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Design And Building Of The Utility Performance Monitoring System At PT. XYZ With Brainstorming Method

Kadek Suarjuna Batubulan [1)]*, Mungki Astiningrum [2)], Dika Rizky Yunianto[3)], Deddy Kusbianto Purwoko Aji[4)]
[1,2,3,4)] Information Technology Department, State Polytechnic of Malang

Corresponding Author
Email : kadeksuarjuna87@polinema.ac.id

Abstract
In general, utilities in engineering are devices or systems designed to provide basic needs or to help complete certain jobs or processes. In engineering, utilities generally refer to systems or devices designed to provide basic needs such as electricity, water, gas, or telecommunications. At PT. The brainstorming method is used to produce creative ideas that can be applied in developing utility monitoring systems. Various ideas are generated through discussion and debate between brainstorming participants. Then, these ideas are analyzed and selected to select those that best suit PT XYZ's needs. Therefore, the author created a utility performance monitoring system to make it easier for the engineering department to carry out work activities. This utility performance monitoring system was created using a JavaScript framework, namely AngularJS for the frontend and ExpressJS for the backend. Apart from that, the author also tested PT XYZ employees so that the system runs according to needs. Of the 10 respondents, more than 50% of the accumulated respondents stated that the utility performance monitoring system application was running satisfactorily and very satisfactorily, there were 10% to 30% of respondents who stated that it was running well and 10% of respondents said it was not working well. Based on the test results above, it was found that the utility monitoring system at PT XYZ could be categorized as a fairly informative information system for the engineering department.

Keywords: Information Systems, Monitoring, Brainstorming

INTRODUCTION

The era of globalization 4.0 is an era marked by very rapid technological developments, especially in the fields of information and communication technology. This era is also marked by increasingly widespread interconnections between countries and increasingly stronger economic integration (Ariesani Hermawanto & Melaty Anggraini, 2020). The industrial sector is one of the fields affected by the era of globalization 4.0 because rapid technological developments have brought major changes in the industrial method of running its business. Information and communication technology has changed industrial methods in processing data, managing supply chains, and communicating with customers (Syahputri et al., 2020).

For example PT. XYZ, which has implemented IoT (Internet of Things) in the engineering department in the utility division, is an example in the industry of applying the latest technology to optimize machine performance (Ipak Ayu, 2021). By connecting electronic devices and machines online, PT. XYZ can monitor machine performance in real-time, predict damage before it occurs, and repair detected problems more quickly so as to increase operational efficiency and productivity.

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At PT. XYZ utility is a division of the engineering department which has the task of monitoring healthy assets, KPI (Key Performance Index), machine monitoring and maintenance reports. This company actually already has a machine monitoring system in the division, but this system only monitors machines and does not cover all the monitoring needs in the division and the machine monitoring data in the system is still difficult for ordinary people to read and understand. Therefore, the author wants to design a utility performance monitoring system to make it easier for the utility division to monitor and the data obtained from the machine can be easily read by ordinary people.

RESEARCH METHODS

Software Requirement Elicitation is the process of finding out the requirements for an intended software system by communicating with clients, end users, system users, and other people who have a hand in software development. There are various methods used to obtain software requirements data such as brainstorming (Indra Rianto, 2021).
Brainstorming is a planning tool that can accommodate group creativity and is often used as a training tool to generate ideas (Ch Desi Kusmindari et al., 2017). The brainstorming stages are as follows:

a. The leader explains the problem
   The leader of the brainstorming meeting explains the problem being faced and explains to the participants how to participate in the brainstorming. The leadership has previously made preparations to find facts about the problem at hand and must provide an introduction to the participants about the nature of the problem (Ch Desi Kusmindari et al., 2017).
b. Brainstorm
   After the leader explains the problem, the next stage is brainstorming. This stage of brainstorming is carried out by looking for key product design problems and discussing them (Wijaya Kusuma Nasution, 2022).
c. Make a mind map
   After the brainstorming stage is carried out, the results of the thoughts and ideas generated by each group member regarding the problems that have been discussed are described using a mind map with the aim of clarifying the ideas/ideas and thoughts produced by each group member related to the problems discussed. (Wijaya Kusuma Nasution, 2022).
d. Determine the final result of the product design
   The final stage of this research method is determining the final product design result. Determining the final result of this product design is obtained from the final decision of ideas/thoughts (Wijaya Kusuma Nasution, 2022).

