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PROJECT EFFECTIVENESS IMPROVEMENT: A CASE STUDY IN PT.X

Zulia Manalu and Yuliani Dwi Lestari
School of Business and Management
Institute Technology of Bandung, Indonesia
zulia.manalu@sbm-itb.ac.id

Abstract. Project management is important and powerful tool in global business because increasingly technically complex products and processes, vastly shortened time to market demand, and the need for cross-functional expertise. PT X is aircraft industry with complex product with millions of individual components and many dependencies. The project success can achieve the customer and contractor objectives of a project, and getting the job done within the constraints of time, cost and quality. The company is delayed delivery Tail boom to Airbus Helicopter. It makes customers give complaints related to the performance of company. CPM used to analyze the project planning. After decide the method for evaluate the planning project, we must clustering 455 elementary part into activities in process production Tail Boom. PERT analysis is used when the duration of activities are not known with certainty, calculated expected time using scenario base of PERT. The expected time will use in new critical path diagram for calculate total time in actual or reality at the time happen the problems of delayed delivery Tail boom. Project Crashing used for compare the project planning and actual to know the appropriate project management.

Keywords: *Project Management, Project success, Critical Path Method (CPM), Project Evaluation and Review Technique (PERT), Project Crashing.*

Introduction

Projects and project management are the wave of the future in global business. Increasingly technically complex products and processes, vastly shortened time to market windows, and the need for cross-functional expertise make project management an important and powerful tool in the hands of organizations that understand its use (J. K. Pinto, 1995). An aircraft is a complex product with millions of individual components and many dependencies (Harrison, 2003). The development and manufacture require involvement and coordination of hundreds of companies from a range of industries for a few years, thus the development process can also be categorized as complex. (Wynn, 2007: 2). Project management is a proactive approach to controlling a project, to ensure that the project objective is achieved even when things do not go according to plan (Gido & Clements, 2006). The characteristic production in aerospace industry is make to order (MOT), the manufacture starts only after a customer's order is received and assembly process starts when demand actually occurs or manufacturing starts with development planning. Therefore, the order of customer will be given treatment as a project (Asprova, 2008).

Project management success is defined as successfully achieving the customer and contractor objectives of a project, and getting the job done within the constraints of time, cost, and quality (Kerzner, 2003). The ultimate benefit of implementing project management techniques is having a

satisfied customer whether you are the customer of your own project or a business (contractor) being paid by a customer to perform a project (Gido Jack, Clements D James).

PT X is an aerospace company. The company main products are aircraft: aircraft structure component, aircraft services, and engineering. The company receive the symptoms in the process of business requires the company to reevaluate the schedule time of project, the symptoms of the company is delayed delivery Tail boom to Airbus Helicopter. It makes customers give complaints related to the performance of company. Reevaluation of project Tail boom is important for PT X especially DPM division because PT X has contract with Airbus Helicopter calls for 15 Tail boom every year valid until 2019. The problem of delayed delivery of Tail boom happen during 2013 until 2015 and it makes PT X cover the demand with purchase the Tail boom of another company.

Literature Review

According to (PMBOK Fifth Edition), every project creates a unique product, service, or result. The outcome of the project may be tangible or intangible. Although repetitive elements may be present in some project deliverables and activities, this repetition does not change the fundamental, unique characteristics of the project work. For example, office buildings can be constructed with the same or similar materials and by the same or different teams.

In order for a project to be successful; i.e. fulfilling criteria of time, cost, performance and client acceptance, it is important that the project plan is feasible (Pinto, 2010: 35). If the initial plan shows not to be feasible the project will be delayed unless the criteria of performance and client acceptance are lowered or the resources and hence costs are increased. However, project delay often also results in increased cost because some of the resources are assigned longer to the project.

According to (Baccarini, 1999) highlighted the following characteristics of project success:

1. Project Management Success is subordinate to Product Success
   The project management success criteria of time, cost and quality are subordinate to the higher product success objectives of goal and purpose. Consequently, a project that is a project management failure is perceived as a project success because the higher-level objective of product success is met.
2. Project Management Success influences Product Success
   Project management success can influence the achievement of product success. Good project management can contribute towards product success but is unlikely to be able to prevent product failure. For example, project management may help to identify the unfeasible nature of the project, and indicate that it should be abandoned or change. Poor project management in terms of cost and/or time overruns may result in the non-attainment of product success such as profitability or market share.
3. Project success is affected by time
   For product success, judgment can only be made once the project's product has been utilized and this can be many years after the project's completion. For project management success, judgment of whether a project has successfully met the objectives of time, cost and quality is a short-term measure made during or at completion of the project. Judgment of whether a project has been conducted in a quality manner and has successfully met the needs of the project team occurs throughout the project.

