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ANALYSIS OF THE IMPLEMENTATION OF PROJECT CONTROL INFORMATION SYSTEMS IN ENGINEERING PROCUREMENT CONSTRUCTION PROJECTS

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Abstract

Information System is a system that is needed by organizations in evaluating the performance of a project. In EPC projects, tools are needed to help evaluate costs and progress. For this reason, through the Project Control Information System (SIPP), the prognosis of costs and project progress can be known. This study uses a mix method that aims to analyze the performance of SIPP in the Sorong Open Access project by comparing the Financial Work Plan (RKK) report with data inputted in the SIPP system and interview methods to users, direct supervisors and upper management, so that a conclusion and recommendations can be produced for improving data input and the use of SIPP in EPC projects. The results of quantitative research that have been carried out on the percentage of suitability of cost item data and RKK progress items inputted in the SIPP in December 2022, January 2023 and February 2023 the conformity value is still small. The SIPP program is stated to be quite good based on the results of qualitative research with interview methods to users, user superiors and upper management. However, improvements are needed in the data verification process after input. The proposed new business process is expected to improve the data input process and the conformity of the input data is 100%. So that payment problems to suppliers and progress do not experience obstacles due to data discrepancies in SIPP.

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INTRODUCTION

Information systems have been widely used in companies engaged in Construction Services. This is because, Construction Service companies need software in the form of an information system that can display updated and accurate conditions regarding the performance of a project being worked on. Of the many Construction Service companies in Indonesia, PT Hutama Karya (Persero) Engineering Procurement Construction (EPC) Division was chosen as a case study in this study. This is because PT Hutama Karya (Persero) is one of the largest state-owned construction services companies in Indonesia.

Currently, there are 9 Engineering Procurement Construction (EPC) projects being carried out by PT Hutama Karya (Persero). One of the EPC projects that will become a case study is the Sorong Open Access Development EPC Project at RU VII Kasim. EPC Project for Open Access Development of RU VII Kasim Sorong. Because currently this project is experiencing delays in work and experiencing an increase in project implementation costs that exceed the Implementation Plan Budget (ARP).

One of the causes of work delay problems is that payment conditions to subcons and vendors experience delays, due to costs recorded on thepayable list contained in the Project Control Information System (SIPP) not in accordance with incoming billing data from subcons and vendors. So that this can have an impact on delays in the progress of work in the field. Because of these problems, it is necessary to conduct quantitative and qualitative analysis to find out the root of the problem and the steps to improve the ongoing business process.

With this background, a problem can be formulated, namely regarding the performance of the Project Control Information System (SIPP) in terms of cost control and progress (time / schedule) of inputting data carried out. From the formulation of the existing problem, three research questions arise, namely how the performance of the Project Control Information System (SIPP) in terms of cost control and the progress (time / schedule) of data input carried out in the EPC project for the Open Access Development of RU VII Kasim Sorong using quantitative methods, how to formulate steps to improve data input on the Project Control Information System (SIPP) in the EPC project for the Open Access RU VII Development Kasim Sorong uses qualitative methods, and how to recommend new business process proposals using qualitative matrices (interview methods or interviews against data input processes).

Based on the formulation of the problem mentioned above, the research objectives to be achieved in this thesis research are as follows:

a. Analyzing the performance of the Project Control Information System (SIPP) in terms of cost control and progress control (time / schedule) from data input in the implementation of the EPC project for the Open Access RU VII Kasim Sorong construction owned by PT Kilang Pertamina Internasional.
b. Formulate steps to improve the Project Control Information System (SIPP) data input system.
c. Recommend proposed improvements to the existing Project Control Information System (SIPP) business processes.

LITERATURE REVIEW

According to Novitasari (2022), it is explained that Operations Management is an activity to regulate or manage resource management optimally in the process of transforming inputs into outputs in producing goods and services. According to Dumas et al. (2018), Business Process Management (BPM) is the art and science of supervising or monitoring how a job is done in an organization to ensure consistent results and can take advantage of opportunities for improvement or improvement. The objectives of improvement include reducing implementation costs, reducing the implementation period (ahead), and reducing error rates, but also gaining competitive advantage through innovation.

According to PMBOK (2021) Project management refers to guiding project work to deliver the desired results. Project teams can achieve results using a variety of approaches (e.g. predictive, hybrid, and adaptive). Engineering Procurement and Construction (EPC) projects have a higher level of difficulty, risk than other projects. EPC projects involve complete engineering to carry out design before proceeding with the procurement, construction as well as testing and operation processes. EPC projects have a lumpsum contractual nature. Neither the procuremenResearch in this case study uses a mixed method type of research, which is a combination or integration of quantitative and descriptive qualitative research and is associated with making root cause analysis (root cause analysis) cause effect diagram (cause effect diagram) from the results of mixed method research to answer research questions t nor construction process can be processed, before it is completed by the engineering team. The output must be in accordance with the contract and the process of testing the output results takes a long time. According to Dumas et al. (2018), root cause analysis is a set of techniques that help to identify and understand the root cause of problems or events that we do not want.There are two techniques for conducting root cause analysis, namely cause-and-effect diagrams and why-why diagrams.

According to Dumas et al. (2018) Cause-effect diagrams explain the relationship between the negative effects given and their potential causes. Potential causes are divided into two, namely causative factors and supporting factors. Because of their visual appearance, cause-effect diagrams are also known as fishbone diagrams. According to Dumas et al. (2018), why diagrams or tree diagrams are another method used to perform cause analysis of the negative effects of problems on a business process. The field of quality management is known as the 5 why principle, whether answering the "why" question five times recursively, allows one to determine the root cause of a given negative effect.

According to Laudon & Laudon (2018), information systems are a series of components that have interrelated relationships in collecting, storing, processing and conveying or distributing information in supporting supervision and decision making in an organization. There have been several previous studies on project management systems related to Project Control Information Systems. One of the studies conducted by Reijers (2021) concluded that in order to make any impact on business processes, it is important to capture and characterize them in a certain way. A clear description of business processes can serve as a starting point for the design of IT systems, for organizing performance measurements, for enforcing processes by BPMS, for conducting simulation studies, and others.