RESULTS AND DISCUSSION

Implementation Brainstorming

The Leader Explains The Problem

The PT XYZ project leader explained a general description of the needs to the author. The discussion forum documentation is as follows:

Picture 1 Image Of Brainstorming With Project Leader

Based on Picture 1, the results show that the project leader stated that PT XYZ needed a dashboard for monitoring data from machine input and checksheet input which was previously done manually by PT.

Brainstorming

After the project leader explains the general description of the system requirements to be created, the next step is to conduct a brainstorming which is attended by several leaders from other departments. Like the following picture::

Picture 1 Picture Brainstorming With Multiple Departments

Based on Picture 2, the results show that this utility performance monitoring system can not only monitor data and checksheet input but can also monitor KPI (Key Performance Index), healthy assets, maintenance reports and training reports.

Make *Mind Mapping*

After finding the needs, the author created a mind map to make it easier to implement the features and technology used. The mind map of the features and technology used:

1. Implementation *Mind Map* Feature

Picture 2 mind map of the features to be created

Based on Picture 3, the author has summarized all the needs for PT XYZ in the form of a mind map so that it is easy to understand.

2. Implementation Mind Map Technology

Picture 3 Mind map of proposed technology

Based on Picture 4, the author suggests that the technology used is Laravel with tailwindcss style and mysql for the database.

Determine the results of product design

Before the author implements it into the system, the author brainstorms with the project leader to determine needs, as in the following picture:

Picture 5 predetermined technology mind map

Based on Picture 5, the results show that the technology used is Angular and Bootstrap for the frontend, while ExpressJS is for the backend and there are no changes to the database.

Implementation of data collection and processing

The data in the utility performance monitoring system is data that comes from checksheet input and actual data from the machine. Then a backend program will be created to bridge the data and visuals.

Interface implementation

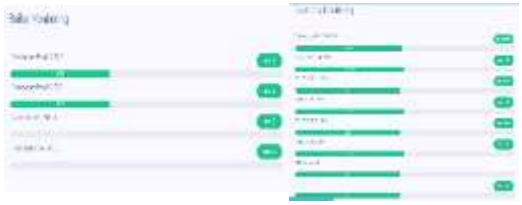
Implementation of the utility performance monitoring system using a JavaScript framework such as AngularJS for the frontend and ExpressJS for the backend. The following is an example of implementing a utility monitoring system at PT:

Picture 6 Example of home and PDM displays

Based on Picture 6, the home display (picture on the left) has real-time data and if the value of the machine exceeds the standard, it will send a telegram notification. Meanwhile, PDM (Predictive Maintenance) (on the right) or Predictive maintenance is the health of the machine for each section.

Picture 7 Example of displaying healthy assets and telegram notifications

Based on Picture 7, the healthy asset display (picture on the left) is a summary of the health of the machine from all sections and the telegram notification (on the right) is a notification if the machine exceeds the maximum limit value that has been determined.



Picture 8 Example of realtime detailed display of good data

Based on Picture 8, it is a detailed display of real-time data from machines that are good or do not exceed the limit so they have a green color.

Picture 9 Example of displaying real-time danger and bug details

Based on Figure 9, a detailed display of realtime data danger (picture on the left) is a detail of realtime data that has a value that exceeds the maximum limit. Meanwhile, realtime data bugs/errors (on the right) are displays where realtime data cannot be displayed.

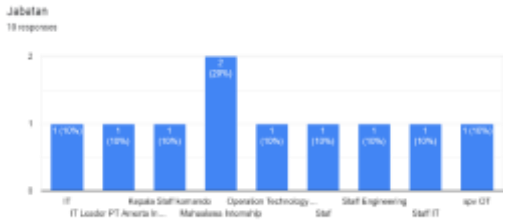
Testing

This test will test whether the utility performance monitoring system application can be accepted by users using the UAT (User Acceptance Testing) method because the system created by the author is a new system so as to find out whether it is in accordance with PT XYZ's needs or not. Testing is carried out by conducting a questionnaire via Google Form. The following is a list of questions from testing the feasibility of the monitoring system:

Table 1 List of Questions

Number	*Questions*
1.	Does the utility monitoring system meet the specified goals and needs?
2.	Can the utility monitoring system provide accurate and timely information about the condition and performance of the utility?
3.	Can the utility monitoring system be relied upon to identify and provide warnings about problems or threats that may occur?
4.	Does the utility monitoring system have the ability to integrate with other management systems (e.g. performance monitoring systems, asset management systems, etc.)?
5.	Does the utility monitoring system have the ability to organize and manage the collected data effectively and efficiently?
6.	Does the utility monitoring system have the ability to monitor performance and manage risk effectively?
7.	Does the appearance of the dashboard comply with standards?

