PROCESS FLOW FOR V E IN PLANNING AND SCHEDULING: A COMPARATIVE CASE STUDY

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ABSTRACT

Developing a work breakdown structure is an important step during the initial phase of the project that once the basic scope have been identified, initial work breakdown structure can be created with a limited scope of information. A work breakdown structure is the basis for planning and managing the key areas within a project. If work breakdown structure is not designed properly, it can have an impact on the whole project as work breakdown structure serves as the basis of planning. The impact for not proper of the work breakdown structure is not clear work assignments and goals difficult to achieve. Experienced project managers know that there are many things wrong or not right in the project no matter how he managed the planning and execution of their work. Unfortunately for inexperienced planners, they can not anticipate what will happen if they do not prepare properly planning. Proper planning should be done to avoid problems that cannot be expected in the future. If not, many problems will arise, especially during construction. Thus, planner must understand and know how to develop a work breakdown structure correctly. For inexperienced planners, there may be some problems in the planning process. In general, an inexperienced planner has problems in the initial stage. He could not identify which one should be done first. Therefore, this study was come out to study the process flow of work breakdown structure during the planning stage. The objectives of this study are to define the process flow of work breakdown structure based on case study, to identify the similarity on process flow of work breakdown structure among case study and to suggest the suitable process flow of work breakdown structure that can be use for inexperienced planner. In this study, data collection is carried out by interviews. Three of the contractors involved in the planning process will be selected for this case study. Then, an interview with three project managers will be conducted. As a result, three case studies has similar process flow but different in the sequence only. Difference sequence based on their experience factor. This research hopes to contribute to the planning of inexperience, especially in developing work breakdown structure in the right way.

ABSTRAK

Membangunkan struktur pecahan kerja adalah satu langkah penting semasa fasa awal projek iaitu sebaik sahaja skop asas telah dikenal pasti, permulaan struktur pecahan kerja boleh diwujudkan dengan maklumat skop yang terhad. Struktur pecahan kerja menjadi asas untuk merancang dan mengurus bidang-bidang utama di dalam sesebuah projek. Sekiranya struktur pecahan kerja yang tidak dirancang dengan sempurna,ia boleh memberi kesan pada keseluruhan projek kerana struktur pecahan kerja bertindak sebagai asas dalam perancangan. Kesan dari struktur pecahan kerja yang tidak sempurna adalah tugasan kerja yang tidak jelas dan matlamat sukar dicapai. Pengurus projek yang berpengalaman tahu bahawa terdapat banyak perkara yang salah atau tidak betul dalam projek tidak kira bagaimana beliau berjaya dalam perancangan dan pelaksanaan kerja mereka. Malangnya bagi perancang kurang pengalaman, mereka tidak boleh menjangkakan apa yang akan berlaku sekiranya tidak menyedia perancangan dengan betul. Perancangan yang rapi perlu dilakukan bagi mengelakkan masalah yang tidak dapat dijangka di kemudian hari. Jika tidak, banyak masalah akan timbul terutama semasa pembinaan. Oleh itu, setiap perancang perlu memahami dan mengetahui bagaimana cara untuk membangunkan struktur pecahan kerja dengan betul. Bagi perancang yang kurang berpengalaman, kemungkinan akan ada masalah dalam proses perancangan. Secara umum, perancang yang kurang berpengalaman mempunyai masalah pada peringkat permulaan. Beliau tidak dapat mengenal pasti yang mana satu harus dilakukan terlebih dahulu. Oleh itu, kajian ini dijalankan untuk mengkaji aliran proses struktur pecahan kerja semasa peringkat perancangan. Objektif kajian ini untuk menentukan aliran proses struktur pecahan kerja berdasarkan kepada kajian kes, untuk mengenal pasti persamaan aliran proses struktur pecahan kerja di kalangan kajian kes dan untuk mencadangkan aliran proses struktur pecahan kerja yang sesuai yang boleh digunakan untuk perancang yang kurang berpengalaman. Dalam kajian ini, pengumpulan data dijalankan melalui kaedah temu bual. Tiga syarikat kontraktor yang terlibat dalam proses perancangan akan dipilih untuk sebagai kajian kes . Kemudian, temu bual bersama tiga pengurus projek akan dijalankan. Hasilnya, tiga kajian kes tersebut mempunyai proses yang sama tetapi hanya berbeza dalam urutan. Perbezaan turutan berdasarkan factor pengalaman mereka. Kajian ini diharap dapat memberikan sumbangan kepada perancang kurang pengalaman khususnya dalam membangunkan struktur pecahan kerja dengan cara yang betul.

