THE DEVELOPMENT OF METROLOGY INFORMATION SYSTEM
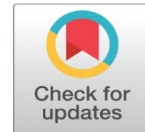
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ABSTRACT

Metrology services are carried out in order to protect the consumers and producers in terms of obtaining fair rights in trade transactions. The Metrology Center as the implementor of metrology still faces obstacles in the implementation of its services, currently the service has only reached 24.7% of the total metrology equipment used. Obstacles that occur in addition to the problem of inadequate facilities and infrastructure are also because the process of capturing metrological data is still done manually using many paper documents. In each service element, there are various kinds of documents that must be filled out manually and in the end these documents will be archived separately. This flow of data and information has not been well documented, although the output data from this process will be processed into metrology information that will be used by management above it in making decisions. Metrology Information System was developed to overcome the obstacles that exist in The Metrology Center, in addition to supporting the performance of The Metrology Center as well for the success of E-Government. The development of a metrological information system uses the System Development Life Cycle (SDLC) method with a Business Process re-engineering approach for metrology services.

Keywords: Metrology, Legal Metrology, Metrology Management System, E-Government

1. INTRODUTION

Law of The Republic Indonesia No. 8 year 1999 about Consumer Protection mandates the government, business actors and consumers to carry out consumer protection efforts based on benefits, justice, balance, security and consumer safety as well as legal certainty. Thus, each party should be able to understand their rights and obligations according to the regulations. One of the important consumer rights is to choose and obtain goods and services in accordance with the exchange rate and the promised conditions. For this reason, precise and correct information and conditions regarding the goods being transacted must be conveyed properly.

One way to confirm that consumers get goods following the exchange rate and good conditions is to make sure that the scales or measurements used by business actors or traders are precise and correct. This guarantee carried out through calibrating and re-calibrating services for measuring instruments and scales by the local government. Thus, consumers can get goods according to the suitable size and the exchange rate paid. The Regional Government, in this case the Department of Industry and Trade, carries out supervision over

the equipment for measuring, dosing and weighing to improve consumer protection and keep up the quality of circulating goods and services.

The measuring instruments and scales used in trade transactions, hereinafter referred to as TMDW (Tools for Measuring, Dosing and Weighing), are used by traders all the time with a high enough frequency that changes are possible in certain parts. This has the potential to cause errors in scales or measurements that will harm consumers and business actors. For this reason, calibration and calculation of TMDW play an important role in consumer protection efforts. From the side of business actors, those who carry out their trade transactions using TMDW are obliged to check or re-calibrate the TMDW through a calibration session. If there are business actors who are not orderly in checking the TMDW used and it is proven already damaged or not according to the dose but is not repaired, the business actor can be subject to sanctions. The accuracy and reliability of TMDW as a measuring instrument for traded goods is required so that each party obtains equal protection. Traders protected from losses due to providing goods in excess of the agreed volume, while consumers are protected from losses due to receiving a quantity of goods that is lower than the volume requested/paid for.

Then, as regulated in Minister of Trade Regulation No. 50 of 2009 concerning Work Units and Legal Metrology Technical Implementation Units, the parties authorized to carry out TMDW testing and the implementation of calibration and recalibration are the provincial and district/city UPT and UPTD. However, UPT and UPTD still face obstacles in the implementation of their services. Calibration and re-calibration services in the regions based on the study only reached 24.7% of the total population of TMDW used. The reasons are, among others, the limited budget for the implementation of calibration and recalculation, the number of calibration resources has decreased by 5% over the last 2 years period, and inadequate facilities and infrastructure.

In addition to the obstacles mentioned above in the calibration and re-calibration service, the process of capturing metrological data is still done manually using many written documents. In each service element, there are various kinds of documents that must be filled out manually and in the end these documents will be archived separately. The flow of data and information has not been well documented even though the output data from this process will be processed into metrological information that will be used by management above it in making decisions. Organizational operational methods that still use this old method will have a negative impact on effectiveness and efficiency in organizational performance. This manual operational transaction process will eventually lead to several problems such as timely reporting, high manual errors, irregular documents, and difficulties in retrieving past data and information.

The development of information and communication technology at this time encourages various aspects of society to develop one of which is E-Government. The development of E-Government is an effort to develop electronic-based governance in order to improve the quality of public services effectively and efficiently. The government has issued a National Policy and Strategy for E-Government Development (E-Government Development Framework) through INPRES No. 3 of 2003 which is the umbrella for all detailed technical policies in the field of E-Government.