Critical Path "In project management, a critical path is the sequence of project network terminal elements with the longest overall duration, determining the shortest time to complete the project."

(WordHistory, 2004). Critical Path Method (CPM) "is s technique for analyzing projects by determining the longest sequence of tasks (or the sequence of task with the least slack) through a project network." (Newbold, 1998) By concentrating on the most critical tasks it can be ensured that the project is on time and is keeping pace with the schedule set up.

The Program Evaluation and Review Technique model, also called Network diagram, represents a project as a series of activities. Before an activity can start results from all predecessors must have been acquired. In the PERT chart a project is built up of nodes and arrows. Most common is to let nodes denote activities and arrows define precedence, but the opposite is also used. (Eppinger et al.1992). The PERT model is often used when planning projects to order activities and to get an overview of the duration of activities (NetMBA, 2010).

Project Crashing common in project management that additional resources are used to either speed up some activities to get the project back on schedule or to reduce the project completion time. Late penalty costs, monetary incentives, cost savings, or strategic benefits are some of the reasons for shortening a project completion time.

Methodology

In this study, we conduct four steps of research. Firstly, we highlight the risk of problem or issues of company. In internal issues, there are problems of DPM division that delayed producing elementary parts and it impact to delayed delivery Tail boom. There are many factors that cause DPM delayed producing elementary part, one of them because is the specifications of duration completion of elementary part not introduce in aircraft table and SAP. So, there is no the detail standard duration for make these part and also DPM division felt that the standard time of company for producing elementary part is not appropriate for their. PT X has signed contract with Airbus Helicopter for delivery 15 Tail boom every year. However PT X cannot fulfill the demand of contract during 2014 and it make the level of customer satisfaction decrease. So, PT X must bear cost of penalty because the delayed of delivery Tail boom. To avoid these risks, they should ensure the standard time, and the appropriate project management. Thus, a study in project management in PT X is critical.

Secondly, we will evaluate the planning phase of project management. The evaluation project planning will be conducted in area DPM division that has issue cause of delayed delivery Tail boom. (Newbold, 1998) Critical Path Method (CPM) "is s technique for analyzing projects by determining the longest sequence of tasks (or the sequence of task with the least slack) through a project network." By concentrating on the most critical tasks it can be ensured that the project is on time and is keeping pace with the schedule set up. So, we used CPM to analyze the project planning. After decide the method for evaluate the planning project, we must clustering 455 elementary part into activities in process production Tail Boom. The research should be conducted in activities of processing 455 elementary parts; it means that one part is one activity. But because of limited time, the activities of project planning based on sub component of Tail boom in assembly process. After decide the list of activities, we calculated the duration of each activity which is the standard time of company. It also provide the total time of project based on planning.

Thirdly, we conduct analysis and evaluation with comparing planning and reality (actual). Before comparing it, we must conducted PERT analysis. PERT analysis is used when the duration of activities are not known with certainty. So, we calculated the duration of activities based on historical data of actual release-finish of all elementary part order of Tail boom in 2013 until 2015. Then, the result used for calculated expected time using scenario base of PERT. The expected time will use in new critical

path diagram for calculate total time in actual or reality at the time happen the problems of delayed delivery Tail boom. And then, the result of analysis would be compared with the result of second steps. Besides that, this study also conducts crashing cost method to get the alternative of project effectiveness. These first, second and third steps are conducted by integrating literature study, field observation, historical data collection and analysis, and depth interview with some stakeholders during January until June 2015. Fourthly, we will provide conclusion which answer project management problem in PT X. The conclusion also proposes recommendation for PT X especially DPM division to choose the alternative of project effectiveness. However, the implementation phase is based on PT X or DPM division managers.

