



DESIGN OF ASPHALT MIXING PLANT INDUSTRY INFORMATION SYSTEM

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ABSTRACT

Asphalt mixing plant is a production equipment that produces hot mix in the form of a mixture of asphalt with some aggregate materials used as road pavement materials. The asphalt mixing plant produces hot mix which must be at a certain temperature so that it does not harden and cannot be used for road pavement. The accuracy in the delivery time of the product to the location where it will be held determines the quality of the production after it is held on the road media. The existence of an information system is a tool for controlling production costs, in this case hotmix products produced from asphalt mixing plant machines are needed to monitor every production process from several departments that have been worked on so that data management can be done quickly and accurately. Seeing the existing problems, this research aims to design and build an industrial information system for the asphalt mixing plant at PT. Wasis by Nugraha. Tools used in making this system is Visual Basic. The application design method uses the ProtoTyping method. The results of this study are that with the design and construction of an industrial information system for the asphalt mixing plant at PT. Wasis Karya Nugraha received a very good category in the functional suitability aspect and a very appropriate predicate in the usability aspect in helping to overcome conventional system problems in the administration of raw material procurement to the production process, sending finished products to consumers and financial reporting which can be caused by human error.

Keywords: asphalt mixing plant; functional suitability aspect; prototyping method; usability aspect

INTRODUCTION

Asphalt mixing plant is a set of mechanical and electronic equipment where the aggregate (raw material) is heated, dried and mixed with asphalt to produce hot mix asphalt that meets certain requirements (Ammann-group, 2022). The asphalt mixing plant (AMP) industry as an industry that produces hot mix asphalt is one of the supporting factors for the development of the construction sector (Wardani, Thanaya, Astana, & Yana, 2019). As long as development activities in the construction sector are rolled out, during that time the AMP processing business will continue to operate. In order to be able to operate sustainably, business actors in the Asphalt Mixing Plant industry must be able to operate their production machines effectively and efficiently so that the resulting hot mix products are able to compete with competitors both in terms of price and quality (amp.co.nz, 2021). The existence of an information system is important to support the production process from raw material processing to finished products (Tukino & Hilabi, 2020).

Information technology can automate the process of managing information from entering information, storing and updating it at any time so that everyone can get the latest information and carry out analysis easily (Florén, Frishammar, Lee, Ericsson, & Gustafsson, 2013). The role of Information Technology (IT) as part of Information Systems (IS) has undergone dramatic changes. Currently, IT is not only expected as a supporting tool for organizational activities but is already part of an organization's strategy to achieve its goals (SEVRANI,

Kordha, & Gorica, 2011). However, the problem nowadays is how to align business strategy and information technology strategy.

One of the factors driving the use of information systems in organizations is the increasing need for the business functions being carried out (Nursanti, Madani, & Abdi, 2022). The impact of all this is that many organizations are competing to implement information systems with their technology by only paying attention to immediate needs and allowing the application of overlapping information systems and the existence of several different systems from one another. On the other hand, cost control is an important instrument to support the success of a business engaged in the industrial sector (Novianty, 2021). Jobs in the industrial sector require optimal production capacity and quality provisions for each work item as well as full supervision from various parties involved in the implementation of the production process (Rinaldo, 2021). Accuracy in completing work in accordance with the scheduled schedule and in accordance with the work specifications specified in the work contract is an important element in the assessment of industrial work which has an impact on the level of consumer confidence (Badan Pengembangan Sumber Daya Manusia Rakyat Kementerian Pekerjaan Umum dan Perumahan, 2016). Controlled costs in the realization of production implementation will affect the profitability of the industry being run without neglecting the quality and timeliness of production completion. Production results from consumer requests must be in accordance with the agreed product specifications so that it requires data management that requires precision and accuracy so that the products produced are expectations (Ramadhan & Nurleli, 2023).