The Metrology Information System as the part of E-Government at the Metrological Center is a solution to the obstacles faced by the Metrological Center. The information system is expected to be able to run high-speed and high-volume numerical computations, and be able to store large amounts of information in a small space and can be easily accessed at any time. The benefits of information

systems for organizations are more intangible which can be in the form of increasing productivity, increasing customer satisfaction, reducing paper documents, reducing transaction costs, and improving decision-making processes.

2. MATERIALS AND METHODS

The Development of a Metrological Information System using enterprise information technology architecture is carried out using the System Development Life Cycle (SDLC) research methodology with a prototyping approach. This method is illustrated in the diagram below:
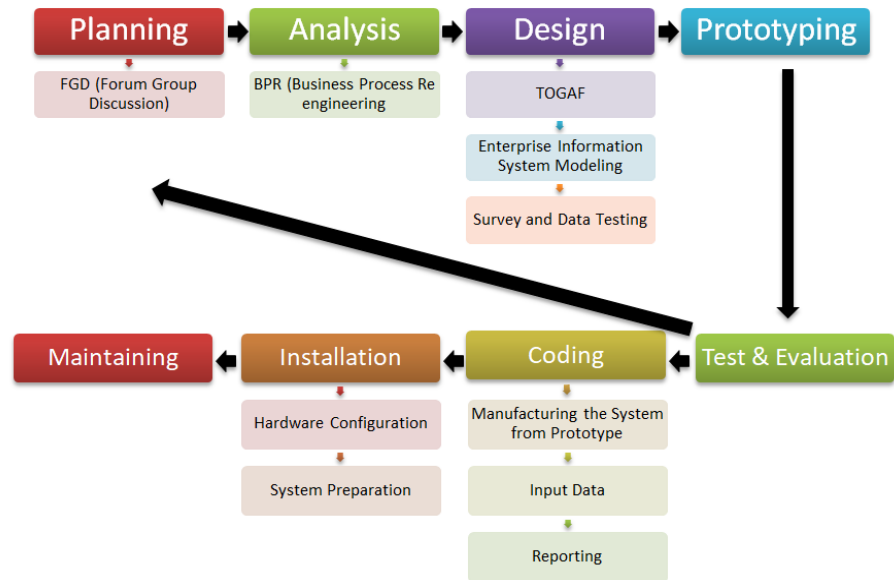

Figure 1 Metrological Information System Development Method

The methodology used is divided into 2 (two) group of stages, namely the stages carried out in the prototyping stage, and the developing stage. The stages in prototyping began with the planning stage, at this stage a Group Discussion Forum (GDF) was held at the Metrological Office of the Ministry of Trade of the Republic of Indonesia, Jakarta. The output of the GDF is documentation of the identification of the need for a metrology information system, appropriate techniques and methods used for the development of a good metrology information system as well as documentation of schedules and work plans.

The second stage in the prototyping is the information system analysis stage, where at this stage the current metrological information systems are being analyzed, the information system analysis is carried out at the Central Metrological Center, Ministry of Trade of the Republic of Indonesia in Jakarta, the Metrological Center Bandung, the Department of Industry and Trade of the City of Bogor and the TMDW Testing Center of the Directorate of Metrology of West Java. The selection of different institutions is based on differences in authority and the existence of integration between related institutions so that information system analysis is carried out using enterprise architecture [Kementerian Perdagangan Republik Indonesia (2013); UNCTAD/WTO. (2004); Pusat Penelitian dan Pengembangan Perdagangan Dalam Negeri (2007); Mutiara et al. (2017); Santoso and Affandi (2016)]. The researcher will make a Business Process Re-Engineering (BPR) to

revise the metrological business process and metrological SOP from the results of the above analysis [Yulianto (2014)].
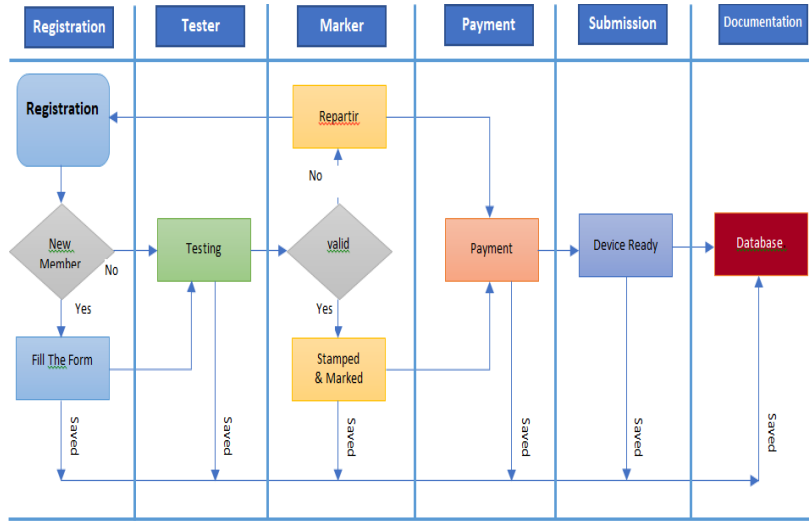

