

CHAPTER II

LITERATURE REVIEWS

In this research, two key subjects of critical success factors and project planning in the set-up of biodiesel factory would be studied. For the critical success factors determination, Porter's Five Forces Analysis, SWOT Analysis and Questionnaires would be employed. Whereas for project planning of setting up a biodiesel production factory, three project planning knowledge areas of Project Time management, Project Resource management, and Project Cost management would be carried out.

2.1 Critical success factors

The term 'critical success factors', it can have different meanings to different people. According to Caralli (7), critical success factors are defined as "key areas of performance that are essential for the organization to accomplish its mission". Additionally, quoted from Rockhart by Caralli (7), he presented five definitions of critical success factors as:

- key areas of activity in which favorable results are absolutely necessary to reach goals;
- key areas where things must go right for the business to flourish;
- "factors" that are "critical" to the "success" of the organization;
- key areas of activities that should receive constant and careful attention from management;
- and, a relatively small number of truly important matters on which a manager should focus attention

To some, it also refers to as key success factors (KSFs). With reference to Thompson et al. (8), the competitive factors that enable the companies to do well in their market and, hence, affect positively in their industry are refers to as key success factors. These competitive factors could be in term of strategy, product feature, assets, know-how, and competitive capabilities – anything, depends from one industry to

another, which could help the companies to result in a positive financial return and not a loss.

To determine the critical success factor, Thompson et al. (8) explained that usually the industry competitive factors are derived from what was learned from the industry and its environment past analysis. The analysis is in term of; the direct flow of the industry's key characteristics factors that are crucial to future competitive success, the nature of industry's competition, the driving forces' impact, the industry participants' comparative market position, and last but not least, the key rival's upcoming moves. Thompson et al. (8) also added that by answering the following three questions, these would help the firms to identify one's key success factors.

The questions are:

- i. Firstly, what are the criteria that the buyers base their buying decision on to purchase a product of the examine industry from different sellers? Of the identified criteria, which is/are the important factor(s)?
- ii. Secondly, what kind of resources or capabilities that a company need to acquire in order to gain a competitive advantage and be successful in the industry?
- iii. Lastly, in the near future, is/are there any event(s) that might endanger company's success or put a company in a disadvantage position?

In answering the first question, basically, the external environment of the examining industry would be analyzed. For the second question, it overlooks at the company's capabilities which sometimes could also be referred to as the internal environment scanning. Lastly, to determine the key success factors, the information gained from the external and internal evaluation would be combined in the form of SWOT Analysis to reveal the critical success factors.

This is supported by theses of Rungcharoenpattanakit (9) and Tovikkai (10). Rungcharoenpattanakit's thesis entitling, 'Critical success factor analysis of textile industry in Thailand', was conducted to determine the competitive factors of Thai textile industry. Tovikkai's thesis entitling, 'The critical success factors in Thai jewelry industry', is about determining the competitive factors of the Thai Jewelry industry. From the two theses, it has to be noted that before one could determine the critical success factors, environmental scanning, SWOT Analysis, and the questionnaires would usually be conducted. Hence, in this research, Porter's Five Forces, SWOT Analysis, and questionnaires would also be studied to determine the critical success factors in the set-up of a biodiesel factory.

2.1.1 Porter's Five Forces Analysis

One of the business frameworks that are used to determine the attractiveness of any market is Porter's Five Forces, developed by Michael E. Porter in 1979. With reference to Thompson and Strickland (11), the five competitive pressures are:

- The competitive pressure associated with offensive and defensive strategic tactics employ among the rival sellers in the industry;
- The competitive pressure associated with the new market entrants;
- The competitive pressure of companies from other industries to win buyers over to their own substitutes products;
- The competitive pressure coming from the bargaining power of suppliers;
- The competitive pressures rising from the bargaining power of buyers.

According to Friend and Zehle (12), an industry is an open system; where competitors come and go, the suppliers and buyers play a critical role in the industry's maturation. Even that, Michael E. Porter has suggested that the structure of an industry will not change in the short period of time as change will take place rather slowly.

