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Design and Implementation of Integrated Software Research and Community Service at State Polytechnic of Manado

T Saroinsong¹, M A.S Kondo², G Kandiyoh³ and G Pontoh⁴

¹ Mechanical Engineering, State Polytechnic of Manado, Indonesia

^{2,4} Information Engineering, State Polytechnic of Manado, Indonesia

³ Civil Engineering, State Polytechnic of Manado, Indonesia

E-mail: tinekesaroinsong@gmail.com

Abstract. The State Polytechnic of Manado (Polimdo) is one of the reliable institutions in North Sulawesi that first implemented ISO 9001. But the accreditation of the institution has not been satisfactory, it means there is still much to be prepared to achieve the expected target. One of the criteria of assessment of institutional accreditation is related to research activities and social work in accordance with the standard seven. Data documentation systems related to research activities and social work are not well integrated and well documented in all existing work units. This causes the process of gathering information related to the activities and the results of research and social work in order to support the accreditation activities of the institution is still not efficient. This study aims to build an integrated software in all work units in Polimdo to obtain documentation and data synchronization in support of activities or reporting of documents accreditation institution in accordance with standard seven specifically in terms of submission of research proposal and dedication. The software will be developed using RUP method with analysis using data flow diagram and ERM so that the result of this research is documentation and synchronization of data and information of research activity and community service which can be used in preparing documents report for accreditation institution.

1. Introduction

Research is one of the main tasks of universities that contribute and benefit to the learning process, the development of science, technology, and art, as well as improving the quality of community life. Universities must have a system of management planning and implementation of research programs that become excellent. This management system includes access and procurement of research resources and services for stakeholders, has a roadmap, conducts research and manages and improves the quality of the results in order to realize the vision, carry out the mission, and achieve the goals the college aspires to. (Book 2. Standard and Procedure of BAN- PT) .Ward and Bond (2006) state that for supporting the business strategy of a corporation requires an information system strategy[1]. Utilization of Information Technology and Communication (ICT) in the field of administrative services academic in college into a needs, not just prestige or lifestyle management of modern higher education[2]. This research is one part of the research that will be developed for accreditation of BAN - PT in Polimdo (grand design). The information system will be built to document all data related to research activities and social work that has been implemented for the past three years, as part of the related unit evaluation component. The standard accreditation used BAN - PT still refers to the seven standards associated with the process of organizing a college. Based on the accreditation standard it is



possible to develop or build an integrated information system in all work units. The current system has not been well documented and is still fragmented (not yet processed on a single data repository). Whereas polytechnics have facilities that are very possible to perform data integration, but not yet well utilized. This causes not efficient to get the data and information needed because the length of time searching data / information required. Moreover, the Polindo is the first campus in North Sulawesi that implements ISO 9001, which means that the management has been referring to the prevailing standard, so the purpose of this research is to produce an integrated software models and can document the results of research and community service in Polindo.

2. Research Methodology

Data collection is one of the important stages in system development. Data collection is done to obtain the information needed in order to achieve the purpose of system development. The information we want to know determines what techniques are used in collecting data. Development of Information System is collected from various data implementation of research and community service that starts from the proposal submission process, the implementation of activities until the evaluation of the implementation results. The collected data is managed and processed by means and methods so as to produce the necessary information in developing the software. The data obtained include proposal format and final report. Reliable data is the result of studying documentation and interviews with potential users of the system.

The utilized method for system development is the method of rational unified process (RUP). The system development of RUP follows iteratively (repeating) process and incremental (gradual with progress upward) process [3]. RUP process has realized as above fundamental principle-based the best practice, whose life cycle has been to be that the basis designs that with iteration develop at the same time. The RUP life cycle is had four development stage if pursuing what 1 shows , every stage is by what once or many times iteration step is composed of , every iterative process is defined a mini waterfall model , is exported a executable edition[4]. It has four phases as follows that is conducted in sequential and iterative process where each iteration can be used to improve the next iteration.

