CONSTRUCTION PLANNING AND SCHEDULING: A CASE STUDY OF "CADANGAN MEMBINA DAN MENYIAPKAN KULLIYYAH SAINS UNTUK UNIVERSITI ISLAM ANTARABANGSA MALAYSIA"

MOHD KHALIL BIN ABDUL KADIR

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ABSTRACT

Construction planning and scheduling is one of the important tool in a construction project. Every construction project involve with a lot of activities which need to be planned and schedule properly to ensure the completion of the project. Therefore the study on construction planning and scheduling must be conduct to provide knowledge on this topic and (a view on how it is be implement theoretically and in the real case of construction project). This study reviewed on the concept of sequence of work for building construction project, scheduling technique used in the primavera project planner and the development of construction planning and scheduling on building construction of science faculty International Islamic University Malaysia (IIUM). From the study is found that the sequence of work for building construction project can be divided in to four main categories which is substructure work, superstructure work, architectural work and mechanical and electrical work. The study also found that the precedence diagramming method PDM is a scheduling technique used in the primavera project planner and the total duration for the IIUM project after developed using the primavera project planner is 695 days.

ABSTRAK

Perancangan dan penjadualan pembinaan adalah salah satu daripada pengetahuan yang amat penting dalam sesuatu Projek pembinaan. Setiap projek pembinaan akan melibatkan banyak aktiviti-aktiviti yang akan dijalankan yang sudah tentunya memerlukan perancangan dan penjadualan pembinaan yang betul bagi memastikan projek tersebut dapat disiapkan dengan mengikut jadual. Oleh sebab itu satu kajian ke atas perancanggan dan penjadualan pembinaan harus dijalankan kerana ianya akan dapat memberikan serba sedikit pengetahuan tentang topik ini dan memberikan gambaran bagaimana ianya dipraktikkan secara teori di dalam situasi pembinaan sebenar. Kajian ini menyentuh tentang konsep turutan kerja untuk projek pembinaan bangunan, teknik penjadualan yang digunakan di dalam perisian primavera dan penghasilan perancanggan dan penjadualan untuk projek pembinaan bangunan bagi kulliyyah sains Universiti Islam Antarabangsa Malaysia. Daripada kajian boleh disimpulkan untuk turutan kerja bagi pembinaan bangunan boleh di bahagikan kepada empat kerja utama iaitu kerja-kerja untuk struktur bawah, kerja untuk struktur atas, kerja-kerja arkitek dan kerja-kerja mekanikal dan elektrikal. Dari kajian juga didapati bahawa kaedah gambarajah duluan adalah kaedah penjadualan yang diguna pakai dalam perisian primavera dan jumlah masa bagi projek pembinaan bagunan untuk kulliyyah sains Universiti Islam Antarabangsa adalah 695 hari.

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CHAPTER 1

INTRODUCTION

1.1 General

The construction industry today has been built on the need of the worlds inhabitants to provide shelter, harness energy, and create public access. The basic human need have not changed over time even though the process and environment in which designer or constructor operate have becoming increasingly more complicated. Rapidly escalating technology has made possible structure and processes unimaginable even from generation to generation.

By referring back to the flow of the global development industries it will see that developing country like Malaysia, Indonesia, Vietnam and India are still spending a lot of money in development of a new project like housing, building office, shopping mall etc. This phenomenon will influence the increasing of the job opportunity for the people at those countries especially the fresh graduate because with the development of the new industrial areas and business area it shows that a lot of new workers needed to involve in the development of the country. The different scenario for the development country

because for them they more stress on the maintaining the existing buildings in order to prolog the life span of the building.

Malaysia is the one of the developing country which is still concentrate in the development of the new buildings and at the same time maintaining all existing building. The government spending a lot of money for the new infrastructure works especially the infrastructure that will provide the public facilities such as school, hospital, university and low cost housing project. With this opportunity it will cause the increasing number of new contractor company. At the same time multinational companies are looking forward in exploring the construction project around Asian nation especially India.