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WBS	Work Breakdown Structure
PMI	Project Management Institute
BQ	Bill of Quantity

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Nowadays, almost every construction industry in Malaysia is experiencing delay problem. As mentioned by Othman (2006), the problems come from variety of reasons. The major source is caused by construction activity which has been executed not according to planning and scheduling efficiently that has been fixed. Accordingly planning and scheduling need to implement satisfactorily and carefully with the purpose of accomplish the project successfully within time, cost and quality required.

Work breakdown structure (WBS) is one of elements of project planning and scheduling in project management. It also is a first task in the preparation of project schedule (Devi & Reddy, 2012, p683). A WBS in project management is a hierarchical tree structure decomposition of a project into smaller components. It contains the project's work elements, defined so as to capture the total scope of work involved in the project. The capturing of the total work and efforts required for the project is extremely important since the WBS is the source framework for cost estimations, schedule planning, and risk mitigation for the project (Sharon & Dori, n.d).

The Guide to the Project Management Body of Knowledge (PMBOK® Guide) promotes a deliverables oriented decomposition of the work to be executed, in order to accomplish the project objectives and produce the anticipated deliverables. In order to produce a deliverables oriented WBS, it should be planned according to planned outcomes throughout the project, instead of planned actions.

There are three reasons to use a WBS in projects (Micah, n.d). The first is helps more accurately and specifically define and organise the scope of the total project. The most common way this is done is by using a hierarchical tree structure. Each level of this structure breaks the project deliverables or objectives down to more specific and measurable chunks. The second reason for using a WBS in projects is to help with assigning responsibilities, resource allocation, monitoring the project, and controlling the project. The WBS makes the deliverables more precise and concrete so that the project team knows exactly what has to be accomplished within each deliverable. This also allows for better estimating of cost, risk, and time because it can work from the smaller tasks back up to the level of the entire project. Finally, it allows to double check all the deliverables' specifics with the stakeholders and make sure there is nothing missing or overlapping.

A poorly constructed WBS can result, among other things, in the following project stumbling blocks and adverse project outcomes:

- Incomplete project definition leading to ongoing project extensions
- Unclear work assignments, goals, objectives, or deliverables
- Scope creep or unmanageable, frequently changing scope
- Budget overrun
- Missed deadlines on scheduled deliverables, or timeline slippage
- Unusable new product or feature
- Failure to deliver on some elements of project scope

environment when not properly disposed. Recycling back of sawdust appears to be a viable solution to overcome the problems. Thus, the lightweight concrete application in industry is one of the solutions that can overcome the decreasing of the raw sources. In lightweight concrete, the usage of sawdust has been introduced.

However the problem that identified in sawdust cement concrete is an incompatibility between cement and wood in other to form a concrete. The presence of substance was found as inhibitor which retards the hydration and the hardening of cement process.

In this research, the changes of mechanical properties of sawdust concrete when using different additives need to pay attention. Additives that will be use is lime, cockleshell and spent bleaching earth and mix ratio of every additives that added together with sawdust concrete is 0.33, 0.67 and 1.00.

1.3 OBJECTIVE OF STUDY

The main objective for this research is to determine the compressive strength of sawdust concrete by using Portland Composite Concrete.

Other sub objectives that may follow this research is :

1. To determine the compressive strength of sawdust concrete when added with additives and to determine the compressive strength of sawdust concrete when having a different mix ratio sawdust concrete and additives
2. To study the effect of lime, cockle shell and spent bleaching earth when

1.3 AIMS AND OBJECTIVES

The aim of this study is to produce a suitable process flow of WBS for inexperience planner.

There are three (3) objectives have been discussed and outlined in order to realize of this study. Objectives of this study are outlined as follows:

1. To define the process flow of WBS based on case study
2. To identify the similarity on process flow of WBS among case study
3. To suggest the suitable process flow of WBS that can be use for inexperienced planner

1.4 SCOPE OF STUDY

The scopes of study have been determined in order to ensure that literature study is focusing on certain fields only. This study area will focus on process flow in developing WBS. Three contractor companies in Kuantan, Pahang will be selected to be as a case study. The requirement to be as a case study is these companies should involve in planning process. Usually main contractor was involved in this process. A short interview face to face approach will be conducted to get a data collection. The respondent that required is planner or project manager in order to understand the current practice on process flow of WBS.