The prototype model is a model that can be used to build a system incrementally, by building a series of prototypes and constantly adapting them to user needs (Purnomo, 2017). Prototype is the initial version of the working model that is being built for the offered information system (Wulandari, Bahar, Arfananda, & Apriyani, 2021). Prototype and RAD (Rapid Application Development) can also be used as an alternative method of SDLC (System Development Life Cycle). The design of the system to be developed can use the prototype model. The prototype model is suitable for developing a device that will be redeveloped (Juman, 2020). Often a user defines a general set of goals for the software, but does not identify detailed input, processing, or output requirements. In other cases, the developer may not have any certainty about the efficiency of the algorithm, the adaptability of the operating system, or the forms that human-machine interaction should take. In this situation, one suitable model is the prototype model (Deris, Omatu, & Ohta, 2000).

McLeod and Schell (2001) suggest that the reasons for users and information specialists liking the prototype model are: (1) Communication between systems analysts and users improves; (2) Analysts can work better in finding user needs; (3) Users play a more active role in system development; (4) Information specialists and users spend less time and effort in developing the system; (5) Implementation becomes easier because the user knows the expected system (Ekowati & Darsini, 2015). PT. Wasis Karya Nugraha is a private company engaged in the Asphalt Mixing Plant industry located in Donojayan Merdikorejo, Tempel District, Sleman Regency, Yogyakarta. Based on the results of observations and interviews with related parties, namely the section head and site manager, currently PT. Wasis Karya Nugraha has not implemented an integrated and centralized information system because the system has not been automated and is still done manually. The existing information system is experiencing obstacles in its development because the system is not aligned with the ongoing business processes and is made to meet the needs of each part only. This has an impact on it takes a long time to process organizational data, access to organizational data cannot be done in real-time and being an

obstacle for management in data transparency, all users who have access to the system cannot see all the most up-to-date information whenever needed even though the information is inputted by other users. In order to meet these needs, an integrated system is needed, and is able to keep up with changes in business processes that occur. The purpose of this research is to produce a desktop-based application program that can be used to facilitate business management in the Asphalt Mixing Plant industry using the ProtoTyping method.

METHOD

This research is Research and Development (R&D) research. The researcher conducts research first to collect the amount of data needed, then develops the system and tests and evaluates the system created. The subject of this research is PT. Wasis Karya Nugraha which is located in Donojayan Merdikorejo, Tempel District, Sleman Regency, Yogyakarta. Models in this research approach that will be used in this study is to use the Prototyping model, in which the prototyping model is one of the models that is suitable for system development. Prototyping is a software development method, in the form of a physical working model of the system and serves as an initial version of the system.

A prototype is an initial sample, model, or product release built to test a concept or process to convert the various abstract properties of an idea into something more tangible or similar to the actual result. System prototyping aims to collect information from users so that users can interact with the prototype model being developed because the prototype describes the initial version of the system so that the user has a clear picture of the system that the development team will build. Prototypes are much quicker to build than finished implementations, so we can evaluate them quicker and get quicker feedback on the good and bad of a design.

Following are the prototype stages in system development (1) requirements gathering and analysis, the initial stage of the prototype model starts with a needs analysis. In this stage the system requirements are defined in detail. In the process, the client and the development team will meet to discuss the details of the system as required by the user. Analysis is carried out to find out what components are in the running system, which can be in the form of hardware, software, network and system users as the end user level of the system. The next step is to collect the information needed by end users which includes the costs and benefits of the system being built or developed. System requirements analysis defines system requirements in the form of system inputs, system outputs, processes that run in the system and the database used. (2) Quick design, the second stage is making a simple design that will give a brief description of the system you want to make. A new design can be made if the requirements from the user are known. After that, design can be made based on requirements gathering and analysis in stage 1. (3) build prototypes, after the quick design is approved by the user, the next stage is the actual prototype development which will be used as a reference for the programmer team for making programs or applications. (4) user evaluation, after the prototype is made, the next stage is the evaluation stage by the user. At this stage, the system that has been created in the form of a prototype is presented to the client for evaluation. Furthermore, the user will provide comments and suggestions on the prototype that has been made. Prototypes are made much quicker than ready-made system implementations, so users can evaluate them more quickly and provide quicker evaluations of good and bad designs. (5) refining prototypes, the refining stage is the prototype improvement stage based on the results of client feedback in stage 4. If the user does not have a revision record of the prototype made, then the team can continue at stage 6 for product implementation. If the client has notes for system improvement, then phases 4-5 will continue to be repeated until the client agrees with the system to be developed. (6) implement product and maintain, after the improvements in stage 5 are approved by the client, then the

