Implementation of standardized wbs (work breakdown structure) for time and cost performance. (study case: building project PT. X, Kuala Tanjung, Sumatera Utara)

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Abstract. The WBS standard is a tool in project management. This WBS standard is used as a basis for developing information systems in construction projects so that projects can be easily managed. By implementing WBS standards to manage construction projects, in this study we will assess the effectiveness of using WBS standards in building projects with case studies on PT. X Kuala Tanjung, North Sumatra. In this study will assess the cost and time performance of the project and the factors that influence it. This study uses a qualitative and quantitative approach. The method used in assessing cost and time performance in this study is with Earned Value Method (EVM). Collecting data by survey uses questionnaires to project managers. The results of this study show that the use of the WBS standard greatly influences the cost and time performance of the project. From observations for 3 months of work progress, the results of the work can be obtained on budget and schedule ahead. Factors that influence cost and time performance include: work items becoming clearer, the volume of material and budget becoming more planned, making purchasing orders (PO) more controlled.

1. Introduction
The progress of the information system is growing rapidly nowadays. Information system involved in various sectors, including the construction sector. Development of information system affected the construction company to get the information quickly, precisely, accurately as a base of decision making. Information system help construction project for increasing work more efficient and effective [1].

The base form system information development in the construction project is using the Work Breakdown Structure (WBS). In project management, use of WBS not only for planning process but also for estimating, scheduling, monitoring and controlling [2], [3], [4]. The WBS is an amount of total project scope [5], [6]. WBS is a hierarchy scope of work into the lowest level, making it manageable [3], [6], [7]. A good WBS preparation will make the target scope, cost and time reached [3], [5].

The problem that often occurs in contractors in Indonesia is that there are often errors in the preparation of WBS and differences in perceptions of the WBS. In the execution of the work, the quality of the product, cost and time are not achieved. Therefore, to overcome these problems, so a standard WBS was developed [3]. The success of the project is determined by the use of efficient WBS standards [8]. Another benefit of the WBS standard in the project is to minimize changes in project scope, minimize the scope of the project to widen, ensure that the products produced are in accordance with requirements, avoid rework, avoid cost and time overrun [5].

The standardized WBS has been implemented project construction, especially in the building project. To know the effectiveness of using WBS at the project, so that in this research will
evaluate the effect of standardized WBS for cost and time performance. The project reviewed in this study is a building project of PT. X in Kuala Tanjung, North Sumatra.

2. Methodology
The measurement of cost and time performance in this research are using Earned Value Method (EVM). Earned value is a tool that easiest to use as performance indicators and progress forecasting of project execution. In cost and time performance measurement, earned value as a link between WBS (scope), schedule and budget [9]. Since planning phase, EVM has required baseline needs performance measurement. Using EVM, project can be executed and manage, so the project execution appropriate with project planning [10].

This research uses qualitative and quantitative approaches. Data collection method is carried out by a survey in the form of a questionnaire, with the respondent project manager or site manager. The questionnaire contains questions about the implementation of the work in terms of the project schedule and budget. Including the factors that most influence the cost and time performance of the project.

In EVM the assessment of cost and time performance is indicated by the Cost Performance Index (CPI) and Schedule Performance Index (SPI). CPI can be used to estimate project costs to complete projects based on performance according to the time target, while SPI is used to estimate the time needed to complete the project [11]. The relationship between cost performance and time in EVM is shown as in the table below.

Table 1. Interpretation of earned value performance measurement

| Performance Measures | Schedule |
|----------------------|----------|
| CV > 0 & CPI > 1.0   | Ahead of Schedule Under Budget |
| CV = 0 & CPI = 1.0   | On Schedule Under Budget |
| CV < 0 & CPI < 1.0   | Behind Schedule Under Budget |

The project reviewed in this research is a building project of PT. X in Kuala Tanjung, North Sumatra. Project starting on July 31, 2018, with a project cost of Rp.336,344,000.000. This performance measurement is to see the relationship between the use of WBS standards on project cost and time performance.

3. Results and discussion
Project observations are carried out for 3 months of work progress. This is done to determine the cost and time performance of the project every month. Based on the survey results, the following results were obtained.
Table 2. Cost and time performance

| Month      | Cost Performance | Time Performance               |
|------------|------------------|-------------------------------|
| 1st month  | On budget        | Ahead of schedule, less than 7 days |
| 2nd month  | On budget        | Ahead of schedule, more than 7 days |
| 3rd month  | On budget        | Ahead of schedule, more than 7 days |

Based on Table 2, can see that cost performance for 3 months is stay on budget planned (CPI = 1). While time performance for 3 months is ahead of schedule planned, with an excess range of fewer than 7 days to more than 7 days (SPI > 1).

Schedule performance index (SPI) is a measurement of the number of jobs that can be completed against the work schedule. While the cost performance index (CPI) shows how effective the project team is in managing resources [9]. Based on the results of this measurement it can be said that the building project team of PT. X can make efficient use of resources so that the number of works can be completed more, but still within the budget.

In this study not only measure the cost and time performance of the project but also determine what factors influence the cost and time performance. Based on data obtained through questionnaires, obtained factors that influence the performance of costs and the time of the building construction project of PT. X, including:

- The categories of each work item become clearer
- Material volume and budget are more planned
- Making purchasing orders (PO) more controlled

In the WBS standard, the lowest level of each work can be defined and supports the management process as a basis for developing schedules, cost estimation, resource allocation and risk assessment [7]. The work package consists of activities, the resources needed to complete the project. This is also the basis for developing the project schedule [7], [11]. With scope, decomposition, and duration of activities that have been standardized in the WBS, reduce excess labor and overtime. The WBS standard also avoids the occurrence of sequence activity errors and increases worker productivity [12].

4. Conclusion

The use of WBS standards on construction projects has a profound effect on cost and time performance. This can be seen in the building project of PT. X in Kuala Tanjung, West Sumatra. Based on the survey that has been conducted, that in progress the implementation of work for 3 months, can be completed on budget and ahead of schedule.

The WBS standard makes the project better managed. With the WBS standard, work can be divided into individual components called work packages. Each work package consists of activities that require resources to implement them. The allocation of resource use, scheduling to financing becomes more measurable.

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6. References

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