Crashing project and design of daily report system: A case study of IT security company

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Abstract. Delayed projects not only lead to over budget but could result in customer unsatisfaction and lower company reputation. Therefore, need to optimize project time to shortened project duration and controlling project through real time daily report between technician and management team. During the pandemic in 2020 there is a health protocol that requires maintaining distance, so it is necessary to establish a web-based interactive daily report. The aims of this study are to optimize project duration and improve daily report system between technician and management team. To optimize project duration use mitigation then continue with Critical Path, Project Evaluation Review Technique, and Crashing Project. The design of web-based daily report is approach with Fishbone Diagram, Quality Function Deployment then The FAST diagram process. The result of this research shows that the project duration of IT security system installation at PT XYZ can be shortened from 86 days to 43 days and the systems of daily report are proposed with web-based system that were designed with function analysis system technique The FAST diagram process.

Keywords: Critical Path, Project Evaluation Review Technique, and Crashing Project, Fishbone Diagram, Quality Function Deployment

1. Introduction

High-tech ICT projects pose unique challenges, and in fact have a high percentage of failures. In spite of managing conventional resources such as equipment and people, ICT projects also rely heavily on sustainability user involvement, appropriate risk management strategies and adoption of an appropriate project management methodology [1]. Delays in ICT’s projects will result in over budgets, penalties from customers, a decline in company reputation and loss of customer trust. Close supervision to avoid project delay is implementing project control, project monitoring and evaluation [2]. Those action need communication between technician at customer sites and management team. During the pandemic in 2020 there is a health protocol that requires maintaining distance, so it is necessary to establish an internet-based real time communication system which could report real time update project with easy access for users [3]. In industry 4.0, which the system has been optimized to be more integrated and modern. In
increasing the productivity of employees and technicians, therefore need a system that makes it easier for users to work. One example is an web-based system to make it easier for users to operate between clients and technicians. The requirement of internet-based system is a portal for reporting updates on any project that is being carried out, such as daily reports, technician scheduling, project duration, management response on problem occurs during technician installation on customer sites, etc.

The case study conducted at PT Info Solusindo Data Utama in short Infodata, an ICT company who offers IT service and security system installation that support the data centre infrastructure of a large company, especially state-owned enterprises (BUMN). Some of the services provided are virtualization, data backup, data centre migration, installation IT security protection, etc. This year 2020, Infodata has anIT security system installation project which has 2 months duration, but the project delayed and impact to over budget. Several constraints found out are outsource company do the installation ineffective, longer duration of the project compare project time target, poor daily report, and slow management response. The case study aim is to optimize project duration and a web-based system for interactive updates of daily report between technician and management team. To reduce McAfee securities installation project duration at PT XYZ, would implement mitigation and project management approach, are Work Breakdown Structure (WBS), Critical Path Method (CPM), Project Management and Review Technique (PERT), and Crashing Project method.

To design interactive daily report, starting with Fishbone Diagram to find out a root cause of a problem, then Quality Function Deployment (QFD) method to identify customer requirement of web-based interactive daily report application.

2. Literature Review

Projects are activities that can be planned and implemented in a unitary form by using resources to get benefits. These activities can include the construction of factories, roads or railways, dams, buildings, and so on. Meanwhile, Meredith and Mantel said that the project has quite complex subtask and requires careful coordination, besides controlling time, cost and performance.

The critical path method is used to estimate the minimum project duration and determine the amount of schedule flexibility on the logical network path in the schedule model. CPM identifies a critical path to an activity that is dependent on the inter-activity, which has a measurable outcome from the duration of its execution. PERT uses an approach that assumes that the activity period depends on many factors and variations, so it is better if estimates are given a range or use three estimated numbers. PERT method is more oriented to the events that occur, in contrast to CPM which is activity oriented. At PERT the project period is complete and the processing time is uncertain.

The PERT method contains three probability activity time estimates as follows: First, Optimistic Time (Optimistic Time): the time an activity would take if things went according to plan. Second, Pessimistic Time: the time an activity will take by assuming unfavorable conditions. Third, The most likely time: the most realistic estimate of the time it will take to complete an activity.