next is the implementation and maintenance stage. In this final phase, the product will be made by programmers based on the final prototype. Furthermore, the system will be tested and handed over to the client and the maintenance phase so that the system runs smoothly without problems. Data collection techniques are the most strategic steps in research, because the main purpose of research is to obtain data. Without knowing data collection techniques, researchers will not get data that meets the established standards. The data collection techniques used in this study include (1) interview, interviews were conducted to dig up descriptive data about the current system and the needs of the system to be developed. (2) observation, observations were made to gather initial data for the preparation of this study. (3) questionnaire, questionnaires are used to collect data on the evaluation of the resulting prototype products.

Analysis of functional suitability aspect data, the test results from the checklist are then analyzed with a formula to determine the feasibility of the system developed on the functional suitability aspect. Whether or not the functions on the match list pass is the determining factor in testing this aspect of functional suitability. Testing on the reliability aspect is carried out using the stress testing method which is carried out with the help of software called Web Application Load, Stress and Performance Testing (WAPT). The results of reliability testing using WAPT are the number of successful sessions, failed sessions, successful pages, failed pages, successful hits, failed hits. The results of the USE questionnaire are then analyzed with a formula to determine the feasibility of the system developed on the usability aspect.

RESULTS

The analysis phase was carried out on the results obtained from observations and interviews with the management of PT. Wasis by Nugraha. Based on the results of observations and interviews conducted, it can be seen that the big picture of the system running at PT. Wasis by Nugraha. From the results of interviews and observations, it can be seen that the system that is still being implemented at PT. Wasis Karya Nugraha still uses a conventional system. The activities carried out include warehouse administration, purchasing transactions, production transactions, sales transactions and financial transactions still using a manual system by writing in an excel file. According to the analysis and based on experience while doing PPL at PT. Wasis Karya Nugraha, administrative activities carried out starting from the procurement of raw materials to the production process and delivery of finished products to consumers as well as compiling HPP and financial reports takes quite a long time. It is felt less efficient against time. Not to mention the frequent occurrence of human errors such as the goods in the warehouse, especially the spare parts whose types reach thousands, are not placed on shelves that are easy to find these items. This will disrupt the process when maintaining heavy equipment that requires fast handling so that the production process is not disrupted.

The task of the admin for each department is to make a recapitulation report for each transaction in accordance with their respective parts which is carried out once a month. The report is made by the admin still manually. In addition, the admin has not been able to present a report on the Cost of Production for each product, both Work In Process and Finish Good because of data constraints that are still separated between departments or sections. Likewise, the preparation of financial reports from the administration has not been able to present them due to data constraints that are still separate and manual. From these conditions it can be seen that there is a need for a system that helps management to manage data in an integrated and efficient manner.

DISCUSSION

Functional Suitability Aspects of Asphalt Mixing Plant Industry Information System Design

Based on the results of the calculations that have been carried out, the percentage of eligibility for the functional suitability aspect is 100%. Based on the Likert scale, the results of testing the functional suitability aspect of the Asphalt Mixing Plant Industrial Information System Design at PT. Wasis Karya Nugraha received the "Very Good" category. From these results Design and Build Information Systems for the Asphalt Mixing Plant Industry at PT. Wasis Karya Nugraha has fulfilled the functional suitability aspect. The aspect of functional suitability is the extent to which a product or system meets requirements when used under certain conditions. Functional Suitability is also called the characteristics of suitability in carrying out the functions that exist in the software whether it is in accordance with user needs (Ariyani, Sudarma, & Wicaksana, 2021). Testing the functional suitability aspect was carried out with 4 experts and obtained a success percentage of 100% in the very good category. Seeing this, we can analyze the design and construction of the asphalt mixing plant industrial information system compiled at PT. Wasis Karya Nugraha can function as expected.

