CHAPTER 2

LITERATURE REVIEW

The purpose of this chapter is to review the relevant literature in regard to the following topics:

- *Make-or-Buy decision*
- *Outsourcing*
- *Application of suitable technologies*
- *Project Management*
- *Delegation and job enrichment*
- *Applications of the theory of constraints*
- *Organisational structures*
- *Organisational cultures*
- *Organisational change*

2.1 Make-or-Buy decision

McIvor, Humphreys, and McAleer (1997) described a strategic decision for a make-or-buy option that had significance for the overall corporate strategy of the organisation. This paper focused on the strategic framework of the company to evaluate the make-or-buy decision. An explanation of each stage involved in the model was covered in the paper, which was worthwhile for further reading

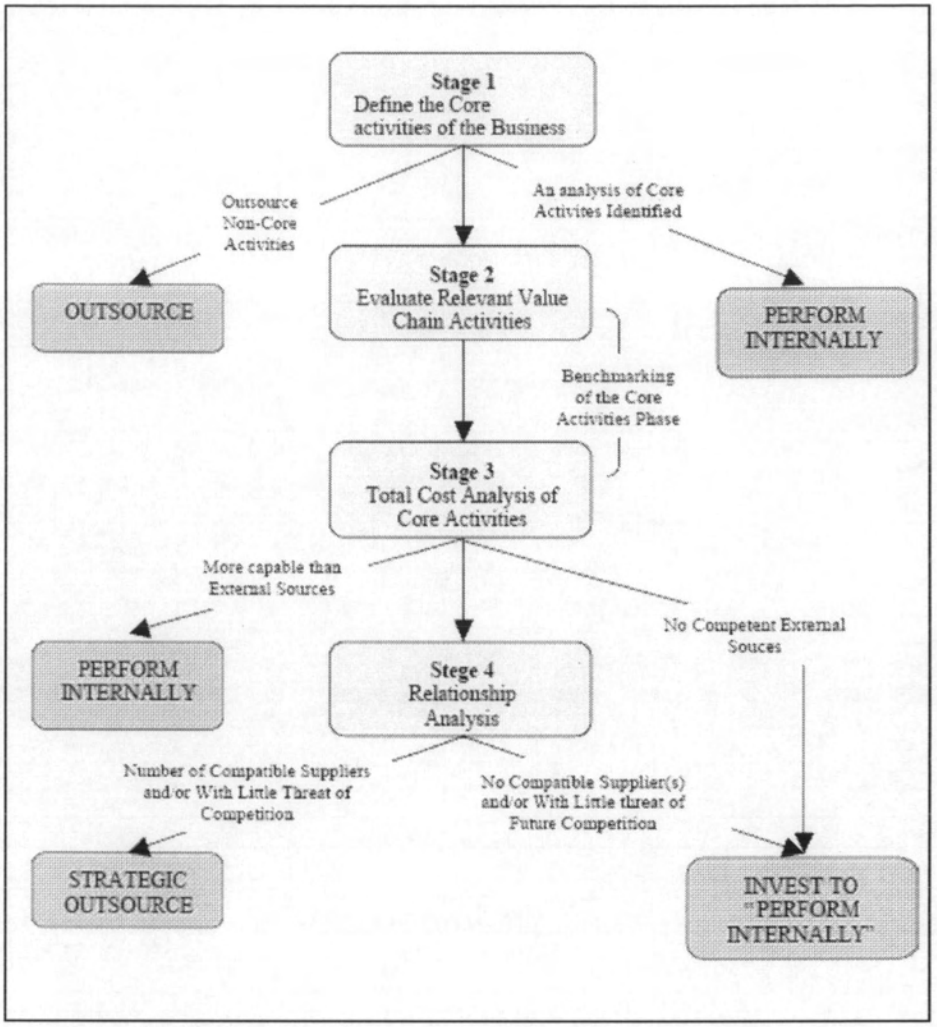

Figure 2.1: McIvor's Strategic Outsourcing Model

Step 1: Define the core activities of the business.

First of all, analyse the undertakings of the company in order to identify core activities and separate them from non-core ones.

Step 2: Evaluate the relevant value chain activities

Consider the department's competencies in the core activities identified in the first step and benchmark against potential external suppliers. Tools such as SWOT analysis are used to identify the department's strengths and weaknesses.

Step 3: Total Cost Analysis of core activities

The measurement of all costs associated with sourcing activities, internally or externally, shall be carried out in this step.

Step 4: Relationship Analysis

The relationships with potential suppliers shall be analysed. The consideration in this stage will be focused on the control and flexibility needed in an outsourcing strategy.

