Classification of Information Systems Based on Their Uses in Various Industrial Fields

Dewi Lestari

Department of Industrial Engineering, Faculty of Engineering, Andalas University

Padang, West Sumatra, Indonesia.

Abstract—**Information systems are an inseparable part of the industrial sector because the industrial sector itself cannot be separated from functional organizations and systems. To achieve every goal in the industrial process requires the cooperation of every component that is related to each other. An important entity forming an information system is the relationship between data and information, where information is data that has been processed into a form that is meaningful to the recipient and useful in current or future retrieval. Information systems can be classified into various types and all of them can be utilized or applied in the industrial sector. Classification of information systems based on their usefulness are Transaction Processing Systems (TPS), Management Information Systems (MIS), Decision Support Systems (DSS), Expert Systems and Artificial Intelligence (ES & AI). The application of information systems in the industrial sector can be intended as a decision-making tool, a data processing tool, calculating and determining various past, present and future possibilities in a process.**

Key words— **Decision, Information System, Management.**

I. INTRODUCTION

THE company is a system consisting of several departments that act as subsystems that make up a company. The system itself can be defined as a set of subsystems, components or elements that work together with the same goal to produce a predetermined output [1]. Meanwhile, according to Muslihudin (2016), the system is a collection of components or a network of procedures that are interrelated and work together to form a network to achieve certain goals or objectives. The elements that represent a system in general are input, processing, and output, each of which will provide information. Information is data that is processed into a form that is useful for making decisions. The information is the result of processing data or facts collected by certain methods or ways [2].

An information system can be defined as a tool for presenting information in such a way that it is useful to the recipient [2]. Information systems can be used for decision making in planning, initiating, organizing, controlling and presenting organizational synergies in the process.

Information systems process various kinds of data and usually information systems are divided into several types of applications. Classification of information systems based on their uses, which are as follows:

1. Transaction Processing Systems (TPS)
2. Management Information Systems (MIS)
3. Decision Support Systems (DSS)
4. Expert Systems and Artificial Intelligence (ES & AI)

Each classification (type) of the information system above will be discussed in this literature study (journal review).

II. LITERATURE REVIEW

Classification of information systems based on their uses are utilized in various industrial sector as following.

A. Transaction Processing Systems (TPS)

Transaction Processing Systems are computerized information systems developed to process large amounts of data for routine business transactions. One of the things that is usually done in this system is to automate the handling of business activity data and transactions. One example of the application of this system in the industrial sector is the case study written by Zhafira et al., entitled "An Application of Genetic Algorithm in Determining Salesmen's Routes: A Case Study".

This case study discusses the determination of vehicles' routes. The case is taken from a pharmaceutical products distribution problem faced by a distribution company located in the city of Padang, Indonesia. This case study is intended to find a useful solution that can reduce the total distribution time required by the salesmen of the company. Since the company uses more than one salesman, then the problem is modelled as a multi traveling salesman problem (m-TSP). The problem is solved by employing genetic algorithm (GA) and a Matlab based computer program is developed to run the algorithm. It is found that, by employing two salesmen only, the routes produced by GA results in a 30% savings in total distribution time compared to the current routes used by the company. This case study determines distances based on the latitude and longitude of the locations visited by the salesmen. Therefore, the distances calculated in this case study are approximations.

B. *Management Information Systems (MIS)*

Management Information System is an information system at the management level that functions to assist planning, control, and decision making by providing routine resumes and certain reports. Management Information Systems take raw data and turn it into more meaningful and needed managers to carry out their responsibilities. One example of a Management Information System is as contained in a research article entitled "Pengembangan Algoritma Manajemen Risiko Proyek Konstruksi" written by Mutiara Yetrina. In this research article, work activity data, realization plan cost data, plan and realization cost weighting data are processed into waste weighting and then Risk Event determination of each waste with the highest weight.

This study discusses the development of project performance evaluation algorithms and risk management in the civil construction project of the Indarung VI Project. Some of the risks that may occur in the project include the arrival of goods or the completion of work late from the time set, design changes due to obstacles in the field, as well as other risks. It is therefore necessary to study the project risks to identify potential problems that may occur and make decisions to reduce risks and increase the likelihood of success of the project. In order for risk management to be performed, the owner must know the steps in evaluating the project and the steps in the implementation of risk management. This study discusses the development of algorithms for project evaluation and risk management. The resulting algorithm is then implemented to the CC-II civil construction project at Indarung VI Project. The results of the implementation show that the project is not running in accordance with the plan. The dominant factors causing delays include BOQ miscalculation by consultants, inadequate and slow decision-making mechanisms, and details of workmanship changes.