In the second study conducted by Izang et al. (2016) concluded that web-based project management systems developed to solve problems and lack of communication. It is recommended that this web-based project management system should be used wherever the need to efficiently manage projects arises. The system is convenient to use, saves time and resources, and reduces stationery and labor costs.

In the third study conducted by Setiawan & Khairuzzaman (2017), a conclusion was drawn that a project management information system was created to process data from projects, Cost Budget Plan data, employee data, material data, payment data. So that management can easily and quickly find out the condition of the ongoing project.

While in this study, it was carried out with a mixed method by first comparing input data in a program called the Project Control Information System (SIPP) quantitatively to determine the root cause analysis of the problems that occur. And qualitative is carried out by direct interview method regarding the application of the program to an EPC project, after which a fishbone diagram is made based on the results of quantitative and qualitative analysis. From the results of data analysis and interviews as well as fishbone diagrams, recommendations can be produced during the process of improving data input and proposed new business processes.

METHOD

Research in this case study uses a mixed method type of research, which is a combination or integration of quantitative and descriptive qualitative research and is associated with making root cause analysis cause effect diagram from the results of mixed method research to answer research questions.

Quantitative Research

Quantitative Research on the Sorong Open Access project uses cost and progress data inputted in the Project Financial Work Plan compared to cost and progress data inputted in the Project Control Information System using Microsoft excel software, to determine the conformity value of Financial Work Plan (RKK) data inputted in the Project Control Information System (SIPP).

The formula used for this quantitative research is as follows:

1. Cost Data Suitability
   a. Percentage of RKK cost data inputted in SIPP

$$\text{Percentage of RKK cost items inputted in SIPP} = \frac{\text{Quantity of RKK cost items inputted in the SIPP}}{\text{Quantity of items cost RKK}}\% \quad \ldots\ldots (3.1)$$

   b. Percentage of RKK cost data that is not inputted in SIPP

$$\text{Percentage of RKK cost items that are not inputted in SIPP} = \frac{\text{Quantity of RKK cost items that are not inputted in the SIPP}}{\text{Quantity of items cost RKK}}\% \quad \ldots\ldots (3.2)$$

   c. The percentage of suitability of RKK cost data inputted in the SIPP

$$\text{Comparison percentage value} = \frac{\text{RKK cost items}}{\text{SIPP cost items}}\% \quad \ldots\ldots (3.3)$$

   d. After knowing the percentage value of the comparison of RKK cost items to SIPP cost items, the conformity value of the RKK cost item data input in the SIPP is calculated with the following formula:

$$\text{Cost input data suitability percentage value} = \frac{\text{Quantity of RKK cost items percentage comparison of 100\%}}{\text{Total input SIPP cost items}}\% \quad \ldots\ldots (3.4)$$

   e. The percentage of conformity of RKK cost data that is not inputted in the SIPP.

$$\text{Cost input data suitability percentage value} = \frac{\text{Quantity of RKK cost items percentage comparison of<100\%}}{\text{Total input SIPP cost items}}\% \quad \ldots\ldots (3.5)$$

2. Suitability of work progress data
   a. Percentage of RKK progress data inputted in SIPP

$$\text{Percentage of RKK progress items inputted in SIPP} = \frac{\text{Quantity of RKK progress items inputted in SIPP}}{\text{Quantity of RKK progress items}}\% \quad \ldots\ldots (3.6)$$

   b. Percentage of RKK progress data that is not inputted in SIPP

$$\text{Percentage of RKK progress items that are not inputted in SIPP} = \frac{\text{Quantity of RKK progress items that are not inputted in the SIPP}}{\text{Quantity of items progress RKK}}\% \quad \ldots\ldots (3.7)$$

   c. The percentage of suitability of RKK progress data inputted in SIPP

$$\text{Comparison percentage value} = \frac{\text{item progress RKK}}{\text{item progress SIPP}}\% \quad \ldots\ldots (3.8)$$

d. After knowing the percentage value of the comparison of RKK progress items against SIPP progress items, the suitability value of the RKK progress item data input in the SIPP is calculated with the following formula:

Progress input data suitability percentage value =

$$\frac{\text{Quantity of RKK progress items percentage comparison of } 100\%}{\text{Total input SIPP progress items}} \% \quad \text{..... (3.9)}$$

e. The percentage of suitability of RKK progress data that is not inputted in the SIPP.

Progress input data suitability percentage value =

$$\frac{\text{Quantity of RKK progress items percentage comparison of} < 100\%}{\text{Total input SIPP progress items}} \% \quad \text{.....(3.10)}$$

The results of the calculation analysis according to the formula in quantitative research are made in the form of a concise table. From the table data, it is necessary to make an explanation and interpretation of the research results to produce an appropriate and appropriate conclusion.

In this qualitative research, 12 people used the direct interview method to resource persons who had used the Project Control Information System (SIPP). Both user level as many as 5 people, direct superiors of users as many as 4 people, and upper level management as many as 3 people.

The interview process was conducted with 2 stages, the initial stage of 10 questions regarding the current business process of the Project Control Information System (SIPP) and the final stage of 3 questions regarding the proposed new business process of the Project Control Information System (SIPP) to answer research questions.