Brannemo (2006) provided examples of sourcing decisions from case studies at two Swedish companies to analyse their processes, and used parts of them as guidelines for a suitable sourcing framework. In this paper, three sourcing models are presented that give a general idea of theoretical outsourcing models and show which parameters are important in these models. For instance, one of the three models for sourcing decisions that are presented below is the framework developed by Probert *et al.* (2000). It begins by analysing the external environment, which is consisted of political aspects, social factors, availability of suppliers and competition from other suppliers. These factors activate triggers for the make-or-buy analysis. Examples of trigger elements, which lead to the question whether the company should produce in-house or buy from an outside supplier, are cost reduction, lack of capacity, higher quality and new product characteristics. In addition, there are four areas that should be compared and evaluated as part of the decision process, which are the following:

1. Technology and manufacturing processes
2. Costs
3. Supply chain management and logistics
4. Support systems

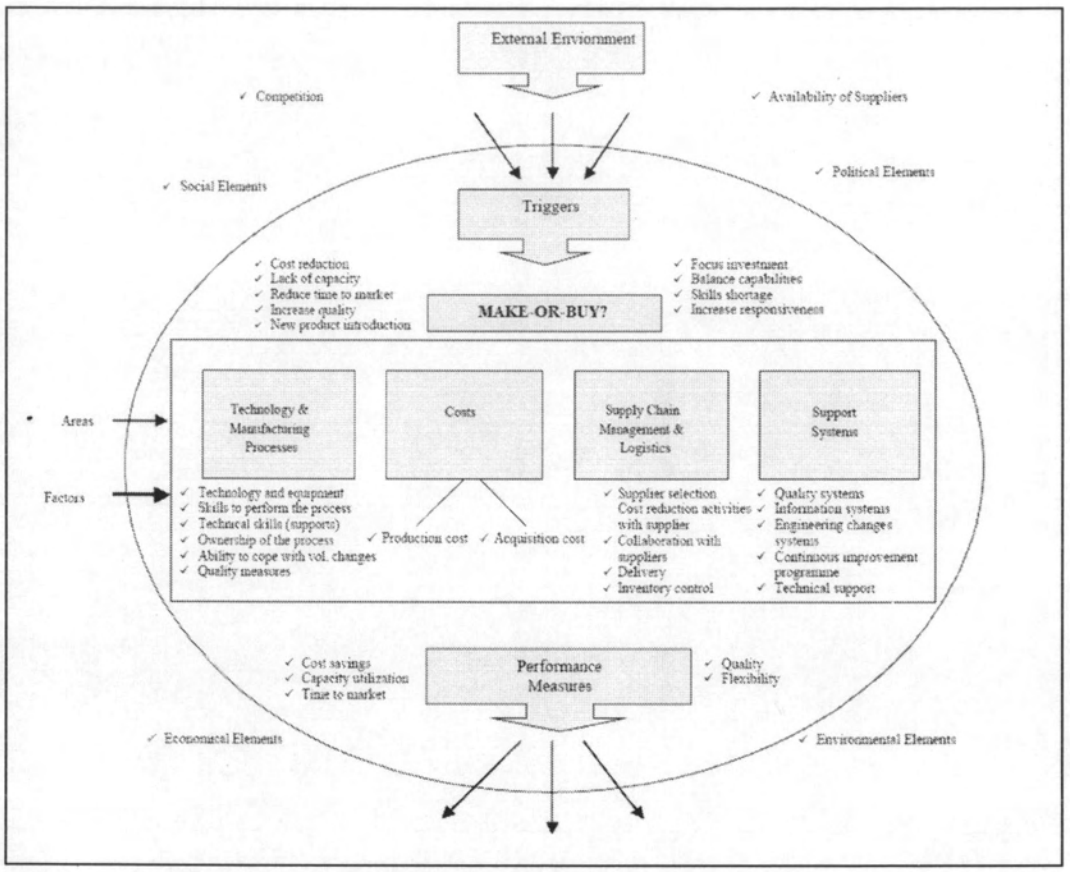

Figure 2.2: Probert *et al.'s Make-or-Buy framework*

Moreover, Russell and Taylor (2000) explained that a make-or-buy decision is a choice concerning which components will be purchased from a subcontractor or produced internally. In this regard, there are numerous factors that should be evaluated before a company reaches a make-or-buy decision, which are the following:

1. Cost

   Cost is an important factor in deciding to produce an item in-house or to buy it from the outside. A company often has to choose the alternative that is cheaper whether to make something or perform a service in-house versus outsourcing to a subcontractor.

2. Capacity

   In order to maintain a level of work force, the company usually makes an item when it is operating at less than full capacity or the available capacity is sufficient

to produce that item. Moreover, it is better to produce internally for a part with steady demand that utilizes a set capacity. On the other hand, the company may subcontract a component that has uncertain demand patterns.

3. Quality

One of the factors that are important to reaching make-or-buy decisions is the capability to provide quality service. In general, it is easier for the company to control the quality of a product that is produced in its factory. However, the company can improve the quality of an item by standardisation of parts, supplier certification, and supplier involvement in design.

4. Speed

Occasionally, a component is purchased for the reason that a subcontractor is able to supply a product faster than the company can. In this regard, the speed of supply can be helpful for a company if the subcontractor is reliable.