Based on the list of questions from Table 1, 10 respondents out of 13 people were involved in working on this utility performance monitoring system. The job graph of respondents to the utility performance system feasibility test is as follows:



Picture 10 Number of respondents by position

Based on Picture 10, we found 10 respondents, namely 3 people from the IT team (IT, IT Staff and IT Leader), 2 people from the Operation Technology team (OT Section Head and SPV OT), 3 people from the engineering department (Staff, Engineering Staff and Chief of Command Staff) and 2 internship students from Malang State Polytechnic as the next utility system developers. According to respondents, they have various answers and opinions as follows:

Picture 1 1st UAT answer results

Based on Picture 11, the results show that 50% think that this utility performance system is satisfactory, 20% think that this system is very satisfactory and sufficient and 10% think that this system is still lacking. Then the second question has the following results :

Picture 2 2nd UAT answer results

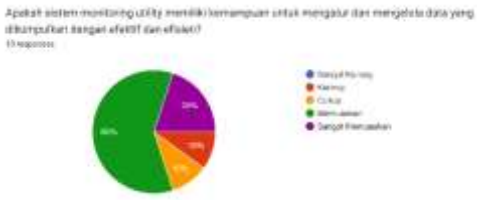
Based on Picture 12, the results show that 60% think that this utility performance system is satisfactory, 20% think that this system is very satisfactory, 10% think that this system is sufficient and still lacking. Next, the third question has the following results :

Picture 13 3rd UAT answer results

Based on Picture 13, the results show that 50% think that this utility performance system is satisfactory, 20% think that this system is very satisfactory and sufficient and 10% think that this system is still lacking. Then the fourth question has the following results:

Picture 14 4th UAT answer results

Based on Picture 14, the results show that 40% think that this utility performance system is satisfactory, 30% think that this system is sufficient and 20% think that this system is very satisfactory and 10% think that this system is still lacking. After that, the fifth question had the following results :

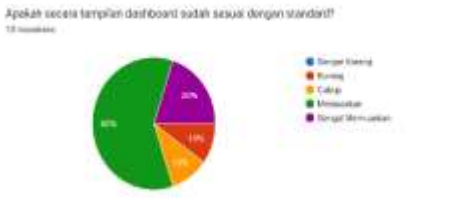


Picture 5 5th UAT answer results

Based on Picture 15, the results show that 60% think that this utility performance system is satisfactory, 20% think that this system is very satisfactory, 10% think that this system is sufficient and still lacking. Furthermore, the sixth question has the following results:

Picture 16 6th UAT answer results

Based on Picture 16, the results show that 50% think that this utility performance system is satisfactory, 20% think that this system is very satisfactory and sufficient and 10% think that this system is still lacking. Meanwhile, the last question has the following results :



Picture 17 7th UAT answer results

Based on Figure 18, the results show that 60% think that this utility performance system is satisfactory, 20% think that this system is very satisfactory, 10% think that this system is sufficient and still not enough.

Results

Based on the results of testing the feasibility of the monitoring system, it was found that 20% of respondents stated that it was very satisfactory, then there were around 40% to 60% of respondents who stated that the application was running satisfactorily. Apart from that, 10% to 30% of respondents stated that the application was running quite well and 10% of respondents stated that the monitoring system application was still not running well.

Discussion

Based on the results of the tests that have been carried out, the following are the results of the discussion obtained:

1. This system was created using the JavaScript framework language, namely AngularJS for the frontend and ExpressJS as the backend.
2. There are two data sources used in this system, namely input via the checksheet application and real-time data from the machine directly.
3. Based on the test results of the utility performance monitoring system, it shows that even though there are bugs in real-time data, the system still runs well with a temporary solution, namely reloading the browser page.
4. Based on the results of testing the feasibility of the monitoring system, more than 50% of the accumulated respondents stated that the utility performance monitoring system application was running satisfactorily and very satisfactorily, there were 10% to 30% of respondents who stated that it was running well and 10% of respondents stated that it was not working well.

CONCLUSION

The author has succeeded in creating a utility performance monitoring system specifically for PT XYZ. This system was built using the JavaScript framework language, namely AngularJS for the frontend and ExpressJS as the backend. Even though the utility performance monitoring system program has been running well, there are several bugs that still need to be fixed, but this does not affect the overall performance of the application. The results of testing the feasibility of this monitoring system involved several employees of PT Thus, it is important to continue developing this utility performance monitoring system in order to achieve more optimal and satisfactory performance and appearance for PT XYZ. Future research can start from improving and completing existing deficiencies in the system and the author hopes that future research on this system can be developed on a website or mobile basis if needed by the company

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