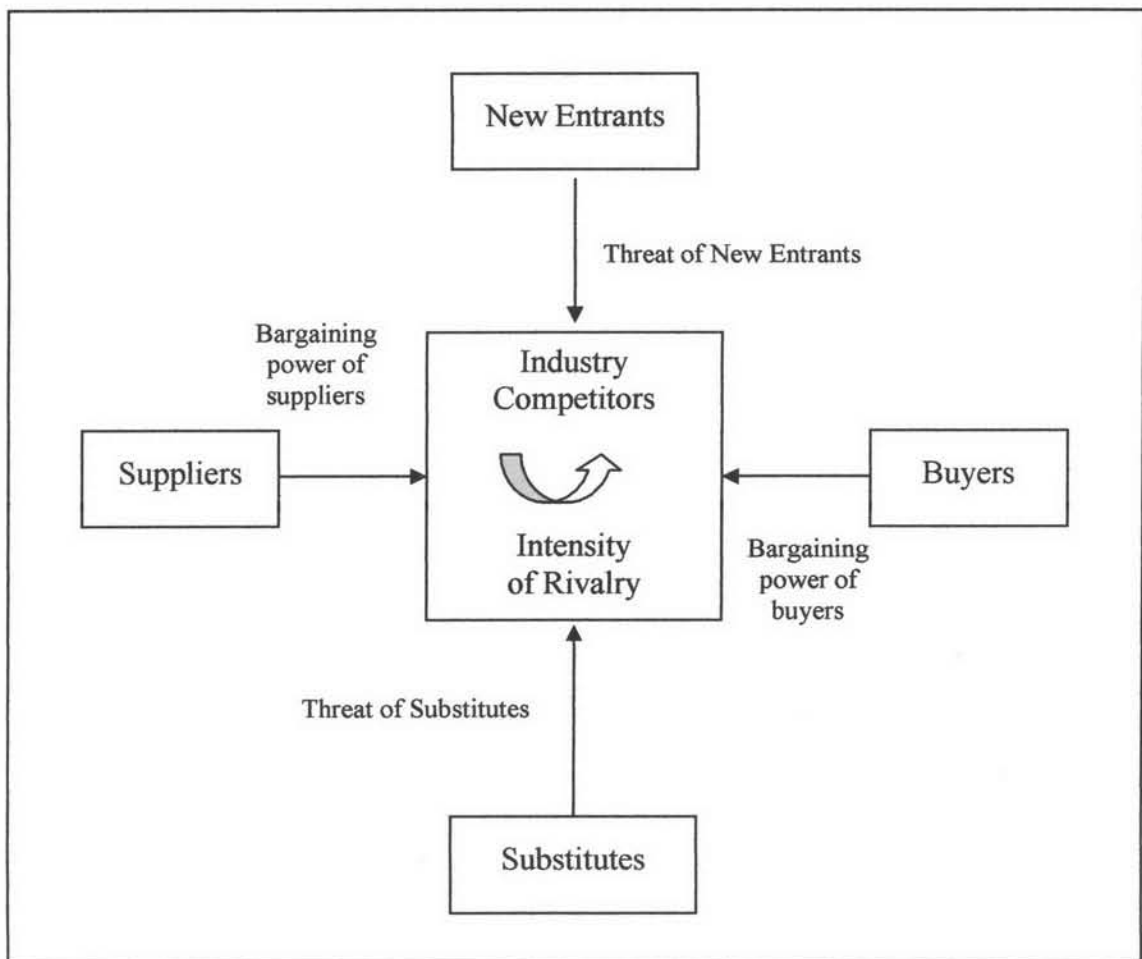


Figure 2.1: A graphical representation of Porter's Five Forces

Source: Thompson and Strickland, 1992 (11)

2.1.2 Threat of new entrants

New companies entering the industry can sometimes put the existing companies at risk as they increase production capacity. As a result, examining the entry barriers is fundamental. Several factors identified by Friend and Zehle (12) that one might need to consider in examining the entry barriers are in terms of:

- Economies of scale
- Proprietary product differences
- Brand identity

- Switching costs
- Capital requirements
- Access to distribution
- Absolute cost advantage
- Proprietary learning curve
- Access to necessary inputs
- Proprietary low cost product design
- Government policy
- Expected retaliation

2.1.3 Bargaining Power of Buyers

As important as the other elements of Porter's Five Forces, the buyers play an important role in an industry. With the pressures of 'pricing' that buyers are exerting on companies in the industry, learning about bargaining power of buyers is essential. In order to learn about that Friend and Zehle (12) have suggested some useful factors. The factors include:

- Buyer concentration versus firm concentration
- Buyer volume
- Buyer switching costs relative firm switching costs
- Buyer information
- Ability to backward integration

2.1.4 Bargaining Power of Suppliers

The number of suppliers certainly affects the way in which an industry functions. This raises the importance on suppliers' bargaining power. To determine the bargaining power of suppliers of an industry, Friend and Zehle (12) have identified some useful factors to help finding out one's industry bargaining power of suppliers. The identified factors include:

- Differentiation of inputs
- Switching costs of suppliers and firms industry
- Presence of substitute inputs
- Supplier concentration
- Importance of volume to supplier
- Cost relative to purchases in the industry
- Impact of inputs on costs or differentiation
- Threat of forward integration relative to threat of backward integration by firms in the industry

2.1.5 Intensity of competition within the industry

Within an industry, the ability to make adequate margins depends largely upon the level of competition or sometimes refers to as the intensity of competition. To determine such intensity, Friend and Zehle (12) have come up with several factors for the companies to question in order to determine one's industry competition level. The factors include:

- Industry growth
- Fixed costs
- Intermittent overcapacity
- Product differences
- Brand identity
- Switching costs
- Concentration and balance
- Informational complexity
- Diversity of competitors
- Corporate stakes
- Exit barriers

2.1.6 Pressure from substitute products

Substitute products can play a significant role, especially if they are cheaper or more cost effective. As a consequence, it is essential to know the pressures from the substitute products that exerted on one's industry. In order to obtain that, several factors identified by Friend and Zehle (12) are a useful guideline to start to determine the industry pressure from substitute products. The factors include:

- Relative price performance of substitutes
- Switching costs
- Buyer propensity to substitute

2.1.7 SWOT Analysis

SWOT is an acronym for Strengths, Weaknesses, Opportunities, and Threats. It refers to as an analysis of the strategic environment involving both internal and external factors of an industry or company. Sometimes, SWOT Analysis also refers to as a simple but yet a powerful tool used to strategically and internally plan company's resources in term of both its capabilities and its inability, and together it helps company to anticipate both the market opportunities and the emerging threats (8).

For Thompson et al. (8), company's strength refers to as, "something a company is good at doing or an attribute that enhances its competitiveness." Additionally, strengths could be divided generally into eight different forms. These eight identified forms include skill, physical assets, human assets, organizational assets, intangible assets, competitive capabilities, achievement, and competitive alliances. Thompson et al. has given examples of each type of these eight different forms of strengths as (8):

- Skill – low-cost manufacturing capabilities, strong e-commerce expertise, technological know-how, skills in improving production processes, a

proven track record in defect-free manufacture, or mass merchandising skills.

- Physical assets – state-of-art plants and equipments, worldwide distribution facilities, or ownership of valuable natural resource deposits.
- Human assets – an experienced and capable workforce, talented employees in key areas, cutting-edge knowledge and intellectual capital, or collective learning embedded in the organization and built up over time.
- Organizational assets – proven quality control systems, proprietary technology, key patents, or sizable amounts of cash and marketable securities.
- Intangible assets – a powerful or well-known brand name, a reputation for technological leadership, or strong buyer loyalty and goodwill.
- Competitive capabilities – product innovation capabilities, short new development times to market, or a strong dealer network.
- Achievement – low overall costs relative to competitors, market share leadership, a superior product, or a wider product line than rivals.
- Alliances – fruitful partnerships with suppliers that reduce costs and/or enhance product quality and performance, or geographic markets.