5. Reliability

It is essential for suppliers to ensure the reliability of their products' quality and delivery schedule. For instance, havoc can occur in the manufacturing system if there are unexpected delays in delivery or received components cannot be used because of quality rejects.

6. Expertise

The company may want to keep control over its processes in which it has expertise or core competence. For instance, automakers might outsource many of their assembly parts, but they exercise proprietary control over major components. Therefore, the decision on whether to share a company's expertise with a supplier for economic gains is a difficult one.

According to Heizer and Render (2001), reaching a make-or-buy decision is choosing to produce a component or perform a service in-house or to purchase it from outside sources. These authors presented several reasons that should be considered in the make-or-buy decision, which are:

Reasons for making

1. Lower in-house production cost
2. Potential suppliers are unsuitable
3. Assure adequate supply (quantity or delivery)
4. Utilise surplus labour or facilities and make a marginal contribution
5. Obtain desired quality
6. Remove supplier collusion
7. Obtain unique item that would entail a prohibitive commitment for a supplier
8. Maintain organisational talents and protect personnel from a layoff
9. Protect proprietary design or quality
10. Increase or maintain size of the company

Reasons for buying

1. Lower acquisition cost
2. Preserve supplier commitment
3. Obtain technical or management ability
4. Inadequate in-house capacity
5. Reduce inventory costs
6. Ensure alternative sources
7. Inadequate managerial or technical resources
8. Reciprocity with suppliers
9. Item is protected by a patent or trade secret agreement
10. Frees management to deal with its primary business

2.2 Outsourcing

As argued by Hill (1993), a company should focus on processes with which it has expertise or core competence. It is vital to determine the appropriate amount of the firm's outsourcing operations to an outside supplier who can provide better quality, lower cost and greater efficiency. Similarly, Kotler (2000) explained that outsourcing was a greater willingness to purchase more goods and services from outside vendors when they could be obtained cheaper and better this way. Each company has to find the suitable level of their outsourcing operation in order to receive the most benefit.

According to Russel and Taylor (2000), outsourcing or subcontracting is a practical option if a supplier is able to reliably meet a company's requirements. It is an agreement between a prime contractor and a subcontractor in order to perform a job following certain contract requirements. Similarly, according to the International Joint Ventures module notes (2006), we can describe subcontracting as a contractual agreement between a contractor and a subcontractor to carry out the following:

a) *Supply a part*: A subcontractor is hired by a contractor to make parts, components, sub-assemblies and assemblies, which are integrated in the project and sold by a contractor.

b) *Provide a component*: The processing of materials that are used in the project for the primary contractor-whether the materials are provided by it or not – and the process or finishing of parts provided by, and returned to the primary contractor.

Subcontracting relationships between and among companies are becoming more common in a modern economy. Subcontracting occurs when a company contracts an order with another firm, the subcontractor, for the production of parts or components to be included in a product that is sold by the contractor. Such orders may include the processing or fabrication of parts by the subcontractor following the instructions of the contractor.

Accordingly, subcontracting is an agreement which involves a relationship between contractor and subcontractor to perform a specific task required for the project which the contractor is unable or unwilling to carry out by itself. Moreover, there are several reasons to hire subcontractors, such as lack of financing, inefficient use of available capacity in-house, lack of special information, technology, or skills, reduction of costs and mitigation of project risks.

Similarly, Wild, Wild and Han (2001) explained that there are some other reasons to subcontract:

- *To lower risk*: It helps a company to lower risk that might occur in the project. For example, the company refuses to invest in plants and equipment abroad in order to reduce the exposure of resources to political risk in other countries.

- *Gain more flexibility*: From buying services from outside suppliers, the company can avoid large investments in assets and facilities, which regularly decreases the company's flexibility.

Moreover, according to Imrie, as cited by Webster, Alder, and Muhlemann (1997), types of subcontracting can be categorised as shown below.

- *Extra capacity:* This type of subcontracting is usually short-term and unstable. It is set up to meet special increases in demand.

- *Specialised:* It is long-term approach, which is established to access specialized skill or technology that is unavailable in-house.

- *Economic:* It is established where cost benefits can be obtained by subcontracting a project.

Sanyal (2001) also demonstrated that there are several factors that a company should consider when it decides to outsource and is trying to identify a good subcontractor whether offshore or onshore, such as:

- Price
- Quality and capabilities
- Support services, which include replacement of defective items, instruction in the use of equipment, and repair of equipment
- Location in relation to shipping time, transportation costs, and response time for rush orders or emergency service
- Inventory policy
- Flexibility of the supplier

Power, Bonifazi, and Desouza (2004) presented ten traps to avoid when the company pretend to implement outsourcing strategy, which are as follows:

1. Lack of management commitment
2. Lack of an outsourcing communications plan
3. Minimal knowledge of outsourcing methodologies
4. Failure to recognise outsourcing business risks
5. Failure to obtain outside outsourcing professionals
6. Not dedicating the best and brightest internal resources
7. Rushing through the initiative
8. Not recognising the impact of the cultural differences
9. Minimising what it will take to make the vendor productive
10. No formal outsourcing governance program

Veloso and Fixson (2001) provided a proposal to determine the Make-Buy decision of a company of whether to develop a new component in-house or to subcontract it to a supplier.