1.5 EXPECTED OUTCOMES

1. To obtain the process flow of WBS that been used for all case study
2. To find the similarity process flow of WBS among case study
3. To provided a suitable process flow of WBS for inexperienced planner

1.6 SIGNIFICANT OF STUDY

Significant of this study is to produce a process flow of WBS that can be use for inexperienced planner. Experienced project manager can develop WBS based on his previous experienced. But for an inexperienced planner, he has no idea what should do first and surely his planning will have a problem soon. The benefit of conducting this study is can give information and as a guideline for inexperienced planner in order to develop WBS for their projects. It is hope that the finding will help inexperienced planner in their planning and poorly constructed WBS can be reduced.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

Planning the development efforts within large-scale projects is a highly complicated mission due to uncertainties regarding different aspects of the complex product to be delivered. Current planning practices employ a host of methods, including WBS. Using WBS, the deliverable the end product to be delivered, its components, and associated enabling products are mostly induced implicitly (Sharon & Dori, n.d).

In planning the project it is very important to consider how the project will have an impact on the programme and eventually in a wider context. A good project plan will properly would have defined how the project results, obtained through external financial support would be used by the social system in a manner that would no longer require external support. A good project will consider how to monitor and evaluate during and after the implementation phase (Detailed Planning or design stage; defining the scope into details and developing a Work Breakdown Structure, 2010)

2.2 PROJECT LIFE CYCLE

The project life cycle refers to a series of activities which are necessary to fulfil project goals or objectives (SQA, 2007). The project management life cycle has four phases which is initiation (concept), planning, execution and closure (transfer).

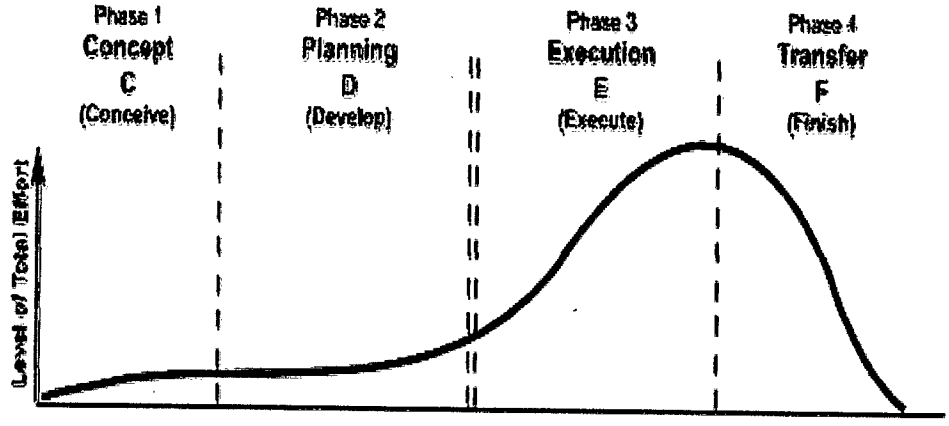

Figure 2.1: Project life cycle

2.2.1 Initiation Phase

The initiation phase involves defining the purpose and scope of the project, the justification for undertaking it and the solution to be implemented. It also involves recruiting the project team and carrying out a phase review, before proceeding to the next stage. A business case is developed, describing the business problem to be addressed by the project, the alternative solutions and the potential costs and benefits associated with each. The business case is foundation for the project as it fully describes the project, the reasons for creating it and the key benefits to be produced.

A feasibility study is then completed to ascertain the likelihood of the alternative solutions actually delivering the stated benefits in the business case. This is used to identify the preferred solution, which must be approved before proceeding. The terms of reference describe what the project intends to achieve and the boundaries within which it must achieve it. This includes the project vision, objectives, scope, deliverables, project organisation and an Implementation Plan.

Once the project is defined, it is time to appoint the project team. The project manager is recruited to take on responsibility for the project and recruit the remaining members of the team. Finally, a phase review is carried out to ensure that all of the required activities have been completed and to provide formal approval to proceed to the next phase of the project.