Figure 2 Business Process Re-engineering

The third stage in the prototyping is the information system design stage which consists of several phases. The first phase the researcher uses The Open Group Architecture Framework to design the enterprise architecture of a metrological information system [Mutiara et al. (2017) ; Nakakawa et al. (2013); Gorkhali and Da Xu (2017)]. The next phase, designing a metrological information system using Enterprise Information System Modeling in which the outputs of this phase are database models, input and output models and process models and computer networks of a metrological information system [Romero and Vernadat (2016)]. From the resulting database model, the researchers conducted a data survey to the Karawang Metrology Center, the TMDW Testing Center for the West Java Metrology Directorate, the Bogor Metrology Center, the Cirebon Metrology Center and the Tasikmalaya Metrology Center. The last phase of the information system design stage is the manufacture of a metrological information system prototype carried out
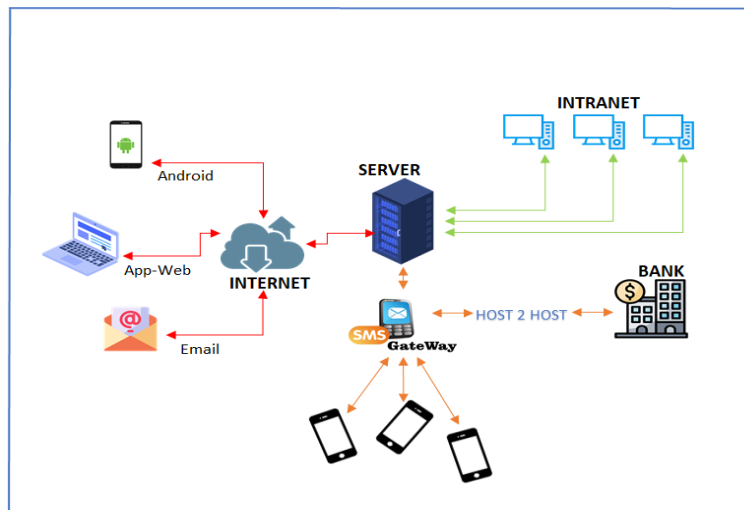

Figure 3 Metrology Information System Architecture Model

The last stage in the prototyping is the internal testing of the metrology information system prototype. The test results will be evaluated using the Software Process Improvement (SPI) and TOGAF methods to compare the results of the prototype trial with the current information system [Unterkalmsteiner et al. (2011); Petri et al. (2015); Carbone et al. (2008)].

In the developing stages, the first stage carried out was a prototype test at the Karawang Metrology Center, the UTTP Testing Center for the West Java Metrology Directorate, the Bogor Metrology Center, the Cirebon Metrology Center and the Tasikmalaya Metrology Center. The trial was carried all the stakeholders and users. The results of the internal trial and user trials will be evaluated in FGDs with the Central Metrology Center in Jakarta. The results of the FGD were analyzed to revise the prototype. The revised prototype will be compiled into a metrological information system. The results of the FGD discussing the comparison of the current metrological information system with the information system developed will be compiled to a full system.

The next stage is the installation of the system to the central metrology center server, followed by inputting data into the metrology information system. There will be training for users at the UTTP Testing Center of the West Java Directorate of Metrology.

3. RESULTS AND DISCUSSIONS

Metrology information system is an internet and mobile-based management information system that can help overcome the problems of metrology centers. The technology used can help speed up the process of metrology services that were previously manual. The users can access the system anywhere and anytime. The services that provided by metrology information system are also getting better with a warning system, where users can be reminded to re-calibrate.

In Metrology Information System uses internet and intranet in its architecture. The internet is used to serve users who cannot make transactions at the metrology center offices, the intranet is used for transaction services at the metrology center office. For payments using host to host with the selected bank, this simplifies and speeds up the payment process. Meanwhile, mobile technology is used to implement a warning system that can inform users of the status of their equipment, as well as remind users to re-calibrate/re-calibrate their equipment.