Another example of a Management Information System is as contained in a research article entitled "Designing Persuasive Application to Promote Public Transportation Use" written by Yogasara and Naomi. In designing a persuasive application that can shape user's behavior in using public transportation, aspects that must be designed are the display interface and persuasive content of the application. Therefore, the interaction design method was employed in this study. According to Preece et al., interaction design is the design of interactive products that support humans in communicating and interacting in their everyday life.

The interaction design consists of four basic activities as design stages, namely establishing requirements, designing alternatives, prototyping, and evaluating. In this research, the design stages were divided into five processes, i.e. identification of user needs, concept generation, concept selection and refinement, prototyping, and evaluation. The stages carried out in this research are; 1. Identification of User Needs, 2. Concept Generation, 3. Concept Selection and Refinement, 4. Prototyping, 5. Evaluation (Performance / Quantitative Analysis and Persuasive Quality / Qualitative Analysis).

This research aims at designing a persuasive application to encourage people to use public transportation more often. The steps of interaction design were employed. First, user needs were identified using interviews, resulting in 48 interpreted needs which were then grouped into nine primary needs. Secondly, design workshop involving users and designers was conducted to produce three concept alternatives. In the next stage, the best concept was selected using the concept scoring method, and was subsequently refined through the SCAMPER method. A high-fidelity prototype was developed based on the final concept. Lastly, the evaluation process of the application prototype named ecoGlide consists of two major parts, i.e. the evaluation on performance and persuasive qualities.

The performance evaluation was conducted through Usability Testing using five criteria. The persuasive quality was evaluated using qualitative method through a coding scheme. The result shows that the Emotion and Persuasion categories were most closely related to the application use. The most influential sub-category of the persuasion aspect is Reward Driven, which ranks 4th out of 14 sub-categories. Overall, the ecoGlide application was considered to have good usability and persuasive ability.

C. *Decision Support Systems (DSS)*

Decision Support Systems are information systems at the management level of an organization that combine data and sophisticated analytical models or data analysis tools for semi-structured and unstructured retrieval. DSS is designed to assist organizational decision making. The case study written by Hisjam et al., entitled "A Decision Support System to Achieve Self-Sufficiency of Soybean: A Case from Central Java Province, Indonesia" is one example of the application of DSS in the industrial sector.

From this case study, it is known that soybean self-sufficiency in Central Java Province is a problem that is difficult to realize at this time. As an important commodity, self-sufficiency becomes a serious concern for the government. Supply chain management of soybean is related to the integration of supply, demand, and distribution of soybean. The characteristics of entities involved in the soybean supply chain are complex, dynamic, and probabilistic that make the problem cannot be solved using an analytical model and it becomes too risky for trial and error. A suitable tool is using a simulation model. This case study discusses the development of a Decision Support System (DSS) using a simulation model that will assist the government in adopting policies in order to achieve self-sufficiency of soybean and the improvement of farmer's welfare. The decision-making process is a cognitive process that results in the selection of a series of actions involving several alternative Scenarios. DSS will help decision-makers to try various scenarios of policy in an easy way.

Every decision-making process will produce the final choice based on the best performance indicator results. Management information system (MIS) that supports a business or organizational decision assessment requires simulations based on DSS. The simulation model is a tool to simulate a system to understand the decision process and/or understand the learning

process. The advantage of the simulation as part of the decision support system is that problems in real systems will be easily defined in the causal loop diagram with easy to analyze both quantitative and qualitative in computer programs. Simulation has advantages that include the ability to model complex systems effectively and efficiently to obtain realistic assessments that consider the uncertainties and dynamics inherent in the system. Software assistance is required to perform a simulation of a model. The modeling software can see the behavior of the model in a fast time.

In this case study the method was started with developing model components, then decision components and next creating user interfaces. The simulation and system modeling created by using Powersim software with the intent to obtain the simulation and single document interface (SDI) of the supply chain model. The result shows that land expansion policy is a top priority for realizing food self-sufficiency while increasing productivity and reducing costs of agricultural activities are the main priorities for improving the welfare of farmers.

A decision support system is an interactive computer-based System or subsystem and suitable computer-based technology to help improve the effectiveness of decision makers to use the data, technology of communication, document knowledge and/or models so that the decision maker can identify, solve the problem, and make a complete the decision process task.

D. Expert Systems and Artificial Intelligence (ES & AI)

Expert System is a knowledge representation that describes how an expert detects a problem. Expert systems are more centered on how to code and manipulate knowledge from information. The research article by Yogasara and Stefiany entitled "Aplikasi Terapi Wicara bagi Remaja Penyandang Disabilitas Intelektual Ringan" is an example of an Expert System. In this research article, an application system is designed that can represent the knowledge of expert doctors in the field of Physical Medicine and Rehabilitation (KFR in Bahasa).