Schniederjans and Zuckweiler (2004) investigated a quantitative approach in order to limit risks that might occur from outsourcing strategy. They focused on a

case study the use of a quantitative model useful for consideration of international risk factors unique to outsourcing-insourcing decision.

In addition, According to Integrated Graduate Development Scheme (IGDS) Supply Chain Management (1999), the following factors comprise the main issue to be discuss for any further outsourcing decision making, which is recommended to be included in the part of consideration is the organization's position in the supply chain that can impact on the outsourcing decision making for example is capacity, workforce, facilities and technology. The summary can be summarised by the list of manufacturing strategy decision areas as shown below.

- Machine Capacity - limited or surplus
- Labour Availability - quantity and skills
- Process Capability – limited or adequate, reliability
- Lead-time
- Cost effectiveness at this volume
- Health and Safety issues
- Environmental factors
- Storage space available
- Transportation system

2.3 Application of suitable technologies

Snyder and Cox (1989) explained that computer integrated manufacturing (CIM) is a major tool in many manufacturers for increasing the profitability of an organization (Snyder and Cox, 1989). It combines various technologies, such as computer aided design and computer aided manufacturing (CAD/CAM), robotics, automated material handling and identification, machine vision, and a communications network to set up an entirely integrated factory.

2.3.1 Computer aided design (CAD)

According to Heizer and Render (2001), CAD is the interactive use of a computer to design a product and prepare engineering documentation. By utilizing CAD software, designers are able to simulate each part and assemble components of the mould virtually in 3D as illustrated in the figure below. As a result of this capability, designers can check for errors, clearances, and collision of product parts without the need to construct a physical prototype.

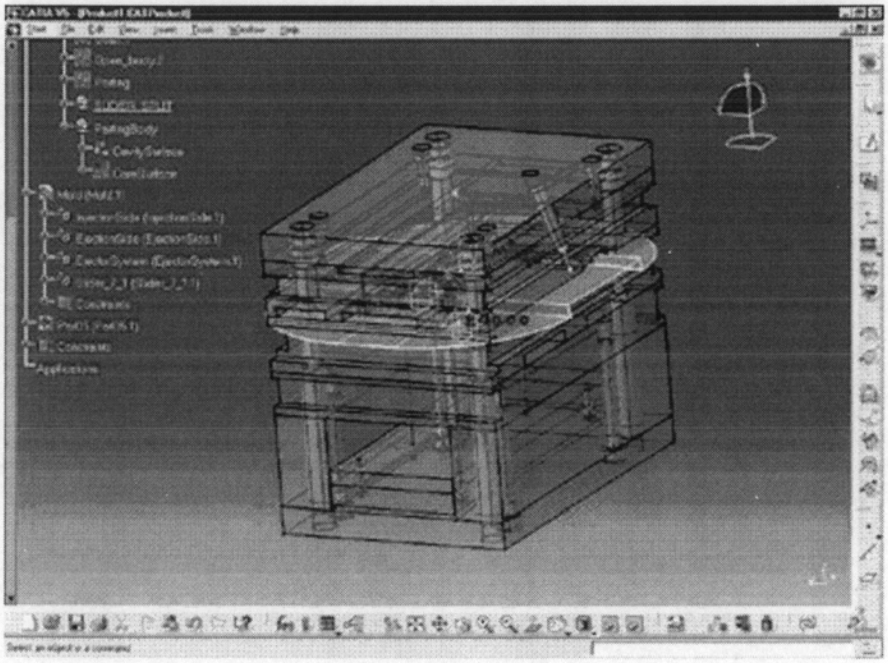

Figure 2.3: 3D simulation of the mould

By executing various software commands, CAD can create complex and yet accurate drawings. It also can help to support manufacturing processes when used in conjunction with CNC programming and together with CAM tools, as will be discussed further in the next section. All of this will enable a manufacturer to increase product quality and decrease manufacturing time and cost, when compared with conventional processes.

2.3.2 Computer aided manufacturing (CAM)

In modern technology, CAM is a tool that helps CAD software interface with various CNC machineries, robotics, lathes, milling machines, welding machines, electro discharge machines, automated material handling equipment, and other tools.