Functional Usability Aspects of Asphalt Mixing Plant Industry Information System Design

Usability is a characteristic that measures the extent to which a system can be used by certain users to achieve certain goals with effectiveness, efficiency and satisfaction in certain usage contexts (Puspaningrum, Rochimah, & Akbar, 2017). Usability can be measured by five criteria, namely learnability, efficiency, memorability, errors, and satisfaction. Learnability measures how easy it is to perform simple tasks when you first encounter a design (Adiartika & Astuti, 2020). Based on the results of the usability test and the calculations that have been carried out, the usability aspect feasibility percentage obtained a result of 90.6%. These results are then converted into a Likert scale qualitative value of five to obtain the title "Very Eligible". From these results, the Asphalt Mixing Plant Industry Information System Design at PT. Wasis Karya Nugraha has fulfilled the usability aspect.

Efficiency measures the speed with which a particular task can be performed after studying the design. In the assessment in the aspect of easy to remember (memorability) is defined how the user's ability to retain knowledge after a certain period of time, the ability to remember is obtained from placing menus that are always fixed. In the error and safety assessment item (errors) it is defined how many errors the user makes, the errors made by the user include the discrepancy between what the user thinks and what is actually presented by the system. Finally, on the aspect of satisfaction (satisfaction) is defined freedom from discomfort, and a positive attitude towards the use of products or subjective measures as users feel about using the system (Alzahrani, Gay, & Alturki, 2022).

The questionnaire used to measure usability in this study is the USE model which includes several aspects of usability measurement, namely efficiency, effectiveness and satisfaction. Several studies that have been conducted show that most product evaluations refer to three dimensions. The results of several observations also show a correlation and mutual influence between the parameters of ease of use and usefulness (Rizal, Widodo, Adi, Riyanto, & Nurhayati, 2020). The usefulness factor is usually less important if the system is an internal system where users are mandatory. The questionnaire was made in the form of a five-point score with a Likert scale model, to measure the user's level of agreement with the statement of measurement results and then processed using descriptive statistical methods and an analysis was carried out either for each parameter or for all parameters. Use is a non-commercial

questionnaire package that can be used for system usability research. According to Jacob Nielsen, usability is a quality attribute that describes or measures how easy it is to use an interface. The word "usability" also refers to a method of increasing ease of use during the design process. Usability is measured by five criteria, namely: learnability, efficiency, memorability, errors, and satisfaction (Sriyeni, Ilham, & Veronica, 2017).

CONCLUSION

Based on the results of research and discussion regarding the Design and Build of Industrial Information Systems Asphalt Mixing Plant at PT. Wasis Karya Nugraha, it can be concluded as follow (1) design of Asphalt Mixing Plant Industry Information System at PT. Wasis Karya Nugraha was developed using the prototype development method and Visual Basic tools to address the management problems of the Asphalt Mixing Plant Industry at PT. Wasis Karya Nugraha which still uses conventional methods. The information system has features including: 1) managing goods data; 2) Manage users; 3) Manage Journal transactions; 4) Manage finances; 5) Managing the Warehouse; 6) Manage Purchasing; 7) Manage Production; 8) Manage Sales; 9) Managing the Operational Budget Plan; 10) Managing Financial Reports; 11) Manage Recapitulation Report per Transaction; (2) Design of Asphalt Mixing Plant Industry Information System at PT. Wasis Karya Nugraha has met standards in the aspects of functional suitability, usability and portability. The results of testing the information system are as follows 1) Testing the functional suitability aspect was carried out with 4 experts and obtained a success percentage of 100% in the very good category; 2) Testing the usability aspect was carried out with 25 respondents using Arnold M. Lund's USE Questionnaire and obtaining a feasibility percentage of 90.6% with the title "Very Eligible";

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