1. Inception (preliminary) is the stage to model the required business processes and to define the need for the system to be proposed. At this stage the preparation of business cases and scope of the system. Through interviews and studying related documents, it is gained an understanding that who can use the system and what benefits will be gained in the presence of this system. the needs of the user becomes very important as a consideration to continue the development of the system. Beath [5] emphasized the importance of management control on software project implementation. She argued that, for fairly simple projects, project managers need to establish an outcome-oriented governance structure between the project team and users

2. Elaboration (extension/planning) is the stage which is more focused on the planning of system architecture. The stage can also be made to determine whether the desired system architecture can be made or not. This stage emphasis the analysis of the system design and implementation. Also, the expected results of this phase is to full fill the Lifecycle Architecture Milestone (boundary/ architectural milestones of the cycle). Flexibility is of benefit in a system which is required to operate in an environment which undergoes change. Not all systems are required to be flexible. However, in general, flexibility and the reduction of the cost of providing flexibility are often considered to be of benefit [6]. The team estimates resources, costs, and schedules as a framework reference. at this stage, the team decides whether the project will proceed or not.

3. Construction is the stage which is more focused on the component development of system or system features. Several iterations have been done that are design analysis, implementation, and testing. this stage takes a long time is 6 months from 8 months of planned work time.

4. Transition is the stage is to elaborate the system design by the deployment or system installation in order to be users friendly. Activities at this stage includes in user training, maintenance and testing of the system according to meet the user expectations.

3. Results Of Analysis Components And Discussion

March and Smith (1995) identify two processes and four products of design science. The two processes are *build* and *evaluate*. The products are constructs, models, methods, and instantiations [7].

Data Flow Diagram (DFD). DFD is designed for the analysis purposes and structured to make it easier to understand the system and sub-system virtually as a series of interrelated data flow. The data flow diagram for system analysis is shown in Figure 1 :

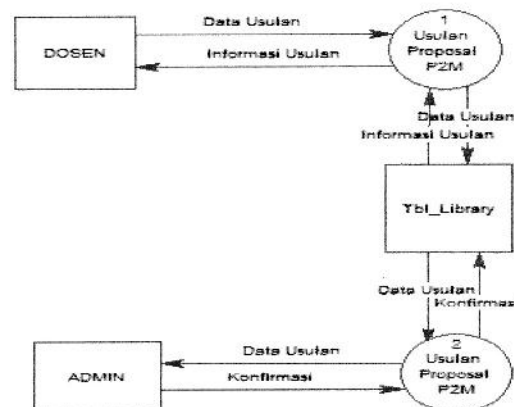


Figure 1. Data flow diagram

The picture above illustrates the application management process in Polimdo. The lecturer can make a proposal online and admin will confirm whether the proposal is complete.

Entity Relationship Models. The logical view of data has been an important issue in recent years. Three major data models have been proposed: the network model ; the relational model ; and the entity set model . These models have their own strengths and weaknesses. The relational model is based on relational theory and can achieve a high degree of data independence, but it may lose some important semantic information about the real world The entity set model, which is based on set theory, also achieves a high degree of data independence. The entity-relationship model can be used as a basis for a unified view of data [8]. The extended entity-relationship model is mainly used as a language for conceptualization of the structure of an information systems applications. Conceptualization of database or information systems aims in a representation of the logical and physical structure of an information system in a given database management system (or for a database paradigm), so that it contains all the information required by the user and required for the efficient behavior of the whole information system for all users [9]. Relations between tables in software research and community service can be described as in the figure 2.

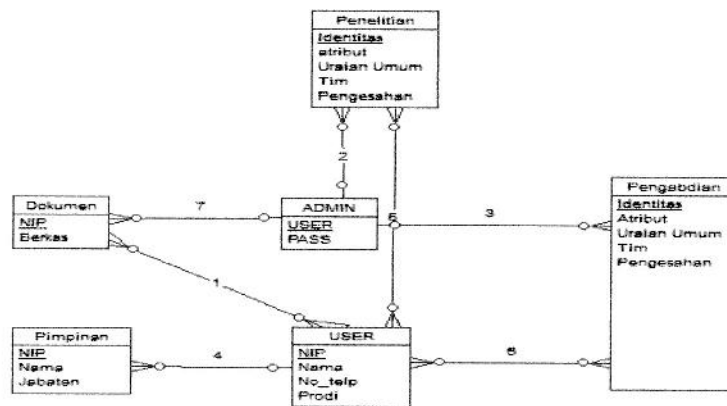


Figure 2. Entity Relationship Diagram

The above picture describes the database system of the software including data structures and relationships between data.