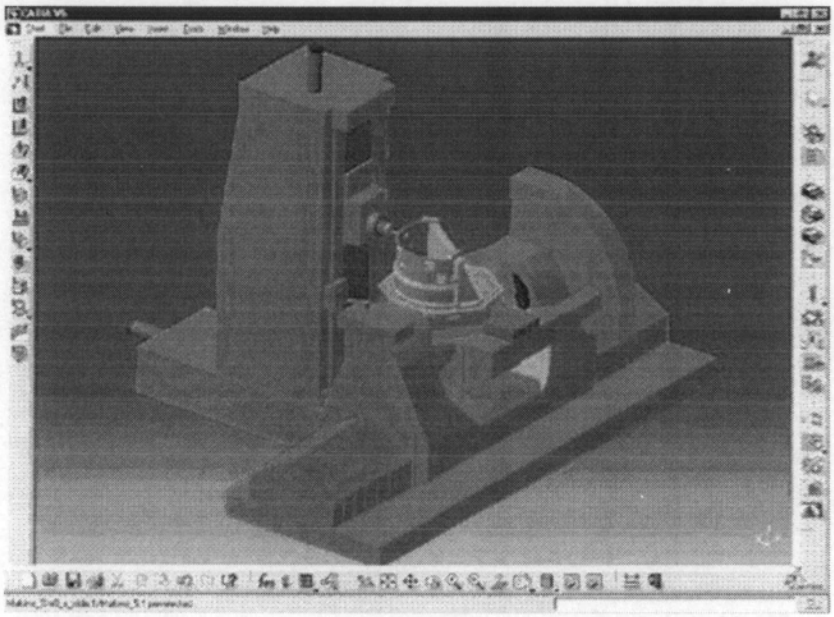

Figure 2.4: Simulation for manufacturing process

The aims of using CNC machinery are for constructing complex and accurate parts, and reducing cost and processing time when compared with older technology. CNC parts programming will enable engineers to construct complex moulds or mechanical parts with complex curves and surfaces.

2.3.3 Computer aided analysis (CAE)

It can be too complicated to test a product with conventional technology. CAE is a computer-based technique to aid design applications. This enables an engineer to test a product without the need for an actual product. CAE can perform finite element analysis, mould flow analysis, and

heat transfer analysis, etc. As illustrated in Figure __ below, CAE helps engineers to calculate the mould injection time and carries out a thermal analysis of the molten plastic.

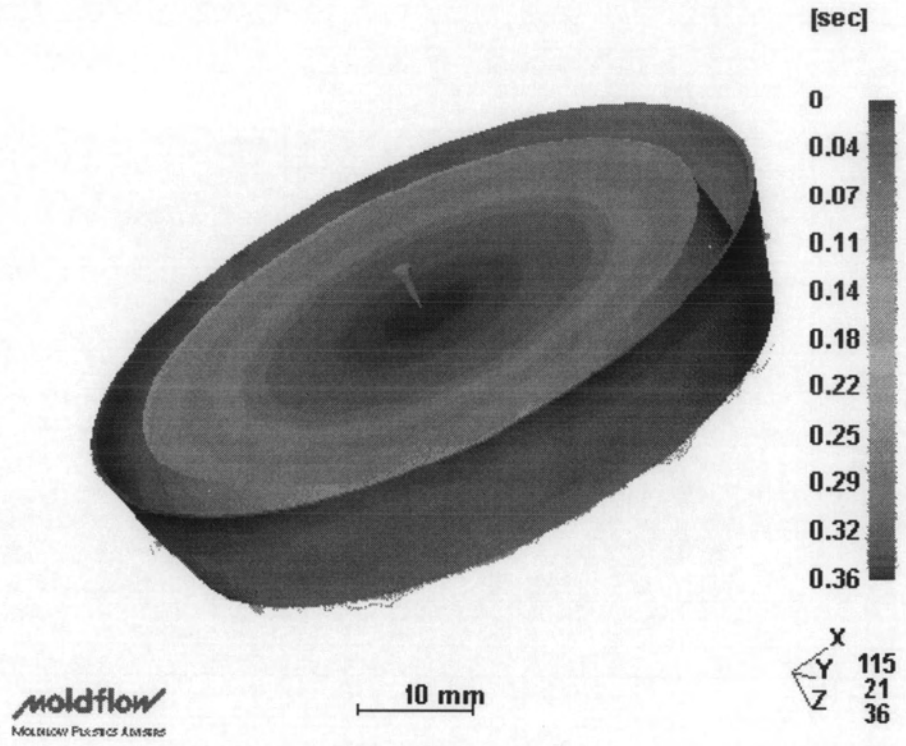

Figure 2.5: Analysis of injection time and thermal

From the results of CAE analysis, designers can redesign or improve on the overheated areas of the product early in the development process to correct errors and increase the quality of the product.

2.3.4 Computer numerical control machines (CNC)

It can reduce production time and increase precision of operations in fabricating the moulds. This technology is suitable for making moulds with complex sequential machining steps, where human error is prone to occur. It is especially advantageous for making moulds that need regular replacements after their useful lives have expired, as CNC operations for repetitive machining can yield work pieces with uniform quality. Of course, mould replacements that have consistent performing characteristics will contribute to

stability of the manufacturing line, and therefore, yield final products with minimal defects.