Crashing Project is an action to reduce the overall duration of work after analyzing existing alternatives from the network. Aims to optimize work time at the lowest cost. According to Heizer and Render, this crashing project can shorten the time of work activities in a network to reduce time on the critical path so that the total completion is reduced.

The Fishbone Diagram (also known as the Cause and Effect Diagram or Ishikawa Diagram). Fishbone Diagram is an illustration used to explore the potential or root causes of a quality problem. Fishbone diagrams are for organizing and displaying the interrelationships of various root problem theories. QFD is a conversion of consumer voices into a product design so that consumer wants and needs are well accommodated. With the use of the QFD method, a House of Quality (HOQ) matrix is created to find out what the consumer wants and meet the needs and expectations.
The concept of using digital platform products is generally a brief description of how the products are made according to customer needs which can later satisfy user needs. The FAST (function analysis system technique) diagram process is carried out to develop several alternative parts of the digital platform design concept based on parameter design by considering the results of the HOQ evaluation [13]. After conducting a FAST diagram, Flowchart can be interpreted as a tool or means that show the steps that must be carried out in solving a problem for computing by expressing it in a series of special graphic symbols.

3. Research Methods
The research conducted at Infodata, during January to June 2020, The data collected is primary data sourced from Infodata by interview, discussion and brainstorming. Secondary data collecting with project team through online such as phone call, WhatsApp’s message, google form and email. The methods used are WBS, CPM, PERT, Crashing Project, Fishbone, QFD, FAST and Flowchart. Results and discussion stage, the theory obtained from the literature study is used as a basis for analyzing and providing solutions to the problems under study. Then conclusion and suggestion are the final stages of the research process. Figure 1 shows the methodology diagram for this research.

![Methodology diagram](image)

**Figure 1.** Methodology diagram

4. Results and Discussion

4.1. Analysis of the McAfee Installation Project Abbreviation by PT Infodata at PT XYZ
The Work Breakdown Schedule consist of 6 Job: A (Job Preparation), B (Unit and License Delivery), C (Advanced Threat Defense (ATD) Solution Configuration and Customization Work (Sandbox)), D (Configuration Work and Customize Endpoint Detection Response (EDR)), E (Testing and Commissioning), and F (Work Completion) as shown in Table 1.
Table 1. Activity, Cost and Duration before and after Optimize project time

| Activity                                      | Job                                      | Cost, in k IDR | Duration Before | Duration After |
|-----------------------------------------------|------------------------------------------|----------------|-----------------|----------------|
| A preparation job                            |                                          | 1,312,230.7    | 18              | 10             |
| B shipping unit and license                   |                                          | 38,460         | 15              | 12             |
| C advanced threat defense (sandbox) solution  |                                          | 3,350          | 20              | 4              |
| D endpoint detection response (EDR) solution  |                                          | 3,259.3        | 6               | 6              |
| E testing and commission                      |                                          | 158,660        | 16              | 15             |
| F completion of job                           |                                          | 3,259.3        | 6               | 6              |
| **Total**                                     |                                          | **1,752,510.0**| **86**          | **50**         |

The analysis of the McAfee project at PT XYZ by Infodata was carried out for 86 days which mean overtime from target 60 days took up to 3 months. This project runs from 5 January 2020 to 9 March 2020. The impact, project costs is over budget, customer apply fines that need to be compensated. In addition, this long-duration takes up the time that could be undertaken to carry out other projects that took place in this short time. Focused to activity A, the preparation job spends 18 days from January 5 to January 23, 2020. Activity B, Delivery spend 15 days. The McAfee dispatch was made from Singapore by PT Infodata technicians who were tasked with confirming the unit was shipped safely with complete unit components.