Data Analysis

Network planning can determined after ascertaining the list of activities of Project Tail boom. This study focuses in DPM division which produces elementary parts of Tail boom. So, the activities of project consideration to duration of overall process of manufacture elementary parts. According to described data general of Tail boom above Figure 4-3 Distribution on Tail Boom Assembly Phase, each Tail boom project is constituted of 455 elementary parts (DPM). Therefore, there are 455 activities undertaken of process manufacture of elementary parts before assembly activities. Based on interview with supervisor of DPM division and the result are shown in Figure 4.10 Cause and Effect Diagram, DPM division has no data of sequence activities of manufacture 455 elementary parts. Therefore, this study focus evaluated project planning using 7 activities sub component assembly of Tail boom. Below is the list of activities assembly process of Tail boom;

Node	Activities	Duration (Days)	Predecessor	Successor
A	PYLON-ASSY-PS2	70.72		C
B	TAIL-CONE-ASSY-PS2	53.62		C
C	CONE-PYLONE-JUNCTION-PS2	48.62	A, B	D
D	TAIL-BOOM-EQUIPMENT-PS2	50.38	C	E
E	TAIL-BOOM-PAINTING-PS2	6.88	D	F
F	TAIL-BOOM-RAIN-TEST-PS2	4.56	E	G
G	KEEL-PRESENTATION-PS2	26.03	F	

The duration of each elementary part of activities, the supervisor stating duration that used for the duration activity is the longest duration time of process manufacture of elementary part of each activity. Based on interviews with the supervisor in the division DPM, PT X has formula for calculate the standard time that used as benchmark in the process of making each elementary part. Below is the formula to calculate the standard time of elementary part in DPM, Standard time table for 455 elementary parts can be seen at appendix.

$$Standard\ Time = Processing\ Time + Setup\ Time + Interpolation$$

The assembly process of Tail boom has duration time for assembly activities and the time of each assembly activity will be added to the standard time which the maximum duration time of each activities. It means that every elementary part of Tail boom is made at the same time. The activity of Pylon assembly will be added 3 weeks, Tail cone Assembly 2 weeks, cone pylon junction and Tail boom equipment will be added time duration 1 week, Tail boom painting and Rain test will be added time duration 3 days, and the last activity Keel presentation will be added 1 day. The result duration of each activity in Table 4-1 List Activities of Tail Boom are already adding the duration time of assembly process.

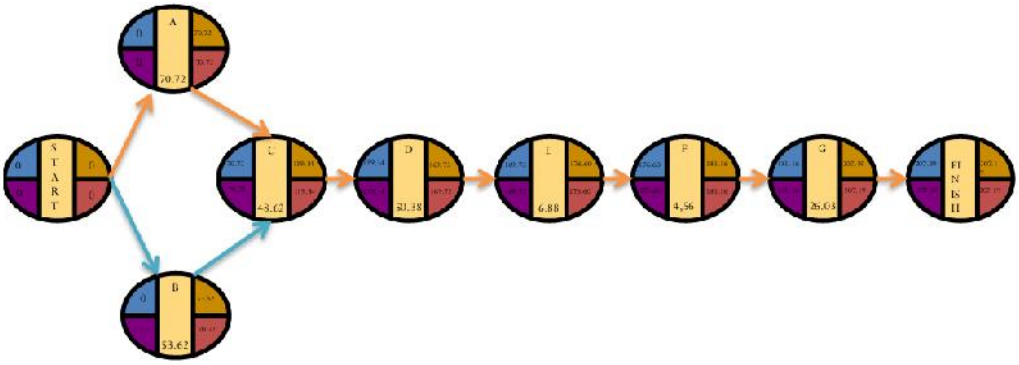

Figure 4-11 Critical Path Diagram (Planning)

Figure above shows the critical path diagram based on planning project management. The objective of Critical path Method is to identify the critical path and figure out how much time the whole project will take. The result of calculation based on Critical Path Method, the total time of the project is 207.19 days and the critical path is A-C-D-E-F-G. To determine the critical path of the project can seeking based on the activity has slack time equal zero. The slack time can be calculated as follows:

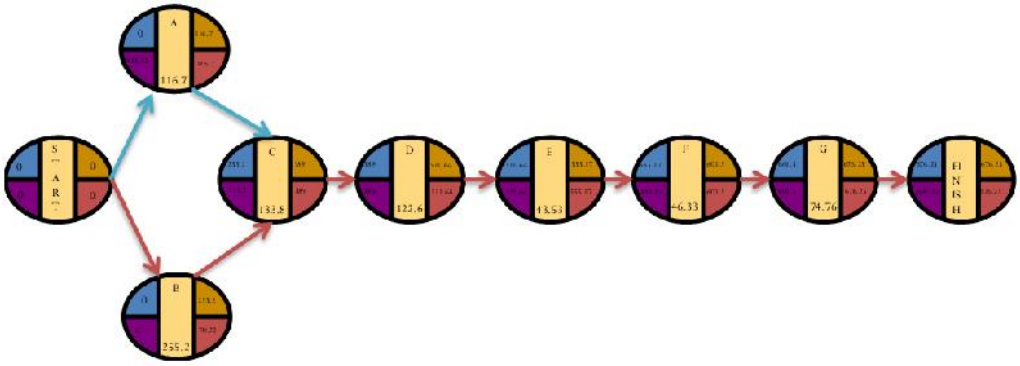

Figure 4-12 Critical Path Diagram (Actual)

Figure above shows critical path diagram based on historical data during 2013 until 2015. The objective of Critical path Method is to identify the critical path and figure out how much time the whole project will take. The result of calculation based on Critical Path Method, the total time of the project is 676.25 days and the critical path is B-C-D-E-F-G.

Project crashing refers to the process of shortening the duration of the project by crashing the duration of a number of activities, to get the project back on schedule or to reduce the project completion time. Since it generally results in an increase of the overall project costs, we must to identify the activities to crash and the duration reduction for each activity such that as the project crashing is done in the least expensive manner possible.

The activity that can be crashed is activity in critical path. Based on Figure 4.12 Critical Path Diagram Actual time, there is only one critical path B-C-D-E-F-G. Based on Table 4.5 Crash Cost, the cost of activity in critical path are Tail cone $18.153, Cone Pylon Junction $19.848, Tail boom Equipment $17.604, Tail boom Painting $14.184, Tail boom rain test $4.942, and Keel presentation $14.860. The selected activity on critical path that prefer to be crashing with short activity duration and the total cost of crashing is small as possible is Tail boom rain test, the crashing cost per period $4.924 with crash time 41.77 days and the total cost of crashing $206.44. After we have the result of crash cost per period, to know the alternative of project management based on calculate crash cost, we have conducted comparison cost between crash cost when company conduct the project crashing and cost of penalty when the company cannot complete the project on time in schedule. Based on interview with staff PMO the cost penalty of delayed delivery Tail boom is $1647/week.

Conclusion and Recommendation

Conclusion

The results of analysis the current project using CPM are the total time of the project is 207.19 days and the critical path is A-C-D-E-F-G. The results of these steps are Total time based on historical data is 676.25 while the total time according project planning is 207.19. Thus, using total time based on historical data three times slower than total time of project planning. So, PT X should be able to produce 3 Tail boom in 676.25 days and critical path of project Tail boom is B-C-D-E-F-G.

The crash cost per day based on actual time of Pylon Assy $19,687.90, Tail cone $43,056.94, Cone Pylon Junction $22,569.38, Tail boom Equipment $20,690, Tail boom Painting $7,343.74, Tail boom rain test $7,816.11, and Keel presentation $12,612.40. Based on interview with staff PMO the cost penalty of delayed delivery Tail boom is $1647/week. If the company conducted the project crash, the best of activities that preferable to crashing of critical path with minimum cost is Tail boom Painting $7,343.74and Tail boom rain test $7,816.11. It activity selected on this critical path that has the smallest crash cost per period. The Tail boom painting and Tail boom rain test needed budget $269,147.95 and $326,478.97, if company will crashed cost both of activity.

Recommendation

In conclusion, the company prefer conducted project crashing the proposed for shortening the duration of the project by crashing the duration of number of activities, to get the project back on schedule or to reduce the project completion time. It can be important for maintain the sustainability of company. And other alternative project management that conducted rescheduling of project planning with AH based on calculation capacity of PT X especially Detail Part Manufacture Division. The Planner of project should include the detail duration and the role of producing elementary part to aircraft table. It can minimize the error information from planner, and PT X have to do training for staff in optimize the implementation SAP in PT X, because this system can help the information delivered to other division that have concernment in the project.

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