Overall, by using a CAD system and imaging software, co-workers at each site can view and discuss the design more expediently. For example, designers can discuss or modify product characteristics in consultation with engineers. It also can reduce cost and time by computer aided engineering (CAE) to analyse structural, kinematic, thermal, and special features. Moreover, CAD can combine with CAE to make digital mock-ups and CAM to make prototypes, all of this leading to reduced costs and shortened design cycles. Finally with CAM tools, CNC machines can reduce production time and achieve greater precision in product fabrication, be it a single job or a long series of outputs.

2.4 Project management

Proper project management helps firms toward the goal of completing projects on time and within budget. Russell and Taylor (2000) argued that project management was carrying out an assignment to develop and execute a new or additional process, which did not continue indefinitely. In principle, it helped a company to keep the project on schedule by planning and performing project activities, while making resources available and following budget constraints. When a project is under way, one can monitor it by a Gantt chart, which is a project time frame, to determine whether the project is proceeding on schedule or not. As the chart essentially represents the time line of tasks required to complete a project, it allows the supervisor to pinpoint the corrective action that is needed to bring it back on track. This method is often suitable for the successful and effective implementation of projects.

For purposes of identifying and solving problems, there are several tools that might be employed, such as brainstorming, continuous improvement, and the seven basic tools of quality control which consist of: process flow charts, Pareto charts, cause and effect diagrams, control charts, checklists, scatter diagrams, and histograms. Staff can select the appropriate tools that are suitable for each problem, with two basic tools discussed below as examples.

2.4.1 Process flow charts

According to Integrated Graduate Development Scheme (IGDS) Supply Chain Management, process flowcharting is one of the primary techniques that help a company to eliminate wastes in its work process. It is usually illustrated by a diagram and is used for tracking the flow in a process. It enables a team to better understand how activities proceed, optimizes overall performance and minimizes the lead time and cost of a process.

2.4.2 Cause and effect diagrams

According to Roberts (2001), these diagrams are also known as Ishikawa or fishbone diagrams. It is a graphical procedure, which has an appearance similar to a fishbone used for finding root causes of a particular effect. This technique is frequently applied when a team uses brainstorming to determine the causes of a problem.

2.5 Delegation and job enrichment

Muir (1995) demonstrated that showing of trust through delegation could be one of the methods that provided encouragement and motivation for workers. Delegation enables a manager to overcome a bottleneck problem, which may result from holding decision-making power by only one person. A work-conducive environment often ensues from good communication between the manager and his subordinates. Staff members can be motivated by appropriate amounts of delegation. In this regard, they must know what is expected, the right way to achieve it, and the authority to perform their job. Therefore, from directions that the manager gives them coupled with their knowledge and experience, they can show their full value and further develop their skills and competence. On the other hand, with suitable monitoring the manager should ensure that serious mistakes are avoided.

Similarly, Chapman (2005) argued that staff could use and develop their skills and knowledge, if a principle of management called "delegation" were followed. Delegation can thus be useful and can lead to increased productivity in a suitable work environment.

Russell and Taylor (2000) stated that the procedure designed to increase employee commitment within the workplace should include job redesign and job enrichment programs.

According to Garg and Rastogi (2006), *job enrichment* is a technique that gives a certain amount of autonomy and responsibility in terms of planning, directing, and controlling to workers. Staff members are authorized to perform their job with greater independence. Furthermore, job enrichment provides the opportunity for personal growth and a meaningful experience for workers, as well.

2.6 Application of the theory of constraints

According to Pegels and Watrous (2005), the theory of constraints (TOC) is used to improve the processes of manufacturing by viewing a process as a chain. Its function is to point out the weak links in a process that can reduce the amount of throughput that a company is able to achieve, and the target is to eliminate defective links or to reinforce them to the extent that they are not detrimental to the entire chain. According to TOC, there will always be at least one constraint that limits the process from becoming a little better regardless of how well an organisation is performing. Thus, TOC can be thought of as a continuous improvement process since no matter how strong the chain is, it will always have at least one link that is a little weaker than the others. The manager has to identify where the system's constraint is in the chain. For example, if all orders are produced on time and there is a shortage of incoming orders, then the constraint is not in the production process but rather the ability to sell more products.

Heizer and Render (2001) argued that the theory of constraints (TOC) coped with issues that hindered a company's ability to accomplish goals. Constraints may be physical such as processes, raw materials, or suppliers and nonphysical such as procedures, morale, or training. In addition, these authors proposed a five-step process in order to deal with these limitations per the following:

"Step 1: Identify the constraints.

Step 2: Develop a plan for overcoming the identified constraints.

Step 3: Focus resources on accomplishing step 2.

Step 4: Reduce the effects of the constraints by off-loading work or by expanding capability. Make sure that the constraints are recognised by all those who can have impact on them.

Step 5: Once a set of constraints has been overcome, go back to step 1 to identify any remaining constraints."