Optimization of this project will be carried out in two events, the first, Mitigation to shortening project time. By conduct discussion & brainstorming with Project technique team to avoid bottleneck problem such as: Late licenses, late unit shipping. This problem can be minimized by disciplining the project manager against a predetermined timeline since the kick-off meeting. The second, is to use the Critical Path Method (CPM) and then the cost will be calculated using the Crashing Project. After that, methods that confirm the success of the critical path will be evaluated using the Program Evaluation Review and Technique (PERT). PERT technique will determine whether the implementation of the optimization of the McAfee project can be realized or not as shown in table 2.

Table 2. McAfee Project Cost on PT XYZ

| Indicators                             | Cost                       |
|----------------------------------------|----------------------------|
| Flexible Manufacturing System (FMS)    | IDR 412,179,300.00         |
| License                                | IDR 1,212,230,000.00       |
| 18 days of Late Payment Compensation   | IDR 100,100,700.00         |
| Late of Shipping Compensation          | IDR 28,000,000             |
| **Total**                              | **IDR 1,752,510,000.00**   |

The next method used is the Critical Path Method (CPM). The first thing to do is to create a path diagram of each component. Line of activity has been determined from the biggest total duration. The larger path is passed with a series A - B - D - E - F of 46 as shown in figure 2.
After that, the cost slope calculation is done for each component that experiences a shortening in duration.

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Slope \text{ Cost } D = \frac{\text{Crash cost} - \text{normal cost}}{\text{normal duration} - \text{crash duration}}
\]

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Slope \text{ Cost } D = \frac{\text{IDR } 173,300,000 - \text{IDR } 158,660,000}{13 - 10}
\]

\[
Slope \text{ Cost } D = \text{IDR } 2,356,667
\]

Activity D crashing 3 days
Path 1 = 10 + 12 + 10 + 5 + 6 = 43
Cost = Total Cost + (2 x Slope Cost + Slope Cost C)
Cost = IDR 1,752,510,000 + (2 x 4,880,000 +4,446,250)
Cost = IDR 1,771,162,500

After determining the cost slope, each component will be calculated as the costs incurred as a whole, and a comparison will be made in terms of duration and cost in table 3. The component chosen to be shortened is D of 3 days so that the total duration is 43 days with a total cost of IDR 1,771,162,00 as shown in table 4.

**Table 3. Shorten Project Time and Cost Using Crashing Project**

|   | Normal | Shortened | Normal | Shortened | Slope Cost |
|---|--------|-----------|--------|-----------|------------|
| A | 10     | 8         | 1,312,230,700 | 1,315,430,700 | 1,600,000  |
| B | 12     | 9         | 38,460,000    | 45,530,000    | 2,356,667  |
| C | 4      | 0         | 207,350,000   | 225,135,000   | 4,446,250  |
| D | 13     | 10        | 158,660,000   | 173,300,000   | 4,880,000  |
| E | 5      | 5         | 32,550,000    | -           | -           |
| F | 6      | 4         | 3,259,300     | 6,750,000     | 1,745,350  |
| **Total** |   |           | **1,752,510,000** |           |            |
Table 4. Activity Abbreviation Analysis Table

| Activity | Path | Duration (days) | Project Cost, IDR |
|----------|------|-----------------|------------------|
| Normal   | 2    | 46              | 1,752,510,000    |
|          | 1    | 35              |                  |
| A        | 2    | 44              | 1,764,602,500    |
|          | 1    | 33              |                  |
| B        | 2    | 42              | 1,766,115,834    |
| D        | 2    | 43              | 1,771,162,500    |
|          | 1    | 35              | 1,764,893,200    |
|          | 2    | 44              |                  |

Furthermore, followed by the PERT method, this method requires several formulas such as activity time, deviation, and variance. After calculating all these calculations, the results of the activity time are 50 days, a deviation of 3.5, and a variance of 7. Then, the probability calculation is carried out which results in 0.857, which means that the project for 43 days can run with an opportunity of 85.7% as shown in Table 5.