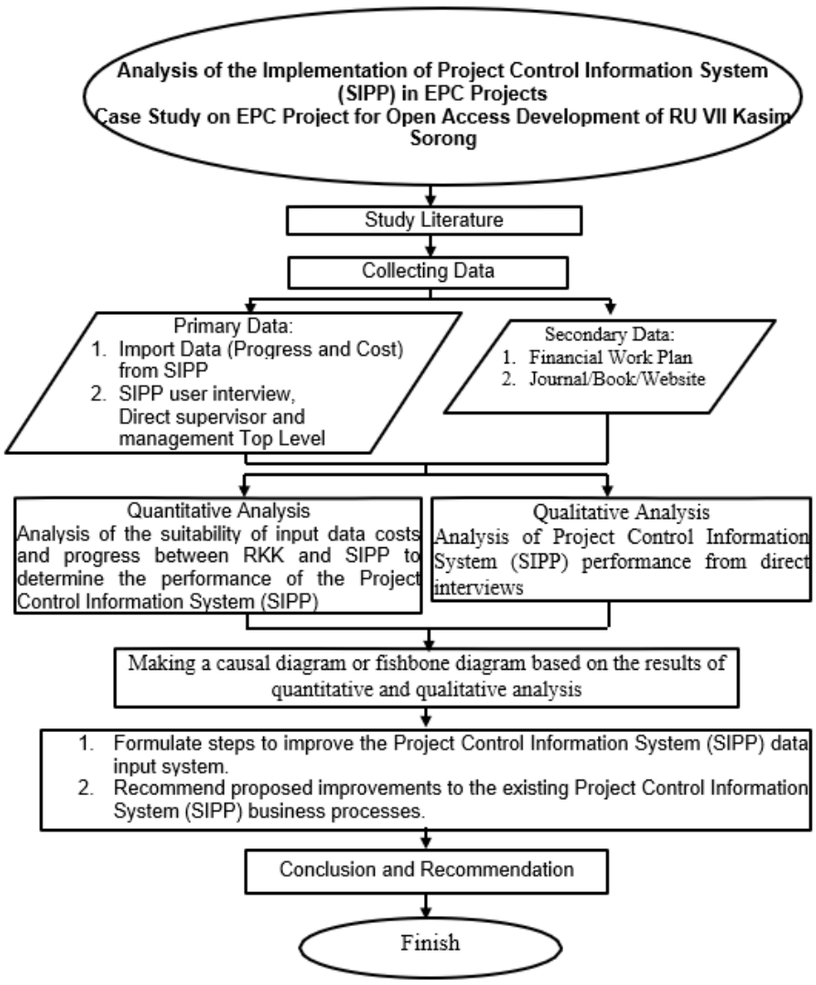

Figure 1 Research Flow Chart

Time and Place of Research

The time needed by researchers in collecting this research data is around 4 months from February to May 2023 at the Open Access RU VII Kasim project, Sorong, Southwest Papua and PT Hutama Karya (Persero) Head Office.

Researchers conducted research on the project located at PT Pertamina (Persero) Refinery Unit VII Kasim District, Sorong Regency, Southwest Papua Province and conducted interviews / interviews with users, managers / direct superiors and upper

management at the project site and PT Hutama Karya (Persero) Head Office.

Research Data Sources

The primary data for the last 3 months (December 2022, January 2023 and February 2023) is the import of Input Data (income or progress and costs) in the SIPP program at the EPC project site for the Open Access Development of RU VII Kasim Sorong. Data was taken during that period, due to problems in the payment process to subcons and vendors. The next primary data is the results of interviews or initial interviews about the current use of SIPP and interviews or interviews about proposed new business processes. Secondary data in the study are Project Financial Work Plan (RKK) reports for the last 3 months (December 2022, January 2023 and February 2023), research journals, reference books and internet websites.

Data Analysis

Data analysis is in accordance with the business process management lifecycle based on theory from Dumas et al. (2018). The business process management life cycle is illustrated as shown in figure 3.2 below.

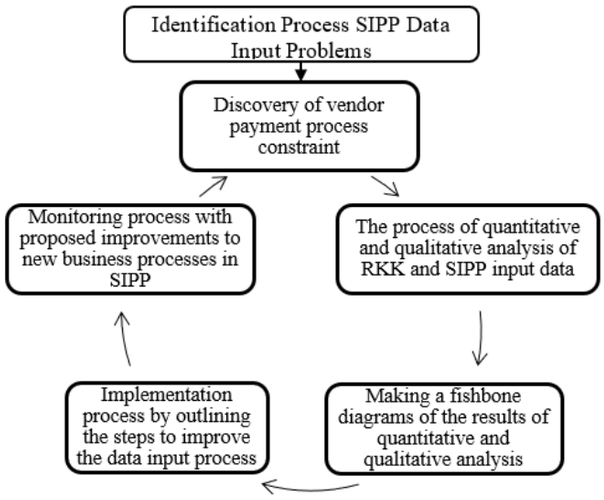

Figure 2 Lifecycle Management Business Process Improvement

ANALYSIS AND DISCUSSION

Company Profile

PT Hutama Karya (Persero) is one of the largest State-Owned Enterprises (BUMN) companies engaged in construction services and its shares are 100% owned by the Government of Indonesia. PT Hutama Karya (Persero) was established on March 29, 1961. PT Hutama Karya (Persero) has a vision, namely Indonesia's Most Valuable Infrastructure Developer as a leading infrastructure developer in Indonesia and a mission to succeed the government's mandate in building and operating the Trans Sumatra Toll Road (JTTS).

PT Hutama Karya (Persero) has a Construction Services Division, namely the General Civil Division which focuses on general civil construction (reservoirs, dams, roads, bridges, wastewater treatment plants), the Building Division which focuses on building construction (apartments, housing, offices, hotels, hospitals, campuses), and the EPC Division which focuses on the construction field of Engineering Procurement and Construction (Oil and Gas, Power Plant, Petrochemical, Plant, Refinery).

General Project Data

The EPC project for the construction of Open Access RU VII kasim, Sorong was carried out by KSO PT Hutama Karya (Persero) and PT Gerbang Sarana Baja. The main work of this project includes the construction of: 4 (four) pieces of Crude Storage Tanks (crude oil tanks) with a capacity of 110 MB and a new jetty capacity of 50,000 DWT complete with supporting facilities related to this EPC project.

Project Control Information System

Project Control Information System (SIPP) is one of the project control tools that can evaluate on business aspects such as revenue, costs, cash flow, and inventory materials. The report produced by SIPP is able to provide information that has high accuracy and produce timely records for decision making by management at the Head Office.