Moreover, Heizer and Render (2001) presented several techniques for dealing with constraints or bottlenecks, which might be employed individually or as a combination:

1. Increase capacity to overcome the constraint. This may require an investment in resources and a period of time for implementation.
2. Adequate training or suitable cross-training should be given to employees in order to operate and maintain the work center causing the constraint.
3. Utilize different routing, processing procedures, or subcontractors.
4. Inspect a process before a bottleneck step. It enables a company to reject any potential defects before they go through the bottleneck.
5. Arrangement throughput to equivalent the capacity of the bottleneck

2.7 Organisational structures

The organizational structure can be a factor that can support or impede a project. A suitable structure would depend on the type of business. According to Robbins (2001), there are 2 types of structure: the organic and mechanistic structures. The characteristics of both structures can be described as follows.

Organic Structures: low complexity, low formalization, high participation in decision making, and decentralization.

Mechanistic Structures: high complexity, high formalization, low participation in decision making, and high centralization.

Organic structures are flexible and less formalized. These structures may be used to run a firm until it has grown fairly large, which will then require more standardization and management controls, leading the company toward a mechanistic structure. The main types of mechanistic structure consist of: the functional organization, the product or project organization, and the matrix organization.

- ***The Functional Organization***

  The functional organization allows employees who have responsibility in an area to specialize in the functions of one department. This structure enables the company to keep costs at a minimum with good utilization of resources.

- ***The Product or Project Organization***

  In its operations, the company focuses on different products or services areas. In this respect, the firm assigns functional staff to each project area on a full-time basis.

  There are several advantages in the project organization, such as: staff members have focusing on a common goal, high efficiency of communication, and service is provided to customers more speedily than in the functional structure. In contrast, disadvantages are duplication of resources and reduced specialization in occupational skills.

- ***The Matrix organization***

  According to Robbins (2001), a matrix organization allows the company to operate the business by utilizing the functional and project structures at the same time.

  Here, an organization is able to benefit from the advantages of the functional structure, such as: development of the cross-functional skills of employees and flexibility to start on new projects. Disadvantages are possible

conflicts between functional and product managers which lead to the confusion of employees.

2.8 Organisational cultures

According to Robbins (2001), organizational culture is a common perception held by the organization's members. The overall effect of one organization's culture may be different from others. Managers may seek to influence the culture in a company, but they need to understand the existing culture to predict, control and manage. Thus, a firm's management should have a clear understanding of the characteristics of different organizational cultures, in order to develop greater cohesion and strength in the company.

Charles Handy (1993) presented in the Integrated Graduate Development Scheme (IGDS) Project Planning and Management Control various organizational cultures, as described below:

- *The Role Culture*

  Logic and rationality play important roles in this culture. People and communication channels are controlled by their job descriptions, and greater emphasis in placed on procedures than on individuals.

- *The Power Culture*

  Power is controlled by the centre, which is a key person. This is usually found in small firms. The system can fail if it interlinks too many people and activities. In the case of a larger organization, it needs to be divided into groups each with its own power culture.

- *The Person Culture*

  The person culture is one in which individuals group together for support, but each person trying to achieve individual goals. This culture is difficult to manage and yet can function if the individuals receive mutual benefit from each other.

- *The Task Culture*

  The task culture as categorized in the matrix organization is project oriented. The focal point of this culture is to get the project done. It calls for the most suitable resources to attain the best results. Employees have power of decision making in their work area.

2.9 Organisational change

Vecchio (2006) mentioned that change is an inevitable element for both individuals and organisations. Evidently, change is an issue that firms must face. As a result, it can impact on organisations and individuals, as well. According to Kyle, as cited by Bovey and Hede (2001):

"Organisational change causes individuals to experience a reaction process."

As a result, it is essential for companies to understand what key factors need to be enhanced and which should be reduced or eliminated, in order to cope with organisational changes.

Robbins (2001) argued that there are five reasons why individuals may resist change, which are habit, security, economic factors, fear of the unknown, and selective information processing as illustrated in Figure 2.6 below. The resistance force is the nature of human of resisting to changes; it can be one of the factors or the combination of many factors depending on each individual.

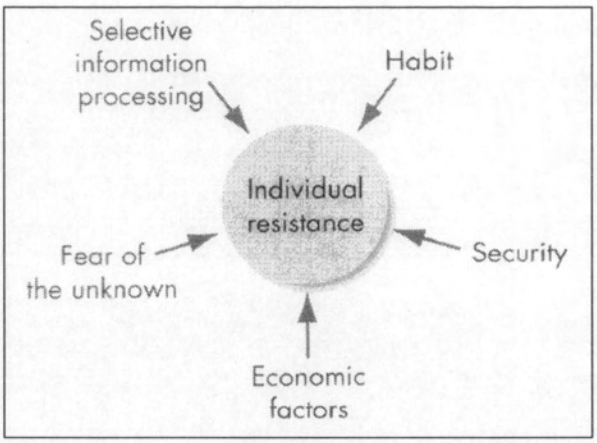

Figure 2.6: Sources of individual resistance to change

The following are descriptions of the major causes of individual resistance to change:

- *Habit*: Workers are familiar with the existing process, and they may object when they have to change any procedures.