Table 5. Probability of Activity Implementation Time

| Activity | Optimistic Time (a) | Realistic Time (m) | Pessimist Time (b) | Waktu aktifitas | Deviation | Variance |
|----------|---------------------|--------------------|--------------------|-----------------|-----------|----------|
| A        | 8                   | 10                 | 12                 | 10              | 0.667     | 1.333    |
| B        | 9                   | 12                 | 14                 | 12              | 0.833     | 1.667    |
| C        | 3                   | 4                  | 5                  | 4               | 0.333     | 0.667    |
| D        | 10                  | 13                 | 15                 | 13              | 0.8333    | 1.667    |
| E        | 4                   | 5                  | 6                  | 5               | 0.333     | 0.667    |
| F        | 5                   | 6                  | 8                  | 6               | 0.5       | 1        |
| Total    | 39                  | 50                 | 60                 | 50              | 3.5       | 7        |

The original project required a duration of 86 days, the post-mitigation project required 50 days, and the post-mitigation project and the CPM / PERT resulting 43 days. This comparison affects the cost of each project. The original project costs IDR 1,752,510,000 the project after mitigation and CPM / PERT is IDR 1,671,033,800. It was due to a reduction in compensation for late payment of licenses and late delivery of IDR 100,128,700. The increase in costs caused by the project shortening of IDR 18,652,500 can be allocated to add technicians so that they can help work on projects in a shorter time.

4.2. System Design for Daily Report Technicians at PT Infodata

The daily report system used by the company is still manual, namely technicians filling out reports in Microsoft Excel and sending them to management via email. This is one of the causes of complaints from clients if there are reports of inappropriate technician activities and can slow down the monitoring and evaluation process from the management. Based on the results of an interview with a technician at PT Info Solusindo Data Utama who is involved in finding the causes of problems that occur with factors such as man, machine, method, material, and the environment as shown in figure 3.
It was found that the root of the problem lies on method factor, namely a manual system (Microsoft Excel). After knowing the root of the problem, a translation of the desires and needs of the respondents was carried out using the QFD method based on the results of questionnaire distributed to determine the value of the level of importance and satisfaction of the respondents.

In designing a system for a technician's daily report, an interview with one of the company's technicians is needed and a questionnaire is distributed to the management and technician divisions to find out the needs and desires of related parties and their level of importance in designing a web-based or online daily report system. The House of Quality matrix assessed is to determine the level of the relationship between Whats and How. The House of Quality Matrix is divided into 6 parts, namely Customer Requirements or WHATs, Planning Matrix, Technical Requirements or HOWs, Relationship Matrix, Correlation Matrix, and Target Matrix. After knowing the respondent's wants and needs as well as the technical requirements in Quality Function Deployment (QFD) and the values in terms of the importance that must be prioritized, a conceptual depiction design can be made of how a web-based or online daily report system is made according to the respondent's needs.

To conduct a research for daily report, researcher uses Quality Function Deployment (QFD) as explained in Section 4.2. These figures show the QFD that were conducted before executing FAST and Flowchart diagrams as shown in Figures 4, 5, 6 and 7.
The compilation process is carried out using a function analysis system technique (FAST) diagram approach while the development of the concept of the flow of a web-based or online daily report system.

This stage is carried out to describe several alternative parts of the design concept based on parameters by considering the evaluation results of the house of quality (HOQ).

After implementing the FAST diagram, concept development is carried out with a flowchart to show an overview of the proposed web-based or online system flow or process.

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**Figure 4.** The Result of Quality Function Deployment (QFD) Daily Report Technician at PT Infodata

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**Figure 5.** The Result of Quality Function Deployment(QFD) Daily Report Technician at PT Infodata
5. Conclusion
By implemented mitigation and project management approach, WBS, CPM, PERT and Crashing Project method, the McAfee securities installation project duration at PT XYZ, shortened from 86 days to be 43 days, while evaluation through PERT, proven that the implementation of the project achieved a success of 85.7%, mean it can be implemented. To overcome slow response and improve daily report between technician and management team, an interactive web-based system of daily report has been design usedQFD to capture user and technologies requirement of web-based interactive daily report application.

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