2.2.2 Planning Phase

The planning phase is often the most challenging phase for a project manager, because he need to make an educated guess of the staff, resources and equipment needed to complete the project. The planning phase involves the creation of a set of planning documents which will guide the team throughout the project. A comprehensive project plan is critical to the success of the project. It identifies the WBS of phases, activities and tasks to be undertaken to complete the project. It also identifies the sequencing, duration and dependencies of tasks and the resources and financial expenditure required to complete the project.

The resource plan should give a detailed assessment of the resources required to undertake the project. It should list the required labour, equipment and materials and quantify the amount of each resource. It should also give a resource usage schedule to give the project manager with a complete view of the total amount of resources needed at each stage. The financial plan describes the financial resources required during each

stage of the project. The total cost of each item of labour, equipment and materials is calculated, as well as the total cost of undertaking each activity.

The quality plan lists the quality targets that need to be achieved to ensure that the project deliverables meet customer requirements. Quality assurance and quality control activities are scheduled to make sure that the required level of quality is achieved throughout the project. The risk plan identifies all foreseeable project risks and rates them in terms of their likelihood of occurrence and potential impact on the project. The risks are prioritised and actions identified to reduce the likelihood of each risk and minimize its impact on the project.

An acceptance plan is created to ensure that customer acceptance is sought for each deliverable produced by the project. The acceptance plan provides a schedule of Acceptance Reviews. The communications plan describes the information to be provided to project stakeholders to keep them informed of the progress of the project. A schedule of communication events and activities is drawn up to make sure that the right information is communicated to the right people at the right time. Finally, a phase review is carried out to ensure that all of the required Planning activities have been completed and to provide formal approval to proceed to the next phase.

2.2.3 Execution Phase

During the execution phase the deliverables are physically built and presented to the customer for acceptance. While each deliverable is being constructed, a group of management processes are carried out to monitor and control activities. Once all the deliverables have been produced and accepted by the customer, the project is ready for closure.

The first and most important step is to build the deliverables specified in the terms of reference. During this activity, a detailed design of each deliverable is created and the deliverables are physically constructed, tested and reviewed to determine whether they meet the quality criteria and the acceptance criteria. When all the criteria have been met the deliverables are signed off on by the customer and handed over. At this stage, the project is ready for closure.

During the construction of the deliverables the project manager performs several management processes to monitor and control the time, cost and quality of each deliverable as follows:

- Time management involves monitoring and controlling the time spent by staff on the project. Timesheets are used to track and record time spent, so that the project manager can ascertain the overall progress of the project.
- Cost management involves identifying project costs and recording the rate of consumption of the project budget.
- Quality management involves undertaking the quality assurance and control activities specified in the quality plan, to manage a project's level of quality and ensure that the project deliverables meet customer requirements.
- Risk management involves monitoring and controlling project risks by taking the steps necessary to prevent risks and minimise the impact on the project should those risks occur.
- Issue management involves resolving any unforeseen issues that may arise before they affect the ability of the project to meet its stated objectives.
- Acceptance management involves carrying out acceptance reviews to gain the customer's approval of each deliverable. If the customer does not accept that the deliverables meet their requirements the success of the project will be compromised.

- Communications management involves completing the activities specified in the communications plan to ensure that every stakeholder receives the right information, at the right time.

- Finally, a phase review is undertaken to ensure that all of the required activities in the Execution phase have been completed and the project is ready to proceed to the next phase.

2.2.4 Closure Phase

The closure phase involves releasing the final deliverables to the customer, handing over project documentation, terminating supplier contracts, releasing project resources and communicating project closure to all stakeholders. The final step is to undertake an evaluation to determine the extent to which the project was successful and note any lessons learned for future projects. The project closure report should list all the activities required to close the project, to ensure that project closure is undertaken smoothly and efficiently. Once the report has been created and approved, the closure activities specified within the report are undertaken and the project is then officially closed.

2.3 PROJECT PLANNING

Planning can be thought of as determining what needs to be done, by "whom", "where", "how" and "when", in order to fulfil one's assigned responsibility. In construction projects the "plans" (blueprints) and specifications for the project generally define both the end product and, often, the general time frame in which to complete the project. However, they normally do not specifically identify the individual steps, their order and the timing followed to achieve the end product (Othman, 2006).