- *Security*: When improvement or innovation is brought into a company, staff may show resistance since they feel their expertise is being undermined. They may become less important, and therefore, they develop negative attitudes toward participating in the change resulting from new technology.

  Moreover, it is difficult to pass knowledge from senior to younger people due to communication barriers. Senior people feel threatened that they may be replaced by younger staff if the latter become very knowledgeable.

- *Economic factors:* The staff may resist change if they believe that it may lower their income. Since a large investment is required for purchasing new equipment in a company, it could become more difficult to increase their salaries. In addition, they may have less overtime work, since projects can be completed faster with advanced technology.

- *Fear of the unknown*: Employees may show resistance when they are introduced to new techniques, because some fear that they will be unable to carry out new procedures in a satisfactory manner. Therefore, they may develop negative attitudes that are obstacles to change and improvement.

- *Selective information processing*: More senior staff members may ignore information that younger colleagues present to them regarding innovative techniques and their potential benefits. This is due to some older people have developed high degrees of self-confidence, and they do not value the information received from younger co-workers.

Moreover, Robbins (2001) presented six major causes of organisational resistance to change, which consist of structural inertia, limited focus of change, group inertia, threat to expertise, threat to established power relationships, and threat to established resource allocations as illustrated in Figure 2.7 below.

Figure 2.7: Sources of organizational resistance to change

The following are descriptions of the major causes of organisational resistance to change:

- *Structural inertia*: People in the company may be used to old procedures that they are following such as the employee selection process, training, and regulations. Hence, the existing organisational structure can act as a counterbalance to change in the name of maintaining stability and the status quo.

- *Limited focus of change*: A department that has been affected by change may resist it if the working environment in the company is not supportive. If not everyone else in the company has to face change, the staff of a department that have to depart from the status quo may feel singled out and will need to be convinced of the underlying reasons for change. Here, good communications and support within the company are essential to any success that may result from change.

- *Group inertia*: This occurs when some individuals wish to make changes, but existing group norms may act as a restraining forces.

- *Threat to expertise*: Staff may feel that their expertise is becoming obsolete as a result of introducing new innovations. For instance, they may be less important if a modern and more efficient machine is going to be installed.
- *Threat to established power relationships*: A power relationship can be threatened by a rearrangement of decision-making authority. For instance, the manager or supervisor may feel that their authority is undermined, when participative decision-making in the empowerment and team working system is implemented.

- *Threat to established resource allocations*: People who are affected by changes in resource allocation may feel change as a threat. They may feel deprived of the amount of resources to which they have been accustomed.

Lewin's 3-step change model

- *Step 1: Unfreezing*

To implement change with efficiency and effectiveness, the first step that a company should take is making people recognize the need for change. According to Schein as cited by Burnes (2004), there are three processes in this step, which are:

1. Disconfirmation of the validity of the status quo
2. The induction of guilt or survival anxiety
3. Creating psychological safety

Sufficient psychological safety is needed. People have to feel secure before they can accept the innovative information and decline previous behaviours. If insecurity prevails, change may be unable to be carried out in the organisation since disconfirming of the status quo is denied and no survival anxiety will be felt. Moreover, in Lewin's theory, there are two factors acting upon a change while it is being carried out, namely the driving forces and restraining forces. In order to move from the equilibrium stage, as demonstrated in Figure 2.8 below, Robbins (2001) argued that according to Lewin's theory, the company needs to enhance the driving forces, which are supporting behaviour of the existing participants and reduce the restraining forces that hinder movement to the desired state.

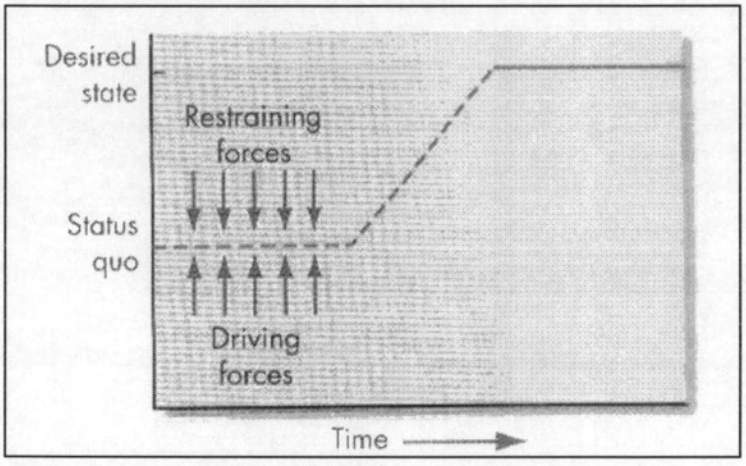

Figure 2.8: A force field diagram

- *Step 2: Moving*

  The process in this step is taking action to transform the organisation from the original stage to the new stage.

- *Step 3: Refreezing*

  Finally, the company needs to stabilise the new changes in order to ensure the new levels of actions will be safe from decline to the previous mode of operation.