Design of Interface. An interface should be designed with a good visual display and ergonomics . In this case, the interface was developed based on the analysis that has been done on several previous description. Figure 3 as follows presents the developed user interface design of applications. It can be seen in this figure that the provided menu information are: Home, research, activities, messages , profiles and manuals.

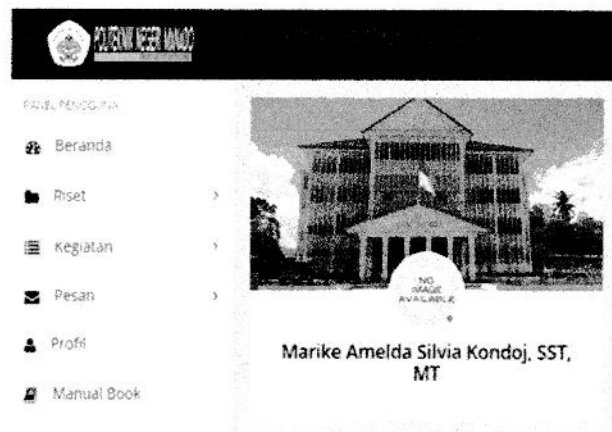


Figure 3. Initial design of interface

The system is tested with black box and respondents tests. Software testing identifies defects, flaws or errors in the application code that must be fixed. We can also define software testing as a process of accessing the functionality and correctness of a software through analysis. The main purpose of testing can be quality assurance, reliability estimation, validation and verification. Software testing is a fundamental component of software quality assurance and represents a review of specification, design and coding. The main objective of software testing is to affirm the quality of software system by systematically testing the software in carefully controlled circumstances, another objective is to identify the completeness and correctness of the software, and finally it uncovers undiscovered errors [10]. Black Box Testing Technique: It is a technique of testing without having any knowledge of the internal working of the application. It only examines

the fundamental aspects of the system and has no or little relevance with the internal logical structure of the system [11]. The testing results are presented as follows. The black box testing is presented in Table 1. Meanwhile, the respondents test result is shown in Figure 4. In this case, the collection of data through questionnaires is carried out by providing a set of written questions to be answered by the 30 respondents where 21 are researchers and 9 are students of informatics study program semester 8 in polytechnic state of Manado. The questionnaire type is a closed questionnaire about application functionality where the answers are already provided, so that respondents can just choose and answer directly based on the results of trials conducted by each respondent based on the application instructions for use. With Likert scale of quality measures, there are three choices of possible answer, i.e very easy, easy, easy enough and is not easy for Implementation of Integrated Software Research And community service in Polimdo.

Table 1. Black Box Testing

No	Process design	Expected results	Results	Additional information
1	Administrator and lecturer login	Administrators and lecturer may do logging according to their user name and password	Working properly	If the input is correct
2	Form input Proses	Saving data	Working	Saving data
3	Data process	Administrator may conduct data process	Working properly	none

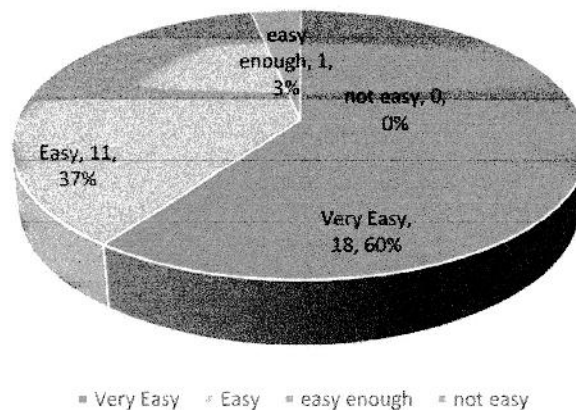


Figure 4. Results of respondent test

In the implementation of the system, testing has been implemented based on several processes namely evaluation, analysis, planning and testing, verification and validation of results. The evaluation stage is carried out by collecting main data and supporting data on the related units in Polimdo. The analysis is done by logging into the system either as admin or lecturer, doing management, data entry, and print data. Testing is done to prevent errors in the system. Testing functionality to system functions. From the implementation of the system conducted then the system can work well in accordance with the expected. This system will be very useful for the management in terms of ease of searching data