Planning aims at formulation of a time based plan of action for coordinating various activities and resources to achieve specified objectives. Planning is the process of developing the project plan. The plan outlines how the project is to be directed to achieve the assigned goals. It specifies a predetermined and committed future course of action, based on discussions and decisions made on the current knowledge and estimation of future trends (Baskar, n.d).

Planning is a general term that sets a clear road map that should be followed to reach a destination. The term, therefore, has been used at different levels to mean different things. Planning involves the breakdown of the project into definable, measurable, and identifiable tasks or activities and then establishes the logical interdependences among them (Emad, 2012).

Detailed planning for tendering purposes and the preparation of construction needs to be conducted through brainstorming sessions among the planning team. The inputs and outputs of the planning process are shown in Figure 2.2.

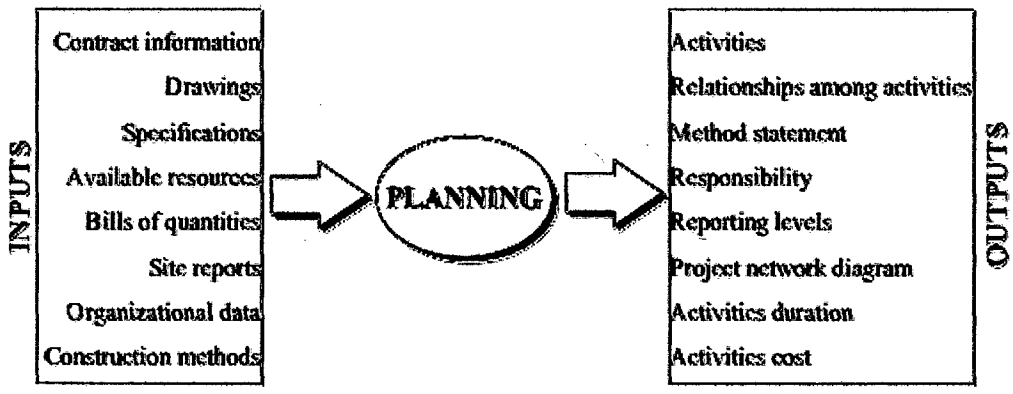

Figure 2.2: Planning inputs and outputs

Planning requires a rigorous effort by the planning team. A planner should know the different categories of work and be familiar with the terminology and knowledge used in general practice. Also, the planning tem should seek the opinion of experts including actual construction experience. This helps produce a realistic plan and avoids problems later on site.

2.3.1 Important Questions Project Planning Should Answer

Think of project planning as a process of "asking questions" and working with project team to "get the answers." It is the process of "detail planning" a project that allows to answer the questions we need addressed to implement and manage the project. These important questions focus on both the work to produce the targeted deliverables and on the work to manage the project (Gregory, 2005). Some of these key questions include the following:

- How exactly will the deliverables be produced?
- What work tasks must be performed to produce the deliverable?
- Who will do the work?
- What other resources (facilities, tools) will we need to do the work?
- Where will the work occur?
- How long will it take to do the work? When will the work be done?
- How much will this project cost?
- What skills, skill levels, and experience are needed for each role? When do I need them?
- When do I need each resource? How do I get resources?
- Who is responsible and accountable for what?

2.3.2 Problem in Project Planning

Planning the project properly, documenting the plan professionally and then implementing the plan successfully are likely the source of most project success and failure outcomes. While project planning is one of the most fundamental skill sets in project management, the requisite processes and actions are not well developed or successfully implemented. There is value in the planning process and value in implementing a well documented plan (George, 2011).

Notes from Baskar stated that scheduling of work activities over time is critical and is emphasized in the planning process. In this case, the planner insures that the proper precedences among activities are maintained and that efficient scheduling of the available resources prevails. Traditional scheduling procedures emphasize the maintenance of task precedences (resulting in critical path scheduling procedures) or efficient use of resources over time (resulting in job shop scheduling procedures). Finally, most complex projects require consideration of cost and scheduling over time, so that planning, monitoring and record keeping must consider both dimensions. In these cases, the integration of schedule and budget information is a major.

2.4 WORK BREAKDOWN STRUCTURE

WBS plays a vital role in the executing, monitoring, controlling and closeout phases of a project, and in so doing, transitions from being seen primarily as a planning tool, to an active role, where the WBS becomes the basis for decision making. It establishes clear boundaries for the project during the initiating and planning phases, and provides a ready tool for ensuring those boundaries are protected during the remaining phases of the project (Norman et al., 2008).