Operation of Project Control Information System (SIPP)

The initial steps of operating internet-based cost control on this project are as follows, first the creation of a Cost Control Master (ARP Contract) and an Analysis Master in Excel/Lotus format/program. Second, carry out the conversion process of Master Cost Control and Master Analysis into Cost Control programs using Cost Control program application facilities.

Data Analysis

Quantitative Data Analysis

For Quantitative data analysis, the author uses 2 variables, namely the comparison of cost input data and the comparison of input progress between the Financial Work Plan (RKK) data

signed by the Project Leader compared to the data inputted in the system in the Project Control Information System (SIPP).

The following is the SIPP display for data retrieval to be analyzed.

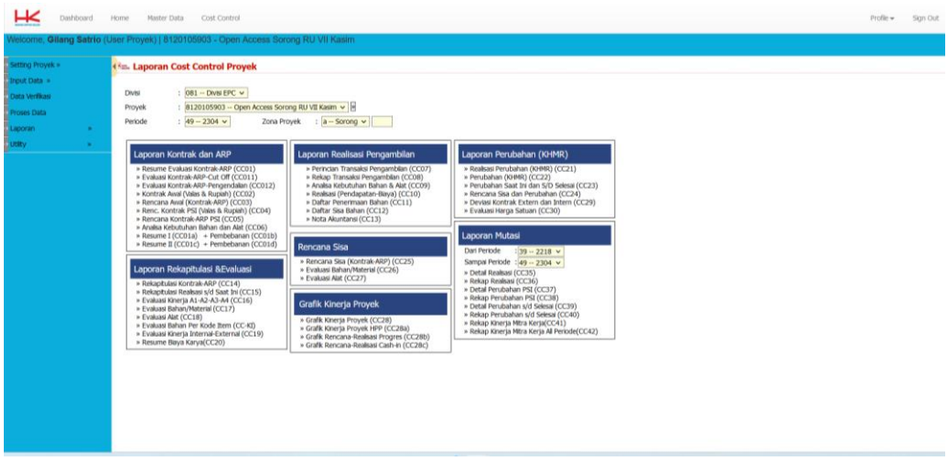

Figure 3 Display Project Control Information System (SIPP) Sorong Open Access Project

Cost Input Data Analysis of Project Financial Work Plan (RKK) vs Project Control Information System (SIPP) Input Data

In this data, the author takes data in the last 3 months of December 2022, January 2023 and February 2023 due to problems processing payments to subcons and vendors. In the 3-month period, the author refers to the system input period in the Project Control Information System (SIPP), which is a 2-week period according to the system. SIPP input data is taken from inputs in the SIPP system from the CC-10 Cost Realization form. Here are the results of some analyses for these periods.

Table 1 Percentage of RKK Data Inputted in SIPP and Suitability of SIPP Input Data for the Period 1 – 15 December 2022

No	Item	Percentage
1.	RKK cost items inputted in SIPP	42%
2.	RKK cost items that are not inputted in the SIPP	58%
3.	RKK cost items are inputted according to 100% on the SIPP	23%
4.	Input RKK cost items that do not match (<100%) on SIPP	77%

In Table 1, the percentage of RKK data inputted in the SIPP and the suitability of the SIPP input data for the period 1 – 15 December 2022 above, it can be seen that only 42% (13 items of 31 items) of the RKK data are inputted in the SIPP system and 58% (18 items of 31 items) of the RKK data are not inputted in the SIPP system. And the RKK data used as input data in the SIPP system by Project Cost Control, which experienced 100% conformity with SIPP data was 23% (6 items out of 26 items), while 77% (20 items out of 26 items) did not match the SIPP data inputted. So that of the 42% (13 items) of RKK data inputted in the SIPP system, 46% (6 items) of the data are in accordance with the SIPP data inputted.

Table 2 Percentage of RKK Data Inputted in SIPP and Suitability of SIPP Input Data for the Period 1 – 15 January 2023

No	Item	Percentage
1.	RKK cost items inputted in SIPP	10%
2.	RKK cost items that are not inputted in the SIPP	90%
3.	RKK cost items are inputted according to 100% on the SIPP	6%
4.	Input RKK cost items that do not match (<100%) on SIPP	94%

In Table 2, the percentage of RKK data inputted in the SIPP and the suitability of the SIPP input data for the period 1 – 15 January 2023 above, it can be seen that only 10% (22 items of 221 items) of the RKK data are inputted in the SIPP system and 90% (199 items of 221 items) of the RKK data are not inputted in the SIPP system. And it can be seen that the RKK data used as input data in the SIPP system by Project Cost Control, which experienced 100% conformity with SIPP data was 6% (10 items out of 168 items), while 94% (160 items out of 168 items) did not match the SIPP data inputted. So that of the 10% (22 items) of RKK data inputted in the SIPP system, 45% (10 items of 22 items) of the data are in accordance with the input SIPP data.

Table 3 Percentage of RKK Data Inputted in SIPP and Suitability of SIPP Input Data for the Period 1 – 09 February 2023

No	Item	Percentage
1.	RKK cost items inputted in SIPP	7%
2.	RKK cost items that are not inputted in the SIPP	93%
3.	RKK cost items are inputted according to 100% on the SIPP	8%
4.	Input RKK cost items that do not match (<100%) on SIPP	92%

In Table 3, the percentage of RKK data inputted in the SIPP and the suitability of the SIPP input data for the period 1 – 09 February 2023 above, it can be seen that only 7% (5 items of 69 items) of the RKK data are inputted in the SIPP system and 93% (64 items of 69 items) of the RKK data are not inputted in the SIPP system. And the RKK data used as input data in the SIPP system by Project Cost Control, which experienced 100% conformity with SIPP data was 8% (1 item out of 12 items), while 92% (11 items out of 12 items) did not match the SIPP data inputted. So that from 7% (5 items) of RKK data inputted in the SIPP system, 20% of the data is in accordance with the SIPP data inputted.