By looking for the expenditure of the constructions industry, the project management profession is being very valuable for the construction companies in order to make sure the project that currently running can be completed successfully. The project management knowledge becomes the critical part in the project because it contains the knowledge in controlling the cost, scheduling, and resources. In this project management field, project manager plays very important role in the construction project. Project manager is responsible personnel to ensure the project complete successfully thus it are important for the project manager to have experience and knowledge in project management technique.

The construction management it may refer to the contractual arrangement under which is a firm supplies construction management service to an owner. However, in its more common use it refers to the act of managing the construction process which is the way to manage the basic resource of construction. The resource included workers and subcontractor, equipment and construction plant, material, money and time. Skillful construction management results in the project completion on time and within budget.

Time management is on keys of effective project management. They are a few problems effect the time management such as a rework activity, the change of job specification without direct notification, work overload, unreasonable time constraint and etc. The impact that from poor time management will cause delay or event worst effect mostly on cost as it is correlates to each other. As a solution of this situation the planning and scheduling will be the best method that can be used to overcome with this problem. With the proper planning and scheduling it will assist the project manager in completing the project within the time and meet the aim and objective of the project.

1.2 Problem Statement

Malaysian Construction industry now days are facing with a lot of problem which is produce the lost of a billions ringgit. The main factor which gives the instability to the construction industry is a cost and time planning. By referring to the news in mass media the cost and the time of the project will be the first factors that lead in the uncompleted of the project or the delayed of the project. This phenomenon will cause a lot of problem to the client which is the client must do the payment back to the bank form the loan that the bank provided although the project did not complete.

Cost of the project is the factor that usually may lead of the project delayed or uncompleted. Without the proper planning the construction company may lost a lot of profit from the project and this situation may cause the project cannot finished on the time. The multi-storey building construction project is the projects that involve a lot of money and using a lot of time to be complete. The construction company should planning the project cost by looking for the future because the company must predict the materials price for the future if anything situation that may lead to the increasing of the materials price occur. The uncontrolled usage of the source at the site also is being the

factor that leads to the lost of the profit. This is because if the construction company did not control well the usage of the source it will cause the company spend more money without following the planning cost and at the end of the project the company will lost a lot of money and sometimes the company will suffer the lost of profit in the project.

The time scheduling also is the major factor that lead to the delayed or the uncompleted of the project. The construction company is facing a tough challenge in the time planning of the project because without the proper planning the time factor will cause the lost of the profit to the company. All of the construction company have planning and scheduling the time first before starting the project and some of the company did not follow well the time constraint of the project and this situation will lead the delayed of the project. Sometimes the construction companies which are planning their time for the project did not concern about the environment factor when doing the planning. The environment factor must be consider when doing the planning because the bad impact of the environment factor to the scheduling of the project will cause the delayed of the project and at the same time will make the loss of profit to the company. Thus it is important to carry a study on schedule developing for a project.

1.3 Objective of Study

For conducting this study the main objective have to be finding first and after that with the clears objective the study can be conduct easily and successfully. Therefore for conducting this study the 3 main objective have been choose and this objective will be the guide line for the production of the final thesis which is related with this topic, " Planning and scheduling using primavera software. A case study of project " Membina proje

Dan Menyiapkan Kulliyyah Sains Untuk Universiti Islam Antarabangsa Malaysia Di Bandar Indera Mahkota, Kuantan, Pahang Darul Makmur ".

1) To identify construction sequence for building construction.
2) To identify scheduling technique used in developing planning and scheduling.
3) To develop scheduling using primavera project planners software.

1.4 Importance of Study

The importance of this study also it will help the project manager to know the critical path of the building construction work sequence. Therefore it will help the project manager to produce the good planning and scheduling for the project and lastly with the good planning and scheduling it will help the project complete on time successfully.

The importance of this study to be conduct because with this study it will give some input to the project manager or the undergraduate civil engineering student about the scheduling technique which has been commonly use in the developing of planning and scheduling for the construction project and from that it will help the person when choosing the best technique to be use for developing the planning and scheduling.