Based on this research article, many people in Indonesia have speech disorders. Speech disorders are also experienced by people with intellectual disabilities, who need speech therapy to practice their expressive speech skills. However, the current types of speech therapy, in general, are not easily accessible and require considerable cost. Based on the existing problems, in this research article a mobile application is designed for speech therapy aids for adolescents with mild intellectual disabilities with expressive speech disorders. Therefore, a speech therapy tool that can be accessed easily and requires low cost.

This research designs a mobile application as a speech therapy tool for teenagers with mild intellectual disability. This study uses four stages in interaction design based on Preece et al., namely (1) identifying user needs that need to be accommodated by the application, (2) designing alternative concepts, (3) building prototypes, and (4) evaluating designs. The design process began with the identification of user needs, followed by the design of application concepts using a design workshop. The best concept was developed into a prototype, which was then evaluated through a usability testing, using

effectiveness, efficiency, learnability, memorability, and accessibility as the evaluation criteria.

The results show that the application has a good level of accessibility. Evaluation was also conducted using the System Usability Scale (SUS) questionnaire, which was in an acceptable manner. In addition, interviews were conducted to identify remaining flaws that were subsequently used as a basis for design improvement of the application.

III. Discussion

Information systems are an inseparable part of the industrial sector. This is because the industrial sector itself cannot be separated from functional organizations and systems. To achieve every goal in the industrial process requires the cooperation of every component that is related to each other. Meanwhile, the data that becomes input, processed data and output from a production process is a form of information, whether structured or unstructured. Hence, it can be said that information systems are one of the important aspects in the industrial sector.

The various types of information systems can be applied and used to support the ongoing process in the industrial sector. Information systems are widely used as a tool or decision support tool used by the person in charge of the process in various industrial fields.

IV. Conclusion

The linkage between data and information as forming system makes a system called an information system. An important entity forming an information system is the relationship between data and information. Information systems can be classified into various types and can be utilized or applied in the industrial sector. The application of information systems in the industrial sector can be intended as a decision-making tool, a data processing tool, calculating and determining various past, present and future possibilities in a process.

References

[1] S. Mulyani, *Metode Analisis dan Perancangan Sistem,* 2nd ed. Bandung, Indonesia: Abdi Sistematika, 2016, pp. 1–18.

[2] M. Muslihudin and Oktafianto, *Analisis dan Perancangan Sistem Informasi Menggunakan Model Terstruktur dan UML.* Yogayakarta, Indonesia: CV. Andi Offset, 2016, pp. 1–16.

[3] N. Zhafira, F. Afrinaldi, and Taufik, "An Application of Genetic Algorithm in Determining Salesmen's Routes: A Case Study," *Jurnal Optimasi Sistem Industri*, vol. 17, no. 1, pp. 26–34, 2018. DOI: 10.25077/josi.v17.n1.p26-34.2018.

[4] M. Yetrina, "Pengembangan Algoritma Manajemen Risiko Proyek Konstruksi," *Jurnal Optimasi Sistem Industri*, vol. 17, no. 1, pp. 101–112, 2018. DOI: 10.25077/josi.v17.n1.p101-112.2018.

[5] T. Yogasara, V. E. C. Naomi, "Designing Persuasive Application to Promote Public Transportation Use," *Jurnal Optimasi Sistem Industri*, vol. 20, no. 1, pp. 22–32, 2021. DOI: 10.25077/josi.v20.n1.p22-32.2021.

[6] M. Hisjam et al., "A Decision Support System to Achieve Self-Sufficiency of Soybean: A Case from Central Java Province, Indonesia," *Jurnal Optimasi Sistem Industri*, vol. 19, no. 2, pp. 144–156, 2020. DOI: 10.25077/josi.v19.n2.p144-156.2020.

[7] T. Yogasara, C. Stefiany, "Aplikasi Terapi Wicara bagi Remaja Penyandang Disabilitas Intelektual Ringan," *Jurnal Optimasi Sistem*

Dewi Lestari was born in Padang Sibusuk, Kecamatan Kupitan, Kabupaten Sijunjung, Sumatera Barat, Indonesia in 2000. She is an undergraduate student in the Department of Industrial Engineering, Faculty of Engineering, Andalas University. Dewi has studied and graduated from SMA Negeri 1 Sijunjung, MTsN Padang Sibusuk, and SD Negeri 11 Padang Sibusuk. Currently Dewi is focusing on studying for her bachelor's degree.