Table 4 Percentage of RKK Data Inputted in SIPP and Suitability of SIPP Input Data for the Period 10 – 23 February 2023

No	Item	Percentage
1.	RKK cost items inputted in SIPP	70%
2.	RKK cost items that are not inputted in the SIPP	30%
3.	RKK cost items are inputted according to 100% on the SIPP	88%
4.	Input RKK cost items that do not match (<100%) on SIPP	12%

In Table 4 of the percentage of RKK data inputted in the SIPP and the suitability of the SIPP input data for the period 10 – 23 February 2023 above, it can be seen that only 70% (7 items of 10 items) of the RKK data are inputted in the SIPP system and 30% (3 items of 10 items) of the RKK data are not inputted in the SIPP system. And the RKK data used as input data in the SIPP system by Project Cost Control, which experienced 100% conformity with SIPP data was 88% (7 items from 8 items), while 13% (1 item out of 8 items) did not match the SIPP data inputted. So that from 70% (7 items) of RKK data inputted in the SIPP system, 100% (7 items of 7 items) of the data are in accordance with the input SIPP data.

From the results of data processing in the 6 input periods of SIPP Cost Items (2 weeks) mentioned above, it was found that there was a discrepancy in the input of RKK data on SIPP, a conformity value of 100% of the RKK data inputted in the largest SIPP System in the input period of February 10-23, 2023 with a value of 88% and a conformity value of 100% of the RKK data inputted in the smallest SIPP System on January 1-15, 2023 with a value of 6%. As a result, it can have an impact on inaccurate reports and cost control, so that it can have an impact on decision making by management. Although the value of the total cost is still the same and appropriate, the breakdown of work items is still not appropriate.

Analysis of Project Financial Work Plan (RKK) Progress Input Data vs Project Control Information System (SIPP) Input Data

The following are the results of the comparative analysis that has been carried out by processing RKK data for the 3-month period in December 2022, January 2023, and February 2023:

Table 5 Percentage of Suitability of RKK vs SIPP Input Progress Data

No	Item	Percentage
1.	RKK progress items are inputted according to 100% in the SIPP for the December 2022 period	25%
2.	RKK progress items entered are not appropriate (<100%) in the SIPP for the December 2022 period	75%
3.	RKK progress items are inputted according to 100% in the SIPP for the January 2023 period	7%
4.	RKK progress items are inputted incorrectly (<100%) in the SIPP for the January 2023 period	93%
5.	RKK progress items are inputted according to 100% in the SIPP for the February 2023 period	0%
6.	RKK progress items are inputted incorrectly (<100%) in the SIPP for the February 2023 period	100%

From Table 5 of the percentage of conformity of RKK vs SIPP progress input data, the results of data processing in the 3 monthly periods mentioned above, there are still discrepancies in RKK data input in SIPP, the largest conformity value in December 2022 with a value of 25% and the smallest conformity value in February 2023 with a value of 0%. As a result, it can have an impact on inaccurate reports and control of progress and time. Because work items that experience delays and accelerations cannot be conveyed to the system, so it can have an impact on decision making by management. Although the total progress is still the same and appropriate, the breakdown of work items is still not appropriate.

Qualitative Data Analysis

The interview method related to the application of SIPP in the EPC Project was conducted on 12 resource persons. There were 10 initial interview questions for 12 resource persons to answer research questions.

Table 6 List of Interview Interviewees

No	Name	Position	Work Experience
Upper Management			
1.	Interviewee 1	Senior Vice President EPC II	28 Years
2.	Interviewee 2	Vice President Operasi EPC II	17 Years
3.	Interviewee 3	Vice President Engineering	16 Years
SIPP User Direct Supervisor			
1.	Interviewee 4	Project Manager	27 Years
2.	Interviewee 5	Project Manager	18 Years
3.	Interviewee 6	Project Manager	16 Years
4.	Interviewee 7	Project Manager	13 T Years
User SIPP			
1.	Interviewee 8	Cost Control Manager	17 Years
2.	Interviewee 9	Project Control Manager	10 Years
3.	Interviewee 10	Plt Manager	10 Years
4.	Interviewee 11	Site Engineering Manager	8 Years
5.	Interviewee 12	Cost Control	4,5 Years

The following is an excerpt of the answer to the initial question about SIPP to 12 speakers.

Table 7 Initial Interview Answers

No	Question	Interviewee's Answer
1.	What do you know about Project Control Information Systems (SIPP) applied to EPC Projects?	Quoting the statement of one of the 12 speakers, Mr. Informant 10 as Acting Manager in the EPC Division stated that "the cost control system implemented at PT. Hutama Karya with the principle of single entry data which in the end is the presentation of consolidated reports of both Divisions and Corporations"
2.	Since what year has SIPP been applied to EPC Projects?	Quoting the statement of one of the 12 speakers, Mr. Informant 8 as Cost Control Manager stated that "since the EPC division was established in 2013"
3.	What are the benefits, goals and objectives of SIPP that you know about?	Quoting the statement of one of the 12 speakers, Mr. Informant 2 as Vice President of Operations II stated that "Benefits: as a medium of information Control of Revenue &; Cost for Projects &; Divisions, Objectives: Intended for Projects & Operations Division, Objectives: Information on Revenue & Cost Control can be done online, making it easier to control"
4.	How is the application of SIPP when input, regarding the data needed to input and how the data collection process. Process, regarding how the role of SIPP in processing data and whether the technology applied now is adequate or sufficient to help the data processing process. And Output, about how the form of output and	Quoting the statement of one of the 12 speakers, Mr. Informant 12 as Cost Control stated that "Input: Contract Value Data, Pay Item Value for each job, Work Item (Material Resources, Wages, Tools, Subcons), Work Unit Price, Work Unit Price Analysis, and Pay Item vs Work Item. Data Collection: The data is obtained after the