The application has 2 models, front end and back end. Front End is the application for users, which can be accessed using metrology information system website. The back end is application for admin, in this case the admin is metrology center.

Some previous research has been done related to metrology information system. Yulianto designed a metrological information system that functions for data and information management in the calibration and re-calibration service process at the Metrology Center [Yulianto (2014)]. This study proposes a new business process for calibration and recalculation services by utilizing the proposed information system design. The proposed new business process by utilizing the information system is able to provide results in accordance with the expected improvement targets for data and information management, such as an easier and faster administrative process, where the average administrative time can be reduced to 41.6%, presentation of information metrology more quickly and accurately, making it easier to find past data and information, cutting out activities

that do not provide added value, and being able to make the data and information management process in the calibration and recalculation services more efficient in terms of the use of document resources, HR, and time of completion of work. Research Akbar, Hasan and Ardiesa also designed a web-based metrological information system with mobile features on the Tera Service at the UPTD Metrology Center, Industry and Trade Office of Sumatra Province [Akbar et al. (2015)].
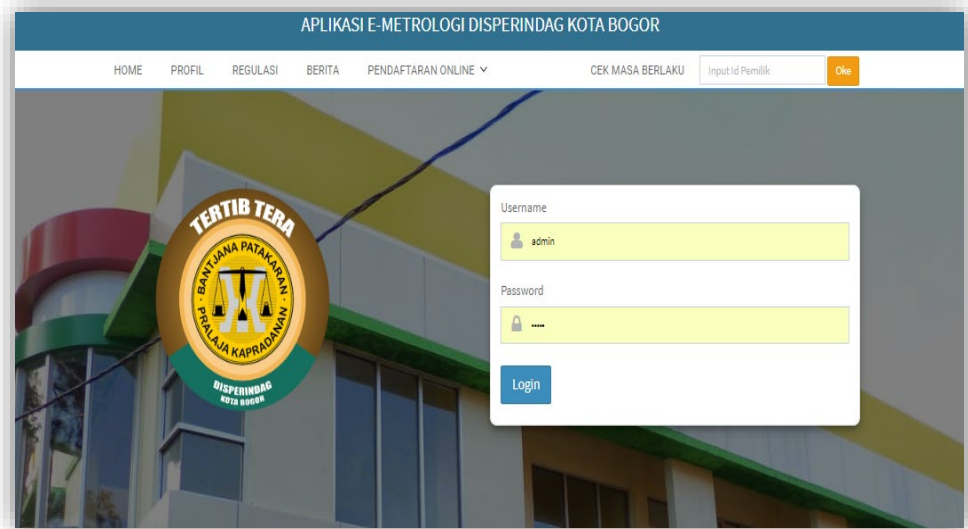
Mutiara, Andreswar and Hanafi made an enterprise architecture blueprint in the form of a description of the current condition of business architecture, information systems and technology and proposed architectural improvements that can be used as a reference in making information system planning strategies to support the continuity of business activities in order to improve performance and support the achievement of strategies business at the Directorate of Metrology as needed based on interviews conducted with the Directorate of Metrology concerned [Mutiara et al. (2017)]. This model adapts the Enterprise Architecture Model at the Medical Device Testing and Calibration Institution made by B. Santoso [Santoso et al. (2016)].

This research uses internet, intranet, host to host and mobile technology. This technology allows services to be accessed more quickly, with high accuracy and valid data. Searching and processing data can be done more easily with a database that is integrated with other metrology centers. The architecture is designed to connect scattered metrology centers into one system. This research makes a major contribution to the government in realizing fair trade and the success of E-Government

4. CONCLUSIONS AND RECOMMENDATIONS

The E-Government Information System at the Metrological Center is a solution to the obstacles faced by the Metrological Center. The information system is expected to be able to run high-speed and high-volume numerical computations, and be able to store large amounts of information in a small space and can be easily accessed at any time. The benefits of information systems for organizations are more intangible which can be in the form of increasing productivity, increasing customer satisfaction, reducing paper documents, reducing transaction costs, and improving decision-making processes [Rodrigues et al. (2016)].

This research produces an enterprise architecture in the form of an overview of the current condition of business architecture, information systems and technology as well as proposed architectural improvements that can be used as a reference in making information system planning strategies to support the continuity of business activities in order to improve performance and support the achievement of business strategies in Directorate of Metrology as needed based on interviews conducted with the Directorate of Metrology concerned.

ACKNOWLEDGEMENTS

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