This study also importance to the constructions industry and the project manager on the application of the primavera project planner software which is the software can be the best solution to solve the problem in the planning and scheduling for the construction project because from this study it will shows that by using this software in the planning

and scheduling and also match it with the good controlling and monitoring to the project it will lead to the successfully of the project and the project will complete on time and the last result the company will receive the profit like as it dream from the first of the project.

1.5 Scope of Study

The primavera software is being the first source in conducting this study. This software will be using to develop a planning and scheduling model for the building construction project. Although the usage of this software between the constructions company is still lower, therefore with the production of these report finally will give the person some input about the importance of the primavera project planner software in the planning and scheduling for the construction project.

This study also will concentrate on a several contractor company which have involve in the multi-storey building construction project around Pahang. The studies just concentrate on the work sequences of the multi-storey building and the planning and scheduling technique that has been using for the project.

This study also will be more focus on the usage of the PDM technique ("PRESEDENCE DIAGRAM METHOD") in planning and scheduling in the project because this technique is a base on the production of the designing primavera software. The several contractors will be choosing to be as a respondent in this study.

One construction project which is still under construction in Kuantan will be choosing as a case study for this project. The project is a "Cadangan Membina Dan

Menyiapkan Kulliyyah Sains Untuk Universiti Islam Antarabangsa Malaysia" and it is situated at Bandar Indera Mahkota, Kuantan, Pahang Darul Makmur

CHAPTER 2

CONSTRUCTION SEQUENCE OF BUILDING CONSTRUCTION

2.1 General

The life cycle is the only thing that uniquely distinguishes projects from non-projects". If that is true, then it would be valuable to examine just what role the so-called project life cycle plays in the conduct of project management. The basic life cycle follows a common generic sequence: Opportunity, Design & Development, Production, Hand-over, and Post-Project Evaluation. A project can be defined as the work required taking an opportunity and converting it into an asset." In this sense, both the opportunity and asset are singular, with the implied use being for generating benefit rather than consumed as a resource in normal operational activity over a prolonged period. (Kerzner, 1995).

2.2 Construction Project Life Cycle

According to Lawrance, (2003) a project has been defined as having a beginning and an end (the life) and the project can be divided up into several stages. The project then is said to have a life cycle. The cycle does not usually repeat.

For a construction project, there are several standard stages for the holistic picture and with looking at. The client is involved in all of these stages and outside appointments may only be made for some of client, depending upon client choice and expertise. The diagram indicates the main phases of a construction project and the order in which they come. Figure 1A Construction Project Life Cycle can be refer to the Appendix 1.

The design and tender stages are included within the pre construction box under this model. Engineering commissioning is making sure the systems are working in the building, and client occupation includes fitting out.

Only one or two of these stages are considered by the contractor and designer; consequently client objectives are not in perspective and there is frequently no overall strategy for the project which would aid the client.

The client's chief concerns are to meet their business objectives which may, for example, concern performance, aesthetics, and sustainability, production or sales targets. This makes the client more active in the beginning and the end stages. In other forms of procurement, such as design and build, PFI (Private Finance Initiative) and construction management, the contractor plays a closer role to the client.

The project team should be concerned with the effectiveness as well as the efficiency of the project. Effectiveness will be enhanced if there is more of an overlap in the roles played by design and construction so that each individual player may take action in the light of a greater understanding of client requirements.

2.3 Sequence of Work

Table 2.1c Courtesy: (Chudley and Greeno, 1999) Sequence of work for building construction

NO	SEQUENCE OF WORK
	SUBSTRUCTURE WORK
1	FOOTING
2	Caisson Excavation
3	Drilling Cassion
4	Prefabricated Steel Casing
5	Installation Temporary Steel Casing
6	Remove water from Hole
7	Installation Reinforced Bars
8	Pouring Concrete Work
9	Concrete Vibration
10	FOUNDATION