	what output is produced and how the process of delivering information?	Project Plan Budget (ARP) is ratified, then the data data on the ARP is inputted as a Master SIPP which is a reference in inputting future realization, For filling realization is carried out every 2 weeks based on the realization of work in the field which has been equipped with Minutes of Work Performance Process: Data processed at SIPP can be used as a reference to evaluate project performance in terms of cost basis, quite helpful. Output: The output produced is the realization of progress and the cost of using resources on the project, the remaining plan, costs for each vendor or subcontractor, the projected cost of project completion"
5.	What are the constraints or obstacles you know in implementing SIPP on EPC Projects??	Quoting the statement of one of the 12 speakers, Mr. Informant 5 as Project Manager stated that "The implementation of the SIPP Project Control Information System needs to be redesigned related to the application of the EPC Project contract type, because there is a higher design risk than bidding, while the service provider is responsible for output performance which will have an impact on additional costs that are not offset by revenue. So that the percentage of COGS will exceed the target. In the process of inputting SIPP, costs will not be inputted when income has been generated as a whole. The application of SIPP is currently more dominant in the type of Unit Price contract"
6.	Whether the quality and quantity of employees who manage SIPP are adequate?	Quoting the statement of one of the 12 speakers, Mr. Informant 5 as Project Manager stated that "Quality: Employees who input SIPP have been equipped with inhouse training organized by the Company. Quantity: Employees with cost control positions there are 1 – 2 personnel and are sufficient in inputting"
7.	What are the supporting facilities and infrastructure of SIPP?	Quoting the statement of one of the 12 speakers, Mr. Informant 4 as Project Manager stated that "Good server and strong internet network"
8.	Whether the resulting information (output) is used as material in the Leader's decision making on the EPC Project, please explain?	Quoting the statement of one of the 12 speakers, Mr. Informant 1 as Senior Vice President stated that "It can be used as a consideration in decision making because there is a report display on SIPP that juxtaposes the condition of ARP resources and cost conditions up to the D-month, this report presents the efficiency and inefficiency of each resource item making it easier for project teams and divisions to find alternative methods for cost on the project Controlled"
9.	What is the hope in the development of SIPP in the future?	Quoting the statement of one of the 12 speakers, Mr. Informant 7 as Project Manager stated that "The control process involves each part that requires each individual user (Logistics, Procurement, Cost Control, SEM, SAM, PM) to further strengthen the control process"
10.	Is SIPP better than other existing software, such as SAP, ERP and so on?	Quoting the statement of one of the 12 speakers, Mr. Informant 10 as the Acting Manager of the EPC Division stated that "SIPP is better than other control tools in terms of leniency in the data process, but from the other side SIPP is still not better than SAP. In SIPP, there is no need for a

		contract value to the vendor to input, on the contrary, if SAP starts from the beginning of input, everything has been clearly mapped."

There are 3 final interview questions to answer the research question, namely how to improve data input from existing SIPP business processes and new business process proposals from SIPP using qualitative matrices (interview methods or interviews on accuracy, flexibility, time).

Table 8 Final Interview Answers

No	Question	Interviewee's Answer
1.	Based on quantitative results, the percentage of comparison of RKK vs SIPP data suitability is still small in the last 3 months (research material) in the Sorong Open Access project with detailed suitability of cost input data in December 2022 period 1 of 23%, period 2 there is no input data. The suitability of January 2023 period 1 input data is 6%, period 2 is not input data. The suitability of cost input data for February 2023 period 1 is 8%, period 2 is 88%. And the suitability of input progress data in December 2022 is 25%, January 2023 is 7% and February 2023 is 0%. According to you, the percentage of suitability of RKK input data in SIPP is small due to what, please elaborate?	In the first question, the researcher quoted the statement of Mr. Informant 12 as the SIPP Cost Control User one of the speakers above "If what is meant is input for work items, the suitability of RKK input data on SIPP is small due to items The realization of work is very different from the Master SIPP made at the beginning, because many items have changed from the SIPP Master as a result of the engineering process still running simultaneously with the progress of work in the field. So that what is used as a reference is the conformity of the total value between RKK and SIPP"
2.	According to you, What are the corrective steps needed in the process of inputting RKK data in the System at SIPP so that the percentage value of conformity of RKK and SIPP is 100%?	In the second question, the researcher quoted the statement of Informant 5 as Project Manager / SIPP User Manager one of the resource persons above, The improvement step is first, Better Training and Understanding: Ensure the project team (Cost Control) can understand well how to use SIPP and input data correctly. Conduct comprehensive training for all users involved in the data input process, including administrative staff, project managers, and other team members. Ensuring a good understanding of the purpose, needs, and procedures of data input will reduce errors and increase the percentage of suitability. Second, Data Standardization and Consistency: Set clear guidelines and standards for inputting RKK data on SIPP. Make sure all team members follow these guidelines consistently. This includes the format, category, and unit used in data input. With strict standardization, it will be easier to compare RKK with data inputted into SIPP and increase the percentage of conformity. Fourth, Data Inspection and Validation: Perform regular checks on the data inputted into the SIPP to ensure accuracy and consistency. Check whether the CTR data has been entered correctly and whether the relevant information has been recorded completely. Data validation is also important to ensure that the data inputted complies with system requirements and that there are no significant errors or omissions. Fifth, Effective Collaboration and Communication: Increasing the percentage of conformity between RKK and SIPP also requires effective collaboration between project team members and related parties. Make sure there are open and clear channels of

		communication so the team can discuss, share information, and clarify any needs or changes that may occur. Good communication will help minimize misunderstandings and improve compatibility between RKK and SIPP. And sixth, Continuous Evaluation and Improvement: Conduct regular evaluations of the RKK data input process at SIPP. Identify areas that require improvement and take necessary action. Continuous improvement will ensure that the data input process is continuously improved to achieve a higher percentage of suitability."
3.	According to you referring to question number 2, the proposal for a new business process from the Current SIPP Business Process (attached), so that the input process has 100% compatibility between RKK and SIPP?	In the third question, the researcher quoted the statement of Informant 5 as Project Manager / SIPP User Manager one of the resource persons above "To achieve a percentage value of RKK and SIPP conformity of 100%, in accordance with question no 2. The closest step needed is to check by the Project Manager and ensure the suitability of data from the Procurement/Warehouse team before input is made on the SIPP Application. This can be done by recording and recapitulating relevant information in an Excel sheet or application worksheet. Checks by the Project Manager will ensure that the RKK has been implemented correctly in the SIPP, while the Procurement/Warehouse team will verify the match between the data inputted and the reality in the field. By systematically checking and validating data, we can increase the level of accuracy and ensure optimal conformity between RKK and SIPP, approaching a 100% conformity percentage. The flow chart above has illustrated a good input proposal, and it would be better if evaluated periodically".