For weaknesses, Thompson et al. (8) views company's weakness as, "something a company lacks or does poorly (in comparison to others) or a condition that puts the company at a disadvantage in the marketplace." Weaknesses could be divided generally into three types: firstly, the unproven skills, expertise or intellectual capital in key areas of business; secondly, the deficiencies key physical, organizational, or intangible assets; and lastly, the missing of capabilities certain key areas. Moreover, Thompson et al. (8) has provided with some key examples of company's weaknesses, such as:

- No clear strategic direction
- Resources that are not well matched to industry key success factors
- No well-developed or proven core competencies
- A weak balance sheet; too much debt

- Higher overall unit costs relative to key competitors
- Weak or unproven innovation capabilities
- A product/service with features inferior to those of rivals
- Too narrow a product line relative to rivals
- Weak brand image or reputation
- Weaker dealer network than key rivals and/or lack of adequate global distribution capability
- Behind on product quality, R&D, and/or technological know-how
- In the wrong strategic group
- Losing market share

For a company's opportunities, Thompson et al. (8) thinks that it is one of the important factors in developing a company's strategy. Certainly, a company could not come up with strategy without exploring its opportunities. Some instances of company's opportunities identified by Thompson et al. (8) include:

- Openings to take market share away from rivals
- Ability to grow rapidly because of sharply rising buyer demand for the industry's product
- Serving additional customer groups or markets or product segments
- Expanding the company's product line to meet a broader range of customer needs
- Utilizing existing company skills or technological know-how to enter new product lines or new businesses
- Online sales via the internet
- Integrating forwardly or backwardly
- Failing trade barriers in attractive foreign markets
- Acquiring rivals firms or companies with attractive technological expertise
- Entering into alliances or joint ventures to expand the firm's market coverage or boost its competitive capability
- Openings to exploit emerging new technologies

Last but not least, a company's threats. To determine a company's threats, Thompson et al. (8) have proposed some external scenarios that company should watch out for. These scenarios include:

- Increasing intensity of competition among industry rivals – may squeeze profit margins
- Slowdowns in market growth
- Likely entry of potent new competitors
- Loss of sales to substitutes products
- Growing bargaining power of customers or suppliers
- A shift in buyer needs and tastes away from the industry's product
- Adverse demographic changes that threaten to curtail demand for the industry's product
- Vulnerability to industry driving forces
- Restrictive trade policies on the part of foreign governments that block access to attractive foreign markets
- Costly new regulatory requirements

For conclusion, with the determination of company's strengths and opportunities, this could act as the company's basis in order to gain the competitive advantage. Identifying the weaknesses and threats, this would help a company to watch out for its possible downside. As suggested by Netmba website (13), "Strengths can serve as a foundation for building a competitive advantage, and weaknesses may hinder it. By understanding these four aspects of its situation, a firm can better leverage its strengths, correct its weaknesses, capitalize on golden opportunities, and deter potentially devastating threats".

2.2 Project Management

According to Rosenau (14), he has identified the characteristics of projects as three-dimensional objective, unique, resources involvement, and last but not least,

could be internally accomplished within the organization itself. Rosenau further explains each of the four characteristics as:

- Three-dimensional objective – a project must be carried out to satisfy the triple constraints of performance specification, allocated time and specified budget. For Rosenau, this refers to as the three-dimensional objective.
- Unique – with only one chance to make a project happens, this make every project has its uniqueness in itself.
- Resource involvement – without resources; whether human resources or capital, projects could never be completed. As a result, to have a successful project, a project manager plays an important role in managing the available resources competently.
- Organization – with a composition of people with different skills, backgrounds and characteristics within an organization, this sometimes create a problem for a project manager as a multiplicity of purposes tends to lead an organization in multi-directions.

