.

KONGSUPAPSIRI, P. (2001) proposes the thesis that intended to present the development of key performance indicators for production. He aimed to improve the production planning and key performance indicators in real factory.

Quality:

KENNETH L. ARNOLD (1994) he suggested strategy for implementation as: design control; process control; inspection and testing; document control; corrective action; and delivery.

CROSBY (1979) quoted that the real strength and value of quality engineering involves learning from the past to make a smoother future. The most non-conformance problems are preventable. In preparation to prevent problems, the best sources to information for situations that required corrective action are through the observation of actual rejections and analysis of trends.

JHAKKRIT THEPPORNPITAK (1995) this research analyzed into the ISO9002 quality system implemented in an electronic parts factory from the commencement to the phase of certification. The outcome of the research given the insight to the problem, to be the working form use in the studied factory. The form did not comply with the document control system ISO 9002. The author thus suggested corrective actions to prevent the problem of document control system prior to the implementation. There were 7 non-conformance items that came from the document control system. After the implementation, no non-conformance on document control was found in the next audits.

CHRYSLER, FORD, GENERAL MORTOR (1994) as part of the quality management system they adopted the continuous improvement methodology known as the "Plan-Do-Check-Act" (PDCA). It is described in ISO 9001 as:

1. *Plan* – establish objectives and processes necessary to deliver results in accordance with customer requirements and the organization's policies;
2. *Do* – implement the processes;
3. *Check* – monitor and measure processes and product against policies, objectives and requirements for the product and report the results;
4. *Act* – take actions to continually improve the performance of process.

THANA BOON PRASIT (1994) this research is to improve the quality inspection system of incoming parts and production processes using a refrigerator factory as a case study. The author has proposed to designing and improving the document system used in the quality inspection task, setting the training courses for staffs and inspectors, and developing the performance indication and corrective action system. After implementation, the rejection of incoming parts was reduced by 22% and the quantity of the defective product using the sampling inspection was reduced by 41%.

Problem Solving:

DALE H. BESTERFIELD (1994) his view toward problem was that for every failure/s, there is/are a root cause/s and that all the cause is preventable, and that prevention is cheap. So he recommended the following as the strategy to improve upon quality:

1. Reduce failure costs by problem solving.
2. Invest in the 'right' prevention activities.
3. Reduce appraisal costs where appropriate and in a statistically sound manner.
4. Continuously evaluate and redirect the prevention effort to gain further quality improvement.

BEN SUTAROM (1995) he researched into the development of quality problem solving methods in metal parts production process for the home appliance industry. He uses the cause and effect diagram (or Ishigawa diagram) to identify the cause of each selected quality problem, set up a basic system for quality assurance. After implementation, the percentage of defective products was reduced by 81%.