- [10] Khan ME, Khan F. A comparative study of white box, black box and grey box testing techniques. *International Journal of Advanced Computer Sciences and Applications*. 2012 Jun;3(6):12-.
- [11] Khan ME. Different forms of software testing techniques for finding errors. *International journal of computer science issues*. 2010 May;7(3):11-6.
- [12]. Polkinghorne DE. Language and meaning: Data collection in qualitative research. *Journal of counseling psychology*. 2005 Apr;52(2):137.
- [13]. Dasar BK. A. Metode Penelitian.
- [14]. Jiang JJ, Klein G, Hwang HG, Huang J, Hung SY. An exploration of the relationship between software development process maturity and project performance. *Information & Management*. 2004 Jan 31;41(3):279-88.

and information research activities and devotion, and facilitate for the lecturers to conduct proposal and reporting. This system is also used for routine data processing done in the Research Center and social work from the proposal submission process to the reporting stage, as well as providing smooth communication between units that require data and research information and devotion in the process of accreditation of the study program or institution.

The purpose of data gathering in qualitative research is to provide evidence for the experience it is investigating. The evidence is in the form of accounts people have given of the experience. The researcher analyzes the evidence to produce a core description of the experience. The data serve as the ground on which the findings are based [12]. The data source is the subject from which data can be obtained. Primary data is direct data originating from source information through direct observation, discussion, direct interviews with respondents and related parties using the list question (questionnaire)[13]. In this study the primary data were obtained from respondents through questionnaires. The test results of respondents currently are accepted that the application easier to use and is also expected when the application is used then the conditions and characteristics similar to the results of the research will have an impact on the system's ease of use. Project performance is viewed differently by each of the stakeholders in the system development effort. It is desirable to incorporate a breadth of success aspects when considering project performance. As such, project performance includes software engineering issues of efficiency and effectiveness, as well as organizational issues of control, communication, and organizational knowledge [14].

4. Conclusion

The proposed integrated software model is developed in accordance with processes in a Polimdo. Based on the analysis and implementation of the system performed, it can be concluded that the developed software can documentation the results research and community service so it is very easy for lecturers in the submission of proposals and reporting, in addition to the existence of this system then there is cost savings and working time and facilitate the search of research information and social work to the library.

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6. References:

- [1]. Ward J, Taylor P, Bond P. Evaluation and realisation of IS/IT benefits: an empirical study of current practice. *European Journal of Information Systems*. 1996 Feb 1;4(4):214-25.
- [2]. Indrayani E. Pengelolaan sistem informasi akademik perguruan tinggi berbasis Teknologi Informasi Dan Komunikasi (TIK). *Jurnal Penelitian Pendidikan*. 2011 Apr;12(1):1.
- [3]. Kondo MA, Langi HS, Kasenda SR. Model Productivity in UKM Coconut Oil based on Information Technology in North Sulawesi. *International Journal of Computer Applications*. 2016 Dec;156(9).
- [4]. Chen Q. Compare and study about owing to the three kinds important softwares develop process. In *Proceeding of the International Conference on Education Technology and Economic Management (ICETEM) 2015 Mar 14* (pp. 450-451).
- [5]. Beath CM. Managing the user relationship in management information systems projects: a transaction governance approach. University of California, Los Angeles; 1986.
- [6]. Barrett, S., Higgins, C., Twomey, C., & Evans, M. (2006). U.S. Patent No. 7,000,219. Washington, DC: U.S. Patent and Trademark Office.
- [7]. Hevner A, Chatterjee S. Design science research in information systems. In *Design research in information systems 2010* (pp. 9-22). Springer US.
- [8]. Chen PP. The Entity Relationship Model—Toward a Unified View of Data. In *Software pioneers 2002* (pp. 311-339). Springer Berlin Heidelberg.
- [9]. Thalheim B. Extended entity-relationship model. In *Encyclopedia of Database Systems 2009* (pp. 1083-1091). Springer US.