For Gray and Larson (15), they have similarly defined the project characteristics that:

- The projects must have clear objectives;
- They must have a beginning and an end;
- They involve the inter-departmental relationship;
- The company does them for the first time;
- They require specific time and money to achieve the required performance.

Additionally, Gray and Larson (15) have furthered defined project management characteristics as:

- It has both a beginning and an end;

- It consists of four phases: defining, planning, executing, and delivering;
- It begins with selecting and prioritizing projects that support the firm's mission and strategy;
- And, successful implementation requires mastering both the technical and the socio-cultural dimensions of the process.

With reference to Spinner (16), a project is defined as a series of activities that have several distinguishing characteristics of specific starting dates and ending dates; has well-defined objectives; achieves a specific result/product; is a unique; non repetitive endeavor; and cost, time schedule, and resources are consumed. Moreover, Spinner (16) carried on defining 'project management' as, "managing and directing time, material, personnel/labor, and cost to complete a project in an orderly, economical manner and to meet the established objectives of time, costs, and technical and/or service results".

With reference to Verzuh (17), in his book '*The Fast Forward MBA in Project Management*', the author has described a big picture of project management. According to the author, the three key project management functions compose of project definition, project planning, and project control. The author has defined each of these components of project management as; the project definition is "*the foundation for a project*", project planning is "*the details of how to meet the project's goals given the constraints*", and project control is "*all the activities that keep the project moving toward the goal*".

With the definition of projects and project management, one could see that the two key barriers of project management are, firstly, the ability to supervise a project so that it is delivered within the defined constraints of time, cost and quality; and secondly, another obstacle is to maximize efficiency and effectiveness of the given resources in order to achieve the defined goals.

However, in this study of analyzing the critical success factors for project planning and setting up a biodiesel factory, only project planning (one of the three project management keys) would be investigated.

2.2.1 Project Planning

To plan a project, this is an important step in managing a project (16). Actually, to many it is sometimes the most important aspects of the three project management components. In planning, Spinner (16) suggested that it is about determining what has to be done in accomplishing a project, establishing the sequence of work, and specifying the interrelations between jobs.

Additionally, supporting by two theses conducted by Sookkee (18) and Jongchalermchai (19); where Sookkee's thesis entitling "Project Management for Relocation of the Beverage Plant" and Jongchalermchai's thesis entitling "Project Planning and Control for Thermal Fuse Production Capacity Expansion", for their project planning sections both the theses firstly identify their goals; followed by identifying project start and determine project completion; allocate resources within the scheduled time and determine the project budget.

As a result, in this study, the three essential project management knowledge areas of time management (scheduling), resource management, and cost management (budgeting) would be explored.

2.2.2 Time management

According to Spinner (16), he suggested that in planning a project the first step is to develop the diagram, which sometimes this refers to as 'activity analysis'. This diagram is created by listing out all the jobs required to complete the project. In listing out of all the jobs required, Spinner (16) added that the process would usually involve experienced personnel of each department to get the correct listing of all the activities needed to be accomplished. With an exclusion of any activity, this would cause

inaccuracies in project scheduling of the whole planning process, which later might result in the delay of project completion. Hence, the key of this process would be to select experienced personnel to get all the required activities.

Next, after the necessary jobs (or works) have been listed out, Spinner (16) pointed out that the relationship of the jobs listed would be determined. With reference to Spinner (16), an arrow diagram would be used to determine the relationship of the jobs listed. Spinner (16) provides two examples in conducting an arrow diagram. Firstly, by obtaining the project's jobs required listing that has been done, and then creates the relationships between jobs before moving to project networking. Secondly, by listing out the jobs and determining their relationships simultaneously.

After the identification of the activity analysis, work breakdown structure is the next step suggested by Spinner (16). According to Young (20), one of the convenient ways to graphically represent all the works of the whole project is by using the work breakdown structure (WBS). Young (20) also added that WBS is easy tool in showing project key stages; where the higher level would be the key stages and the lower levels are detail describing each of the key stages identified earlier.