Project Control Information System Fishbone Diagram

Fishbone diagram analysis based on quantitative and qualitative methods in the application of Project Control Information System as shown in figure 4 below.

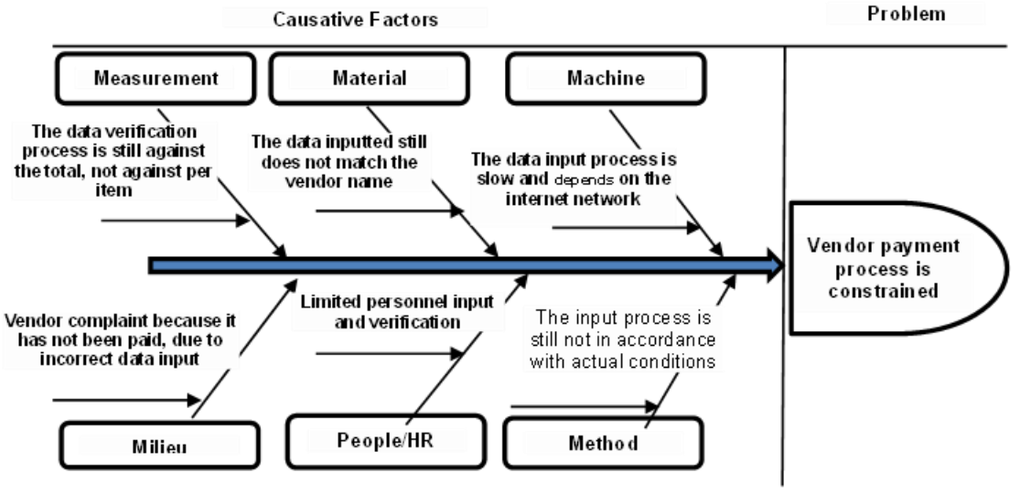

Figure 4 Fishbone Diagram of Sorong Open Access Project Control Information System Problems

In figure 4 of the Fishbone diagram above, the cause of the problem is described as the payment process of subcontractors or vendors constrained due to data inputted in the Project Control Information System (SIPP), namely first, the method: The data input process is still not in accordance with actual conditions. Second, humans: Limited personnel input and verification; Input personnel have not understood the procedure. Third, environment: Vendors or subcontractors complain because they have not been paid due to data input errors. Fourth, machine: The data input process is slow and depends on the internet network. Fifth, material:

The data inputted still does not match the vendor name. And sixth, measurement: The data verification process is still against the total, not against per work item.

Formulate Steps To Improve The Data Input System

Based on the results of qualitative descriptive analysis of, corrective steps can be made in the Data Input System. The improvement steps are first, when carrying out the input process, cost control and checking by the Project Head and the procurement, construction and engineering teams to ensure that the data to be inputted into the Project Control Information System must be in accordance with the Financial Work Plan data that has been authorized by the Project Head. Second, cost control ensures that the vendor name is in accordance with what is realized. Third, cost control routinely inputs every 2-week period, both revenue and cost progress. Fourth, the head of the project and the procurement, construction and engineering teams need to check and verify again the data that has been inputted by cost control, so that the data that has been inputted is appropriate. Fifth, after the data input process by the project team, the cost control admin team in the Division must check the details per each work item, vendor name, and total progress of revenue or costs. Sixth, if discrepancies are found, the data that has been inputted can be rejected by the Division cost control admin and re-inputted. Seventh, after a rejection by the Division's cost control admin, the project team immediately re-inputs according to actual conditions according to the Financial Work Plan report. Eighth, if there is still an error, the Division's cost control admin team gives a warning and calls to the Head Office, for a directly supervised input process. And ninth, the data input process that has been verified together and is appropriate, can be used to process payments to vendors.

Proposed Business Process Changes in Project Control Information System (SIPP)

Based on the results of Quantitative and Qualitative Analysis in the period December 2022, January 2023 and February 2023, there are still discrepancies in inputting data from the Financial Work Plan (RKK) inputted into the Project Control Information System program. The conformity score is still relatively small, so changes in business processes are needed. So that the data inputted can have a 100% conformity value, so that upper management can make the right decisions for projects in Engineering Procurement and Construction (EPC).

Here's a look at proposed changes to new business processes.

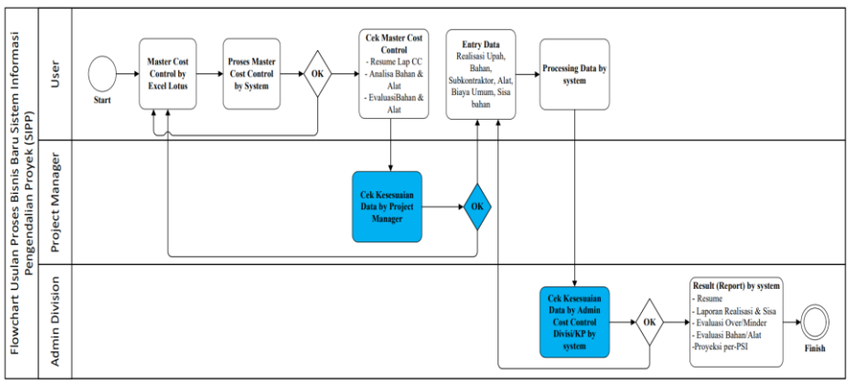

Figure 5 Flowchart of New Business Process Proposal Project Control Information System (SIPP)

The proposed new business process in figure 5 is mainly blue items, adding 1 process activity before Data Entry is carried out, namely the data conformity check process by the Project Manager and 2 activities after data processing occurs, namely the data conformity check process by the Division or Head Office cost control admin on all work items inputted in the SIPP compared to RKK data. It is expected that the data input process can be 100% compliant and the payment process to subcons and vendors will not have problems. So that work at the project site does not experience delays due to no payment to subcons or vendors.