Table 2.1c: Continued

11	Positioning Formwork
12	Prefabricated Reinforcement Bar
13	Installation Reinforcement Bar
14	Pouring concrete
15	Concrete Vibration
16	Curing Process
17	Striping Concrete Formwork
18	GROUND FLOOR BEAM
19	Positioning Formwork
20	Prefabricated Reinforcement Bar
21	Installation Reinforcement Bar and Plumbing
22	Pouring concrete
23	Concrete Vibration
24	Curing Process
25	Striping Concrete Formwork
26	GROUND FLOOR SLAB
27	Cleaning of Slab Form
28	Positioning Formwork
29	Prefabricated Base Reinforcement Concrete (BRC)
30	Installation of Base Reinforcement Concrete (BRC)
31	Pouring Concrete
32	Concrete Vibration
33	Curing Process
34	Striping Concrete Formwork
	SUPERSTRUCTURE
1	GROUND FLOOR COLUMN
2	Prefabricated Steel Cage of Column
3	Installation Steel Cage
4	Column Rebaring
5	Column Plumbing
6	Cleaning of Column Form
7	Positioning Formwork
8	Pouring Concrete
9	Concrete Vibration
10	Curing Process
11	Striping Concrete Formwork
12	STAIRCASE CONSTRUCTION
13	Positioning Formwork

Table 2.1c: Continued

14	Prefabricated Steel Reinforcement Bar
15	Installation Reinforcement Bar
16	Poured Concrete
17	Concrete Vibration
18	Curing Process
19	Striping Concrete Formwork
20	GROUND FLOOR LEVEL WALL CONSTRUCTION
21	Installation of reinforcement bar(wall height more than3m)
22	Mortar mixed
23	Concrete Block Lying
24	ROOF CONSTRUCTION
25	Prefabricated Roof Trusses at Plant
26	Installation of Roof Trusses
27	Installation of Roof Membrane
28	Installation of Roof Covering
	INTERNAL CONSTRUCTION and FINISHES
1	DOOR
2	Prefabricated Door
3	Installation of Door
4	WINDOW
5	Prefabricated Window
6	Installation of Window
7	PLASTERING
8	Gypsum Mixing
9	Installing the Wall Plaster
10	ROOF CEILING
11	Prefabricated Ceiling
12	Installation of Ceiling
13	PLUMBING

Table 2.1 c: Continued

14	GROUND FLOOR COLUMN
15	Prefabricated Pipe for Plumbing Work
16	Installation of pipe
17	Pipe Fitting
18	ELECTRICAL WORK
19	Prefabricated Electrical Accessory
20	Wiring Work
21	Installation of Electrical Accessory
22	PAINTING
23	Wall painting

For the structure above the ground level, the sequence of work for the construction process just repeated the super structure work above and the sequence of work will be repeated until the project complete.

2.4 Work Breakdown Structure (WBS)

Work breakdown structure is a process of dividing the project task into smaller manageable components for planning purpose. A complex project is made manageable by first breaking it down into individual component in a hierarchical structure, known as the work breakdown structure (WBS). The WBS is the structure which defined task, facilitating resource allocation, assignment of responsibilities and measurement and control the project. The WBS is widely use by the project manager as a tool in the planning activity for the construction project (Newitt, 2005).

The Work Breakdown Structure (WBS) is a key planning tool used to define a project in terms of its deliverables, while providing a method for breaking down those deliverables into meaningful work efforts. The WBS enables project managers to clearly describe the hierarchical nature of work to be performed. The WBS also establishes a foundation for other elements of the formal project plan. Project managers regularly are challenged to clearly describe desired project outcomes to all involved, while they also capture the order and sequence of the work necessary to produce those outcomes. Once it is complete, the WBS becomes an essential building block and reference point for other project plan components. (Newitt, 2005).

2.4.1 Use of Work Breakdown Structure (WBS)

Some companies prefer to use WBS to help identify the activities prior to developing the schedule. This is systematic means of defining the activities so that each activity can be readily identify by its WBS number. The WBS numbers builds intelligence into the activity ID number. The numbering system is typically unique for a company or project. Some prefer to divide the project by the responsible person, firm, or subcontractor. Others divide the project or break it down according to the building or area of work. Sometimes it makes sense to break it down according to the divisions in the specification. A common method is to break down the project according to phases. (Newitt, 2005).

For example with a building, start with the major phases of the project and number them accordingly:

Phase 1 Project Feasibility
Phase 2 Design and Engineering