With reference to Gray and Larson (15), they added that the WBS can help the project manager in various ways as:

- WBS provides all the elements of the project in a hierarchical format, and it automatically provides a relationship of the project and its end items.
- The organizational units and individuals are assigned responsibility for accomplishment of work packages as WBS is being developed.
- WBS gives a framework helping to identify the project's cost and project's progress; making it possible to plan, schedule, and budget.
- Lastly, the small parts of project are easy to understand with WBS showing the connection of each small unit to become one big picture.

An example of WBS is illustrated in figure 2.2 showing a simplified WBS for development of a new Voice Data Recognition project to be used by field personnel to collect and analyze data (15).

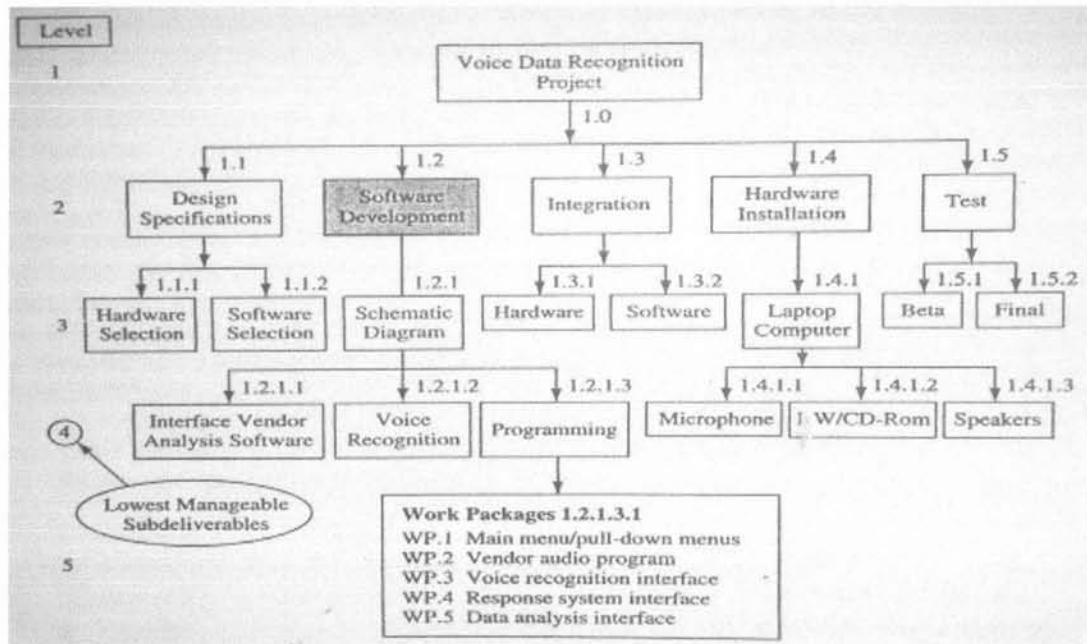


Figure 2.2: Example of Work Breakdown Structure

Source: Gray and Larson, 2002 (15)

And last but not least, after the work breakdown structure is accomplished, Spinner (16) suggested that it is time to determine the relations between jobs – network diagram. According to Gray and Larson (15), the tool used for planning, scheduling, and tracking project progress is the used of project network. Usually the project network is obtained from the information listed in WBS. It is a graphic flowchart of the project job plan.

With references to Gray and Larson (15), the network depicts:

- The project activities that must be completed;
- The logical sequences for the activities;
- The interdependencies of the activities to be completed;

- In most cases, the times for the activities to start and finish along with the longest path(s) through the network – the critical path.

An example of network diagram is illustrated in figure 2.3 showing a simplified network diagram of a company which decided to add a new product to its line (16).