CONCLUSION

From the research conducted using a combined quantitative and descriptive qualitative mix of methods on the data input process at SIPP. From the results of quantitative analysis, the suitability value of cost input data and progress in December 2022, January 2023 and February 2023 is still small (<100%). As a result, it can have an impact on inaccurate reports and control costs and progress (time / schedule). Because work items that experience increased costs and progress are not appropriate, so that it can have an impact on decision making by management. Although the total cost and progress are still the same and appropriate, the breakdown of work items is still not appropriate. In this case study in the Sorong Open Access Project, the Project Control Information System program has not been effective, because the conformity value of data input is still small (not reaching 100%).

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February 2023 is still small (<100%). As a result, it can have an impact on inaccurate reports and control costs and progress (time / schedule). Because work items that experience increased costs and progress are not appropriate, so that it can have an impact on decision making by management. Although the total cost and progress are still the same and appropriate, the breakdown of work items is still not appropriate. In this case study in the Sorong Open Access Project, the Project Control Information System program has not been effective, because the conformity value of data input is still small (not reaching 100%).

Based on qualitative descriptive results with interview method to 12 resource persons regarding the proposal for new business process improvements for Project Control Information System is the addition of 1 activity during the data entry process, with checking by the Project Manager and Procurement, Construction and Engineering teams. And the addition of 2 additional activities after data processing, namely checking by the Division / Head Office team, if appropriate will go directly to the final process, and if not appropriate will Return to the Data Entry activity.

Based on the limitations of the study and suggestions from researchers for further research are as follows the results of this research can be followed up with studies on projects other than EPC that may have similar problems. After the data input process, it is necessary to further check the suitability of the data inputted in the Project Control Information System (SIPP) to make it more valid and effective.

REFERENCES

Ariani, D. W. (2017). *Manajemen dan Strategi Operasional*. Tangerang Selatan: Universitas Terbuka.

Arianie, G. P., & Puspitasari, N. B. (2017). *Perencanaan Manajemen Proyek Dalam Meningkatkan Efisiensi Dan Efektifitas Sumber Daya Perusahaan* (Studi Kasus: Qiscus Pte Ltd). J@ti Undip : Jurnal Teknik Industri, 12(3), 189.

Condrobimo, A. R. (2023, Mei 04). *Cara Meningkatkan Bisnis dengan Sistem Informasi – School of Information Systems*. https://sis.binus.ac.id/2021/04/20/cara-meningkatkan-bisnis-dengan-sistem-informasi/

Creswell, J. W., & Creswell, J. D. (2018). Research Design: *Qualitative, Quantitative, and Mixed Methods Approaches*. Los Angeles: Sage publication.

Datekno. (2023, Mei 23). *Cara Membuat Diagram Fishbone Di Word*. https://www.datekno.com/2023/02/cara-membuat-diagram-fishbone-di-word.html

Dumas, M., La Rosa, M., Mendling, J., & Reijers, H. A. (2018). *Fundamentals of Business Process Management.* Springer Berlin Heidelberg.

Husen, A. (2009). *Manajemen Proyek*. Yogyakarta: Andi Offset.

Hutama Karya. (2015). *Materi sosialisasi implementasi program SIPP PT Hutama Karya (persero)*. Jakarta.

Hutama Karya. (2022, Desember 28). *Sejarah Perusahaan.* https://www.hutamakarya.com/sejarah-perusahaan

Jacobs, F. R., & Chase, R. B. (2018). *Operations and supply chain management (Fifteenth edition)*. McGraw-Hill Education.

Kale, S., Shewale, A., Sarang, P. J., Pawar, P. S., Sadruddin, S., & Scholar, U. (2017). *Project Management System (PMS).* International Journal of Engineering Development and Research (www.ijedr.org).

Laudon, K. C., & Laudon, J. P. (2018). *Management information systems managing the digital firm (Fifteenth edition).* Pearson Education.

Novitasari, D. D. (2022). *Manajemen Operasi Konsep dan Esensi.* Yogyakarta: STIE Widya Wiwaha.

O'Brien, J. A., & Marakas, G. M. (2011). *Management information systems (10th ed).* McGraw-Hill/Irwin.

Project Management Institue. (2021). *The standard for project management and a guide to the project management body of knowledge (PMBOK guide) seventh edition*. Pennsylvania: Project Management Institute

Reid, R. D., & Sanders, N. R. (2013). *Operations management (5th ed).* John Wiley & Sons.

Reijers, H. A. (2021). *Business Process Management: The evolution of a discipline.* Computers in Industry, 126, 103404.

Rusdiana & Irfan, D. (2014). *Sistem informasi manajemen*. Bandung: Pustaka Setia.

Santosa, B. (2009). *Manajemen proyek konsep dan implementasi (pertama).* Yogyakarta.

Setiawan, H., & Khairuzzaman, M. Q. (2017). *Perancangan Sistem Informasi Manajemen Proyek : Sistem Informasi Kontraktor*. 2.

Sujanawati, R. P., Er, M., & Wibowo, R. P. (2021). *Analysis of Business Process Management (BPM) Effect towards Data and Information Quality Improvement at Higher Education: A Literature Study*. IPTEK The Journal for Technology and Science, 31(3), 353.

Tulembayev, A., Adilova, A., Serikbekuly, A., Seidaliyeva, D., & Shildibekov, Y. (2020). *The effectiveness of the project management application analysis in the Kazakhstani defense industrial complex holding*. Problems and Perspectives in Management, 18(3), 141–149.

Watson, R. T. (2007). *Information system.* Athena, Georgia, Amerika Serikat: University of Georgia.