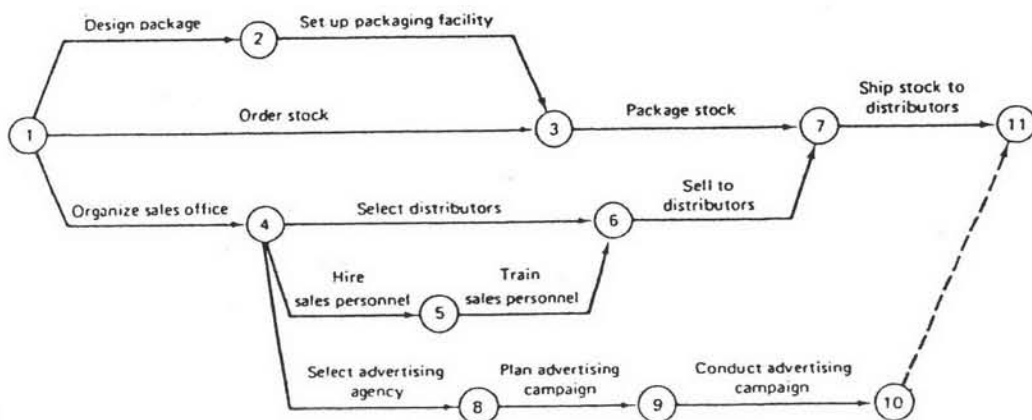


Figure 2.3: Example of Network Diagram

Source: Spinner, 1981 (16)

2.2.3 Resource management

As time management focuses solely on the duration of the whole project, and subsequently, the duration of each small identified task comprising the project, it does not take into an account of the limited resources provided by the organization (21). Without integrating the limited resource into project planning, this would cause the project not to be feasible. Hence for a project to be viable, after conducting the WBS and the network diagram (time management), allocating the available resources should be the next step in planning a project.

According to Gray and Larson (15), it is important to manage the resources. Particularly, in term of resource scheduling, it provides the information required to create project's timeline, work requirement, and project's budget. With a construction of resource scheduling plan, this help a project manager to calculate the impact of any unpleasant events; such as turnover, equipment breakdowns, or transfer of project personnel, once it emerges (15). Moreover, Gray and Larson (15) added that by scheduling resources, it could help a project manager to evaluate project's flexibility over certain resources.

With reference to Cleland (22), resources could be referred to as both the human and non-human objects provided by a company to fulfill its objectives and goals. For Frigenti and Comminos (21), they suggested that resources sometimes could be divided into four categories of people, materials, equipment and services.

For people, Gray and Larson (15) have indicated that it is the most evident resource in planning a project. People refer to as the manpower used for the whole project. They are from various departments; from engineers, computer programmers, quality inspectors, marketing personnel, site supervisor until the construction workers – anyone of them who contributes to the success of the project.

Next, it comes to materials. Gray and Larson (15) added that 'materials' (as one of the four identified resources) could endanger the success of a project; therefore, they should be properly allocated and scheduled. If there is a shortage of material, this would hugely affect the scheduling of the whole project. As a result, it is important to manage materials carefully to prevent shortage – so the project could be delivered on time.

For the equipments, Gray and Larson (15) think that they are usually disregarded as a constraint. Frequently, the equipments are concerned in term of their specification, capacity, and quantity. In special cases, Gray and Larson (15) indicated that equipments could help to speed up the project scheduling.

Last but not least, the services. Particularly for the set-up of a biodiesel plant, the contractors are considered the important service employed in this project. With any delay caused in the construction by the hired contractors, this would hugely affect the deliverance of the project.

Nonetheless for this research, the resource management would be dealing with five kinds of resources in term of; people, material, equipments, contractors, and facility. These identified resources would be administered competently to deliver an efficient project.

2.2.4 Cost management

With reference to Spinner (16), the principal reasons for scheduling costs are the following:

- To assist the financial group in funding the project. By projecting its cash flow through a cost schedule, finance personnel will know when and how much of the funds will be needed at any period of time.
- To assist the project management team in developing the expenditure distribution over the life of the project. Once project is underway, this planned distribution can be compared with actual costs.
- The financial activity will also use the cost schedule for property tax purposes and depreciation schedules.
- Project cost schedules become the basis for determining timing for various payments.

To illustrate Spinner's cost scheduling principles; an example of a cost schedule calculation and a cost scheduling of a company which decided to add a new product to its line is illustrated in Figure 2.4 and Figure 2.5 (16).

Period	Activity	Activity time (weeks)	Cost slope (dollars/week)	Total activity expenditures (dollars)
0-5	Design package	2	\$ 3,750	\$ 7,500
	Order stock	5	154	770
	Set up packaging facility	3	4,500	13,500
	Organize sales office	5	2,000	10,000
	Total 0-5			\$31,770
6-10	Order stock	5	154	774
	Set up packaging facility	5	4,500	22,500
	Organize sales office	1	2,000	2,000
	Hire sales personnel	4	2,000	8,000
	Select distributors	4	1,444	5,776
	Select advertising agency	2	2,000	4,000
	Plan advertising campaign	2	1,500	3,000
	Total 6-10			\$46,050
11-15	Order stock	3	154	464
	Set up packaging facility	2	4,500	9,000
	Package stock	2	1,000	2,000
	Train sales personnel	5	4,000	20,000
	Select distributors	5	1,444	7,220
	Plan advertising campaign	2	1,500	3,000
	Conduct advertising campaign	3	3,600	10,800
	Total 11-15			\$52,484
16-20	Package stock	4	1,000	4,000
	Train sales personnel	2	4,000	8,000
	Sell to distributors	3	10,666	31,998
	Conduct advertising campaign	5	3,600	18,000
	Total 16-20			\$61,998
21-25	Sell to distributors	3	10,666	31,998
	Ship to distributors	2	1,500	3,000
	Conduct advertising campaign	2	3,600	7,200
Total 21-25			\$42,198	
26-29	Ship to distributors	4	1,500	6,000
TOTAL PROJECT COSTS				\$240,500

Figure 2.4: Example of cost schedule calculation

Source: Spinner, 1981 (16)

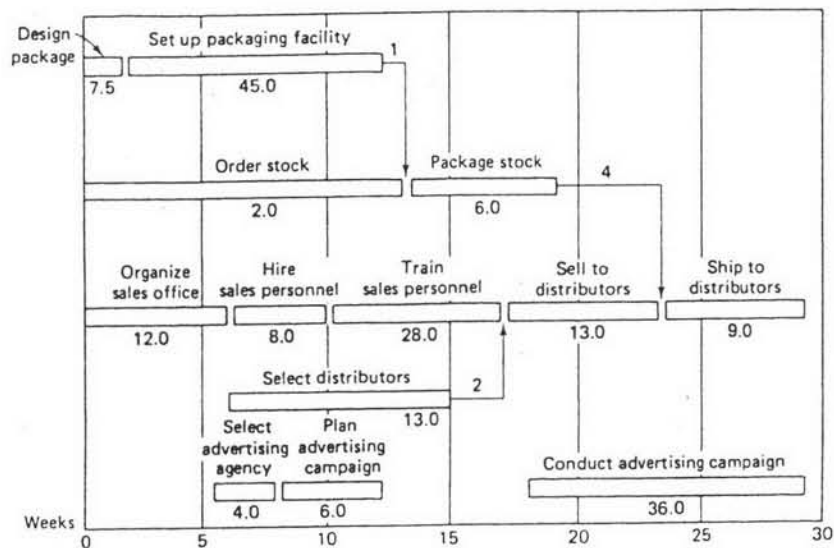


Figure 2.5: Example of cost scheduling

Source: Spinner, 1981 (16)

According to Rosenau (14), “Having a cost plan can help you avoid a situation where actual project cost overruns the estimate or you fail to get the job because you overestimated costs during the proposal and negotiation phase.” Rosenau added that with the cost schedule plans, often there exist the inaccuracies inherent in cost estimates. As a result, the inaccuracies – as one of the cost obstacles, should be expected within the limit of tolerance given, but never to be encouraged. For Rosenau (14), the key of cost scheduling is to get as accurate as possible – “The more effort you put into a cost estimate, the more accurate it is likely to be”.